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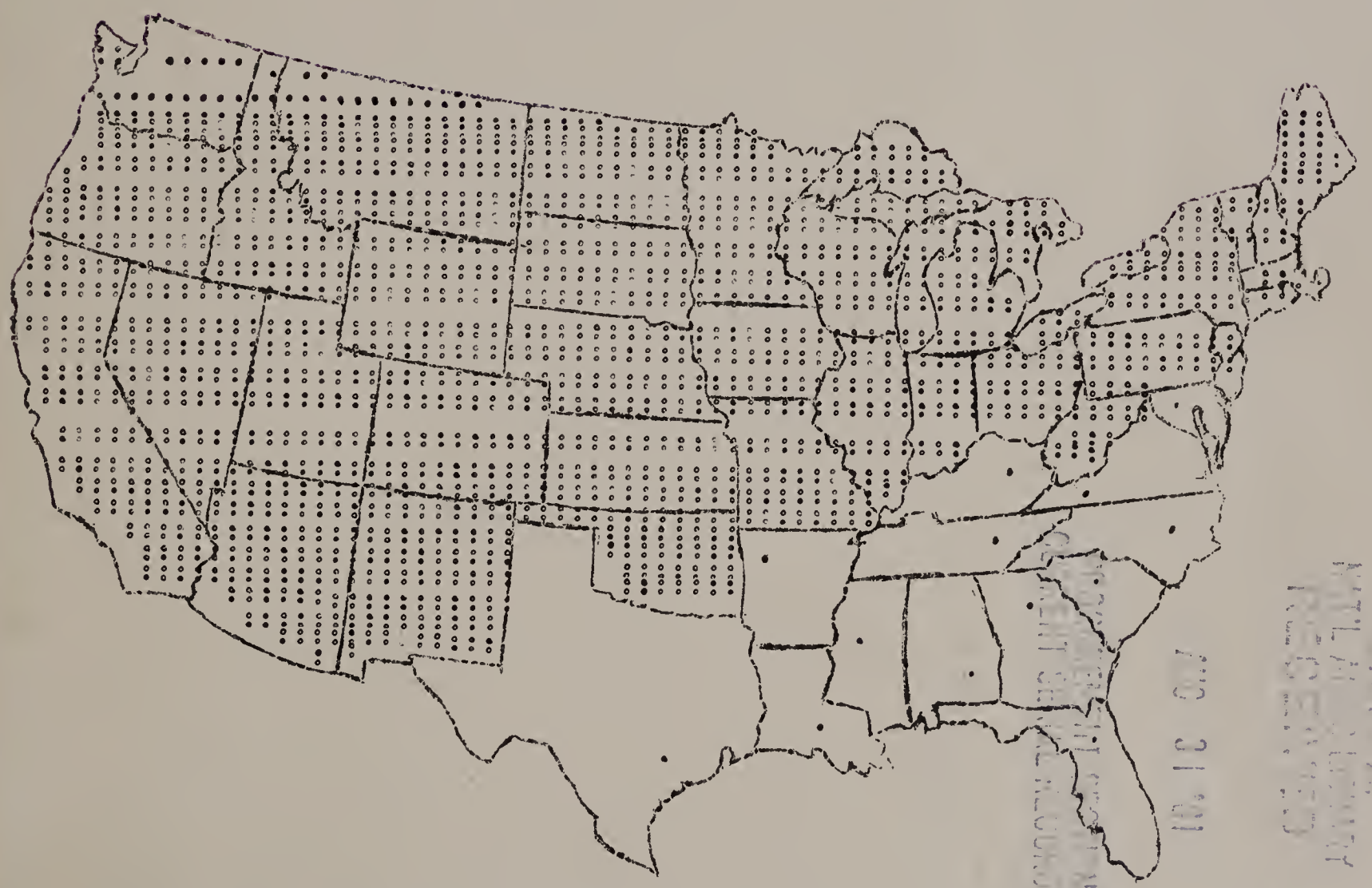
U.S. DEPARTMENT OF AGRICULTURE
AGRICULTURAL RESEARCH SERVICE
ANIMAL AND POULTRY HUSBANDRY RESEARCH BRANCH
AND
COOPERATING SOUTHERN STATES

1956 Annual Report of S-10 IMPROVEMENT OF BEEF CATTLE FOR THE SOUTHERN REGION THROUGH BREEDING METHODS

January 1, 1957



This is a report of project leaders and the Regional Coordinator covering research projects not yet completed. It is intended for the use of administrative leaders and workers in this or related fields of research. The material is not intended for general distribution and should not be quoted in publications.

C O N T E N T S

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INTRODUCTION

This project was initiated in 1948 to investigate and develop methods of breeding more productive beef cattle for the south. Detailed annual reports showing research developments and progress in each state have been prepared each year since 1950. Earlier reports have included material on the overall program and will not be repeated here. A limited number of these earlier reports for each year are available and may be obtained from the Regional Coordinator.

The state reports in this publication were prepared by station project leaders and personnel as summaries of research developments and progress at each station during 1956. The results are not considered as final but the information presented will aid cooperators and the coordinator in developing an integrated program. This material also provides information needed by Animal Husbandry department heads, station directors and U. S. Department of Agriculture officials. These data is not intended for general distribution and should not be quoted in publications.

SCOPE OF PROJECT AND DEVELOPMENTS DURING 1956

As of July 1, 1956, there were 10,014 cattle in experiment station herds contributing to the project. This inventory included 4851 cows of breeding age (2 years old or over), 1166 yearling heifers, 3233 calves (under 1 year of age), 332 bulls and 432 steers. During the year feeding tests for the measurement of individual performance were completed on 831 young bulls, 606 heifers and 326 steers. The number of breeding cows showed a slight increase over 1955 but the number of animals tested for performance increased by 21%. This indicates a shift of emphasis from expansion of breeding herds toward more intensive work with animals raised in the project.

Experimental cattle were maintained at 32 experiment stations and substations in the area. Of these, 29 are state-owned and 3 Federally-owned. The latter three stations at Jeanerette, Louisiana; Brooksville, Florida; and Front Royal, Virginia, are in each case, operated cooperatively with the state in which the station is located.

Mating Systems In The Project

The diversity of the S-10 project with respect to types and kinds of cattle in breeding herds is shown by tabular material in Table 1. This table shows the different kinds of matings in 1955 for 1956 calves and provides a ready reference for those interested in finding information in state reports on specific breeds and/or crosses. The "inter se" matings include ten different breeds or strains. Of these, 2545 head belonged to the British breeds and 478 head to newer breeds or strains derived from crosses among British and Zebu cattle. Each of the 12 states with breeding herds in 1955 had at least one of the British breeds in their program and four stations were testing one or more of the recently derived breeds or strains. Crossbreeding accounted for about 12% of the matings with approximately 1/3 of them among British breeds and 2/3 among British and/or other kinds.

Research Results of the Year

The state reports show accomplishments at each station more or less in detail. Statements which follow summarize some of the more important findings with general application to the region.

1. Influence of Sire and Genetic Background on Meat Quality.

Studies at the Texas Station show significant sire influences on tenderness of cooked meat and on percentages of dress-off items for steers fed out in dry lot. Estimates of the heritability of tenderness from intra sire, half-sib correlations ranged from 28 to over 100%. Cross-bred steers (Brahman X Hereford) shrank less in transit and dressed higher than Herefords.

At the Louisiana Station, steers sired by Charolaise bulls showed, on the average, larger rib-eye and lower carcass grades than those by other kinds (Angus, Hereford, Shorthorn, Brahmans, Brangus). Carcass grades tended to be higher for the British types.

In a comparison at the Florida Station of yearling steers with varying amounts of Brahman and Shorthorn blood, the data showed that carcass grade decreased as percentage of Brahman blood increased, with purebred Brahmans grading low-good and 1/4Brahman-3/4Shorthorns grading low-choice in the carcass.

2. Dams With Brahman Blood Wean Heavy Calves.

It is increasingly apparent that dams with some Brahman blood wean heavier calves than either British or native types, particularly in the Gulf Coast and southern region. For the fourth consecutive year the Brahman-Angus strain developed at Jeanerette, Louisiana, weaned heavier calves than Brahman, Angus, or Hereford in tests at Baton Rouge and at Brooksville, Florida. At the latter station Santa Gertrudis calves were heavier than the other four kinds. In general, the same picture holds for the Texas and Georgia stations.

At the South Carolina station 210-day weights of slaughter calves from Angus, Angus-Hereford, Angus-Brahman and Hereford-Brahman dams sired by a Shorthorn bull favored the dams with Brahman blood, but purebred Angus calves raised under the same conditions averaged heavier than any of the crossbred groups. Average slaughter grades were somewhat the same for all crossbred groups.

3. Productivity of Dams

Analysis of data at the Georgia station show repeatability of 210-day weight for two herds of .42 and .38, respectively. The repeatability of birth rate was low (.11). In this study, age of dam had a significant influence on birth weight and 210-day weight. Studies of cow productivity at several states in the region and over a period of years indicate somewhat variable influence of age of dam on weaning weight with both environmental and genetic factors responsible for the differences.

4. New Kinds Continue to Look Promising.

Charolaise or Charbray animals owned by cooperating breeders and fed at the Texas, Florida and Alabama stations continue to show high performance relative to other breeds and kinds in feeding tests. For the fourth consecutive year calves sired by Charolaise bulls at the Louisiana station were heaviest at weaning in tests using bulls from six different breeds.

Other tests with new or uncommon breeds or strains showed heavy weaning weights for Santa Gertrudis at the Texas, Florida and Georgia stations and also for Romo Carolinas at the North Carolina station. Plans are underway to test the latter strain under rather rigorous environmental conditions at the Frying Pan Range of that state. At the Florida station, Santa Gertrudis steers graded lower in the carcass than other kinds in the same dry-lot feeding test.

5. Measurement of Achievement From Selection for Rapid Growth.

At the Texas station, progenies (both sexes) of fast, intermediate and slow gaining bulls showed respectively average gain ratios for a two-year period in post-weaning gain tests of 104.4, 100.6 and 95.6, respectively. This is in general agreement with a similar selection experiment at the Virginia station completed in 1955 and also further confirms many previous findings that growth rate in the feed-lot is highly heritable. The Kentucky station plans to progeny test fast and slow gaining bulls in order to measure expected achievement from selection.

A study of data from a herd that had been graded up over a 20-year period at the North Carolina station showed a selection differential about 1/5 as large as it could have been if 40% of the fast gaining calves to weaning had been saved. The study also indicated that selecting heifer calves for weaning weight would result in a very slow improvement and suggested that the most rapid improvement in weaning weight would be obtained by selecting sires from dams that had heavy calves at weaning. Heritability estimates of growth rate at the Georgia stations for steers, heifers and bulls were .33, .55 and 0, respectively.

6. Evaluation of Conformation in Live Animals.

Pooled data from the Arkansas-Maryland-North Carolina-Tennessee stations indicate that weight is an important factor in type score. In a multiple correlation study the data indicated that weight and several body measurements accounted for from 14 to 58% of the variance in type score. Ratios that showed consistent positive correlations with score were chest depth wither height and chest depth/chest height. At the Arkansas station, a study of major sources of variation in type score showed large real differences in animals scored at different ages and by different judges. Differences among judges and seasons with intraction accounted for about 10% of the variance. This indicates permanent differences in conformation among cows which experienced judges will pick up fairly consistently.

Studies at the Maryland station showed significant differences among judges with respect to deviation from the average and magnitude of variation of type scores within groups of animals.

Trios of half-sibs similar in age and type fed on three levels of nutrition at the Tennessee station indicate that gain and fatness have a marked influence on live animal evaluation in terms of type score and grade. Differences apparent at 18-months of age had mostly disappeared by the time these animals were three or four-years old. The data suggests that a high degree of fatness at 18-months of age may reduce fertility and mothering ability of dams.

7. Growth Curves for Beef Cattle.

Studies of average growth rate in terms of weights and body measurements were made for Angus and Herefords herds at the Arkansas station from 1940 to 1953. These studies will provide useful data on the growth and development of cattle in these breeds.

At the Maryland station gains of Angus calves weaned at 90 and 180-day and full-fed after weaning to 370-days of age, showed growth patterns that were similar and essentially linear. This work indicates that gain testing for individual performance may be accomplished by the time the animal is 12-months old.

8. Line Testing.

Progeny testing of sires from different sources was continued at the Mississippi station and has included bulls from Montana, texas, Georgia, Virginia and Mississippi. It is expected that this work will be of value to the whole region in the identification of superior lines and strains. At other stations (Alabama, Florida, Georgia, Arkansas, North Carolina, Tennessee, Texas and Virginia) average gains of station-raised bulls have usually been equal to or above the average of those with similar breeding from herds cooperating breeders.

9. Pregnancy Examinations for Efficient Use of Facilities.

Pregnancy examinations have been utilized at least three stations to identify and eliminate barren cows. This avoids wintering cows that will not calve and also provides material for the study of causes of reproductive failure.

10. Cow Fertility

At the Brooksville, Florida station fertility was higher in cows of British breeding than in those of Brahman breeding. Angus and Hereford cows tended to calve every year while the Brahmans tended to calve in alternate years. Santa Gertrudis and Brahman-Angus were intermediate in this respect with the latter showing higher fertility for lactating cows. The study of conception rates at the Front Royal, Virginia station indicated that with a 90-day breeding season calving date influenced conception. It appeared that selection for early calving would result in an immediate increase in calving rate. Observation of heat in a small percentage of pregnant cows indicated that culling on the occurence of heat may result in discarding as non-pregnant cows that actually are in-calf.

11. Bull Buyers Pay a Premium for High Performance.

Prices paid at auction sales of gain-tested bulls indicated that rate of gain and conformation influenced sale value. In general, the bulls that brought the highest prices were those with fast gain and good conformation. At the Alabama station sale, a comparison within breed showed that station-owned bulls sold for $90 more per head than cooperator-owned bulls. The station-owned bulls had graded higher and gained faster. The correlation between average daily gain and sale price for bulls sold at McGregor, Texas was .72. In this sale, purchasers paid low prices for slow gaining bulls regardless of conformation. In a sale at PanTech, Texas 25 bulls that gained at least 2.6 pounds per day averaged $214 per head more than 42 bulls with gains below 2.2 pounds per day. Observations of the sales at Fayetteville, Arkansas and Front Royal, Virginia indicated that buyers purchased mostly on visual

appraisal but paid more for bulls with superior feed-lot records.

12. X-Ray Techniques To Identify Dwarf Carriers.

Work was continued with X-ray techniques at the Tennessee station (576 calves X-rayed). Matings between females with different type radiographs and dwarf bulls indicated that in some cases animals with normal appearing lumbar vertebra were carriers of dwarfism. It appears that for vetebra structure in carriers and non-carriers, each exhibits a continuous distribution with averages that differ but with over-lapping. The results suggest that the X-ray technique may be useful for identifying carrier bulls through progeny tests even when all cows in the herd are clean. In matings where both parents were presumed clean no extreme abnormalities were observed but in matings where one parent was a carrier a small fraction of the progeny showed marked abnormalities.

13. Blood Serum Studies on Dwarfism.

Studies at the Texas station continue to show no conclusive differences in protein bound iodine, phosphatase, glucose or glutathione content of the blood. These studies of blood serum, however, to continue to indicate that body chemistry is related to physiological functions. Bioassay of pituitaries of dwarf and normal calves at the Virginia station showed no significant differences in thyrotropic gonadotropic or ACTH potency. This work does suggest that growth hormone is a factor in bovine dwarfism.

14. Other Studies on Dwarfism.

Complete necropsies of dwarf and normal calves at the Virginia station showed no gross differences which were not discernable in live animals. At the Florida station 8 phenotypically different kind of dwarf calves were examined (post-morten) for brain and bone abnormalities. Seven of the 8 kind showed hydrocephalus. At the Florida and Louisiana stations, matings among different kinds of dwarfs have been made but are too few as yet for the clarification of the genetic picture.

At the Virginia station about 100 herds in the beef cattle program are providing data for the estimates of the frequency of dwarfism in the British breeds and to measure variation in type and degree of the expression of this abnormality. At the Front Royal, Virginia station, calves born in 1955 and 1956 from matings among presumed different kinds of carriers indicated that the same gene loci may be involved in dwarfism observed in conventional Herefords, comprest Herefords, and one kind of Angus..

Interest of Public In Project

Earlier reports (1954 and 1955) have pointed out that on-the-farm testing programs for beef cattle in the south are a direct outgrowth of this breeding research. A national organization, The American Beef Cattle Performance Registry Association, Canyon, Texas, is in operation and certifying animals with outstanding performance made under authorized conditions. The Virginia Beef Cattle Improvement Association, Blacksburg, Virginia, a statewide organization that requires entry of all calves in cooperating herds included 95 herds with over 4200 calves in 1956. In at least 10 of the southern states organized performance testing programs have been activated. In some states this is handled jointly by the experiment station and the extension

division while in others, it is an extension activity. It seems that the demand for animals with good performance records far exceeds the supply. In many instances breeders are testing animals up to weaning and also under feedlot conditions on their own initiative.

Public interest has been further emphasized during the year by the following things:

a. Large crowds attended several Field Days and auction sales where research information was presented and tested bulls sold.

b. State-wide and local beef cattle breeders conferences usually include in their program one or more phases of the beef cattle breeding research in the state or region. Performance testing in particular has been a live subject at beef cattle meetings and also in breed journals and magazines and the livestock industry during the past year.

c. The coordinator for S-10, with help and assistance from many others, wrote a pamphlet on performance testing which was handed out in connection with a national exhibit on beef cattle breeding at the International Livestock Show in Chicago.

Table 1. NUMBER OF COWS IN DIFFERENT TYPES OF MATINGS FOR 1956 CALVES AT STATIONS COOPERATING IN S-10 PROJECT

Type of Mating	Number of Matings By States												
Interse	Ala	Ark	Fla	Ga	La	Md	Miss	N.C.	S.C.	Tenn	Tex	Va	Total
Angus	49	157	25	37	19	30	21	15	25	142	-	180	700
Hereford	90	89	32	100	8	30	118	163	-	753	142	110	1635
Shorthorn	29	14						11				156	210
Brahman			59		45						44		148
Brah-Ang			41		127								168
Brah-Here								32					32
Santa-Gertrudis			34								16		50
Afric-Ang					52								52
Afric-Ang-Here								17					17
Romo-Carolina								11					11
Crosses													
Ang X Here					16					7			23
Ang X Sh					8				10				18
Here X Sh					8								8
Ang X Sh-Here										29			29
Here X Ang-Here								20					20
Sh X Ang-Here									12				12
Ang X Brah					16								16
Ang X Brang					16								16
Here X Brah					16			27			14		57
Here X Brang					16								16
Sh X Brah			15		8								23
Sh X Brang					8								8
Sh X Brah-Here									11				11
Sh X Brah-Sh			19										19
Sh X Brah-Ang									12				12
Brah X Brah-Here										24			24
Brah X Brah-Sh			26										26
Brah X Brang					16								16
SG X RP											8		8
SG X Here-SG											2		2
SG X Brah-Here											13		13
Char X Ang					8								8
Char X Here					8								8
Char X Brah					8								8
Char X Brang					8								8
TOTAL	168	260	251	137	411	60	139	296	70	931	236	446	3432

PERSONNEL of the S-10 PROJECT

STATE AGRICULTURAL EXPERIMENT STATION WORKERS
(asterick indicates Technical Committee Members for 1957)

Alabama	*W. M. Warren, W. D. Salmon	Auburn, Ala.
Arkansas	*Warren Gifford, C. J. Brown	Fayetteville, Ark.
Florida	*Marvin Koger, A. C. Warnick	Gainesville, Fla.
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South Carolina	*E. G. Godbey, W. C. Godley	Clemson, S. C.
Tennessee	*C. S. Hobbs, H. J. Smith, J. W. High,	
	Ralph Dodson . . .	Knoxville, Tenn.
	J. M. Bird, R. A. Reynolds	Oak Ridge, Tenn.
	J. H. Felts	Greeneville, Tenn.
	J. A. Odom	Crossville, Tenn.
	L. M. Safley	Springfield, Tenn.
	E. J. Chapman, J. McLaren	Spring Hill, Tenn.
	R. Moorman, J. Bryan, R. Scott	Grand Junction, Tenn.
Texas	*T. C. Cartwright, B. L. Warwick	McGregor, Tex.
	R. E. Patterson, Sylvia Cover, O. D. Butler,	
	H. O. Kunkel	College Station, Tex.
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	William McClure	Steeles Tavern, Va.

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REGIONAL OFFICERS - 1957

R. L. Patterson, Administrative Adviser . . . . . College Station, Texas
R. A. Damon, Jr., Chairman . . . . . Baton Rouge, Louisiana
Warren Gifford, Secretary . . . . . Fayetteville, Arkansas
W. W. Green, Executive Committee Member . . . . . College Park, Maryland

ALABAMA STATION

-by-

W. M. Warren, W. D. Salmon, and G. B. Meadows

I. Project Title: No. Alabama 525. Contributing to S-10.

The Evaluation of Performing Ability in Purebred and Crossbred Beef Cattle.

II. Objectives:

(1) To determine the effectiveness of mass selection for total performance in beef cattle.
(2) To develop criteria for evaluating and selecting breeding animals.
(3) To study the influence of heterosis in crosses between the three British breeds of beef cattle.

III. Accomplishments During the Year:

(1) Acquisition of cattle: Twenty Angus and twenty-four Hereford females of breeding age were shifted from the teaching herds to the breeding research herds.

(2) Improvement of facilities: Approximately 100 acres of land was cleared of brush and seeded to permanent pasture crops during the year. A 100-ton hay barn was erected.

(3) Research results: The fourth calf crops in the Angus and Hereford lines and the third calf crop in the Shorthorn line were born during the year. Data collected on these calves include birth weight, weaning weight, and weaning score. The heifers, 22 Angus, 27 Herefords and 10 Shorthorns, were placed on a 140-day post-weaning performance test on November 15th. The 7 Angus, 8 Hereford and 5 Shorthorn bull calves were started on an official performance test on the same date.

A 140-day post-weaning performance test was completed on 50 bulls owned by Alabama breeders and 28 owned by the Experiment Station (23 Angus, 26 Hereford, 17 Polled Hereford, 5 Polled Shorthorn, 2 Charbray, and 2 Santa Gertrudis) and 31 heifers (13 Angus, 14 Hereford and 4 Shorthorn).

The better performing heifers and bulls from the 1955-56 Performance Test were retained in the breeding herds. Selection of replacements was based on a total performance rating with equal value given to weight per day of age, gain on test, and conformation. Three Angus bulls, one Hereford and one Shorthorn were retained for use at the Station. The remaining bulls sold at public auction at the termination of the test. On the basis of total score, 11 Angus, 11 Hereford, and 3 Shorthorn heifers were retained as replacements.

The Station sold 1 Angus and 3 Hereford bulls from the 1955-56 Performance Test to Sub-stations for progeny testing.

IV. Future Plans:

(1) Improvement of facilities: Reclamation of land, seeding of pastures, erection of hay sheds, and improvement of handling facilities will be continued as rapidly as possible.

(2) Continuation of Objectives 1 and 2

(3) Make the initial matings designed to accomplish Objective 3. Because of reproductive difficulties in the Shorthorn herd, and the limited number of Shorthorn females, the crossbreeding experiment will be initiated as follows:

Breed and No. of Cows	Breed of Bull					
	Hereford 1	Hereford 2	Angus 1	Angus 2	Shorthorn 1	S'h 2
24 Hereford	6	6	3	3	3	3
24 Angus	3	3	6	6	3	3
24 Shorthorn	3	3	3	3	6	3

(4) Cooperate with the Extension Service in the promotion of an on-the-farm production testing program for cow herds in the state.

V. Publications planned:

Warren, W. M., W. D. Salmon, and G. B. Meadows. The Effectiveness of Mass Selection for Total Performance in Beef Cattle (submitted as Station Bulletin).

POST-WEANING PERFORMANCE OF 1955 CALVES FULL FED AFTER WEANING
(or pastured for high gains)

Alabama Agricultural Experiment Station

Line or group designation	Sta.	Breeder	Sta.	Breeder	Station	Breeder
Location	Auburn		Auburn		Auburn	Auburn
Breeding of calves	Angus		Hereford		Shorthorn	Charbray
Av. inbreeding (%)	---		---		---	---
Bulls, No.	10	13	14	12	3	2
Av. inbreeding (%)	--	--	--	--	--	--
Av. weaning wt.	546	--	516	--	530	---
Av. 12 month wt.	730	703	710	670	734	1036
Length of feeding period	154	154	154	154	154	154
*Feed per cwt. gain (lbs)						
Concentrates	920#	920#	920#	920#	920#	920#
Roughage	243#	243#	243#	243#	243#	243#
Av. daily gain on test	2.29	1.99	2.36	2.06	2.35	2.66
Av. type score (12 mos)	13.5	12.5	13.0	11.75	12.75	11.67
Steers, No.						
Av. inbreeding (%)						
Av. Weaning wt.						
Av. 12 month wt.						
Length of feeding period						
Feed per cwt. gain (lbs)						
Concentrates						
Roughage						
Av. daily gain on test						
Av. type score (12 mos)						
Heifers, No.	13		15		4	
Av. inbreeding (%)	--		--		--	
Av. weaning wt.	478		434		386	
Av. 12 month wt.	599		558		503	
Length of feeding period	154		154		154	
*Feed per cwt. gain (lbs)						
Concentrates	600#		600#		600#	
Roughage	378#		378#		378#	
Av. daily gain on test	1.62		1.67		1.54	
Av type score (12 mos)	14.0		12.5		11.25	

* Group fed

POST-WEANING PERFORMANCE OF 1955 CALVES FULL FED AFTER WEANING
(or pastured for high gains)

Alabama Agricultural Experiment Station

Line or group designation	Breeder	Breeder	Breeder
Location	Auburn	Auburn	Auburn
Breeding of calves	Santa Gertrudis	Polled Hereford	Polled Shorthorn
Av. inbreeding (%)	--	--	--
Bulls, No.	2	16	5
Av. inbreeding (%)	--	--	--
Av. weaning wt.	--	--	--
Av. 12 month wt.	887	708	737
Length of feeding period	154	154	154
*Feed per cwt. gain (lbs)			
Concentrates	920#	920#	920#
Roughage	243#	243#	243#
Av. daily gain on test	2.92	2.01	2.53
Av type score (12 mos)	14.5	11.5	11.0
Steers, No.			
Av. inbreeding (%)			
Av. weaning wt.			
Av. 12 month wt.			
Length of feeding period			
Feed per cwt. gain (lbs)			
Concentrates			
Roughage			
Av. daily gain on test			
Av. type score (12 mos)			
Heifers, No.			
Av. inbreeding (%)			
Av. weaning wt.			
Av. 12 month wt.			
Length of feeding period			
Feed per cwt. gain (lbs)			
Concentrates			
Roughage			
Av. daily gain on test			
Av. type score (12 mos)			

PRODUCTION AND/OR SLAUGHTER DATA ON YEARLING AND OLDER CATTLE
NOT INCLUDED IN BREEDING HERDS IN 1956

Alabama Agricultural Experiment Station

Line or group designation	Angus	Hereford
Breeding:		
Sex:	Steers	Steers
No.	10	10
Av. age (fall 1955)	270	250
Av. wt. (fall 1955)	465	430
Days on pasture *	210	210
Av. gain on pasture	227	231
Days on feed*	140	140
Av. wt. adjusted to 18 months of age	830	799
Av. gain on feed	306	335
Animals slaughtered:		
Av. age at slaughter (days)	705	657
Av. slaughter weight	998	996
Av. slaughter grade	Low choice	Low choice
Av. dressing percent	61.9	61.3
Av. carcass grade	choice-	good+

* Indicate in footnotes the general method of feeding and type of ration. Include average daily ration, period fed, and feed per cwt. gain if known.

Supplement to:

PRODUCTION AND/OR SLAUGHTER DATA ON YEARLING CATTLE NOT INCLUDED IN BREEDING HERDS IN 1956

	Fan	No Fan
Group	1	2
Sex	9 steers	10 steers
Breed	5 Angus 4 Hereford	5 Angus 4 Hereford
Initial wt. (8-1-56)	758#	758#
Final wt. (11-5-56)	996#	969#
Gain on feed	238#	211#
Days on feed	140	140
A.D.G. on feed	2.48#	2.33#
*Ave. slaughter grade	12	12
Ave. dressing percentage	59.3	58.5
Carcass grades	4 choice 5 good	4 choice 5 good
**Feed consumed		
Daily		
Concentrates	17.6#	17.1#
Roughage	1.8#	1.6#
Per cwt. gained		
Concentrates	1036#	1134#
Roughage	109#	103#

* 17, 16, 15 = Prime; 14, 13, 12 = Choice, etc.

** Roughage = Coastal Bermuda Hay
Concentrates = 1% salt, 74% Gd. snap corn, 10% C.S.M., 15% Gd. Alf. hay, 1# Stilbestrol/ton of feed

PERFORMANCE OF COW HERDS. 1956 CALVES

Alabama Agricultural Experiment Station

Line of group designation	Angus	Hereford	Shorthorn
Location	Auburn	Auburn	Auburn
Breed of sire	Angus	Hereford	Shorthorn
Breed of dam	Angus	Hereford	Shorthorn
No. cows bred	49	90	29
No. cows calving	43	66	22
No. calves raised	40	64	20
Av. inbr. of dams (%)	--	--	--
Av. inbr. of calves (%)	--	--	--
Av. birth date	12-4-55	11-24-55	12-16-55
Av. birth wt. (lbs)			
Bulls	61	60	67
Heifers	55	58	66
Were calves creep fed	No	No	No
Av. wt. at six mos. (lbs):			
Bulls			
Steers	All weighed and weaned at 250 days of age		
Heifers			
Av. weaning date:			
Bulls	8-14-56	7-19-56	9-9-56
Steers	8-24-56	7-24-56	8-26-56
Heifers	8-8-56	8-3-56	8-20-56
Av. weaning wt.: *			
Bulls	548	512	496
Steers	491	456	441
Heifers	449	433	409
Av. weaning type score:			
Bulls	13.75	13.0	12.0
Steers	11.5	11.5	11
Heifers	12.5	12.5	12.0
Av. weaning condition score:			
Bulls	11.5	11.5	11.0
Steers	11.0	11.0	10.5
Heifers	12.5	12.0	11.5
Calves slaughtered at weaning:			
1. Steer or bull calves	--	--	--
No.			
Av. age			
Av. wt.			
Av. slaughter grade			
Av. dressing per cent			
Av. carcass grade			
2. Heifer calves			
No.	--	--	--
Av. age			
Av. wt.			
Av. slaughter grade			
Av. dressing per cent			
Av. carcass grade			

* Uncorrected for age of dam effect.

ARKANSAS STATION
-by-

Warren Gifford and C. J. Brown

I. Project Title: No. An. Ind. & Vet. Sci. 170. Contributing to S-10.

The Determination of Adequate Record of Performance Test for Beef Cattle.

II. Objectives:

To develop practical, but adequate, methods for evaluating the breeding worth of beef sires and dams which would include the following:

(a) A system of measuring variations in young animals and the values of such measures in predicting variations in the same animals at more mature ages.

(b) Methods of measuring and evaluating the records of performance of brood cows.

(c) The determination of the kind of records and number of progeny necessary to prove beef sires.

III. Accomplishments During the Year:

The data included in this report are from the herds of purebred Angus, Hereford and Shorthorn cattle maintained at the Main Experiment Station and the purebred Angus cattle maintained at the Livestock and Forestry Station. Pasture breeding was practiced during two 60-day breeding seasons. Calves were dropped in the fall (Sept. or Oct.) or Spring (February or March). Calves were weaned at approximately 7 months of age. Male calves were not castrated until weaned.

(a) The following facilities have been acquired during the past year.
One additional set of scales and corrals for weighing and sorting cattle in pasture.
One Model 40 John Deere tractor
One International Carry-all truck
Paving exercise lots in bull testing barn
Approximately 2 miles of permanent fence was built.
Approximately 10 acres of Bermuda was sodded.
Approximately 100 acres of pasture was fertilized and seeded to small grain with a grassland drill.
The following cattle have been acquired:
Female replacements grown out and added to the herds include
23 Angus, 14 Hereford and 5 Shorthorn
One 4-year old performance tested Angus bull
One 6-year old Hereford bull and
One 2-year old Shorthorn bull was purchased.
Service of one Angus bull was leased for breeding season.

(b) Research Results:
Forty-eight bulls and 3 steers were fed individually for 154-days to obtain measures of gain and efficiency. A selected group of 21 of these bulls were sold at auction and the buyers' evaluation of performance records was determined.

Six young bulls were fed on a 154-day performance test for co-operating breeders.

Growth as indicated by weights and body measurements were recorded on all young and mature animals.

All animals were classified for type and breeding worth by a committee of four judges.

Records of milk production of 21 first calf heifers were obtained.

IV. Future Plans:

Continue individual feeding of bull progeny of station sires and the feeding of steer and heifers when possible in order to study factors which determine differences in rate and efficiency of gain.

Continue studies of growth and development and classification scores.

Continue cooperation with breeders and Extension Service in production testing programs in order to locate cattle of superior performance.

Continue development of lines within herds based on performance records. Transcribe all records to IBM cards in order to facilitate further analysis of data.

V. Publications During the Year:

Brown, C. J., Heritability of Weight and Certain Body Dimensions of Beef Cattle at Weaning, Ph.D. Thesis, Okla. A & M Library, June, 1956.

Brown, C. J., Maurice L. Ray, Warren Gifford and R. S. Honea. Growth and Development of Hereford Cattle. Ark. Expt. Sta. Bul. 570. 1956.

Brown, C. J., Maurice L. Ray, Warren Gifford and R. S. Honea. Growth and Development of Aberdeen-Angus Cattle. Ark. Expt. Sta. Bul. 571.

Brown, C. J., E. J. Warwich, H. J. Smith, W. W. Green, and H. A. Stewart Relationships between Conformation Scores and Live Animal Measurements of Beef Cattle. J. Ani. Sci. 15:911-921. 1956.

Brown, C. J. "What Would you Pay For 'Good Doing' Facts". Polled Hereford World. July, 1956.

VI. Publications planned:

Bulletin on feed lot performance of bulls.
Bulletin on reproductive performance.

PERFORMANCE OF COW HERDS. 1956 CALVES

Bates & Main Station

	Fall	Spring	Fall	Fall
Line of group designation	McLeandolier	McLeandolier	Nobleman	195
Location	Batesville	Batesville	Main	Main
Breed of sire	Angus	Angus	Shorthorn	Angus
Breed of dam	Angus	Angus	Shorthorn	Angus
No. cows bred	26	10	14	10
No. cows calving	26	10	11	5
No. calves raised	16	6	10	5
Av. inbr. of dams (%)	.19%	0	0	6.4%
Av. inbr. of calves (%)	1.14%	.533%	9.09%	1.60%
Av. birth date	10-25-55	3-24-56	10-3-55	10-2-55
Av. birth wt. (lbs):				
Bulls	64	63	65	54
Heifers	57	59	54	55
Were calves creep fed?	No	No	No	No
Av. wt. at six months (lbs)				
Bulls	394	376	--	240
Steers	--	--	317	--
Heifers	364	328	268	314
Av. weaning date:	5-25-56	10-24-56	4-25-56	4-27-56
Bulls				
Steers				
Heifers				
Av. weaning wt.				
Bulls	439 (6)*	--	--	288 (1)
Steers	--	--	362 (7)	--
Heifers	408 (9)	355 (4)	312 (3)	365 (4)
Av. weaning type score:				
Bulls	--	--	--	68
Steers	--	--	63	--
Heifers	66	69	65	64
Av. weaning condition score:				
Bulls	--	--	--	68
Steers	--	--	63	--
Heifers	64	67	63	61
Calves slaughtered at weaning:				
1. Steer or bull calves				
No.				
Av. age				
Av. wt.				
Av. slaughter grade				
Av. dressing percent				
Av. carcass grade				
2. Heifer calves				
No.				
Av. age				
Av. wt.				
Av. slaughter grade				
Av. dressing percent				
Av. carcass grade				

* Number of records averaged

PERFORMANCE OF COW HERDS. 1956 CALVES

	Main Station			
	Spring	Spring	Fall	Spring
Line of group designation	Black Peer	241	241	Eric
Location	Main	Main	Main	Main
Breed of sire	Angus	Angus	Angus	Angus
Breed of dam	Angus	Angus	Angus	Angus
No. cows bred	17*	13	18	24
No. cows calving	4	6	11	18
No. calves raised	4	6	11	16
Av. inbr. of dams(%)	1.09%	1.89%	2.22%	2.21%
Av. inbr. of calves (%)	1.00%	3.31%	7.36%	6.61%
Av. birth date	3-4-56	3-12-56	10-7-56	3-14-56
Av. birth wt. (lbs)				
Bulls	68	64	58	60
Heifers	54	57	55	59
Were calves creep fed	No	No	No	No
Av. wt. at six months (lbs)				
Bulls	400	354	281	421
Steers	--	--	255	--
Heifers	335	341	268	386
Av. weaning date:	9-30-56	10-5-56	4-28-56	10-10-56
Bulls				
Steers				
Heifers				
Av. weaning wt.				
Bulls	408 (3)	370 (2)	326 (3)	432 (6)
Steers	--	--	301 (3)	--
Heifers	395 (1)	359 (4)	302 (5)	413 (10)
Av. weaning type score:				
Bulls	64	67	67	72
Steers	--	--	66	--
Heifers	65	71	64	66
Av. weaning condition score:				
Bulls	65	66	65	67
Steers	--	--	61	--
Heifers	66	67	61	65
Calves slaughtered at weaning:				
1. Steer or bull calves				
No.				
Av. age				
Av. wt.				
Av. slaughter grade				
Av. dressing percent				
Av. carcass grade				
2. Heifer calves				
No.				
Av. age				
Av. wt.				
Av. slaughter grade				
Av. dressing percent				
Av. carcass grade				

* Artificial insemination using frozen semen

PERFORMANCE OF COW HERDS. 1956 CALVES

	Main Station			
	Fall	Spring	Fall	Fall
Line of group designation	Eric	295	Creator	221
Location	Main	Main	Main	Main
Breed of sire	Angus	Hereford	Hereford	Hereford
Breed of dam	Angus	Hereford	Hereford	Hereford
No. cows bred	39	9	2	11
No. cows calving	27	7	2	9
No. calves raised	24	6	2	9
Av. inbr. of dams (%)	1.01%	.03%	1.55%	.65%
Av. inbr. of calves (%)	4.35%	9.55%	0	9.77%
Av. birth date	10-7-55	2-17-56	9-17-55	9-30-55
Av. birth wt. (lbs):				
Bulls	53	65	67	71
Heifers	54	67	--	71
Were calves creep fed?	No	No	No	No
Av. wt. at six months (lbs):				
Bulls	309	405	--	281
Steers	364	284	384	182
Heifers	291	333	--	237
Av. weaning date:	5-6-56	9-19-56	4-30-56	5-1-56
Bulls				
Steers				
Heifers				
Av. weaning wt.				
Bulls	375 (9)	445 (1)	--	359 (6)
Steers	405 (1)	323 (1)	417 (2)	229 (1)
Heifers	341 (14)	359 (4)	--	292 (2)
Av. weaning type score:				
Bulls	64	72	--	68
Steers	--	70	70	67
Heifers	69	70	--	60
Av. weaning condition score:				
Bulls	65	68	--	65
Steers	--	66	69	64
Heifers	62	66	--	60
Calves slaughtered at weaning:				
1. Steer or bull calves				
No.				
Av. age				
Av. wt.				
Av. slaughter grade				
Av. dressing percent				
Av. carcass grade				
2. Heifer calves				
No.				
Av. age				
Av. wt.				
Av. slaughter grade				
Av. dressing percent				
Av. carcass grade				

PERFORMANCE OF COW HERDS. 1956 CALVES

	Main Station			
	Fall	Spring	Fall	Spring
Line of group designation	268	268	FL	FL
Location	Main	Main	Main	Main
Breed of Sire	Hereford	Hereford	Hereford	Hereford
Breed of dam	Hereford	Hereford	Hereford	Hereford
No. cows bred	5	10	12	9
No. cows calving	4	9	8	9
No. calves raised	4	9	8	8
Av. inbr. of dams (%)	0	.63%	0	1.60%
Av. inbr. of calves (%)	0	4.15%	2.30%	19.18%
Av. birth date	9-28-55	2-25-56	10-2-55	2-3-56
Av. birth wt. (lbs):				
Bulls	56	67	69	57
Heifers	62	56	70	60
Were calves creep fed?	No	No	No	No
Av. wt. at six months (lbs):				
Bulls	207	330	276	315
Steers	--	--	--	250
Heifers	208	296	275	317
Av. weaning date:	4-22-56	9-28-56	4-22-56	9-21-56
Bulls				
Steers				
Heifers				
Av. weaning wt.				
Bulls	254 (2)	381 (2)	314 (4)	315 (1)
Steers	--	--	--	287 (2)
Heifers	258 (2)	312	338 (4)	361 (5)
Av. weaning type score:				
Bulls	69	74	65	64
Steers	--	--	--	61
Heifers	65	71	66	66
Av. weaning condition score:				
Bulls	66	67	64	65
Steers	--	--	--	57
Heifers	61	64	64	66
Calves slaughtered at weaning:				
1. Steer or bull calves				
No.				
Av. age				
Av. wt.				
Av. slaughter grade				
Av. dressing percent				
Av. carcass grade				
2. Heifer calves				
No.				
Av. age				
Av. wt.				
Av. slaughter grade				
Av. dressing percent				
Av. carcass grade				

PERFORMANCE OF COW HERDS. 1956 CALVES

Main Station

	Spring	Fall
Line of group designation	267	267
Location	Main	Main
Breed of sire	Hereford	Hereford
Breed of dam	Hereford	Hereford
No. cows bred	16	15
No. cows calving	9	10
No. calves raised	9	9
Av. inbr. of dams (%)	3.20%	.38%
Av. inbr. of calves (%)	10.26%	6.99%
Av. birth date	3-13-56	10-3-55
Av. birth wt. (lbs)		
Bulls	75	74
Heifers	74	67
Were calves creep fed?	No	No
Av. wt. at six months (lbs)		
Bulls	399	301
Steers	--	--
Heifers	393	235
Av. weaning date:	10-1-56	4-26-56
Bulls		
Steers		
Heifers		
Av. weaning wt.		
Bulls	433 (6)	351 (6)
Steers	--	--
Heifers	412 (3)	291 (3)
Av. weaning type score		
Bulls	68	68
Steers	--	--
Heifers	66	63
Av. weaning condition score:		
Bulls	68	66
Steers	--	--
Heifers	66	62
Calves slaughtered at weaning:		
1. Steer of bull calves		
No.		
Av. age		
Av. wt.		
Av. slaughter grade		
Av. dressing percent		
Av. carcass grade		
2. Heifer calves		
No.		
Av. age		
Av. wt.		
Av. slaughter grade		
Av. dressing percent		
Av. carcass grade		

POSTWEANING PERFORMANCE OF 1955 CALVES FULL FED AFTER WEANING
(or pastured for high gains)

Main Station

	Spring	Fall	Fall	Spring
Line or group designation	McLeandolier	McLeandolier	Prince of Orchard Hill	Fl
Location	Main	Main	Main	Main
Breeding of calves	Angus	Angus		Hereford
Av. inbreeding (%)	--	--	--	--
Bulls, No.	5	5	3	6
Av. inbreeding (%)	--	--	--	.011
Av. weaning wt.	412	415	501	447
Av. 12 month wt.	728	776	932	796
Length of feeding period	154 days	154	154	154
Feed per cwt. gain (lbs)	1076	787	777	963
Concentrates	718	525	518	642
Roughage	358	262	259	321
Av. daily gain on test	2.05	2.34	2.80	2.27
Av. type score (12 mos)	76	--	--	70
Steers, No.				
Av. inbreeding (%)				
Av. weaning wt.				
Av. 12 month wt.				
Length of feeding period				
Feed per cwt. gain (lbs)				
Concentrates				
Roughage				
Av. daily gain on test				
Av. type score (12 mos)				
Heifers, No.				
Av. inbreeding (%)				
Av. weaning wt.				
Av. 12 month wt.				
Length of feeding period				
Feed per cwt. gain (lbs)				
Concentrates				
Roughage				
Av. Daily gain on test				
Av. type score (12 mos)				

POSTWEANING PERFORMANCE OF 1955 CALVES FULL FED AFTER WEANING
(or pastured for high gains)

Main Station

Line or group designation	Fall FL	Spring EER Victor Ton W.V.	Spring Alos Ev. Ph. H. 2nd	Spring Nobleman
Location	Main	Main	Main	Main
Breeding of calves	Hereford	Hereford	Angus	Shorthorn
Av. inbreeding (%)	--	--	--	--
Bulls, No.	1	3	3	3
Av. inbreeding (%)	.016	--	--	--
Av. weaning wt.	439	711	435	344
Av. 12 month wt.	817	1011	787	694
Length of feeding period	154 days	154	154	154
Feed per cwt. gain (lbs)	802	1255	947	960
Concentrates	535	837	632	640
Roughage	267	418	315	320
Av. daily gain on test	2.45	1.95	2.29	2.27
Av. type score (12 mos)	71	74	72	69
Steers, No.				3
Av. inbreeding (%)				--
Av. weaning wt.				364
Av. 12 month wt.				624
Length of feeding period				154 days
Feed per cwt. gain (lbs)				1212
Concentrates				808
Roughage				404
Av. daily gain on test				1.68
Av. type score (12 mos)				76
Heifers, No.				
Av. inbreeding (%)				
Av. weaning wt.				
Av. 12 month wt.				
Length of feeding period				
Feed per cwt gain (lbs)				
Concentrates				
Roughage				
Av. daily gain on test				
Av. type score (12 months)				

POSTWEANING PERFORMANCE OF 1955 CALVES FULL FED AFTER WEANING
(or pastured for high gains)

	Main Station			
	Spring	Spring	Fall	Spring
Line or group designation	Barman	Eric	Eric	221
Location	Main	Main	Main	Main
Breeding of calves	Angus	Angus	Angus	Hereford
Av. inbreeding (%)	--	--	--	--
Bulls, No.	4	10	1	3
Av. inbreeding (%)	.027	.032	.010	.023
Av. weaning wt.	393	365	413	408
Av. 12 month wt.	739	716	745	751
Length of feeding period	154 days	154	154	154
Feed per cwt. gain (lbs)	1012	904	796	909
Concentrates	675	603	531	606
Roughage	337	301	265	303
Av. daily gain on test	2.25	2.28	2.16	2.22
Av. type score (12 mos)	72	70	67	71
Steers, No.				
Av. inbreeding (%)				
Av. weaning wt.				
Av. 12 month wt.				
Length of feeding period				
Feed per cwt. gain (lbs)				
Concentrates				
Roughage				
Av. daily gain on test				
Av. type score (12 months)				
Heifers, No.				
Av. inbreeding (%)				
Av. weaning wt.				
Av. 12 month wt.				
Length of feeding period				
Feed per cwt. gain (lbs)				
Concentrates				
Roughage				
Av. daily gain on test				
Av. type score (12 months)				

POSTWEANING PERFORMANCE OF 1955 CALVES FULL FED AFTER WEANING
(or pastured for high gains)

	Main Station
	Fall
Line or group designation	221
Location	Main
Breeding of calves	Hereford
Av. inbreeding (%)	--
Bulls, No.	1
Av. inbreeding (%)	.039
Av. weaning wt.	410
Av. 12 month wt.	760
Length of feeding period	154 days
Feed per cwt. gain (lbs)	756
Concentrates	504
Roughage	252
Av. daily gain on test	2.27
Av. type score (12 mos)	75
Steers, No.	
Av. inbreeding (%)	
Av. weaning wt.	
Av. 12 month wt.	
Length of feeding period	
Feed per cwt. gain (lbs)	
Concentrates	
Roughage	
Av. daily gain on test	
Av. type score (12 months)	
Heifers, No.	
Av. inbreeding (%)	
Av. weaning wt.	
Av. 12 month wt.	
Length of feeding period	
Feed per cwt. gain (lbs)	
Concentrates	
Roughage	
Av. daily gain on test	
Av. type score (12 months)	

FLORIDA STATION
-by-

Marvin Koger

I. Project Title: No. 390. Contributing to S-10.

Breeding Beef Cattle for Adaptation to Florida. Range Cattle Station, Ona, Florida. Leaders: W. G. Kirk and F. M. Peacock.

II. Objectives:

1. To determine the value of different crosses and strains of cattle for foundation animals and commercial beef production.

III. Accomplishments During the Year:

This project has been underway since 1949. Cattle of varying proportions of Brahman and European breeding have been studied to determine their value for foundation animals and commercial beef production. Weanling calf production and feed-lot performance of steers have been the criteria for evaluating performance. In recent years, steers from this experiment have been used in meats studies dealing with factors affecting carcass grade and tenderness.

Steer calves of varying proportions of Brahman and Shorthorn breeding have been fed in dry-lot and slaughtered from 13 to 16 months of age. All groups have been successfully finished to good and choice grades. Carcass grades have tended to be slightly lower and efficiency of feed utilization slightly higher in animals with levels higher of Brahman breeding.

IV. Future Plans:

The work will continue with no major changes.

V. Publications During the Year:

Peacock, F. M. 1953. Factors affecting the weaning weight of range calves. Master Thesis.

Peacock, F. M., W. G. Kirk and M. Koger. 1953. Effect of breeding of dam on weaning weight of range calves. J. Animal Sci. 12:896.

Peacock, F. M., W. G. Kirk, and M. Koger. Factors affecting the weaning weight of range calves. Florida Agricultural Experiment Station Technical Bulletin. In press.

POSTWEANING PERFORMANCE OF 1955 CALVES FULL FED AFTER WEANING
(or pastured for high gains)

	Range Cattle Experiment Station, Ona			
Line or group designation				
Location	R.C. Station	R.C.Station	R.C.Sta.	R.C. Station
Breeding of calves	Brahman	3/4Br-1/4Sh	1/2Sh-1/2Br	3/4Sh-1/4Br
Av. inbreeding (%)				
Bulls, No.	3			
Av. inbreeding (%)	--			
Av. weaning wt.	533			
Av. 12 month wt.	703			
Length of feeding period	140			
Feed per cwt. gain (lbs)				
Concentrates	Not known - fed in group R.O.P. Brooksville, Fla.			
Roughage				
Av. daily gain on test	2.20			
Av. type score (12 months)	10			
Steers, No.	4	4	4	4
Av. inbreeding (%)	--	--	--	--
Av. weaning wt.	453	554	576	584
Av. 12 month wt.	698	790	752	781
Length of feeding period	140 days	140	140	140
*Feed per cwt. gain (lbs)				
Concentrates	521	566	638	635
Roughage	150	153	162	155
Av. daily gain on test	2.04	2.01	1.89	1.98
Av. type score (12 mos)	10	10	11	11
Heifers, No.				
Av. inbreeding (%)				
Av. weaning wt.				
Av. 12 month wt.				
Length of feeding period				
Feed per cwt. gain (lbs)				
Concentrates				
Roughage				
Av. daily gain on test				
Av. type score (12 months)				

* Fed same amount of hay and citrus molasses and as much of concentrate ration as was eaten twice daily. Conc. ration first 56 days; citrus pulp 55#, C.S. meal 30#, Cornmeal 10#, 3/4" alf. 5#; last 84 days citrus pulp increased to 60# and C.S. meal reduced to 25#.

PERFORMANCE OF COW HERDS. 1956 CALVES

Range Cattle Experiment Station
Ona

Line of group designation Location Breed of sire Breed of dam No. cows bred	R.C.Sta. Brahman Brahman 30[1]	R.C.Sta. Brahman ½Sh-½Br 26	R.C.Sta. Shorthorn ½Sh-½Br 19	R.C.Sta. Shorthorn Brahman 15
No. cows calving	17	24	19	14
No. calves raised	17	24	19	14
Av. inbr. of dams (%)	--	--	--	--
Av. Inbr. of calves (%)	--	--	--	--
Av. birth date	2-27-56	1-31-56	1-20-56	2-3-56
Av. birth wt. (lbs)				
Bulls	--	--	--	--
Heifers	--	--	--	--
Were calves creep fed?	No	No	No	No
Av. wt. at six months (lbs)				
Bulls	385[3]	410[2]	478[2]	--
Steers	352	390	378	394
Heifers	333	376	409	412
Av. weaning date:				
Bulls	9-15	9-19	9-19	--
Steers	9-24	9-20	9-20	9-19
Heifers	10-1	9-20	9-19	9-19
Av. weaning wt.				
Bulls	483	605	670	--
Steers	392	558	565	549
Heifers	388	526	580	519
Av. weaning type score				
Bulls	12	12	14	-
Steers	10	11	12	11
Heifers	9	11	12	12
Av. weaning condition score				
Bulls	13	14	13	--
Steers	10	11	12	11
Heifers	9	12	13	12
Calves slaughtered at weaning:				
1.Steer or bull calves				
No.	1	2	3	2
Av. age (days)	236	239	197	232
Av. wt.	460	625	427	505
Av. slaughter grade	10	11	10	10
Av. dressing percent	59.50	61.66	60.23	56.16
Av. carcass grade	8	9	9	8
2.Heifer calves				
No.				
Av. age				
Av. wt.				
Av. slaughter grade				
Av. dressing percent				
Av. carcass grade				

1. Many heifers 2. One bull in each lot. 3. Two bulls. Score Commercial 7;Good 10.

Florida Station

I. Project Title: No. 629. Contributing to S-10.

Selection of Cattle for Beef Production in Southeastern United States. (In cooperation with USDA). West Central Florida Experiment Station, Brooksville, Florida. Leaders: M. Koger, A. C. Warnick, W. G. Kirk, C. M. Kincaid and W. C. Burns.

II. Objectives:

1. To establish herds of Angus, Brahman-Angus, Brahman, Hereford, and Santa Gertrudis cattle and compare their ability for beef production on improved pastures in Florida.

2. To determine whether lines can be developed by means of cross-progeny testing which will show superior nicking in crossbreeding programs.

3. To compare rotational crossbreeding programs involving Brahman and British cattle with programs of grading to breeds or strains such as Santa Gertrudis and Brahman-Angus, containing combinations of British and Brahman blood.

4. To compare the performance of straight bred cattle with that of animals resulting from a crisscross system of breeding.

III. Accomplishments During the Year;

This project was initiated in 1952. The performance of five breeds of cattle are being compared under conditions prevailing at the West Central Florida Experiment Station, Brooksville. The breeds included are Angus, Brahman, Brangus, Hereford and Santa Gertrudis. Foundation herds of 25 to 45 cows had been established for all breeds. Plans have been completed for using bulls from three of these foundation herds in studying breeding systems for commercial beef production and to determine whether specific combining ability between strains can be improved. The first bulls will be put in service in 1957.

The weaning data from the 1955 calf crop indicates the principal difficulties that have been encountered in the various breed groups to date. Weanling weights from the British breeds have been substandard while reproduction efficiency is substandard in the Crossbred and Brahman groups. These results are in general agreement with results observed in private operations in southern Florida. The causes of these difficulties remain to be determined. Post-weaning growth of these cattle to date has been about what one would expect in view of the mature size of the breeds involved.

In the winter of 1955-56 performance tests were completed on 77 bulls group-fed in six lots. In the summer of 1956, steers raised at the station in various lines and breeding groups (48 head in all) were full fed in dry-lot for 160 days and slaughtered for carcass evaluation. Average grade by groups ranged from high-standard to high-good. In the carcass the Angus graded highest and the Santa Gertrudis, lowest with the other groups falling in-between (see tabular material for the various groups).

IV. Future Plans:

The breeding system for various groups will continue without major change in 1957. Fifty-seven young bulls (under 1-year of age) and 46 service age bulls (approximately 2-years old at end of test) will complete performance tests in 1957. Plans have been made for clearing additional land in order to activate plans for the development of herds under objective #3.

V. Publications:

Warnick, A. C., W. C. Burns, M. Koger and M. W. Hazen. Puberty in English, Brahman and Crossbred Breeds of Beef Heifers. Southern Agricultural Workers Conference. February 1956.

PERFORMANCE OF COW HERDS. 1956 CALVES

Brooksville, Florida Station

Line of group designation	Hereford	Angus	Brahman	Brangus	Santa Gert.
Location	Brooksville				
Breed of sire	Hereford	Angus	Brahman	Brangus	Santa Gert.
Breed of dam	Hereford	Angus	Brahman	Brangus	Santa Gert.
No. cows bred	32	25	29	41	34
No. cows calving	24	24	17	19	13
No. calves raised	22	24	17	18	13
Av. inbr. of dams (%)					
Av. inbr. of calves (%)					
Av. birth date	2/17/56	1/20/56	2/19/56	2/22/56	2/15/56
Av. birth wt. (lbs)					
Bulls	63.1	51.3	64.1	61.8	72.0
Heifers	63.5	47.1	51.7	58.8	67.0
Were calves creep fed?	No	No	No	No	No
Av. wt. at six months (lbs)					
Bulls	302	251	361	368	389
Steers	-	-	-	-	-
Heifers	288	267	304	341	388
Av. weaning date					
Bulls	8/20/56	8/20/56	8/20/56	8/20/56	8/20/56
Steers					
Heifers					
Av. weaning wt.					
Bulls	325.4	345.7	374.2	385.5	420.1
Steers	-	-	-	-	-
Heifers	322.4	357.6	327.0	373.3	481.6
Av. weaning type score					
Bulls	11.4	11.3	9.1	9.7	9.1
Steers	-	-	-	-	-
Heifers	11.2	11.6	8.9	10.3	10.0
Av. weaning condition score					
Bulls	8.4	9.1	8.5	9.3	9.6
Steers					
Heifers	9.6	10.4	9.4	11.0	10.3
Calves slaughtered at weaning					
1. Steer or bull calves					
No.					
Av. age					
Av. wt.					
Av. slaughter grade					
Av. dressing percent					
Av. carcass grade					
2. Heifer calves					
No.					
Av. age					
Av. wt.					
Av. slaughter grade					
Av. dressing percent					
Av. carcass grade					

POSTWEANING PERFORMANCE OF 1953 CALVES FULL FED AFTER WEANING
(or pastured for high gains)

Brooksville, Florida Station

Line or group designation	Hereford	Angus	Brahman	Brg	SGRP	Santa Gert
Location	Brooksville					
Breeding of calves	Hereford	Angus	Brahman	Brg	SGRP	Santa Gert
Av. inbreeding (%)						
Bulls, No.	2	1	3	2	-	7
Av. inbreeding (%)						
Av. weaning wt.						
Av. 12 month wt.	607	579	622	627	-	689
Length of feeding period	140	140	140	140		140
Feed per cwt. gain (lbs)						
Concentrates	-	-	-	-	- -	-
Roughage						
Av. daily gain on test	2.5	2.7	2.36	2.2		2.67
Av. type score (12 mos)	10.5	8.0	9.0	10.0		9.0
Steers, No.	11	6	8	8	12	3
Av. inbreeding (%)						
Av. weaning wt.	289.0	315.8	326.8	345.0	377.4	380.0
Av. 12 month wt.	304.9	365.2	388.0	406.8	430.2	466.0
Length of feeding period	160	160	160	160	160	160
* Feed per cwt. gain (lbs)						
Concentrates	7.77	8.07	7.30	7.13	6.72	7.88
Roughage	1.72	1.69	1.56	1.49	1.36	1.51
Av. daily gain on test						
Av. type score (12 mos)	2.06	1.99	2.22	2.29	2.54	2.30
Heifers, No.						
Av. inbreeding (%)						
Av. weaning wt.						
Av. 12 month wt.						
Length of feeding period						
Feed per cwt. gain (lbs)						
Concentrates						
Roughage						
Av. daily gain on test						
Av. type score (12 mos)						

* Steers were lotted according to weight and not by breed. Amount of feed per pound of gain was calculated for breed by figuring the amount of feed consumed per animal in each lot and then the amount of feed for each breed was calculated for the feeding period.

PRODUCTION AND/OR SLAUGHTER DATA ON YEARLING AND OLDER CATTLE
NOT INCLUDED IN BREEDING HERDS IN 1956

Brooksville, Florida Station

Line or group designation	Hereford	Angus	Brahman	Brg	SGRP	Santa Gert
Breeding:	Hereford	Angus	Brahman	Brg	SCRP	Santa Gert
Sex:	F	F	F	F	F	F
No.	15	3	8	18	8	8
Av. age (fall 1955)	277	354	271	268	264	278
Av. wt. (fall 1955)	285.9	344.3	345.7	356.8	404.0	433.4
Days on pasture*	Ran on pasture continually from weaning					
Av. gain on pasture Summer gain 3/6/-6/20/56	96	79	107	112	122	115
Days on feed*						
Av. wt. adjusted to 18 or 30 months of age**						
Av. gain on feed						
Animals slaughtered:						
Av. age at slaughter						
Av. slaughter weight						
Av. slaughter grade						
Av. dressing percent						
Av. carcass grade						

* Indicate in footnotes the general method of feeding and type of ration. Include average daily ration, period fed, and feed per cwt. gain if known.

** See report of committee on methods of measurement for method of adjusting pasture cattle to standard age.

Heifers were run on unfertilized improved pasture with 1 lb. 41% cottonseed pellets from weaning (9/1/55) to December 1, 1955. From December 1, 1955 until March 15, 1956, they received 4 lbs. chopped Indigo hay, 1 lb. pellets and 2 lbs. citrus molasses.

GEORGIA STATION
-by-

B. L. Southwell

I. Project Title: Ga. A. H. 1. 1-2-3. Contributing S-10.

Improvement of Beef Cattle in Georgia Through the Use of Selection for Economic Factors Brought Out in the Process of Inbreeding, Crossbreeding and Outbreeding.

II. Objectives:

1. Sire testing studies with polled Hereford and Angus cattle.
2. To study the relative value of grading, crisscrossing and rotational crossing as breeding systems for economical beef production when using bulls of the polled Hereford, Angus and Santa Gertrudis breeds.

III. Accomplishments During the Year:

A. Six Polled Hereford bulls were used in the 1956 breeding program. The 104 females in the total group were assigned to breeding herds as follows:

Herd	Sire Number	No. of cows
"Rate of gain"	513	18
Weaned weight	534	18
Type	543	18
Index	562	18
Test	565	16
Test	F27	16

An effort is being made to use 2-year-old bulls instead of 14 month-old bulls as has been the practice in the past. Only one young bull (No. 565) was used in 1956 and he was from the herd of A. J. Singletary, Blakely, Georgia. This bull was fed by the Station during the winter 1955-56 and made an excellent record.

The two Angus bulls used during the 1956 breeding period were purchased, one from Wye Plantation, Queenstown, Maryland and one from Meadow Lane Farm, North Salem, New York.

No new equipment was added during the year other than minor items.

One proved polled Hereford bull was loaned to Mississippi State College for the 1956 breeding program.

An Angus bull was loaned to the Coastal Plain Station in the spring of 1956 by Wye Plantation for possible use in the 1957 breeding program. The calf had been fed in the Wye Plantation testing program.

B. (1). Polled Hereford Sire Testing Studies: Six bulls were proved during the fall and winter 1955-56 by feeding all their offspring in dry lot for 140 days. At the end of the test period each calf was rated according to the following formula:

$$\text{Rating} = \text{Type score} + \frac{\text{Avg. daily gain}}{.05}$$

Each sire was given a rating equal to the average of all his offspring. Type score influenced the rating 50 percent and rate of gain 50 percent. The six bulls tested received the following rating.

No. 497, A.L.F. Beau Rollo 56	- 73.63
No. 441, Coastal Sir Perf. 52	- 77.49
No. 452, Coastal B. Rollo 34	- 68.70
No. 508, Coastal D. Plato 4	- 73.34
No. 233, H.S.F. Beau Victor 76	- 68.21
No.1331, C.M.R. Larry Rolo 1st.	- 68.82

Sires 441, 452 and 508 were raised in the Station herd and two of them rated well. Sires 233 and 1331 were brought in from two well known Polled Hereford herds. These records are excellent examples of the ability of a sire's offspring to gain. It is interesting to know that the progeny of Sire 441 gained .5 and .37 pound daily (for bulls and heifers respectively) more than did the progeny of Sire 233.

Offspring from two Polled Hereford sires (3 and 4 bull calves in each case) owned by a cooperative breeder in the state were fed along with the Station bull calves. Their ratings were 77.00 and 83.29 respectively.

All the bull calves were full-fed a grain mixture and were also full-fed Coastal Bermuda hay. The grain mixture was composed of:

6 parts ground snapped corn
1 part cottonseed meal

The heifer calves were limited-fed grain (about 10 pounds daily per heifer) but were full-fed hay.

Forty-five bull calves and thirty heifer calves sired by six Polled Hereford bulls are being fed during the 1956-57 feeding period.

B. (2). Angus: Offspring from two Angus sires were fed in 1955-56. This was the second year the calves from Sire No. 92, Eileenmere 1136, were fed. His rating based on the performance of eleven bull calves and eleven heifer calves was 70.28 while the rating of the second sire (property of a cooperator in the state) was 66.66. The offspring from one Angus sire performed and rated higher than offspring of two Polled Hereford bulls tested but they were not as good as those from two Station bred Polled Hereford sires (441 and 508). Type scores of the Angus bull and heifer calves were generally higher than for the Polled Herefords.

Offspring from three Angus bulls are being fed during the 1956-57 test period.

B. (3). Crossbreeding Studies: The cooperative beef cattle crossbreeding project at the State Prison Farm, Reidsville, Georgia, involving Polled Hereford, Angus and Santa Gertrudis cattle has been in progress four or more years. Grade Hereford cows were bred to bulls of the above breeds to produce the foundation females for this crossbreeding study. The first of this foundation group (78 head) of two year-old heifers, were bred in the spring of 1956. It is anticipated that the numbers in the seven breeding groups can be built up to the desired number rather rapidly now and that in two or three years 300 or more brood cows will be involved in the study.

IV. Future Plans:

It is anticipated that the breeding groups of Polled Hereford and Angus females will be the same in 1956-57 as in 1955-56. The crossbreeding studies at the Georgia State Prison Farm will be conducted and increased as planned.

A special allotment has been made available to construct facilities for feeding, at this Station, 100 bull calves for cooperative breeders. The facilities should be ready to feed bull calves in the fall and winter of 1956-57.

V. Publications During the Year:

Annual Reports to the Georgia Coastal Plain Experiment Station, to the Regional Coordinator of the Southern Beef Cattle Breeding Project and the Animal and Poultry Husbandry Research Branch, ARS, U.S.D.A.

"Factors Affecting Performance in Herds of Purebred Herefords and Grade Polled Hereford Cattle" - by W. C. McCormick, B. L. Southwell and E. J. Warwick. Tech. Bul. N.S. 5 Ga. Agri. Exp. Stations. 1956.

"A Comparison of Brahman Crossbred With British Crossbred Cattle" - W. C. McCormick and B. L. Southwell, Jour. An. Science.

VI. Publications Planned:

None at present.

POSTWEANING PERFORMANCE OF 1955 CALVES FULL FED AFTER WEANING
(or pastured for high gains)

Georgia Coastal Plain Experiment Station

Line or group designation	Polled Here	Angus
Location	Tifton	Tifton
Breeding of calves	Polled Here	Angus
Av. inbreeding (%)	--	--
Bulls, No.	34	13
Av. inbreeding (%)	-	-
Av. weaning wt.	440	509
Av. 12 month wt.	748	813
Length of feeding period	140 days	140 days
Feed per cwt. gain (lbs)	712	860
Concentrates	619	753
Roughage	93	107
Av. daily gain on test	2.20	2.07
Av. type score (12 mos)	11.50	12.40
Steers, No.		
Av. inbreeding (%)		
Av. weaning wt.		
Av. 12 month wt.		
Length of feeding period		
Feed per cwt. gain (lbs)		
Concentrates		
Roughage		
Av. daily gain on test		
Av. type score (12 mos)		
Heifers, No.	32	15
Av. inbreeding (%)	-	,-
Av. weaning wt.	386	427
Av. 12 month wt.	608	620
Length of feeding period	140	140 days
Feed per cwt. gain (lbs)	930*	930*
Concentrates	654	654
Roughage	276	276
Av. daily gain on test	1.56	1.27
Av. type score (12 mos)	11.8	12.40

* Angus and Hereford heifers fed together.

Bulls - Full fed grain mixture (6 parts snapped corn and 1 part cottonseed Meal) and Coastal Bermuda hay.

Heifers - Limited -Fed same grain mixture (10 pounds) and full fed hay.

PERFORMANCE OF COW HERDS. 1956 CALVES

Georgia Coastal Plain Experiment Station

Line of group designation	Polled Here	Angus
Location	Tifton	Tifton
Breed of sire	P.H.	Angus
Breed of dam	P.H.	Angus
No. cows bred	100	37
No. cows calving	79	35
No. calves raised	76	31
Av. inbr. of dams (%)	-	-
Av. inbr. of calves (%)	-	-
Av. birth date	2/17/56	2/18/56
Av. birth wt. (lbs)		
Bulls	70.6	64.1
Heifers	64.4	56.2
Were calves creep fed?	Yes	Yes
Av. wt. at six months (lbs)		
Bulls	379	384
Steers	-	-
Heifers	365	351
Av. weaning date		
Bulls	9/17/56	9/17/56
Heifers	9/17/56	9/17/56
Av. weaning wt.		
Bulls	430	437
Steers	-	-
Heifers	414	400
Av. weaning type score		
Bulls	11.1	11.0
Steers	-	-
Heifers	11.4	12.0
Av. weaning condition score		
Bulls	9.2	10.0
Steers	-	-
Heifers	10.3	10.8
Calves slaughtered at weaning		
1. Steer or bull calves	None	None
No		
Av. age		
Av. wt.		
Av. slaughter grade		
Av. dressing percent		
Av. carcass grade		
2. Heifer calves		
No.	None	None
Av. age		
Av. wt.		
Av. slaughter grade		
Av. dressing percent		
Av. carcass grade		

KENTUCKY STATION
-by-

A. R. Parsons and D. G. Steele

I. Project Title: No. A. H. 72. Contributing to S-10

A Performance and Progeny Testing Program for Bulls of the Beef Breeds.

II. Objectives:

To use weaning weights, rate of gain, efficiency of gain, conformation score and condition score of bull calves in an effort to determine the value these items should receive in predicting the future value of bulls in the breeding herd.

III. Accomplishments During the Year:

(1) Two 154-day performance tests using a total of 30 bulls have been completed. The data from these tests are presented in tables I and II. The fourth performance test involving fifteen bulls is underway.

(2) The breeding dates of all brood cows in the University herd is being changed from a year-around program to a two and one-half months breeding season for early spring calves so that comparisons within breeds and between breeds can be made.

IV. Future Plans:

(1) Two 154-day performance tests will be conducted each year.

(2) Two bulls from the performance test, one a slow and one a fast gainer, will be mated on 20 grade Hereford and 20 Red Poll cows where the calves will be compared as to birth weights, weaning weights, feed lot performance and carcass value. The calves from the different breeds of cows will be compared as to feeder and fat calf production.

(3) Four bulls from the performance test will be mated with 25 Hereford cows each where the calves will be compared as to birth weights, weaning weights, feed-lot performance and carcass value. The cows will be allotted as uniformly as pssible with respect to age and conformation.

V. Publications:

None

Table I - August 4, 1955 - January 5, 1956

Breed & Identification Number	Initial wt. lbs.	Final wt. lbs.	Av. Da. Gain, lbs.	Feed/cwt. gain lbs.	Age at end of test days	Weight* for age	Ave.** Score conformation	Ave *** score condition	Breeder
Hereford 1	577	1000	2.75	757.8	490	2.04	2	low good	J. D. Gay, Jr.
Hereford 2	603	1010	2.64	804.2	450	2.24	2 +	low good	J. D. Gay, Jr.
Hereford 3	597	1085	3.17	687.1	457	2.37	2	low good	J. D. Gay, Jr.
Angus 4	567	895	2.39	854.0	449	1.99	2 -	hi.standard	J. Clark
Angus 5	607	975	2.39	923.8	417	2.34	2	low good	J. Clark
Angus 6	787	1125	2.19	1019.4	485	2.32	2 +	low good	Hicks Bros.
Shorthorn 7	782	1105	2.10	1070.3	490	2.26	2	low good	Henry Knight
Shorthorn 8	707	1010	1.97	973.3	478	2.11	2	Av.stand.	Henry Knight
Shorthorn 9	743	1170	2.77	902.7	523	2.24	2	low good	Henry Knight
Angus 10	460	810	2.27	893.9	429	1.89	3 +	low stand.	B. C. Cotton
Angus 11	452	815	2.36	759.4	389	2.10	2	hi.stand.	B. C. Cotton
Angus 12	407	785	2.45	736.2	367	2.14	3 +	low stand.	B. C. Cotton
Angus 13	582	970	2.52	740.8	461	2.10	2	low good	Ward Renaker
Hereford 14	373	840	3.03	593.6	381	2.20	3 +	low stand.	Laban Jackson
Hereford 15	432	845	2.68	678.3	389	2.17	2	av. stand.	Laban Jackson
Average			2.51	826.2					

* Final weight divided by age (days)

** Scored from 1 + 3 -. 1 + indicates most desirable conformation.

*** This score indicates only the degree of finish as determined by slaughter grade standards.

Table II - February 10 - June 29, 1956

Breed & Identification Number	Initial wt. lbs.	Final wt lbs	Av Da gain, lbs	Feed/cwt gain lbs.	Age at end of test days	Weight* for age	Av.** score conformation	Ave. score*** condition	Breeder
Hereford 1	563	1008	3.18	659.3	416	2.42	2	low good	Bland Bros.
Hereford 2	610	1102	3.51	617.6	432	2.55	2 +	hi good	Bland Bros.
Angus 3	730	1042	2.23	952.9	447	2.33	2 -	low good	Clifford Smith
Angus 4	507	842	2.39	824.2	383	2.20	3	av.stand.	Clifford Smith
Angus 5	488	812	2.31	852.3	382	2.13	3 +	hi stand.	Clifford Smith
Angus 6	495	938	3.16	676.4	444	2.11	3 +	hi stand.	Hicks Bros.
Angus 7	922	1182	1.86	1133.5	517	2.29	2 +	av good	Univ. of Ky.
Angus 8	818	1092	1.96	1188.1	510	2.14	2	low good	Univ. of Ky.
Shorthorn 9	965	1302	2.41	906.5	520	2.50	2 -	hi good	Univ. of Ky.
Hereford 10	533	940	2.91	644.1	395	2.38	3 -	av. stand.	Gene Becker
Hereford 11	492	913	3.01	684.6	361	2.53	2	low good	Gene Becker
Hereford 12	473	955	3.44	591.9	534	1.79	3 +	hi stand.	Laban Jackson
Hereford 13	522	948	3.04	691.1	497	1.91	3	hi stand.	Laban Jackson
Shorthorn 14	665	988	2.31	812.7	487	2.03	3-	hi utility	Theo.Terry, Jr.
Shorthorn 15	582	957	2.68	732.0	401	2.39	3	av stand.	Brown-Forman
Average			2.69	797.8					

* Final weight divided by age (days).
** Scored from 1 + 3 -. 1 + indicates most desirable conformation.
*** This score indicates only the degree of finish as determined by slaughter grade standard.

LOUISIANA STATION
-by-
R. A. Damon, Jr.

I. Project Title: La. 605. Contributing to S-10.

Comparison of Various Crossbred Cattle and High Grade Cattle With Respect to Fattening Ability, Rate of Growth and Meat Quality.

II. Objectives:

(a) To develop types of beef cattle best suited to conditions along the Gulf Coast.

(b) To compare the performance of several breeds of beef cattle and crosses between these breeds with respect to rate of growth on pasture, fattening ability, and meat quality of steers.

(c) To estimate the amount of hybrid vigor that can be expected to result from crossing beef breeds and to ascertain the methods best suited for its utilization and maintenance.

III. Accomplishmentd During the Year:

(a) A total of 117 calves were raised in the crossbreeding project during 1956. This makes a total of 460 calves produced during the four years which this project has been carried on. Some of the data which have been collected during the past year are presented in the following tables. Weaning weights have been adjusted to 180 days of age. Again, the data have been presented by grouping the calves according to the breed of the dam and also by the breed of the sire. Although we are particularly interested in the performance of the individual crosses, rather than groups, these data are not presented due to the amount of space required. These data, of course, are being compiled.

When the 180-day weights are examined by the breed of dam, it can be seen that the Brangus and Brahman cows continue to raise heavier calves than do the Angus and Hereford cows. This heavier weight is reflected in the higher grades placed on these calves at weaning.

When the 180-day weights are grouped by breed it can be seen that again the calves sired by Charolaise, Hereford, and Shorthorn bulls are heavier than those sired by the Angus, Brahman, and Brangus bulls. Again, these heavier weights are reflected in the higher grades of these calves at weaning. These results have been quite consistent over the four years of the experiment.

(b) Since the females produced in this project are retained for further breeding studies, a record of their growth rate is of interest. When the heifers are grouped by breed of dam, the heifers out of Brahman cows have consistently shown a greater rate of gain than heifers out of the other cows. When grouped by breed of sire, those heifers sired by the Charolaise, Hereford and Shorthorn bulls are noticeably heavier than those sired by Angus, Brahman, and Brangus bulls.

(c) Fifty-four steers produced in this project in the spring of 1955 were fed on a wheat pasture with a concentrate supplement plus a little hay. The steers were fed an average of $7\frac{1}{2}$ pounds of concentrate daily and made an average rate of gain of 1.96 pounds per day. At the end of the 168-day feeding period the steers were slaughtered in the meats laboratory of the University. Some of the data collected from the steers are presented in the following tables.

(d) The last crop of calves in the first phase of this project will be dropped in the spring of 1957. The second phase of this project is a back-cross breeding program. The breeding for this back-cross will start on April 1, 1957.

(e) Breeding and carcass studies are continuing in the study of the inheritance of muscular hypertrophy, or "double muscling" in cattle.

(f) Several matings have been made in the study of dwarfism, and this herd and corresponding facilities are being enlarged.

IV. Future Plans:

The crossbreeding project will continue as originally planned. The back-cross program will start in the spring of 1957 and the cows used in the original breeding herds will be bred for the production of calves in a new project which is to be developed.

The studies of dwarfism and muscular hypertrophy will be continued.

V. Publications:

"Crossbreeding in Beef Production". R. A. Damon, Jr. Paper presented at the Annual Conference of the College of Agriculture, Louisiana State University, Baton Rouge, La. December 4, 1956.

Annual Report of 1954-55. Louisiana State Experiment Station. Improvement of Beef Cattle for the Southern Region. R. A. Damon, Jr., C. B. Singletary, P. B. Brown, S. E. McCraine, T. M. DeRouen, and R. M. Crown.

PERFORMANCE OF COW HERDS. 1956 CALVES

Baton Rouge, Louisiana Station

Location	Baton Rouge									
Breed of dam	Brangus	Angus	Hereford	Brahman	Angus	Brahman	Brangus	Charolaise	Hereford	Hereford
No. cows bred	48	48	48	48	32	32	32	32	32	32
No. cows calving	33	32	30	32	27	21	8	19	25	23
No. calves raised	30	26	29	32	25	20	8	19	22	23
Av. birth date	2-22-56	2-14-56	2-20-56	2-23-56	2-15-56	2-29556	3-7-56	3-5-56	2-5-56	2-12-56
Av. birth wt. (lbs)	69.1	66.8	73.5	65.4	59.8	66.0	76.9	76.2	72.1	67.5
Bulls	70.7	66.6	74.9	66.0	58.6	69.4	78.6	82.4	69.9	70.2
Heifers	67.8	66.9	71.4	64.9	61.4	62.9	72.5	71.5	73.7	65.0
Were calves creep fed?	No	No	No	No	No	No	No	No	No	No
Av. wt. at six mos.(lbs)	421.6	374.0	380.8	412.1	355.3	393.4	399.1	422.6	423.0	405.1
Bulls										
Steers	446.4	396.2	393.5	416.0	367.7	417.3	398.0	453.7	434.0	434.8
Heifers	402.6	364.1	362.8	408.2	341.9	369.6	402.5	408.2	416.8	377.9
Av. weaning date:	10-18-56	10-18-56	10-18-56	10-18-56	10-18-56	10-18-56	10-18-56	10-18-56	10-18-56	10-18-56
Bulls										
Steers										
Heifers										
Av. weaning wt.:	499.2	441.0	448.8	495.8	429.4	446.5	475.6	485.5	533.0	473.9
Bulls										
Steers	528.1	473.1	467.0	500.9	446.9	466.0	472.5	522.5	434.0	524.5
Heifers	477.1	426.7	422.9	490.6	410.4	427.0	485.0	468.5	523.6	427.5
Av. weaning type score										
Heifers	Choice	L-Choice	H-Good	H-Good	L-Choice	Choice	L-Choice	L-Choice	H-Choice	L-Choice
Av. weaning condition score:	L-C	H-G	Good	L-C	Good	H-Good	Good	H-Good	Choice	L-Choice
Steers	L-Choice	H-Good	Good	H-Good	Good	H-Good	Good	H-Good	L-Choice	L-Choice
Heifers	L-Choice	H-Good	Good	L-Choice	Good	H-Good	H-Good	H-Good	Choice	H-Good

POSTWEANING PERFORMANCE OF 1955 STEER CALVES
Fed on Pasture and Concentrate Supplement

Baton Rouge, Louisiana Station

168 Days

	Angus Crossbreds	Brahman Crossbreds	Brangus Crossbreds	Charolaise Crossbreds	Hereford Crossbreds	Sh Crbs.
No. Steers	5	9	12	10	12	9
Feeder Grade[1]	12.30	11.75	10.96	10.90	12.10	12.19
Slaughter Calf Grade[2]	9.90	10.75	9.62	8.65	10.10	10.17
Av. Daily Gain on Feed	2.01	2.08	1.81	2.05	1.88	1.80
Carcass Grade	12.87	11.81	11.03	10.27	11.72	13.52
Hot Dressing Percentage	59.59	59.32	59.24	58.27	57.28	60.96
Chilled Dressing Percentage	58.10	57.80	57.58	57.39	55.52	59.42
Planimeter Area Eye of Lean	9.27	9.16	9.21	9.15	8.39	8.63
Shearing Strength Tenderness	13.35	14.14	14.32	14.01	14.04	13.89

1 Common 3-5, Medium 6-8, Good 9-11, Choice 12-14, Fancy 15-17

2 Utility 3-5, Commercial 6-8, Good 9-11, Choice 12-14, Prime 15-17

LOUISIANA STATION

I. Project Title: Contributing to S-10.

The Improvement of Beef Cattle for the Southern Region Through Breeding Methods.

II. Objectives:

(a) Development from crossbred foundations beef cattle that possess a high degree of inherent adaptability to the environmental conditions of the Gulf Coast area and to estimate the degree of adaptation by means of production records.

(b) Improvement of reproductive performance. (1) To study the cause or causes of reproductive failure in beef and dual-purpose cattle and (2) to investigate methods of altering environmental and physiological conditions to overcome reproductive failures.

III. Accomplishments During the Year;

(a) Fifty-four heifers purchased to be used in newly inaugurated reproduction study.

(b) Research results. Analysis of heat tolerance data showed highly significant correlations between respiration rates and rectal temperatures. Correlations for crossbreds ranged from approximately 0.5 to 0.6. These correlations are not considered sufficiently high to justify the use of respiration rates as a measure of body temperature or of heat tolerance. Correlations between dams coefficient of heat tolerance and performance as measured by her own birth weight, six month weight and five-year weight and those of her progeny were not significant.

(c) Record-of-performance bulls and steers are fed a mixture of ground hay, ground yellow corn, molasses, and cottonseed meal. Average daily gains of bulls and steers on feed for 1955 and 1956 were: purebred Brahman bulls, 2.06; purebred Brahman steers, 1.80; crossbred Africander-Angus bulls, 2.13; crossbred Africander-Angus steers, 1.74; crossbred Brahman-Angus bulls 2.50; crossbred Brahman-Angus steers, 1.79. There were no purebred Aberdeen-Angus on feed in 1955 and 1956.

IV. Future Plans:

To continue present work.

V. Publications During the Year:

None.

VI. Publications Planned:

Report on the analyses of heat tolerance data as soon as completed.

PERFORMANCE OF COW HERDS. 1956 CALVES

Iberia Livestock Experiment Station

Line of group designation	Aberd-Angus	Brahman	Afric-Angus	Brah-Angus
Location	Jeanerette			
Breed of sire	Aberd-Angus	Brahman	Afric-Angus	Brah-Angus
Breed of dam	Aberd-Angus	Brahman	Afric-Angus	Brah-Angus
No. cows bred	11	37	52	119
No. cows calving	8	26	42	95
No. calves raised	8	18	40	81
Av. inbr. of dams (%)	None	None	8.35	3.74
Av. inbr. of calves (%)			10.62	6.14
Av. birth date	2/4/56	2/11/56	1/30/56	2/7/56
Av. birth wt. (lbs)				
Bulls	60.8	53.9	64.6	67.4
Heifers	53.2	53.2	59.1	62.3
Were calves creep fed?	No	No	No	No
Av. wt. at six months (lbs)				
Bulls	420.0	444.0	439.8	473.1
Steers	322.0	337.1	383.1	395.5
Heifers	323.0	320.9	363.2	380.3
Av. weaning date				
Bulls	9/26/56	9/26/56	9/26/56	9/26/56
Steers				
Heifers				
Av. weaning wt:				
Bulls	480.0	520.0	506.2	548.1
Steers	356.7	370.0	443.5	458.7
Heifers	365.0	348.9	428.9	447.5
Av. weaning type score:				
Bulls	10.7	13.3	12.3	13.0
Steers	7.9	8.4	9.2	10.0
Heifers	9.5	9.4	11.0	11.6
Av. weaning condition score:				
Bulls	8.3	11.0	10.8	11.3
Steers	7.1	7.6	8.9	9.8
Heifers	8.5	8.0	10.4	10.4

POSTWEANING PERFORMANCE OF 1955 CALVES FULL FED AFTER WEANING
(or pastured for high gains)

Iberia Livestock Experiment Station

Line or group designation	Brahman	Afric-Angus	Brah.-Ang
Location	←----------	Jeanerette	----------
Breeding of calves	Brahman	Afric-Angus	Afric-Ang
Av. inbreeding (%)	None	12.57	5.56
Bulls, No.	2	5	13
Av. inbreeding (%)	None	13.68	6.27
Av. weaning wt.	402.5	475.0	554.2
Av. 12 month wt.	782.5	814.0	956.9
Length of feeding period	154 days	154 days	154 days
Feed per cwt gain (lbs) Concentrates) a Roughage)	849.85	889.28	861.05
Av. daily gain on test	2.06	2.13	2.51
Av. type score (12 months)	12.0	8.7	11.5
Steers, No.	2	6	25
Av. inbreeding (%)	None	11.64	5.19
Av. weaning wt.	312.5	417.5	460.0
Av. 12 month wt.	622.5	711.7	757.6
Length of feeding period	154 days	154 days	154 days
Feed per cwt. gain (lbs) Concentrates) a Roughage)	Data not available		
Av. daily gain on test	1.80	1.74	1.79
Av. type score (12 months)	10.2	8.7	9.6

(a) Ration consisted roughage and concentrate ground and mixed together.

1 - 1st 28 days
7 lbs. Allyce clover hay
3 lbs. corn
2 lbs. molasses
2 lbs. cottonseed meal

2 - Remainder of period
7 lbs. Allyce Clover hay
7 lbs. corn
4 lbs. molasses
3 lbs. cottonseed meal

MARYLAND STATION

-by-

W. W. Green

I. Project Title: No. C-14, Contributing to S-10.

A Study of Productiveness of Purebred Beef Cattle in Maryland.

II. Objectives:

(1) To study productiveness of existing or introduced stocks of beef cattle. Productive characteristics measured will include rate of gain, economy of gain, market type, carcass quality, fertility, longevity, adaptation to environmental conditions, and other factors affecting the utility value of beef cattle.

(2) To compare selective criteria (individual and pedigree) with actual performance of progeny.

(3) To evaluate breeding techniques for small purebred herds under the varying conditions encountered in practice in purebred herds.

(4) To attempt to produce beef cattle with superior productive capacities by line breeding and selection. (Using criteria of selection as developed in this project and by cooperating stations in this and other regions).

III. Accomplishments During the Year;

Routine weights and linear measurements as requested by the S-10 Committee have been secured on the Aberdeen-Angus and Hereford herds owned by the University of Maryland on the same basis as reported previously.

Cooperative work involving the weighing of calves (and scoring see Project C-14-b) was continued with the manager of an Aberdeen-Angus herd. The 32 bull calves started on a gain-test trial on October 28, 1955, were weighed on November 22, 1955, January 6, 1956, and March 29, 1956. The average weight and age on October 28, 1955 was 570 pounds and 248 days respectively. The average daily rate of gain from October to March was 2.4 pounds. The coefficients of correlation between the pounds gained and initial weight and age were -0.08 and -0.09 respectively. Twenty additional bull calves were put on trial January 5, 1956. Fifty-two heifer calves were on trial during the 1955-56 season. To date, 42 bull and 36 heifer calves have been put on gain-test trial for the 1956-1957 season. Some statistical analysis has been done on the data secured from the 32 bull calves started on trial in October 1955 but no analysis has been made on the data secured from the other calves mentioned above.

The results secured under this project as well as Projects C-14-a and C-14-b have been used to interest breeders in securing performance data on their herds and to assist Extension Service Specialists in the formulation of a record of performance program for the breeders of beef cattle in the State of Maryland.

IV. Future Plans:

Routine weights and linear measurements will be taken of the animals of the Aberdeen-Angus and Hereford herds owned by the University of Maryland. Cooperative work will be continued with the owner of the herd mentioned above. The data will be analyzed as rapidly as possible. Additional cooperators will be added to the project if contributions to the project are foreseen.

V. Publications During the Year:

Brown, C. J., E. J. Warwick, H. J. Smith, W. W. Green, H. A. Stewart. Relationships Between Conformation Scores and Live Animal Measurements of Beef Cattle. Jour. Ani. Sci. 15:911-921.

Green, W. W. and J. Buric. Record of Performance Program For Beef Cattle. Univ. Md. Agri. Exp. Sta. Misc. Publ. 267:10

Green, W. W. Studies of Scores of Conformation and Gains of Bull Calves. Univ. Md. Ari. Exp. Sta. Bul. 461. (in press).

VI. Publications Planned:

None.

MARYLAND STATION

I. Project Title: C-14-a. Contributing to S-10.

Effect of Early Weaning on the Duration of Maternal Influences in Beef Calves.

II. Objectives:

(1) To attempt to develop a new technic for an earlier evaluation of feed lot performance, progeny testing, and genetic evaluation of beef animals.

(2) To develop sound feeding and management practices for early weaned beef calves.

(3) To evaluate the calves' genetic ability to thrive under new systems of care.

III. Accomplishments During the Year:

Analyses of the data secured from individually fed Aberdeen-Angus during the years of 1949 through 1955 have been continued. Unless otherwise specified, the analyses have been done on a within sex (heifer or steer), within weaning age (90 or 180 days) basis. The calves weaned at 90 days of age were fed until an age of 370 days; the total 280 day period being subdivided into ten 28 day periods (90-118, 118-146, 342-370 days). There were 30 heifers and 39 steers weaned at 90 days of age and 27 heifers and 31 steers weaned at 180 days of age or a total of 127 calves. There were no statistically significant differences between the average weights of sire progeny groups (on a within year basis) at birth or at the start of any of the 28 day sub-periods in reference to the calves at 180 days of age. Statistically significant differences (at the 5% level) were found at the ages of 230, 258, 286 and 314 days but not at 202 or 342 days for the steers weaned at 180 days. No statistically significant differences were found between the averages of sire progeny groups (on a within year basis) for the number of pounds gained from birth to 90 days of age or for any of the 28 day periods for either sex weaned at either age with the exception of the gains made by the females weaned at 90 days and the steers weaned at 180 days for the period of 342-370 days of age (1% level). Coefficients of correlation between the weight at the start of a 28 day period and the gain during the period were calculated from the residual (within bulls within years) line of covariance analysis. Only two of the 34 coefficients were statistically significant. These were for the steers weaned at 90 days for the period of 118-146 days (1% level) and for the steers weaned at 180 days for the period 342-370 days (5% level).

Correlation studies involving the pounds of TDN (Y) consumed during a 28 day period, the pounds gained (X_1) during a 28 day period and the average weight of the animal (X_2) during a 28 day period were initiated wherein the correlations, r_{YX_1}, r_{YX_2}, and $r_{X_1X_2}$ were

calculated from the residual (within sire within year) line of covariance analyses in a within sex within weaning age basis. In addition to the zero order correlations the following were calculated beta $Y X_1 \cdot X_2$, beta $Y X_2 \cdot X_1$, $r_{YX_1 \cdot X_2}$, $r_{YX_2 \cdot X_1}$ and also $R_{Y \cdot X_1 X_2}$. Similar statistics were also run from the data of the "total" line of analysis of covariance. In addition, similar statistics were also calculated for the age periods of 90-202 and 202-370 days for the calves weaned at 90 days of age, and 202-370 days for the calves weaned at 180 days of age. For the 28 day feeding periods the coefficients of $R_{Y \cdot X_1 X_2}$ ranged in value from about 0.45 to 0.90, most of them falling in the range of 0.6 to 0.8. This indicated that about 1/3 to 2/3 of the variance of the TDN consumed during a 28 day period was associated with factors other than the gain or "maintenance" (average weight during the period being used as an indicator of the maintenance requirements of the animal). The sizes of $r_{YX_1 \cdot X_2}$, $r_{YX_2 \cdot X_1}$, $b_{YX_1 \cdot X_2}$ and $b_{YX_2 \cdot X_1}$ varied in size from feeding period to feeding period with no special trends in magnitude or change in magnitude being indicated. Further work on the problem of TDN utilization is being made by combining the data of both sexes and weaning age groups in various combinations. The estimated amount of TDN consumed by individual calves per period has been calculated (using the multiple regression equation) to be used in connection with the study to be described immediately following this.

The average weight per period and the TDN consumed per period have been plotted against the age of the calves not only on the basis of the averages of the various weaning age and sex groups but also on the basis of many individual calves. At the age period of 118-146 days the calves consumed pounds of TDN approximately equal to half of their body weight. As the time progressed the calves tended to consume proportionately less TDN in relation to their body weight, indicating that they were increasing in efficiency. The season of the year apparently did not affect this relationship.

The means, standard deviations, and coefficients of variation have been calculated for each of the 48 body measurements which were secured from a total of 55 calves fed individually during the years of 1953 and 1954. The calves which were weaned at 90 days were measured when 90, 180, and 370 days of age and the calves weaned at 180 days were measured at 180 and 370 days of age. Separate statistics were calculated for each weaning age and sex group for each age of measurement. This work was done as a preliminary phase for proposed correlation and analyses of covariance studies.

IV. Future Plans:

Work will be continued on the analysis of the data.

V. Publications During the Year:

Green, W. W. and J. Buric. Record of Performance Program for Beef Cattle. Univ. Md. Agri. Exp. Sta. Misc. Publ. 267: 10.

VI. Publications Planned:

Publications will be prepared as rapidly as studies on the data will permit.

MARYLAND STATION

I. Sub-Project Title: C-14-b. Contributing to S-10.

Type Classification As An Aid In Selection of Beef Breeding Cattle.

II. Objectives:

To determine the value of type classification in beef cattle, i.e., heritability of beef cattle type and production.

III. Accomplishments During the Year:

The Aberdeen-Angus and Hereford herds of the University of Maryland were classified twice during the year by use of the new scoring system which was described in last year's report. A second scoring was made of the bull calves fed by the cooperator mentioned under Project C-14. The calves being fed under Sub-Project C-14-d have also been scored using the same scoring system.

The means, standard deviations, and coefficients of variation of the scores as recorded have been calculated for each of the 54 items scored by each of four scorers in October 1955 and March 1956, for the 32 bull calves fed by the cooperator mentioned under Project C-14. The same statistics were calculated using the data secured from the scoring of 37 mature Hereford and Aberdeen-Angus cows of the herds of the University of Maryland and the data from each of four scorers scoring on one date. The same statistics were calculated from the data of the above two groups of animals but the amount the score deviated from 100 was used instead of the actual score as recorded. A review of the results indicated that there were seemingly significant differences between judges not only in the amount their average scores deviated from 100 but also in the amount of variation they indicated to exist within a group of animals.

IV. Future Plans:

The Aberdeen-Angus and Hereford herds of the University of Maryland will be scored semi-annually as in the past. Scores have not been taken on the 1956 calves of the cooperator's herd and it is not anticipated that scores will be taken during the coming spring. It is intended that the calves being fed under Sub-Project C-14-d will continue to be scored by use of the new scoring system. As soon as possible additional studies will be made of the data in an attempt to revise the scoring system if such revision is so indicated.

V. Publications During the Year:

See Project C-14.

VI. Publications Planned:

None.

MARYLAND STATION

I. Sub-Project Title: C-14-d. Contributing to S-10.

Group Versus Individual Feeding of Weaned Beef Calves.

II. Objectives:

(1) To evaluate the accuracy of group vs. individually fed calves as a technique in the testing of sire-progeny groups.

(2) To study the possibility of forecasting the productiveness of beef calves by using single or combined measurements taken on live animals.

(3) To study the value of scores taken on live animals in relation to forecasting their performance.

(4) To compare measurements and scores in order to search for objective methods of determining scores.

(5) To study absolute and relative changes in measurements and scores from one age to another.

III. Accomplishments During the Year:

The 19 Aberdeen-Angus and 22 Hereford calves which were placed on trial on October 11, 1955, completed their trial on May 22, 1956. All animals were measured when one year of age. All animals were measured and also scored at the completion of the trial.

Twenty-two Aberdeen-Angus and 26 Hereford calves (steers and heifers) of the 1956 calf crop were weaned and placed on trial October 9, 1956. The method of allotting the calves and the methods of feeding and management for these calves are the same as used last year. Shortly after being placed on trial all animals were scored by a committee of four scorers and were also measured. No analysis of the data has been initiated and no analyses are anticipated until the data of both the 1955 and 1956 calves are available.

IV. Future Plans:

The calves now on trial will be measured a second time when they are one year of age. The calves will be kept on trial until May 21, 1957. All animals will be measured and scored at the termination of the trial. Analysis of the data will be initiated as soon as possible after the 1956 calves complete their trial.

V. Publications During the Year:

None.

VI. Publications Planned:

Manuscripts will be prepared as rapidly as the analysis of the data will permit.

SCORING SYSTEMS USED AT THE UNIVERSITY OF MARYLAND

Two scoring systems have been used at the University of Maryland:

(1) The scoring system which was used for the years 1949 through 1955 was as follows: Six categories were used on the score sheet. They were: (a) general type, (b) head and neck, (c) forequarter, (d) body, (e) hindquarter, (f) over-all rating. The categories were usually scored in the order listed. Category (f) represented an average of the other five categories and was calculated by the scorer at the time of scoring the animal. The relative emphasis placed on the various categories in computing the over-all rating were, in terms of percent, 25, 12-1/2, 12-1/2, 25 and 25 for categories (a) through (e) respectively. The scale of points used to note the degree of desirability ran from 1 through 5. A score of "1" would be given an animal which represented the "attainable ideal" in conformation for the category being scored; the basis for determining the "attainable ideal" was the usual show-ring standards. A score of "3" indicated that the animal was of an "average" degree of desirability in the category being scored. A score of "5" indicated that the animal was about as poor in that category as possible and still be classified as being of beef type. Care was exercised in order to have a unit change in the numerical scale parallel an equivalent change in the degree of desirability of the animal. The scores were usually recorded in terms of a whole number and a decimal, e.g., 2.1, 2.2, etc. The scores as recorded under this system were readily convertable into the numerical system which was suggested for standard use by all cooperating states in the S-10 project.

In addition to the categories listed above, the age of the animal was recorded as well as the date of the last calving of females which were in the reproductive phase of their life cycle. The size of the animal was also scored. A score of "1" was given if the animals were of an acceptable size for age and scores of "2" or "3", etc. were given if the animal were too small or too large for its age or purpose. A score was also given for the condition of the animal. A score of "1" indicated that the breeding animal was in an acceptable breeding condition. A score of "2" or "3" indicated that the animal was considered too fat or too thin for an individual in a breeding herd.

(2) The scoring system which has been used for the past year includes 55 items. The scale of points allowed for any one given item varies from 50 to 130. A score of "100" indicates that the animal is equal to the "attainable ideal" for the item being scored. As in the above system (1), usually accepted show-ring standards are used as a base for scoring the different parts of the animal. By using a scale of points ranging from below to over 100 the scorer would be able to indicate not only that the animal did not meet the standard but also the "direction" of the fault exhibited by the animal. In the proposed system it was suggested, for example, that an item like, "length of head" would be scored "100" if the head were perfectly satisfactory, be scored less than "100" if the head were not long enough, and would be scored over "100" if the head were too long. Over-all appraisal of the animal would be calculated in terms of the average amount of deviation from "100." Scores were recorded in terms of units of 5 such as; 80, 85, 90, etc. An effort was made to have variations in numerical score parallel similar differences in the degree

of desirability of the animal. The condition of the animal is rated according to usual slaughter animal grades. An over-all score is also given at the time of scoring not on the basis of an average of the other items on the score sheet, but based on an over-all impression of the animal and recorded by use of the same range of scores (1 through 5) as indicated in (1) above. This last was added for two reasons: (a) so the data could be used with that collected under the former system, and (b) so a convertable figure would be available to use in connection with the S-10 system.

The use of the Maryland system instead of the scoring system recommended by the Technical Committee of the Regional Project S-10 by the workers at the Maryland Station indicates neither dissatisfaction with the scoring system proposed by the S-10 group nor a specific intent to disregard the system. The first system described above (1) was already in use at the time the S-10 system was adopted. Inasmuch as data had already been collected by use of the Maryland system and analysis of that data had been initiated and inasmuch as the scores as recorded on the Maryland system were readily converted into the numerical scores of the S-10 system, the consensus of opinion of the workers at the Maryland Station was that the Maryland system should be continued as established, converting to the S-10 system whenever necessary or desirable. The second system (2) was designed in an attempt to devise a method which might be of more use to the breeder. A more complete itemization of the various parts of the body as well as an indication of the "direction" of a fault was indicated as being of possible advantage.

PERFORMANCE OF COW HERDS. 1956 CALVES

University of Maryland Station

Line of group designation	U. of Md.	U. of Md.
Location	U. of Md.	U. of Md.
Breed of sire	Angus	Hereford
Breed of dam	Angus	Hereford
No. of cows bred	30	30
No. cows calving	28	29
No. calves raised	27	27
Av. inbr of dams (%)	Outbred Herd	Outbred Herd
Av. Inbr of calves (%)	Outbred Herd	Outbred Herd
Av. birth date	2/12/56	2/13/56
Av. birth wt. (lbs)		
Bulls	59	68
Heifers	56	61
Were calves creep fed?	Yes	Yes
Av. wt. at six months (lbs)		
Bulls	455	None
Steers	405	390
Heifers	372	385
Av. weaning date:		
Bulls	10/8/56	None
Steers	10/8/56	10/8/56
Heifers	10/8/56	10/8/56
Av. weaning wt.		
Bulls	495	None
Steers	490	475
Heifers	500	500
Av. weaning type score:		
Bulls	13	None
Heifers	14	12
Steers	13	13
Av. weaning condition score:		
Bulls	13	None
Steers	13	13
Heifers	13	13
Calves slaughtered at weaning:	None	None

POSTWEANING PERFORMANCE OF 1955 CALVES FULL FED AFTER WEANING
(or pastured for high gains)

University of Maryland Station

Line or group designation	U. of Md.	U. of Md.		
Location	U. of Md.	U. of Md.		
Breeding of calves	Aberdeen-Ang	Aberd-Angus		
Av. inbreeding (%)	Outbred herd	Outbred Herd		
Bulls, No.	None	None		
Steers, No.	Indiv. Fed 4	Group Fed 5	Indiv. Fed 7	Group Fed 6
Av. inbreeding (%)	Outbred	Herd	Outbred	Herd
Av. weaning wt.	534	532	511	526
Av. 15 month wt.	851	924	905	943
Length of feeding period	224	224	224	224
Feed per cwt gain (lbs)	1130	1118	944	1010
Concentrates	723	775	637	693
Roughage	407	343	307	317
Av. daily gain on test	1.42	1.75	1.76	1.86
Av. type score 15 months	12	12	12	13
Heifers, No.	5	5	3	4
Av. inbreeding (%)	Outbred Herd	Outbred Herd	Outbred H	Outbred Herd
Av. weaning wt.	450	463	442	455
Av. 15 months wt.	757	815	755	818
Length of feeding period	224	224	224	224
Feed per cwt. gain (lbs)	1086	1102	987	1057
Concentrates	759	759	645	730
Roughage	327	343	342	327
Av. daily gain on test	1.37	1.57	1.40	1.62
Av. type score 15 months	12	13	12	12

PRODUCTION AND/OR SLAUGHTER DATA ON YEARLING AND OLDER CATTLE
NOT INCLUDED IN BREEDING HERDS IN 1956

University of Maryland Station

Line or group designation	U. of Md.	U. of Md.
Breeding:	Angus	Hereford
Sex:	Heifers to be added to herd	
No.	5	5
Av. age (fall 1955)	21 mos	20 mos
Av. winter gain	100	79
Av. wt. (fall 1955)	926	903
Days on pasture (1956)	161	161
Av. wt. adjusted to 18 months of age		
Av. gain on pasture	69	136

Above heifers were selected to go back into breeding herd and were fed for development rather than finish. From November 5, 1955 to April 30, 1956 wintered on approximately full feed of roughage (silage and hay) and 6 pounds of concentrate per head daily. Grazed on permanent pasture from April 30 to October 8.

MISSISSIPPI STATION

-by-
Troy B. Patterson and B. G. Ruffin

I. Project Title: Miss. A.H. 1. Contributing to S-10

A Study to Determine the Breeding Worth of Inbred and Outbred Bulls From Various Sources.

II. Objectives:

(a) To compare the growth rate, carcass qualities and maternal abilities of the progenies of bulls selected from various sources as potentially superior sires.

(b) To develop a high producing herd of cows by using the progeny of good producing bulls as replacement heifers.

(c) To determine the effectiveness of a selection index when used on heifers at weaning time.

III. Accomplishments During the Year;

The calves from 5 bull units (4 Hereford and 1 Angus) were dropped during the spring of 1956. The bulls used on these units included: (1) one bull from Montana line No. 1; (2) one high gaining bull from the Texas Station; (3) one Polled Hereford bull from the Georgia Station (4) one Hereford bull from the Mississippi Station (included in last year's test); (5) one Angus bull from the Virginia Station. Five steer calves were selected at random from each bull unit and placed on uniform pasture composed of oats and rye grass. In addition, eight heifers from each unit were selected at random and placed on pasture. One heifer had to be culled later because of injury, leaving only seven in one group. These heifers will be kept for replacements after the grazing period. The steers will be slaughtered and carcass data collected.

A limited amount of data was collected on steer calves from the 1955 calving season. However, because of the method of selection and the variability that existed in the trials on which they were placed, comparisons of sires based on these results would not be considered valid.

A third series of bulls consisting of : 1) one high gaining Hereford from the Texas Station; 2) a Polled Hereford from the Georgia Station; 3) two "commercial" Herefords from the Mississippi Station; 5) one Angus from the Virginia Station were bred to cows this spring.

IV. Future Plans:

Post-weaning performance of the 1956 calf crop will be measured under uniform conditions. These animals will not be super-imposed on any other experiment.

Effort will be made to secure bulls from other sources in addition to those already in use.

V. Publications During the Year:

None

PERFORMANCE OF COW HERDS. 1956 CALVES

Mississippi Agricultural Experiment Station

Line of group designation		Ga. Polled			Va. Angus Station
Location	Mont. 558	T444	Texas 534	T 161	EN 16
			Prairie		
Breed of sire	Hereford	Hereford	Hereford	Angus	Hereford
Breed of dam	Grade Here	Grade Here	Grade Here	Grade Angus	Gr. Hereford
No. cows bred	30	30	30	21	28
No cows calving	21	25	23	17	25
No calves raised	20	24	22	15	25
Av. inbr of dams (%)					
Av. inbr. of calves (%)					
Av. birth date	3/18/56	3/11/56	3/16/56	3/4/56	3/10/56
Av. birth wt (lbs)					
Bulls	72.3	61.8	69.9	64.1	67.8
Heifers	72.8	63.0	62.4	59.8	64.2
Were calves creep fed?	No	No	No	No	No
Av. weaning date:					
Bulls	--	--	--	--	--
Steers	10/11/56				
Heifers	10/11/56				
Av. weaning wt:*					
Bulls	--	--	--	--	--
Steers	439.9	419.5	421.0	410.5	415.6
Heifers	436.6	401.7	377.7	398.6	385.0
Av. weaning type score					
Bulls					
Steers	10.2	11.3	10.4	11.6	11.2
Heifers	10.2	10.7	10.5	11.0	9.8
Calves slaughtered at weaning	None	None	None	None	None

* Adjusted to 205 days.

POSTWEANING PERFORMANCE OF 1955 CALVES FULL FED AFTER WEANING
(or pastured for high gains)

	Mississippi Experiment Station				
	Mont. No. 1	Mont No. 1	Texas	Station	Station
Line or group designation	481	394	828	EN 45	EN 16
Location	Prairie, M.				
Breeding of calves	Grade Herefords	Grade Herefords	Grade Herefords	Grade Herefords	Grade Herefords
Av. inbreeding (%)	0				
Bulls, No.					
Steers, No.	6	2	4	3	1
Av. inbreeding (%)	0	0	0	0	0
Av. weaning wt.	445.8	498.5	454.7	513.1	427.9
Av. 12 month wt	616.7	697.0	615.2	675.7	630.0
Length of feeding pd.*	176.0	177.0	177.0	175.0	177.0
Feed per cwt gain (lbs)					
Concentrates					
Roughage	Pasture	Pasture	Pasture	Pasture	Pasture
Av. daily gain on test	2.03	2.16	1.55	2.42	1.70
Av. type score (12 mos)					
Heifers, No.					

* Only the results of the pasture period are reported here as the rations these steers were placed on after pasture varied greatly. It is therefore, doubtful if the results would have any meaning.

PRODUCTION AND/OR SLAUG TER DATA ON YEARLING AND OLDER CATTLE
NOT INCLUDED IN BREEDING HERDS IN 1956

Mississippi Station

Line or group designation	Mont. No. 1 481	Mont. No. 1 394	Texas 828	Station EN 45	Station EN 16
Breeding:	Grade Hereford	Grade Hereford	Grade Hereford	Grade Hereford	Grade Here.
Sex:	Steers	Steers	Steers	Steers	Steers
No.	6	2	4	3	1
Av. age (fall 1955) 1/	246.4	244.0	253.2	231.0	231.0
Av. wt. (fall 1955) 2/	445.8	498.5	454.7	513.1	427.9
Days on pasture	176.0	177.0	177.0	175.0	177.0
Av. gain on pasture	357.3	382.5	274.8	425.5	301.0
No. on feed 3/	6	1	2	2	0
Av. wt. adjusted to 18 mos. 4/	947.2	1036.1	942.6	1000.8	927.9
Days on feed	95	95	95	95	-
Av. gain on feed	206.0	153.0	188.5	168.5	---
Animals slaughtered:					
Av. age at slaughter	545.8	506.0	512.2	513.0	462.0
Av. slaughter weight	976.0	957.0	894.5	957.7	746.0
Av. slaughter grade	--	--	--	--	--
Av. dressing percent	59.4	58.6	58.9	59.5	57.4
Av. carcass grade	11.6	9.5	11.2	10.7	8.0

1/ Actual weaning age.

2/ Adjusted to average age of 244 days

3/ Same animals as those on pasture except for five that were slaughtered off pasture.

4/ Adjusted to 18 months of age including the five that were slaughtered after pasture.

NORTH CAROLINA STATION
-by-
E. U. Dillard

I. Project Title: N. C. 74. Contributing to S-10.

The Improvement of Beef Cattle Through Breeding Methods.

Project Title: N. C. 46. Contributing to S-10.

The Development of Beef Cattle Especially Adapted to the Coastal Plains Region of North Carolina and Similar Areas.

II. Objectives:

(1) To establish breeding groups of cattle from top crosses of Brahman Africander and Romo Sinuano bulls to grade Hereford cows.

(2) To evaluate the feedlot performance of purebred bulls and heifers of Angus, Hereford and Shorthorn breeds and prospective herd sires of the other breeding groups being established.

(3) To study total performance of progeny of bulls used in the same herd the same year.

(4) To study methods of measuring and evaluating performance of brood cows.

III. Accomplishments During the Year:

(1) Facilities and cattle acquired: One each purebred Angus, Hereford and Shorthorn bulls were added to the breeding herd in 1956 through purchase. Five Angus cows were purchased as additions to the purebred Angus herd.

Some additional land clearing and seeding for pasture was done at Raleigh and at the Tidewater Station. A small pond for water supply and another trench silo were constructed at Raleigh. A cattle squeeze was purchased in cooperation with the Dairy and Veterinary Sections for use at Raleigh. A portable scale was purchased for use by the research stations and for an on-farm performance evaluation program.

(2) Research results and progress report: Breeding herds of 34 Brahman-Hereford, 31 Africander-Angus-Hereford and 20 grade Hereford cows are now at the Frying Pan Experimental Range. In 1956 fifty-six calves were born of 76 cows bred. Six of these calves died prior to weaning. All calves were weaned early (at approximately four months of age) this year in hopes that the cows which normally enter the winter in rather thin flesh might regain some weight after the calves were weaned and before the beginning of the winter feeding period. Calves born on the range have generally been light in weight at birth. This is believed to be due in part to inadequate nutrition of the cow in the late stages of the gestation period. As in previous years the rate of gain was higher for crossbred calves than for the grade Herefords; however, the sale price per hundred pounds was generally lower for the crossbred

calves within the same weight class. Some difficulty has been encountered with the Brahman-Hereford cattle of F_2 or later generations from apparent fatal parasitism when these cattle were moved to infested areas for pasture.

Interse matings of the groups at the Frying Pan Range will be continued. Selections will be made on the basis of cow productivity and reproductive performance. Bull calves with good preweaning rate of gain and acceptable conformation are fed in post weaning gain tests for sire selection.

The Romo Carolina cows in that breeding group now at the Central Station in Raleigh will be moved to the range station in 1957 to evaluate their performance under the more unfavorable environment.

In the 1955-56 post weaning gain tests a total of 20 bulls and 26 heifers were fed for a period of 168 days. The four high indexing Hereford bulls were mated to commercial cows at two of the research stations for progeny test information. Three bulls of other breeds were retained as sires in their respective breeding groups. Three bulls in previous gain tests and progeny in the station research herds were leased to commercial beef producers in 1956. Their progeny in these herds may be used for further evaluation of the sires.

Steer progeny groups which included 42 head for the sires used in 1954 were fed out and slaughter and carcass data obtained.

The North Carolina station this year initiated a project "The Use of Records of Performance Selection Program for Improving Beef Cattle" which should contribute valuable information to the S-10 project.

The purpose of this study is to increase the number of herds as well as the number of cattle on which performance data are collected. It is considered that estimates of genetic parameters obtained from station controlled herds are from limited numbers and should be compared with those from herds handled as they may be under farm conditions if recommendations from the findings are to be made with confidence.

An opportunity to gain valuable information is provided if data obtained from Record of Performance work is evaluated and compared with information on station controlled herds. Dairy cattle breeding associations and U.S.D.A. continue to use information from HIR, DHIA, and other herd performance records for estimating genetic parameters, even though these records may have been collected for improving management practices within herds. Beef cattle breeders can do likewise.

This project is designed to obtain data which will allow comparisons between

(1) Sire progeny groups within farms (sire selection)
(2) Performance of cows within herds as evidenced by calf weight and grade (cowherd culling and age adjustment).
(3) Calves of the same cow, year confounded (age of dam adjustment).
(4) Performance of individual calves in selecting herd replacement.

Herds cooperating in this project in 1956 had more than 700 cows and approximately 600 calves were indexed on the basis of 182 day weight and grade.

IV. Future Plans:

No major changes are planned for 1957. Modifications in rations or management treatments may be made to allow for nutritional research. Data collected to date will be analyzed to determine usefulness of such data to beef cattle improvement programs and to beef cattle breeding. The Record of Performance project will be continued with herds able to supply data useful for research purposes. Other herds will be included in a separate program to be supervised primarily by the Extension Service.

V. Publications:

Carmon, J. L., H. A. Stewart, C. C. Cockerham and R. E. Comstock. Prediction Equations for Rotational Crossbreeding. Journal of Ani. Sci. 15: 930-936.

Boss, Frederick Earl. Evaluation of Selection Practiced for Weaning Weight in a Grade Hereford Herd. Master's Thesis. North Carolina State College.

Brown, C. J., E. J. Warwick, H. J. Smith, W. W. Green, H. A. Stewart Relationships Between Conformation Scores and Live Animal Measurements of Beef Cattle. Jour. of Ani. Sci. 15: 911-921.

PRODUCTION AND/OR SLAUGHTER DATA ON YEARLING AND OLDER CATTLE
NOT INCLUDED IN BREEDING HERDS IN 1956

North Carolina Station

Upper Mountain Research Station

Line or group designation	Bull 313	Bull s01
Breeding:	G. Heref.	G. Heref.
Sex:	Steers	Steers
No.	7	9
Av. age (fall 1955)	235 days	234 days
Av. wt. (fall 1955)	462.9	461.0
Days on pasture	None	None
Av. gain on pasture	- -	- -
Days on feed	154	154
Av. weight adjusted to 18 or 30 mos. of age	836.3	807.1
Av. gain on feed	384.1	363.5
Animals Slaughtered:		
Av. age at slaughter	21.2 mo	21.2 mo
Av. slaughter weight	1041.7	1003.4
Av. slaughter grade	11.4	11.9
Av. dressing percent	56.8	56.4
Av. carcass grade	11.7	11.1

PRODUCTION AND/OR SLAUGHTER DATA ON YEARLING AND OLDER CATTLE
NOT INCLUDED IN BREEDING HERDS IN 1956

North Carolina Station

Tidewater Research Station, Plymouth

Line or group designation	H-319	H-62	H-360
Breeding:	G. H.	G. H.	G. H.
Sex:	Steers	Steers	Steers
No.	7	8	9
Av. age (fall 1955)	277	285	254
Av. wt. (fall 1955)	478.6	500.6	417.8
Days on pasture			
Av. gain on pasture			
Days on feed	142	142	142
Av. wt. adjusted to 18 or 30 mos. of age	818.9	830.3	787.7
Av. gain on feed	226	267	264
Animals slaughtered:	7	8	9
Av. age at slaughter	20.6 Mo.	20.9 Mo.	18.9 Mo.
Av. slaughter weight	951.4	983.8	880.0
Av. slaughter grade	10.0	11.4	9.9
Av. dressing percent	58.8	58.8	57.2
Av. carcass grade	9.3	10.4	9.2

POSTWEANING PERFORMANCE OF 1955 CALVES FULL FED AFTER WEANING
(or pastured for high gains)

North Carolina (Raleigh) Station

Line or group designation	Hereford	Angus	Shorthorn	Brahman	Africander	Romo-Carolina
Location	Raleigh					
Breeding of calves	Hereford	Angus	Shorthorn	Br X H	Af X B X H	RC X A X H
Av inbreeding (%)	0	0	0	0	0	
Bulls, No.	8	3	3	2	2	2
Av. inbreeding (%)	0	0	0	0	0	
Av. weaning wt.	472	509	467	335	340	575
Av. 12 month wt.	701	710	667	565	625	865
Length of feeding period	168	168	168	168	168	168
Feed per cwt gain (lbs)						
Concentrates	7.10	7.10	7.10	7.10	7.10	7.10
Roughage	.66	.66	.66	.66	.66	.66
Av. daily gain on test	1.67	1.52	1.43	1.65	2.03	2.19
Av. type score (12 mos)	11.58	10.89	9.44	6.33	7.5	8.33
Steers, No.						
				G.H.		
Heifers, No.	9	5	3	5		4
Av. inbreeding (%)	0	0	0	0		0
Av. weaning wt.	477	461	521	561		517
Av. 12 months wt.	601	595	698	693		643
Length of feeding period	168	168	168	168		168
Feed per cwt gain (lbs)						
Concentrates	9.33	9.33	9.33	9.33		9.33
Roughage	2.52	2.52	2.52	2.52		2.52
Av. daily gain on test	1.18	1.15	1.26	1.17		1.06
Av. type score (12 months)	11.1	10.2	11.	11.2		8.1

PERFORMANCE OF COW HERDS. 1956 CALVES

North Carolina (Raleigh) Station

Line of group designation	Hereford	Angus	Shorthorn	Romo-Carolina	Gr. Hereford
Location			Raleigh		
Breed of sire	Hereford	Angus	Shorthorn	RC X H	H X A
Breed of dam	Hereford	Angus	Shorthorn	RC X H	Gr. Hereford
No. cows bred	40	15	11	11	20
No. cows calving	34	13	9	11	16
No. calves raised	33	13	8	11	15
Av. inbr of dams (%)	0	0	0	0	0
Av. inbr of calves (%)					
Av birth date	1/14/56	12/1/55	1/13/56	1/19/56	1/14/56
Av. birth wt. (lbs)					
Bulls	65	58	68	67	66
Heifers	61	53	66	62	63
Were calves creep fed?	yes	yes	no	no	yes
Av. wt. at six months (lbs)					
Bulls	359	371	418.5	370	372
Steers					
Heifers	330	348	425	363	369
Av. weaning date					
Bulls	9/5/56	8/20/56	9/5/56	9/5/56	9/5/56
Steers					
Heifers	10/3/56	10/3/56	10/3/56	10/3/56	10/3/56
Av. weaning wt:					
Bulls	449	497	490	441	477
Steers					
Heifers	477	496	541	498	482
Av. 182 Day Feeder Grade					
Bulls	11	11	11	8	10
Steers	10.5	11	11	7.5	10

PERFORMANCE OF COW HERDS. 1956 CALVES

North Carolina Station

	Tidewater Research Sta.		Upper Mountain Research	
Line of group designation	G. H.	G. H.	Bull 319	Bull 421
Location	T.R. Sta.	T.R. Sta.	L. Springs	L. Springs
Breed of sire	H-405	H-417	Hereford	Hereford
Breed of dam	G. H.	G. H.	G. H.	G. H.
No. cows bred	26	31	25	14
No. cows calving	19	26	24	13
No. calves raised	15	20	24	13
Av. inbr of dams (%)	0	0	0	0
Av. inbr of calves (%)	0	0	0	0
Av. birth date	1/20/56	1/19/56	2/29/56	1/23/56
Av. birth wt. (lbs)				
Bulls	67.6	76.2	72.3	69.0
Heifers	68.2	74.5	68.1	63.0
Were calves creep fed?	No	No	No	No
Av. wt. at six months (lbs)				
Bulls	351.6	384.0	367.7	349.0
Steers	-	-	-	-
Heifers	346.0	364.9	348.0	349.0
Av. weaning date	11/14/56	11/14/56	212 days	249 days
Bulls				
Steers			202 days	242 days
Heifers			216 days	239 days
Av. weaning wt:				
Bulls	481.2	515.0	403.5	448.7
Steers				
Heifers				
Av. 182 day feeder grade				
Bulls			10.4	11.0
Steers	10.4	10.2	10.4	11.3
Heifers	10.6	9.7	10.4	10.6

PERFORMANCE OF COW HERDS. 1956 CALVES

North Carolina Station

	Frying Pan Experimental Res. Sta.				Upper Mt. Res.	
Line of group designation	G.H.	Br X G.H	Br x GH	AfxAxGH	Bull 319	Bull 421
Location	FPER	FPER	FPER	FPER	L.Spring	L.Spring
Breed of sire	Here.	Brah.	Br x GH	AFxAxH	Here.	Here.
Breed of dam	G.H.	G.H.	Br x GH	AfxAxH	G.H.	G.H.
No. cows bred	(27)*	27	32	17	25	14
No. cows calving	5	14	25	2	24	13
No. calves raised	5	13	21	11	24	13
Av. inbr. of dams (%)	0	0	0	5	0	0
Av. inbr of calves (%)	0	0	15	2	0	0
Av. birth date					2/29/56	1/23/56
Av birth wt. (lbs)					72.3	69.0
Bulls	66	69	55	61	77.3	72.5
Heifers	70	55	52	58	68.1	63.0
Were calves creep fed?	No	No	No	No	No	No
Av. wt. at six months (lbs)					367.7	349.0
Bulls					-	-
Steers	(all calves were weaned when				390.9	370.6
Heifers	approximately 4 months of age)				348.0	314.6
Av. weaning date					212 days	249 day
Bulls						
Steers (ave. age weaning)					202	242
Heifers					216	239
Av. weaning wt:					403.5	448.7
Bulls					-	-
Steers					415.9	463.1
Heifers					393.1	426.0
Av. 182 day Feeder grade					10.4	11.0
Bulls					--	--
Steers					10.4	11.3
Heifers					10.4	10.6

SOUTH CAROLINA STATION

-by-

E. G. Godbey

I. Project Title: No. SC 25. Contributing to S-10.

The Use of Purebred and Crossbred Cows in the Production of Slaughter Calves.

II. Objectives:

The objects of the test were to determine the birth and weaning weights, animal and carcass grades and dressing percentages of calves out of crossbred and purebred dams.

III. Accomplishments During the Year:

Seventy cows produced 66 calves. Sixty-four of these calves were raised to weaning.

IV. Future Plans:

This work will be continued through 1957 and 1958.

V. Publications During the Year:

Publications have not been issued.

PERFORMANCE OF COW HERDS. 1956 CALVES

Clemson, South Carolina Station

Line of group designation	Pb.Angus	Bra x Ang	Bra x Here	Angus	Here X Ang
Location		Coast	Station		
Breed of sire	Angus	Shorthorn	Shorthorn	Shorth	Shorthorn
Breed of dam	Angus	Bra x Ang	Bra x Here	Angus	Here X Ang
No. cows bred	25	12	11	10	12
No. cows calving	23	11	11	10	11
No. calves raised	23	11	10	10	10
Av. inbr of dams (%)	None	None	None	None	None
Av. inbr of calves (%)	None	None	None	None	None
Av. birth date	Feb. 3	Feb. 14	Feb. 3	Jan 27	Jan 29
Av. birth wt. (lbs)					
Bulls	73.63	70.00	63.40	63.43	74.71
Heifers	68.73	65.25	66.83	62.33	60.33
Were calves creep fed?	Yes	Yes	Yes	Yes	Yes
Av. wt at six months (lbs)					
Bulls					
Steers					
Heifers					
Av. weaning date (210 days)					
Bulls					
Steers	Sept 1	Sept 27	Aug 26	Aug 23	Aug 31
Heifers	Aug 31	Sept 1	Sept 7	Aug 26	Aug 15
Av. weaning wt (210 days)					
Bulls					
Steers	531.75	564.25	511.40	473.43	493.57
Heifers	496.73	489.57	477.40	455.33	466.67
Av. weaning type score:					
Bulls	This				
Steers	Group				
Heifers	not				
Av. weaning condition score	graded or slaughtered				
Bulls					
Steers					
Heifers					
Calves slaughtered at weaning:					
1. Steer or bull calves					
No.		4	5	7	7
Av. age	None	211 days	212 days	213 days	213 days
Av. wt.		557.50	499.00	465.71	485.00
Av. slaughter grade		Good +	Good+	Good+	Good
Av. dressing percent		57.35	59.54	58.97	58.90
Av. carcass grade		Good+	Good+	Good+	Good
2. Heifer calves					
No.		7	5	3	3
Av. age	None	213	210	211	215
Av. wt.		473.57	464.00	438.33	446.67
Av. slaughter grade		Good+	Good+	Good	Choice-
Av. dressing percent		58.66	60.04	56.73	55.60
Av. carcass grade		Choice-	Choice-	Good+	Good+

TENNESSEE STATION
-by-

Charles S. Hobbs, H. J. Smith, and Joe W. High

I. Project Title: No. 15. Contributing to S-10.

The Improvement of the Producing Ability of Beef Cattle.

II. Objectives:

(a) To develop lines or line crosses, or combinations of lines and crosses, of beef cattle which will make the most efficient use of Tennessee pastures and forages and that will result in an improvement of such characters as rate of gain, economy of gain, carcass quality, fertility and longevity.

(b) To develop effective breeding techniques for improving the productivity of existing lines of beef cattle.

(c) To investigate the productiveness of existing lines of beef cattle.

(d) To study the effect of different levels of nutrition on the development of type and conformation, on economy of gain, fertility and longevity.

III. Accomplishments During the Year:

1. Post-weaning performance tests.
Performance tests of promising bull were continued with thirty Hereford and Angus bull calves, (19 Hereford and 11 Angus bulls) selected from the calf crops of the purebred herds at the main station and sub-stations. Two Hereford bulls were also purchased from Tennessee breeders for the test. Bull calves were selected in station herds on the basis of a performance index which gives equal importance to weaning type grade and weaning weight. The performance tests were conducted at Knoxville under dry-lot conditions. The bulls were sorted within breeds into groups of 10 to 12 on the basis of weight and group-fed for 196 days in concrete lots with access to a barn. For the first 135 days of the test, the bulls were fed a high roughage-limited concentrate ration consisting of grass silage ad libitum, 3 pounds of alfalfa hay and 6 pounds of a concentrate mixture per head daily. During the last 61 days of the tests, the bulls were fed a full feed of concentrates, hay, and grass silage. The average daily gain for the Hereford bulls for the first 135 days of the test on the high roughage-limited concentrate ration was 1.46 pounds with a range of 1.95 to 0.95 pounds. Average daily gain and range of gains for Angus bulls were 1.28 pounds and 1.66 to 0.97 pounds. For the last 61 days of the test, when the bulls were on a full feed of concentrates, the Hereford bulls averaged 1.80 pounds daily gain and gains varied from 2.33 to 1.20 pounds. Angus bulls averaged 1.63 pounds daily gain with a range of 2.57 to 1.26 pounds.

It was necessary to terminate the full feeding phase of the tests after a limited time to use some of the bulls, and the results indicate only slight overall correlation between the gains of bulls made on the different levels of feeding during the first and second periods.

Heifer progenies at some stations were fed on performance tests for 140-150 daysto provide information to aid in selection of heifers to go into breeding herds and to develop heifers for use in the breeding herds as replacements. Future plans include similar performance tests of all heifers in the breeding program at all stations.

2. Progeny Testing of Sires.

Progeny test information was obtained on 31 Hereford bulls at 6 stations and 11 Angus bulls at 3 stations during 1956. This information is of specific value to the project in the selection of herd sires for the development of herds and lines. Information obtained also contributes to the overall objectives of the project.

3. Level of Feeding Studies.

The study of the effect of level of nutrition on the development of type and conformation, on growth rate, economy of gain, and reproductive efficiency was continued during 1956. Several new trios of calves were started on feed in 1956.

4. Tennessee Beef Cattle Improvement Program.

This program was initiated in 1955-56 in cooperation with the Extension Service and the Tennessee Livestock Association. Approximately 15 herds were entered in the program this year. The program will be expanded in 1957 to include all breeders who are interested in participating in this on-the-farm testing program for beef cattle.

5. The performance of cow herds by sire groups at the various stations for 1956 is shown in the accompanying tables.

IV. Future Plans:

1. Continue the performance and progeny testing of sires.
2. Continue cow performance testing in all herds.
3. Continue the level of feeding studies.
4. Continue the development of herds and lines at the main station and sub-stations.

V. Publications During the Year:

Smith, H. J., and C. S. Hobbs. Selecting Beef Breeding Stock for High Performance. Tennessee Farm and Home Science. Progress Report 17. March, 1956.

Smith, H. J., Joe W. High, Jr. and C. S. Hobbs. Performance Testing of Bull Calves. AH-VS Mimeo 111. October 1956.

Hobbs, C. S. Influence of Plane of Nutrition on Performance Traits. Aberdeen-Angus Journal. Vol. 38, No. 1, August 1956; page 160.

Brown, C. J., E. J. Warwick, H. J. Smith, W. W. Green and H. A. Stewart. Relationships Between Conformation Scores and Live Animal Measurements of Beef Cattle. Jour. of Ani. Sci. 15:911-921.

VI. Publications Planned:

Results of the work will be published as results justifies.

POSTWEANING PERFORMANCE OF 1955 CALVES FULL FED AFTER WEANING
(or pastured for high gains)

Tennessee Station

Line or group designation	Performance Testing		
Location	Knoxville		
Breeding of calves Av. inbreeding (%)	Hereford	Angus	All Bulls
Bulls, No.	19	11	30
Av. inbreeding (%)			
Av. weaning wt.			
Av. 12 month wt.			
Length of feeding period[1]	196	196	196
Feed per cwt gain (lbs)[2]			
Concentrates			546
Roughage Hay			199.
Grass silage			1841.
Av. daily gain on test	1.63	1.39	1.51
Av. type score (12 months)	11.7	12.4	12.0

1 Bulls were group-fed in lots of 10-12 (sorted on a weight basis only).

2 During the first 135 days of the test the bulls were fed grass silage (ad libitum), hay (3 pounds per head daily) and concentrates (6 pounds per head daily). During the last 61 days the bulls were full-fed concentrates, hay and silage.

TENNESSEE STATION

I. Project Title: Contributing to S-10.

The Detection of Animals Heterozygous for Recessive Bovine Dwarfism.

II. Objectives:

1. To investigate methods of identifying at young ages animals heterozygous for recessive bovine dwarfism.

III. Accomplishments During the Year and Summary of Progress to Date:

Radiographs were made of the lumbar vertebrae of approximately 600 young calves in the spring of 1956, usually within two weeks of age. From the radiographs, the calves were classified as either C (clean or non-carriers of the dwarf gene, B (carriers of the dwarf gene), or A (dwarfs) on the basis of vertebrae abnormalities. The B classification is divided into seven sub-groups, B_2 through B_8. The B_2 type vertebrae approaches that of the C type vertebrae and similarly the B_8 type vertebrae approaches that of a dwarf. Body measurements were made on some of the calves X-rayed. Some of the measurements included head length, head width, cannon length, wither height, loin width and body length. To check the accuracy of these methods, progeny tests have been and are being conducted. Heifers X-rayed as calves were mated to dwarf bulls and bulls X-rayed as calves were mated to known carrier cows (cows that had produced dwarf calves).

To date, radiographs of the lumbar vertebrae of approximately 1100 calves have been made (Table 1). Some of these calves were radiographed at weekly intervals up to three months of age to determine the effects of age on vertebrae abnormalities. Some thirty body measurements were made on sixty of the calves (the progeny of three known carrier bulls) at birth and at approximately monthly intervals up to weaning in 1954. Some of these measurements were repeated on fifty-seven calves in the spring of 1955. A total of more than 15,000 measurements have been made to date.

The progeny of twenty-five heifers (X-rayed as calves; 8 were classified as C type and 17 B type) that were mated to dwarf bulls were X-rayed during 1956. Also, X-rayed were the progenies of eight bulls (4 X-ray type C and 4 X-ray type B) mated to four known carrier cows each. These matings, with one B type bull being replaced, were repeated in 1956. In addition eighty-two heifers, X-rayed as calves were mated to dwarf bulls in the late spring and early summer of 1956.

Data to date indicate the following:

A. Radiographs
   1. With the present technique, there appears to be considerable overlap between carrier and non-carrier classifications. (Table 1).
   2. Abnormal vertebraes change toward normalcy with age. Therefore, calves should be X-rayed under two weeks of age.
   3. Radiographs of a bull's progeny may be used to estimate the dwarfism status of the bull provided the cow herd he is mated to is dwarf-free (Table 2).

It is important that the genetic history of the herd be known with respect to dwarfism.

B. Breeding Tests

1. One X-ray type C heifer mated to a dwarf bull dropped a dwarf calf. This heifer was 21 days of age when X-rayed, therefore, it is entirely possible that had she been X-rayed at an earlier age her vertebrae might have shown abnormalities.

2. One B type bull out of the four mated to dwarf producing cows sired a dwarf calf.

C. Measurements

1. The C type calves were on the average heavier, higher at the withers, graded slightly less and had longer cannons in proportion to width than did the B type animals at 150 or 220 days of age. It should be emphasized that these differences were small and that they were between X-ray classification groups and not between groups of animals with known genotypes.

IV. Future Plans:

1. Continue X-ray of calves during 1957 with major emphasis on X-ray of progeny groups by sires which have herd sire possibilities.

2. Continue breeding tests to evaluate the accuracy of X-ray techniques. Eighty-two heifers, X-rayed as calves and mated to dwarf bulls in the spring and early summer of 1956 will calve in 1957. Approximately 32 carrier cows bred to C and B type bulls will also calve in 1957.

3. Initiate studies to investigate the response of clean, carrier and dwarf animals to stress (Insulin) as determined by changes in total number and kinds of white cells in the blood.

V. Publications During the Year:

High, Joe W., Jr., H. J. Smith, C. M. Kincaid, and C. S. Hobbs
The Detection of Carriers of Recessive Bovine Dwarfism in Beef Cattle. AH-VS Mimeo 110, October 1956.

High, J. W., H. J. Smith, E. J. Warwick, and C. S. Hobbs
Relationship of Body Measurements to Genotypes for Bovine Dwarfism as Estimated from X-ray of Lumbar Vertebrae. Sou. Agri. Workers' Meeting, February 1956.

VI. Publications Planned:

Results of work will be published as progress justifies.

TABLE 1.

Summary of the Distribution of X-ray Classifications of all Calves X-rayed in 1954-5-6 Sired by Angus and Hereford Bulls

Dwarfism status of bulls	% Dwarf carriers in cow herd[a]	Number of calves	X-ray Classifications			
			C	B_2	B_3-B_8	A
					% of total	
Carrier	0-30	327	18.7	37.3	37.3	6.7
Unknown	10-30	239	29.3	45.6	25.1	
Unknown	0-10	254	52.7	29.9	17.3	
Unknown[b]	0-10	141	50.3	37.6	12.0	
		961	35.0	37.5	25.3	2.3

[a]Estimated

[b]Angus bulls

Table 2. Distribution of X-ray Classifications of Calves From Various Type Matings

Bull number	No. of calves	X-ray Classification								
		C	B2	B3	B4	B5	B6	B7	B8	A
Clean bulls x apprently clean cows										
175	20	13	6	1						
195	20	13	6	1						
225	5	4	1							
235	14	12	2							
176	8	6	2							
186	11	9	1							
	78	57	18	3						
Carrier bulls x apparently clean cows										
14	14	4	6	3	1					
24	22	6	10	3	3					
34	37	16	14	3	4					
75	15	4	4	4	2	1				
	88	30	34	13	10	1				
Clean bulls x approx. 40% carrier cows										
295	15	1	11	1	1	1				
96	21	5	10	3	1	2				
	36	6	21	4	2	3				
Carrier bulls x approx. 40% carrier cows										
44	5	1						1	1	2
25	18	4	6	6		1				1
35	16	1	8	5		1				1
55	15	2	4	4	1	2				1
65	21	1	9	7	1	1				1
105	10	1	2		4			1		2
155	18	4	11	2						1
205	13	3	3	3		1				3
255	40	1	22	6	7	1				3
285	18		4	4	3	4			2	1
26	15	2	2	3	1	2		3		2
36	18	4	5	4		1	1			3
46	16	3	6	1	2	2	1			1
106	16	4	5	3		2				2
	239	31	87	48	19	18	4	5	3	24

PERFORMANCE OF COW HERDS. 1956 CALVES

University of Tennessee Station

Line of group designation	80	212	0000	27	33	103	325	432	533	5329	0000
Location	Knox	Knox	Alcoa	Alcoa	Alcoa	Alcoa	Alcoa	Alcoa	Alcoa	Alcoa	Oak Ridg
Breed of sire	Angus	Here.	Here.	Here	Here	Here	Here	Here	Here	Here	
Breed of dam	Angus	Here.	G. Here.	Here.	Here.	Here.	Here.	Here.	Here.	Here.	Here.
No. cows bred	23	31	50	19	25	21	24	24	27	22	25
No. cows calving	19	22	47	18	22	20	24	22	25	20	25
No. calves raised	17	19	47	18	21	20	24	21	24	19	24
Av. inbr. of dams (%)											
Av. inbr. of calves (%)											
Av. birth date	March 13	4/12	2/16	3/13	3/21	2/25	3/3	3/1	3/11	2/23	1/17
Av. birth wt. (lbs)											
Bulls	68	69	68	77	64	72	64	70	74	74	75
Heifers	60	65	67	80	64	73	65	68	67	60	70
Were calves creep fed	No	No	No	No	No	No	No	No	No	No	No
Av. wt. at six mos. (lbs)											
Bulls											
Steers	397	369	386	386	362	398	357	385	369	438	326
Heifers	375	374	353	373	333	366	336	350	360	346	301
Av. weaning date:											
Bulls											
Steers	11/6	11/6	10/29	10/30	10/30	10/31	11/1	10/31	10/30	10/29	10/19
Heifers	11/6	11/6	10/26	10/30	10/30	10/31	11/1	10/31	10/30	10/29	10/19
Av. weaning wt:											
Bulls											
Steers	428	445	494	481	442	508	479	492	460	528	373
Heifers	461	392	475	465	417	473	412	453	430	449	360
Av. weaning type score:											
Bulls											
Steers	11.4	12.4	11.8	12.0	11.7	12.7	12.3	12.3	12.0	12.8	10.9
Heifers	12.0	12.1	11.0	12.3	11.6	12.2	11.8	11.6	11.0	12.1	10.5
Av. weaning condition score											
Bulls											
Steers	8.9	9.6	8.3	7.6	8.4	8.6	7.6	8.3	8.2	9.7	7.9

PERFORMANCE OF COW HERDS. 1956 CALVES

University of Tennessee Station

Line of group designation	3	11	13	14	40	173	213	238	246	346	369
Location	Oak Rd.	Oak Rg	Oak Rd	Oak Rg	Oak Rg	Oak Rg	Oak Rg	Oak Rg	Oak Rg	Oak Rg	Oak Rg
Breed of sire	Here.	Here.	Here.	Here.	Here.	Here.	Here.	Here.	Here.	Here.	H ere.
Breed of dam	Here.	Here.	Here.	Here.	Here.	Here.	Here.	Here.	Here.	Here.	Here.
No. cows bred	25	29	25	31	25	7	25	15	25	25	31
No. cows calving	21	25	22	29	21	6	20	12	21	21	28
No. calves raised	21	24	22	29	20	6	20	12	20	20	27
Av. birth date	2/20	2/27	2/27	3/13	3/4	2/24	2/24	3/19	2/19	2/27	3/28
Av. birth wt. (lbs)											
Bulls	75	75	75	71	74	75	75	75	75	74	74
Heifers	70	70	70	70	70	70	70	70	70	70	70
Were calves creep fed?	No	No	No	No	No	No	No	No	No	No	No
Av. wt. at six months (lbs)											
Bulls											
Steers	408	239	353	351	369	384	370	350	359	365	425
Heifers	376	338	350	350	339	318	338	345	367	350	365
Av. weaning date											
Bulls											
Steers	10/21	10/26	10/19	10/21	10/23	10/19	10/21	10/26	10/19	10/19	10/23
Heifers											
Av. weaning wt:											
Bulls											
Steers	511	402	429	434	452	490	480	389	448	446	475
Heifers	479	427	419	426	422	378	406	430	463	430	406
Av. weaning type score:											
Bulls											
Steers	10.6	11.1	10.8	11.3	11.2	11.6	12.2	10.1	10.6	9.8	11.6
Heifers	11.3	10.5	10.7	12.0	11.2	9.2	10.8	10.4	11.1	9.4	10.7
Av. weaning condition score											
Bulls											
Steers	8.9	7.0	7.6	7.9	7.9	9.0	8.2	7.1	8.0	7.8	8.8
Heifers	10.0	8.9	9.0	10.0	8.6	8.2	8.2	8.9	10.5	7.9	8.7

PERFORMANCE OF COW HERDS. 1956 CALVES

University of Tennessee Station

Line of group designation	529	586	688	864	865	58	5320	9	62	63
Location	Oak Rg	Oak Rg	Oak Rg	Oak Rg	Oak Rg	Grvlle	Grvlle	Crvlle	Crvlle	Crville
Breed of sire	Here.	Here.	Here.	Here.	Here.	Here.	Here.	Angus	Angus	Angus
Breed of dam	Here.	Here.	Here.	Here.	Here.	Here.	Here.	Angus	Angus	Angus
No. cows bred	25	25	25	21	21	24	19	17	17	14
No. cows calving	19	19	24	20	19	24	19	15	14	13
No. calves raised	19	19	23	18	19	19	15	15	13	13
Av. birth date	2/17	3/28	2/28/	4/7	3/25	2/17	2/25	2/27	2/29	3/18
Av. birth wt. (lbs)										
Bulls	75	74	75	70	75	79	68	61	66	62
Heifers	70	70	70	68	70	75	63	59	57	51
Were calves creep fed?	No	No	No	No	No	No	No	No	No	No
Av. wt. at six months (lbs)										
Bulls										
Steers	370	362	408	299	301	334	337	410	432	444
Heifers	394	341	367	286	288	339	307	352	359	419
Av. weaning date										
Bulls										
Steers	10/19	10/19	10/19	10/27	10/19	10/1	10/1	10/5	10/5	10/5
Heifers	10/19	10/19	10/19	10/27	10/19	10/1	10/1	10/5	10/5	10/5
Av. weaning wt.:										
Steers	465	386	496	293	335	404	404	483	518	482
Bulls										
Heifers	507	391	456	334	315	406	360	416	419	387
Av. weaning type score:										
Bulls										
Steers	10.6	10.4	11.9	9.5	9.1	11.3	11.0	12.7	11.7	12.8
Heifers	10.2	10.7	11.0	9.1	8.9	11.6	10.8	12.2	11.3	12.7
Av. weaning condition score:										
Bulls										
Steers	8.3	7.2	8.3	5.5	6.5	8.6	8.2	10.1	9.3	12.3
Heifers	8.4	8.5	9.9	7.0	6.2	9.2	10.3	12.3	10.5	13.0

PERFORMANCE OF COW HERDS. 1956 CALVES

University of Tennessee Station

Line of group designation	132	133	156	653	719	23	52	217	64	203	221
Location	Crville	Crville	Crville	Spfld	Spfld	SpHill	SpHill	SpHill	Ames	Ames	Ames
Breed or sire	Angus	Angus	Angus	Here	Here	Here	Here	Here	Angus	Angus	Angus
Breed of dam	ShXH	Angus	ShXH	Here	Here	Here.	Here.	Here.	Angus	Angus	Angus
No. cows bred	16	15	13	17	10	14	14	14			
No. cows calving	16	12	13	17	10	11	13	14	19	12	35
No. calves raised	16	11	13	16	10	11	13	13	17	11	35
Av. birth date	2/19/	3/9	3/7	3/24	3/18	2/25	2/10	3/3	3/30	2/26	2/24
Av. birth wt. (lbs)											
Bulls	72	58	67	72	78	72	72	72	42	57	52
Heifers	68	44	68	64	74	66	63	66	44	51	51
Were calves creep fed?	No	No	No	No	No	No	No	No	No	No	No
Av. wt. at six months (lbs)											
Bulls											
Steers	416	404	402	338	351	396	416	378	284	334	354
Heifers	388	328	374	346	402	339	305	341	273	302	319
Av. weaning date:											
Bulls											
Steers	11/1	10/5	11/1	10/8	10/8	10/4	10/4	10/4	10/18	10/18	10/18
Heifers	11/1	10/5	11/1	10/8	10/8	10/4	10/4	10/4	10/18	10/18	10/18
Av. weaning wt:											
Bulls											
Steers	551	442	506	356	376	443	534	446	316	402	448
Heifers	514	438	488	369	454	409	372	398	310	371	404
Av. weaning type score:											
Bulls											
Steers	10.8	12.3	11.9	10.8	11.6	10.8	12.5	11.6	11.1	11.3	11.1
Heifers	11.1	11.4	10.2	12.0	12.1	11.1	10.5	11.3	11.7	10.3	11.0
Av. weaning condition score:											
Bulls											
Steers	9.5	9.7	10.4	7.4	8.5	6.6	8.6	7.5	9.0	9.7	9.6
Heifers	9.6	10.8	9.5	9.4	10.9	7.6	7.1	7.4	10.3	9.2	9.9

PERFORMANCE OF COW HERDS. 1956 CALVES

University of Tennessee Station

Line of group designation	718
Location	Ames
Breed of sire	Angus
Breed of dam	Angus
No. cows bred	
No. cows calving	5
No. calves raised	5
Av. inbr. of dams (%)	
Av. inbr. of calves (%)	
Av. birth date	3/16
Av. birth wt. (lbs)	
Bulls	58
Heifers	52
Were calves creep fed?	No
Av. wt. at six months (lbs)	
Bulls	
Steers	291
Heifers	310
Av. weaning date	
Bulls	
Steers	10/18
Heifers	10/18
Av. weaning wt.	
Bulls	
Steers	342
Heifers	330
Av. weaning type score:	
Bulls	
Steers	11.5
Heifers	10.5
Av. weaning condition score:	
Bulls	
Steers	9.5
Heifers	9.5

Texas Station
-by-

T. C. Cartwright

I. Project Title: Texas Project No. 670. Contributing to S-10.

Improvement of Beef Cattle Through Selection of Performance Tested and Progeny Tested Sires.

II. Objectives:

1. To determine heritability of gain and other economic characteristics as beef conformation, quality of flesh, earliness of maturity, and size of animal.
2. To study the effects of the application of such information on the improvement of breeding herds.
3. To determine the mode of inheritance of the pigmentation of eye lids and to determine the relationship of eye lid pigmentation to "cancer eye".
4. To make detailed analysis of appropriate existing data.
5. To determine suitable and economical rations of locally grown feeds and supplements for proper development of young breeding stock.

III. Accomplishments during the Year:

Tests under this project are conducted at three different locations.
Balmorhea:

a. Six new pens were built for the 1956-57 test.
b. Last year 139 breeding animals (119 bulls and 20 heifers) belonging to cooperators were tested. The test ran from October 14, 1955 to March 2, 1956 or a total of 140 days. These animals were Herefords with the exception of three Santa Gertrudis bulls and two Charbray bulls. The average gain for all bulls was 2.38 and heifers 1.72 pounds per day. When divided into high, intermediate and low gaining groups, the characters age, condition of flesh and conformation grade at the beginning of the test did not contribute to the gaining ability of either of the groups. The daily ration was 3 pounds of 41% cottonseed meal, 3 pounds of alfalfa hay and all the hergari bundles they would consume. The hegari contained approximately 25% grain. All feeds were ground and mixed.

McGregor:

During the last test season two separate tests were conducted to allow testing of calves born over a wider portion of the year. On the first test there were 139 bulls, 163 heifers and 124 steers for a total of 426 animals. The average daily gain for the bulls was 2.3 pounds per day, 1.7 for the heifers and 1.9 for the steers. On the second test there were 39 bulls and 40 heifers which gained 2.8 and 1.9 pounds per day, respectively. After the end of the first test, a field day was held in order to allow visitors to the Station to inspect the cattle and to attend a program explaining the work. In addition, a sale of certain breeding animals was held for the first time. It appeared that buyers at this sale were not willing to pay much more than beef prices for any bull without a good gaining record regardless of conformation or pedigree.

This trend can be seen in the table below:

Average Sale Prices of all bulls sold at auction at the McGregor Experiment Station at the 1955-56 Field Day.

Group Averaged	No. of Animals	Ave. Price Paid	Range of Prices
All bulls	41	$232	$115 - $400
All above ave. daily gain	17	$299	$140 - $400
All below ave. daily gain	24	$184	$115- $380
All qualifying for ABCPRA*	6	$386	$350 - $400
All not qualifying for ABCPRS	35	$205	$115 - $380

* American Beef Cattle Performance Registry Association.

The correlation coefficient between rate of gain and sale price of the cattle sold at the sale was .74 indicating that on the average approximately 55% of the differences in sale prices were due to the differences in gain record of the individuals.

Hereford steers and Hereford heifers from tested high gaining, medium gaining and low gaining sires were on test this year. The results were as follows:

Type of selected sire	Rate of gain of offspring - total lbs. gain in 140 days	
	Steers	Heifers
Tested high gaining	303	232
Tested medium gaining	268	228
Tested low gaining	245	184

The appearance of the low and high groups was remarkably similar just as the appearance of their sires was similar. These cattle were sold at Ft. Worth to packers where the steers brought $19.00 and the heifers $18.00. The average difference in return between the steers sired by the high gaining and low gaining bulls is $11.02 per steer due to the difference in gain in the feed lot (59 lbs. difference in gain x 19¢ equals $11.02). For the heifers it is $8.64 per heifer (48 lbs. difference in gain x 18¢ equals $8.64).

Combining these data with similar data from the two previous years the following is obtained:

Type of selected sire	Total No. of animals for 3 years	Gain Ratio*
Tested high gaining	28	104.4
Tested medium gaining	19	100.6
Tested low gaining	31	95.6

*100 represents an average gaining animal from the respective age and year group.

The above data include both heifer and steer progeny from bulls selected at the end of a gain evaluation test on their own individual records. Different bulls were selected each of the three years. Since three years and two sexes are involved the gain record was converted to a gain ratio which is an individual's total daily gain on test divided by the average total daily gain of the same breed and sex group and multiplied by 100.

PanTech Farms, Panhandle, Texas:
Beef cattle improvement investigations have continued since the fall of 1950 with bulls from 46 different rances being tested for gaining ability. Data from these tests have been summarized into high, middle and low gaining sire groups to obtain a further insight into feed efficiency. The bulls at this station are fed with each sire group in a separate pen and feed records kept by pens. The information presented in the table below indicates that the high gaining sire groups are considerably more efficient.

HIGH GAINING BULLS REQUIRE LESS FEED PER 100 LB. GAIN
189 Sire groups - 678 Bulls 1950 - 56

	High Gaining Sire Groups	Middle Gaining Sire Groups	Low Gaining Sire Groups	Difference Between High & Low Sire Groups
No. of Sire Groups	63	63	63	0
No. of Bulls	224	234	220	4
Ave. Weight	798.82	804.03	771.64	27.18
Ave. 140 day Gain	375.25	344.27	313.04	62.21
Feed Req. Per 100# Gain	857.96	923.09	961.34	103.38

An annual sale was held at field day as in past years. The highest selling bull sold for $1,335.00 while the lowest selling bulls sold for $120.00. The sale average was $294.00. The following observations were made concerning the sale prices:

1. The three fancy grading bulls averaged $835.00
2. The 100 choice grading bulls averaged $300 or just above sale average.
3. The 26 good grade bulls brought $214.
4. The 25 bulls that gained 364 pounds (ABCPRA requirement) or over averaged $424.
5. The 42 bulls that gained less than 300 pounds averaged $210.

In addition to the gain test, data on performance of cows and slaughter were obtained. The herd was divided into 4 groups as follows:
A- Conformation and performance given equal weight.
B- Performance stressed with little emphasis on conformation.
C- Average of herd.
D- Low producing cows.

The data reported this year may be somewhat misleading as the production of the cows was unknown as this year's data were the first records obtained.

IV. Future Plans:

Balmorhea:
A supplement wasadded to the project for the 1956-57 year to include steer feeding. The objectives of the steer feeding are: (1) to determine if the progeny of a given sire gain in relation to the progeny of other sires on a high concentrate ration as they do on the bulky ration now being fed to the breeding animals, (2) to determine carcass differences, if any, by progeny groups on each ration and carcass differences of same progeny on different rations.

McGregor Station:
The gain evaluation test will be continued as in the past. Testing of new and less common sources of genetic material will be continued and encouraged. In order to encourage more testing for gaining ability on privately owned ranches, rations, procedures and methods will be kept as practical as possible and improved and simplified where practical. It is anticipated that another sale will be held at the end of the current test.

PanTech Farms:
A sale and test will be continued as usual. Data from Beefmaster and registered Hereford cows will be available in 1957.

V. Publications:

Melton, A. A. and J. H. Jones. Beef Cattle Performance and Progeny Test, Balmorhea Station, 1955-56. Texas Agri. Exp. Sta., Progress Rep. 1899.

Melton, A. A., J. H. Jones and R. E. Patterson. Field Day Report 1955-56 Gain Test Report. Balmorhea, Texas.

Smith, J. P., W. L. Stangel, and Frank H. Sims. Beef Cattle Improvement Investigations 1955-56. PanTech Farms, Panhandle, Texas.

Cartwright, T. C. Beef Cattle Gain Evaluation Test Reports, Substation 23, McGregor, Texas. Texas Agri. Exp. Sta. Misc. Publ. 152C, 162D, 162E, 152F.

Cartwright, T. C. Beef Cattle Gain Evaluation Test Reports (Second Test) Substation 23, McGregor, Texas. Texas Agri. Exp. Sta. Misc. Publ. 153A, 153B, 153C, 153D, 153E, 153F.

VI. Publications Planned:

Results of 1956-57 Gain Test, Balmorhea, Texas.

Results of 1956-57 Beef Cattle Improvement Investigations, PanTech.

Beef Cattle Gain Evaluation Test, Substation 23, McGregor, Texas. First Test Reports 1956-57.

Beef Cattle Gain Evaluation Test, Substation 23, McGregor, Texas. Second Test Reports 1956-57.

POSTWEANING PERFORMANCE OF 1955 CALVES FULL FED AFTER WEANING
(or pastured for high gains)

Texas (Balmorhea) Station

Line or group designation	
Location	Balmorhea
Breeding of calves	Hereford, Santa Gertrudis, Charbray
Av. inbreeding (%)	
Bulls, No.	119 (114 Hereford, 3 Santa Gertrudis, 2 Charbray
Av. inbreeding (%)	
Av. weaning wt.	588
Av. 12 month weight	922
Length of feeding period	140
Feed per cwt. gain (lbs)	
Concentrates	292
Roughage	621
Av. daily gain on test	2.38
Av. type score (12 mos)	12.69*
Heifers, No.	20
Av. inbreeding (%)	
Av. weaning wt.	528
Av. 12 month weight	769
Length of feeding period	140
Feed per cwt. gain (lbs)	
Concentrates	372
Roughage	755
Av. daily gain on test	1.72
Av. type score (12 mos)	11.70

* 2 to 6 = Fancy
8 to 12 =Choice
14 to 20 = Good

Ration: (see text).

FIRST TEST - 1955-56
POSTWEANING PERFORMANCE OF 1955 CALVES FULL FED AFTER WEANING
(or pastured for high gains)

Texas Station
Substation 23, McGregor

Line or group designation	-	-	-	-	-	-	-	- -	
Location	McGregor	----------	----------	----------	----------	----------	----------	----------McGregor----	
Breeding of calves	Hereford	Brahman	St. Gert	Charbray	Charolaise	Angus	Shorthorn	Red Poll	Brangus
Av. inbreeding (%)	-	-	-	-	-	-	-	-	-
Bulls, No.	20	1	57	7	2	40	9	-	3
Av. inbreeding (%)									
Wt. 11-29-55	536	543	739	816	795	570	539		658
Length of feeding period	140	140	140	140	140	140	140	140	140
Feed per cwt gain (lbs)	836	836	982	836	836	963	936		836
Concentrates	293	293	341	293	293	337	293		293
Roughage	543	543	641	543	543	626	543		543
Av. daily gain on test	2.4	2.1	2.3	2.4	2.8	2.1	2.2		2.7
Av. type score (12 mos)	5.0*	5.7	4.7	4.4	5.8	5.6	5.5		4.6
Steers, No.	30	10	6	0				2	
Av. inbreeding (%)									
Wt. 11-29-55	551	497	577					655	
Length of feeding period	140	140	140					140	
Feed per cwt gain (lbs)	925	925	925					925	
Concentrates	648	648	648					648	
Roughage	278	278	278					278	
Av. daily gain on test	2.1	1.3	1.7					2.0	
Av. type score (12 mos)	6.0	3.0	3.8					3.7	
Heifers, No.	34	4	16	14		33	3	3	
Av. inbreeding (%)									
Wt. 11-29-55	500	445	593	660		499	365	532	
Length of feeding period	140	140	140	140		140	140	140	
Feed per cwt. gain (lbs)	1077	1077	1077	1077		1077	1077	1077	
Concentrates	377	377	377	377		377	377	377	
Roughage	700	700	700	700		700	700	700	
Av. daily gain on test	1.7	1.7	1.8	1.9		1.6	1.6	1.7	
Av. type score (12 mos)	6.0	3.6	5.4	5.1		6.3	5.7	4.7	

9 Fancy
8 Fancy
7 Choice
6 Choice-
5 Good

4 Good -
3 Commercial
2 Commercial -
1 Inferior

Ration for breeding animals:
Ground milo grain 20%
Cottonseed meal 15%
Johnson grass and sorghum hay 65%

Ration for fattening animals
Ground milo grain 60%
Cottonseed meal 10%
Johnson grass & sorghum hay 30%

FIRST TEST - 1955-56

Line or group designation Location Breeding of calves Av. inbreeding (%)	1-Cross 1-Cross	3-Cross 3-Cross	4-Cross 4-Cross	9-Cross 9-Cross	11-Cross McGregor 11-Cross	12-Cross 12-Cross	13-Cross 13-Cross	14-Cross 14-Cross	21-Cross 21-Cross	Ave. all Crosses b Sex
Bulls, No.										139
Av. inbreeding (%)										
Wt. 11-29-55										650
Length of feeding period										140
Feed per cwt gain (lbs)										927
Concentrates										603
Roughage										324
Av. daily gain on test										2.3
Av. type score (12 months)										5.1
Steers, No.	25	11	13	6	2	6	7	4	2	124
Av. inbreeding (%)										
Wt. 11-29-55	584	598	592	558	544	566	617	626	573	572
Length of feeding period	140	140	140	140	140	140	140	140	140	140
Feed per cwt gain (lbs)	925	925	925	925	925	925	925	925	925	925
Concentrates	648	648	648	648	648	648	648	648	648	648
Roughage	278	278	278	278	278	278	278	278	278	278
Av. daily gain on test	2.1	1.7	1.5	2.1	2.0	2.1	1.5	1.6	1.2	1.9
Av. type score (12 mos)	4.9	5.0	3.8	4.7	5.0	4.7	5.1	4.6	3.0	4.8
Heifers, No.	10	8	6	6	7	4	6	4	5	163
Av. inbreeding (%)										
Wt. 11-29-55	568	579	526	505	564	548	557	595	576	539
Length of feeding period	140	140	140	140	140	140	140	140	140	140
Feed per cwt gain (lbs)	1077	1077	1077	1077	1077	1077	1077	1077	1077	1077
Concentrates	377	377	377	377	377	377	377	377	377	377
Roughage	700	700	700	700	700	700	700	700	700	700
Av. daily gain on test	1.8	1.7	1.4	1.9	1.8	1.7	1.6	1.6	1.6	1.7
Av type score (12 mos)	4.2	5.4	3.7	5.1	6.4	5.3	5.2	4.5	4.5	5.5

BREED AND CROSS CODE (Letters = breed; figures = cross)

A	Aberdeen-Angus
B	Brahman
BA	Brangus
C	Charbray
G	Santa Gertrudis
H	Hereford
L	Charolaise
R	Red Poll
S	Shorthorn
1	First cross; unregistered Hereford dams x Brahman sires.
3	Back cross; 1 cross dams x Hereford sires; (3/4H - 1/4B)
4	Back cross; 1 cross cams x Brahman sires; (34B - 1/4H)
9	Back cross; unreg. Here. dams x 1 cross sires; (3/4H - 1/4B)
11	First cross; unreg. Hereford dams x Santa Gertrudis sires
12	First cross; unreg. Hereford dams x Red Poll sires.
13	1 cross dams x Santa Gert. sires; (1/2G - 1/4H - 1/4B)
14	1 cross dams x Red Poll sires; (1/2R - 1/4H - 1/4B)
21	1 cross dams x 1 cross sires.

SECOND TEST - 1955-56

POSTWEANING PERFORMANCE OF 1955 CALVES FULL FED AFTER WEANING
(or pastured for high gains)

Texas Station
Substation 23, McGregor

Line or group designation Location Breeding of calves Av. inbreeding (%)	McGregor					1-Cross	3-Cross	4-Cross	Av. all Breeds & Cross
	St. G.	Here.	Charo.	Angus	Shorth	1-Cross	3-Cross	4-Cross	Cross
Bulls, No.	28	9	2						39
Av. inbreeding (%)									
Wt. 1-31-45	736	466	691						671
Length of feeding period	140	140	140						140
Feed per cwt gain (lbs)	759	759	759						759
Concentrates	276	276	276						276
Roughage	483	438	438						483
Av. daily gain on test	2.8	2.8	3.1						2.8
Av. type score (12 mos)	4.7*	5.9	4.7						5.0
Heifers, No.	7	7		3	2	7	7	7	40
Av. inbreeding (%)									
Wt. 1-31-56	622	540		483	517	606	559	575	570
Length of feeding period	140	140		140	140	140	140	140	140
Feed per cwt gain (lbs)	759	759		759	759	759	759	759	759
Concentrates	276	276		276	276	276	276	276	276
Roughage	483	483		483	483	483	483	483	483
Av. daily gain on test	2.1	1.8		1.6	2.0	1.9	1.8	1.8	1.9
Av. type score (12 mos)	5.3	5.0		5.4	5.9	4.5	4.6	4.6	4.9

* Same as first test Substation 23, McGregor
Ration same as first test Substation 23, McGregor

POSTWEANING PERFORMANCE OF 1955 CALVES FULL FED AFTER WEANING (or pastured for high gain)

Texas Station
PanTech Farms

Line or group designation	-	-	-
Location	PanTech Farm	PanTech Farm	PanTech Farm
Breeding of calves	Hereford	Angus	Beefmaster
Av. inbreeding (%)	-	-	-
Bulls, No.	122	14	4
Av. inbreeding (%)			
Wt. 11-10-55	667	586	547
Av. 12 month weight	-	-	-
Length of feeding period	140	140	140
Feed per cwt. gain (lbs)	932	1080	808
Concentrates	280	324	242
Roughage	652	756	566
Av. daily gain on test	2.4#	2.2#	2.4#
Av. type score (12 mo)	6*	6	4

*Same as McGregor Station

Ration:

Cottonseed hulls	25%
Ground hegari or cane	30% (bundles)
Cottonseed meal	10%
Ground alfalfa hay	10%
Ground milo grain	20%
Millrun (bran & shorts)	5%

PRODUCTION AND/OR SLAUGHTER DATA ON YEARLING AND OLDER CATTLE NOT INCLUDED IN BREEDING HERDS IN 1956

Texas Station
PanTech Farms

	A (High)	B (Low)
Line or group designation	High	Low
Breeding:	Hereford	Hereford
Sex:	Heifers	Heifers
No:	6	5
Av. age (fall 1955)	7 mo	7 mo
Av. wt. (fall 1955)	459	422
Days on pasture*	330	330
Av. gain on pasture	348	329
Days on feed*		
Actual weight average	807	751
Av. wt. adjusted to 18 or 30 months of age**		
Av. gain on feed	None	None
Animals slaughtered:		
Ave. age at slaughter Av. slaughter weight Av. slaughter grade Av. dressing percent Av. carcass grade	NO SLAUGHTER DATA, BUT HAVE 5 STEERS AND 3 HEIFERS OUT OF CONTROL GROUP ON FEED	

A. Heifers out of high gaining bulls that showed 3.2 or better per day gain on progeny test.

B. Heifers out of low gaining bulls that showed 2.5 per day gain or below on progeny test.

PERFORMANCE OF COW HERDS. 1955 CALVES

Texas (PanTech Farms) Station

	A	B	C	F
Line of group designation	Grade	Grade	Grade	Grade
Location		Panhandle, Texas		
Breed of sire	Hereford	Hereford	Hereford	Hereford
Breed of dam	Hereford	Hereford	Hereford	Hereford
No. cows bred	25	25	27	23
No. cows calving	21	23	24	20
No. calves raised	19	20	20	20
Av. inbr of dams (%) EST	5%	5%	5%	5%
Av. inbr of calves (%)	7%	7%	7%	7%
Av. birth date	3/8/56	3/4/56	3/1/56	3/2/56
Av. wt. (lbs) 5-24-56				
Bulls				
Heifers	140	149	155	140
Steers	166	163	153	165
Were calves creep fed?	No	No	No	No
Av. wt at six months (lbs)				
Bulls		WEIGHED ONLY AS SHOWN BELOW		
Steers				
Heifers				
Av. weaning date				
Bulls	9/14/56	9/14/56	9/14/56	9/14/56
Steers				
Heifers				
Av. weaning wt				
Bulls			525	
Steers	472	476	452	470
Heifers	430	443	476	450
Av. weaning type score	None			
Bulls				
Steers		NONE		
Heifers				
Av. weaning condition score		NONE		
Bulls				
Steers				
Heifers				

I. Project Title: Texas Project No. 650. S-10 Contributing.

The Improvement of Production and Adaptation of Beef Cattle Within Pure Breeds and Certain of Their Crosses Through Breeding Methods.

II. Objectives:

a. The improvement of rate of gain of beef cattle by selection based on weaning weight and gain in the feed lot.
b. The improvement of rate of gain in the Brahman breed by crossing with the Hereford and backcrossing to the Brahman with recurrent selection.
c. To evaluate cattle with regard to adaptability to environment, especially during the summer months.
d. To improve production during the hot months by selection based on individual summer gain and other evaluation records.
e. To determine the magnitude of carcass differences within breeds and to determine the heritability of differences.
f. To evaluate new crosses and breeds with respect to carcass merit.
g. To determine the relative potential value of the carcasses of bulls culled from the project.
h. To evaluate the significance of hybrid vigor in hybrids and their offspring with regard to gaining ability, carcass value, fertility adaptability and hardiness.
i. To make available breeding animals of proven superiority.

III. Accomplishments During the Year:

(a)Facilities and cattle acquired. A new office building, dictaphone, electric typewriter, file cabinets and shelves for storing IBM cards were obtained. A building was remodeled with space for a livestock laboratory. Two 1½ ton trucks and five tractors were added for partial use of the cattle projects. A "bull tight" fence 1.6 miles total length and another 4.75 miles of lighter fence was added to increase and improve pasture facilities. Seven stock watering tanks costing $600 to $900 each were constructed.

Two tested high gaining yearling Hereford bulls and 13 weaned Hereford heifers of suitable age for testing were purchased. Four Angus heifers, 8 Charbray heifers and one Charolaise bull were loaned to the station.

(b)Research results: Collection and analyses of production, slaughter, carcass and meats data from 38 steers slaughtered in 1954 has been completed. Included were 18 Herefords and 20 F_1's Hereford x Brahman, from nine sires. Forty-seven variables were chosen for analysis including analysis of variance (corrected by the covariance where indicated for age, slaughter weight, etc.) and correlation coefficients for each trait and each of all the others under study. Most significant findings probably were the significant heritability estimates for tenderness as measured either by organoleptic tests of a scoring panel or by a mechnaical shear force test. The estimates based on intra-sire ½ sib correlation coefficients, were as follows:

	Broiled Loin	Braised Loin	Broiled Bottom Round	Braised Bottom Round
Tenderness scores	71%	119%	37%	28%
Shear Force values	74%	102%	86%	100%

Measures of juiciness and flavor were apparently not influenced by sires. When gathering and analysis of the data are completed for the steers killed in 1955 and 1956, heritability estimates for tenderness and other qualities of meat will be computed. These additional data should be extensive enough to warrant more definite conclusions.

A separate study from the abofe 38 items on the relationship of fatness to juiciness and tenderness was completed and published. Fatness as measured by physical separation, estimated marbling and percentage ether extract of trimmed muscles was positively correlated with measures of eating quality for two cuts cooked by two methods. The correlations, although significant in some cases, were not high. When loin steaks were cooked by broiling, variations in fatness accounted for about 10% of the variation in tenderness and about 25% of the variation in juiciness. In braised bottom round steaks, the variation in fatness accounted for about 30% of the variation in tenderness and about 5% of the variation in juiciness.

From the same 38 steers a study of the factors contributing to difference in dressing percentage was completed and published. Dress-off items were weighed in an attempt to account for the 2 to 3% advantage in dressing percentage of the crossbred steers. Shrinkage in trucking 110 miles was about the same for the two groups, but the Hereford steers shrunk about 1.5% more on overnight stand before slaughter when only water was available. Based on slaughter weight and chilled carcass weight the dressing percentage was 60.25 for the Herefords and 62.98 for the crossbreds. The contents of the digestive tract amounted to 7.84% of the slaughter weight of the Herefords, and 6.15% for the crossbreds. Most of this difference was found in the paunch. The empty digestive tract was 6.02% of the slaughter weight for the Herefords, and 5.34% for the crossbreds. Other dress-off items exerted little influence on the 2 to 3% yield difference noted consistently over a four year period for the two breeds. Hereford steers made better use of the high concentrate ration as shown by gains and grades when compared to Hereford steer on the low concentrate ration. Ration had little effect on gains or grades of the crossbreds. Sires within breeds caused a statistically significant difference in total fill in the digestive tract, which suggests inheritance of digestive capacity or eating habits.

Thirty-three bulls and 44 steers were slaughtered in 1954 and both sides were treated the same with respect to carcass composition and wholesale cuts determinations. These were analyzed and published during the year. It was determined that data obtained from the left side of a carcass apparently are sufficiently accurate for most purposes.

Slaughter data from most of the steers slaughtered on this project through 1954 were analysed and a summary published of slaughter and carcass characteristics. Fifty-nine Hereford and 90 F_1, Brahman x Hereford steers were included. The crossbred steers were 40 pounds heavier at slaughter, and about 55 pounds in carcass weight. The crossbreds gained their live weight advantage mostly in the suckling period and this combined with a higher dressing % (62.9 vs. 59.9) gave them an even

higher carcass weight advantage. There was little difference in carcass grade as determined by USDA grades, or in yields of wholesale cuts although the crossbred carcasses were longer bodied and longer of leg. Results reflect considerable doubt on the importance of compactness as a conformation factor in beef steers.

Intense selection for productiveness has continued in the herd. This has resulted in a very young herd as a complete life production history was not recorded on the older cattle and many have been culled because of "no record". The average age of the 347 breeding age females in the herd is 3.6 years. Although time and management trends are confounded with improvement due to selection, it appears that progress is being made as evidenced by a fairly definite yearly trend for weaning weights and feed lot gain to increase since the project started.

IV. Future Plans:

Work will continue along the same lines. Slaughter, carcass and meats data collection and analysis will be given emphasis to help eliminate the confusion that now exists and to develop criteria for selecting beef cattle for improved killing or carcass qualities if possible and to more definitely establish the relationship of the eating quality of meat with breeds and breeding of individual steers. New genetic material and combinations in the way of additional breeds and crosses either will be added to the herd or will begin production in the herd.

V. Publications During the Year:

Butler, O. D., B. L. Warwick, and T. C. Cartwright. Slaughter and Carcass Characteristics of Short Fed Yearling Hereford, and Brahman x Hereford Steers. Jour. of Ani. Sci. 15:93.

Cover, Sylvia, C. D. Butler and T. C. Cartwright. The Relationship of Fatness in Yearling Steers to Juiciness and Tenderness of Broiled and Braised Steaks. Jour. of Ani. Sci. 15:464.

Butler, O. D., R. L. Reddish, G. T. King and R. L. Simms. Factors Contributing to the Difference in Dressing Percentage Between Hereford and Brahman x Hereford Steers. Jour. of Ani. Sci. 15:523.

Butler, O. D., M. J. Garber and R. L. Smith. Beef Carcass Composition and Yield of Wholesale Cuts as Estimated From Left and Right Sides. Jour. of Ani. Sci. 15:891.

Warwick, Bruce L. and T. C. Cartwright. Improvement of Beef Cattle by Use of Red Polls. Red Poll News 20:7 (July-August issue).

Test Your Beef Cattle. Farm Family 13:3 (November 1956 issue).

VI. Publications Planned:

Cover, Slyvia, T. C. Cartwright and O. D. Butler. The Relationship Among Certain Measurements of Production, Carcass Characteristics and Eating Quality of Yearling Steers. I. The Relationship of Ration Inheritance and Certain Animal Characteristics to the Eating Quality of Meat.

Cartwright, T.C., O. D. Butler and Sylvia Cover. The Relationship Among Certain Measurements of Production, Carcass Characteristics and Eating Quality of Yearling Steers. II. The Relationship of Ration, and Inheritance and Certain Animal Characteristics to Each Other and to Certain Carcass Characteristics.

Cover, Sylvia, O. D. Butler and T. C. Cartwright. The Relationship Among Certain Measurements of Production, Carcass Characteristics and Eating Quality of Yearling Steers. III. The Relationship of Certain Measures of Fat Desposition and Muscle Development To The Eating Quality of the Meat.

Butler, O. D. T. C. Cartwright and Sylvia Cover. The Relationship Among Certain Measurements of Production, Carcass Characteristics and Eating Quality of Yearling Steers. IV. The Inter-relationships Among Certain Measures of Fat Deposition and Muscular Development.

Cartwright, T. C., O. D. Butler and Sylvia Cover. Beef Cattle Production. III. Production, Killing, Carcass, and Meat Quality Characteristics of Beef Cattle. Texas Agri. Exp. Sta. Bulletin.

PERFORMANCE OF COW HERDS. 1956 CALVES

Texas (Substation 23)STATION

Line of group designation	Hereford	Brahman	St.Gert	1-Cross	4-Cross	13-Cross	23-Cross	32-Cross	51-Cross
Location					McGregor				
Breed of sire	Hereford	Brahman	St. Gert	Brahman	Brahman	St.Gert.	Brahman	St.Gert.	St. Gert.
Breed of dam	Hereford	Brahman	St. Gert	Hereford	1-Cross	1-Cross	4-Cross	11-Cross	Red Poll
No. cows bred									
No. cows calving	42	44	16	14	22	13	2	2	8
No. calves raised	39	25	15	14	21	11	1	2	8
Av. inbr. of dams (%)	0	0	0	0	0	0	0	0	0
Av. inbr. of calves (%)	0	0	0	0	0	0	0	0	0
Av. birth date	2/2/56	2/27/56	2/27/56	2/9/56	2/26/56	2/2/56	3/30/56	2/5/56	1/29/56
Av. birth wt. (lbs)									
Bulls	69.0	58.4	59.4	94.5	67.5	63.4	75.0	60.0	80.0
Heifers	61.3	62.1	69.0	67.1	68.8	68.6		70.0	66.0
Were calves creep fed?	No	No	No	No	No	No	No	No	No
Av. wt. at six months (lbs)									
Bulls	426	406	465						
Steers	403		478	519	486	474	475	430	493
Heifers	391	386	455	460	462	418		510	436
Av. weaning date									
Bulls	9/14	9/26	10/9						
Steers	9/21		9/21	9/23	9/21	9/18	10/22	9/13	9/13
Heifers	9/13	9/28	10/5	9/13	10/4	9/13		9/13	10/3
Av. weaning wt.									
Bulls									
Steers									
Heifers									
Av. weaning type score:									
Bulls	4.2	3.6							
Steers	5.4		4.3	4.4	3.5	4.3	5.0	5.0	4.6
Heifers	5.6	3.6		4.2	3.7	4.6		5.7	5.0
Av. weaning condition score									
Bulls	3.5	4.2	5.7						
Steers	4.6		5.4	5.4	5.5	5.8	5.7	5.7	5.5
Heifers	5.0	3.9	5.4	4.5	4.7	5.2		5.3	5.0

PRODUCTION AND/OR SLAUGHTER DATA ON YEARLING AND OLDER CATTLE
NOT INCLUDED IN BREEDING HERDS IN 1956

Texas (Substation 23) Station

Line or group designation Breeding	Hereford Hereford	Brahman Brahman	1-Cross Hereford x Brah.	3-Cross 1-Cross x Here.	4-Cross 1-Cross x Brah.
Sex:	Steers	Steers	Steers	Steers	Steers
No.	9	10	12	8	12
Av. age in days 11/29/55	280	275	271	282	276
Av. wt. 11/29/55	519	497	585	595	595
Days on pasture					
Av. gain on pasture					
Days on feed	140	140	140	140	140
Av. wt. adjusted to 18 or 30 months of age					
Av. gain on feed	338	174	309	244	206
Animals slaughtered:					
Av. age in days at slaughter	448	443	440	450	445
Av. slaughter weight	867	680	904	854	808
Av. slaughter grade	71	52	68	66	59
Av. dressing percent	60.36	59.19	60.85	59.30	60.13
Av. carcass grade	7	11	8	8	10

I. Project Title: Texas Project No. 714. S-10 Contributing.

Methods for Measuring Potential Rate of Gain and Efficiency of Feed Utilization in Immature Beef Cattle. Leader, H. O. Kunkel.

II. Objectives:

(a) To develop methods of a biochemical or physiological nature which will measure the potential rate of gain in the immature animals,
(b) To develop methods of measurement of the potential efficiency of utilization of feed for building body tissue.

III. Accomplishments During the Year:

In the 1955 Annual report of S-10 two major objectives of the research were outlined for the year 1956:

1. The development of standardized methods of laboratory analyses of greater precision in estimating absolute rather than relative values.
2. Estimation of the extent of contribution of each of several biochemical factors with the aid of multiple regression.

During the year 1956 a fair degree of success has been achieved with respect to the first objective. A more highly repeatable method of determining the serum protein bound iodine has been adapted to the conditions of our laboratory. Consistent values for glutathione, hemoglobin, serum globulin and phosphatase have been obtained.

As a result of the major effort to develop methods of analyses, work toward the second objective has been delayed. Analyses for protein bound iodine will be completed shortly, at which time extensive statistical analyses will be carried out.

Serum Alkaline Phosphatase

An analysis has been made of the effect of age upon the level of serum alkaline phosphatase and upon correction for age repeatabilities of determinations on successive serum samples from three groups of young Brahman bulls were a -0.12, 0.19 and 0.59** over periods of 3 to 5 months. For heifers the repeatabilities were 0.54**, 0.82, and 0.76**. The repeatability of phosphatase values in mature cattle appears to be on the order of 0.75**.

Thus far the only significant correlations between phosphatase level and rate of gain have been in Brahman calves. Extension of the study to Santa Gertrudis cattle has yielded negative results.

Serum Protein Bound Iodine

The principal effort in these investigations continues to be a study of the serum protein bound iodine (PBI) values. A major change in method of analyses has been made and preliminary evidence would indicate that fairly reliable data are now being made available. Results

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** Significant at 0.01 level of probability.

prior to 1956 were obtained with an alkaline ash method. In 1956 the wet ash, distillation method of Moran was adapted to analyses of bovine blood. A repeatability of 0.91 on successive determinations of the same samples was obtained with the distillation method in contrast to a repeatability of 0.72 with the alkaline ash method. Correlations between the values obtained with the two methods ranged from 0.59 to 0.64. These low values cast considerable doubt concerning the degree of validity of PBI values obtained prior to 1956.

The coefficient of correlation between the PBI level and subsequ sequent rate of gain in a group of 71 Hereford bulls was -0.32**. In curvilinear correlation, the quadratic component was not significant, but the distribution of PBI values was such that a possible curvilinear correlation in other groups was not precluded. Results with other groups of cattle have been less significant, but preliminary evidence has been obtained which would indicate that hemodilution, variation in serum globulin levels, and age affect the PBI in predicting rates of gain.

A genetic correlation of 0.64** has been calculated with the 71 Hereford bulls described above. This might be interpreted that as much as 64% of the heritable variation in gain can be accounted for in the "heritable" variation in PBI. The fact that the heritability estimates of PBI values was above 1.00 in this study causes the genetic correlation to be in suspect and, therefore, the value of 0.64 is only a preliminary value. Nevertheless, it seems evident that variation in feed lot performance is related to variation in thyroid activity and that the determination of PBI is, at present, the most practical way of estimating thyroid activity in a large number of animals.

Glutathione

Reduced glutathione and hemoglobin levels have been determined in bloods of beef calves in gain evaluation tests over a period of three years. The repeatability of the reduced glutathione to hemoglobin ratio (GSH/Hb), an expression of GSH concentration in the erthrocytes is higher than that for the GSH level in whole blood. Variations in GSH/Hb are probably more indicative of any physiological variation in cattle than are the GSH levels in the blood. The coefficient of correlation between GSH/Hb values and the initial body weight is small, but significant statistically and is of greater magnitude than is the coefficient of correlation between GSH/Hb and age. The GSH/Hb is linearly related to the previous rate of gain to a small extent and appears to be indicative of the severity of dietary restriction. Product-moment correlations between GSH/Hb and subsequent rates of gain in feed lot are generally not significant statistically. Significant curvilinear coefficients of correlation, ranging from 0.409 to 0.591 have been obtained with groups of Brahman, Charbray and Angus cattle. The curvilinear coefficients of correlation were small but not significant for groups of Herefords and Santa Gertrudis cattle.

Other Blood Constituents

Values have been obtained for serum globulin, serum albumin and the albumin-globulin ratio in over 150 animals. Statistical evaluation of relationships has not been completed.

Free amino acids (histidine, glycine and glutamic acid) in serum have been studied in a few Hereford steers and heifers. The great day to day variability in the amino acid levels discourage the use of the serum amino acid values as predictive indices.

IV. Future Plans:

Investigations with the levels of PBI, phosphatase (in Brahmans), glutathione and blood proteins will be continued. Since a standardization of laboratory techniques has accomplished, attempts will be made to evaluate the effects of age, sex and environmental factors on these blood constituents.

Multiple regressions will be calculated, and each contributing factor will be evaluated with respect to the extent of its contribution to the measurement of potential rates of gain. When appropriate genetic correlations will be estimated.

The use of experimental animals in record of performance tests and on private ranches will be continued.

Other approaches suggested by experimental findings with other animals will be explored as time and facilities permit.

V. Publications:

Kunkel, H. O., J. F. Spalding, G. de Franciscis, and M. F. Futrell. Cytochrome Oxidase Activity and Body Weight In Rats and in Three Species of Large Animals. Am. J. Physiol. 186, 203 (1956).

Fletcher, J. L., R. R. Shrode and H. O. Kunkel. Serum Alkaline Phosphatase and Gain in Brahman Cattle. J. Ani. Sci. 15, 1119.

Kunkel, H. O. The Relationship of Reduced Glutathione-Hemoglobin Ratios to Rates of Gain in Immature Beef Cattle. J. Ani. Sci. 15, 1220.

Stokes, D. K., Jr. Relationship of the Serum Protein-Bound Iodine to Rate of Gain in Beef Cattle. Ph.D. Dissertation, A&M College of Texas, January 1956.

Fletcher, J. L. Variation in Serum Alkaline Phosphatase Activity in Cattle. Ph.D. Dissertation, A&M College of Texas, January 1956.

I. Project Title: Texas Project No. 959. S-10 Contributing.

Biochemical and Physiological Anomalies of Bovine Dwarfism and Their Use in Detection of Heterozygotes. H. O. Kunkel.

II. Objectives:

1. The detection of biochemical and physiological anomalies which may be associated with bovine dwarfism of various types, with an attempt to identify the metabolic defects which cause dwarfism.

2. The determination of the usefulness of biochemical or physiological anomalies, which may be detected in dwarfs, in the detection of the heterozygotic phenotypically normal animals.

III. Accomplishments During the Year:

During the year, fifteen dwarfs of the snorter type, three of crooked-leg type (comprest dwarf) and ten phenotypically normal 8-12 month old calves all of Hereford breeding were used as experimental animals.

Continued emphasis has been placed on biochemical factors related to connective tissue metabolism in view of the increasing evidence that the "snorter" type of dwarfism is a form of osteo-or chondrodystrophy or an anchondroplasia. Blood levels of glycine, glutamic acid, and glucuronic acid have been investigated under conditions of varying periods of fasting and with insulin administration. Significant differences in metabolism, however, have not been found, although there is some indication that glycine metabolism may be anomalous in the dwarf.

Extensive efforts to duplicate the findings of differences in insulin tolerance reported by Missouri Experiment Station personnel, have not been successful thus far at the Texas Station. Differences in insulin preparations may be responsible for the lack of agreement between our experimental findings and those of the Missouri Station. This possibility has not yet been tested.

IV. Future Plans:

The immediate plans are to test the tolerance of normal and dwarf cattle to various preparations of insulin. If the results are positive this line of work will be expanded. In addition, further studies will be made of a variety of blood constituents and tissue components, not yet studied, as a continued search for a biochemical disorder in the bovine dwarf.

V. Publications:

None.

VIRGINIA STATION
-by-
G. W. Litton

I. Project Title: Project No. S-031-5. S-10 Contributing.

The Improvement of Beef Cattle for Virginia Through Breeding Methods.

II. Objectives:

a. To establish, maintain, and develop herds of beef cattle within the pure breeds that will be highly adapted to the Appalachian region, as measured by their ability to utilize grass and rations with limited concentrates, in the efficient production of animals which yield high quality carcasses of desirable type and conformation.

b. To estimate the progress to be expected from mass selection in the improvement of beef cattle.

c. To evaluate selection criteria and procedures and develop more precise and effective measures of quality and performance of beef cattle.

d. To simplify methods of progeny or sib testing whereby breeding cattle can be evaluated at comparatively young ages.

III. Accomplishments During the Year:

a. Facilities and cattle acquired. The Greenhill stable was remodeled with lot, water and stall facilities to group feed 10 groups of steers with eight steers in each group.

One additional stable in the Marvin Maddox area adapted for group feeding of heifers. Seven lots are now in use with feed troughs under roof, water in each lot and capacity of 20 heifers per lot.

The interior of the cattle pavillion and barn was further improved and remodeled.

Seven young Hereford bulls were purchased from three different breeders, New York, Maine, and Virginia and added to the ROP feeding group. Five purchased with USDA funds and 2 state funds. As a further effort to improve the Hereford females in the research herds, 25 young Hereford females (dwarf-clean pedigrees) purchased with funds obtained from the sale of 22 USDA owned Shorthorn and Angus cows.

Two Angus bulls and two Shorthorn bulls were added to the ROP group; one on loan from VPI College herd and one from a private breeder.

The 1956 breeding herds were increased by production of 87 head. The increase included 27 Angus, 32 Hereford, and 28 Shorthorn two-year old females bred for the first time. One hundred fifteen females including 37 Angus, 32 Herefords and 46 Shorthorns will be added to the breeding herds in 1957. One hundred forty females were put on ROP group feeding test in 1956; 46 Angus, 23 Hereford, 47 Shorthorns produced and 24 Herefords purchased.

b. Research Results:

Breeding herds, heat dates, and pregnancy diagnosis. Breeding dates on cows in all breeding herds were obtained by Dr. J. N. Wiltbank and station personnel by painting all bulls in breeding herds and observing marked cows. Rectal palpation of all cows for pregnancy was done at the end of the breeding season (June 28-July 3) and 3½ months after the end of the breeding season (September 15-19). In addition cows open when palpated in early July were palpated on August 6-8. Results of these observations indicated that of the 470 total cows in breeding herds, 405 cows were pregnant on either the July or August pregnancy check. Eight of these cows were open however, on the October check indicating embryonic death loss. Vibrio fetus was found in several cows in only one Angus inbred herd, and one cow in this herd aborted subsequent to the last pregnancy check.

Postweaning performance tests: Performance tests of promising bull calves was continued with 46 head fed individually and 7 cross-bred bulls fed in groups for 168 days. ROP bulls not needed in the breeding program and considered good enough for use in commercial herds were sold on April 4 at the annual field day. The minimum standard for bulls to go in the sale was the equivalent of 1.9 pounds gain per day and a type score of 11 (good +). Performance information was furnished on each bull at the time of sale and it appeared this information influenced upward the prices paid.

Performance tests of all heifer calves continued with 115 head being tested in groups for rate of gain in the wintering feeding period of 140 days with barley-alfalfa silage fed free choice with hay grain-ration held constant at 6#. Following the winter test period they were grazed on pasture alone. Gains were lower on pasture than during the previous winter period indicating that the grazing value of the pastures at the Front Royal station are not sufficient for maximum gains on yearling cattle and indicate the need for fertilization.

Performance test of steer progeny of the Shorthorn bulls was initiated in 1955 and 39 steers were full fed for 196 days and were slaughtered at the end of the tests. No significant sire differences were found however, the trends in several traits indicated that real sire differences did exist.

Foundation Herds: Angus: Two sets of foundation females have been completed and are in production (Eileenmere and Rock Delus). Two foundation sets have 24 females each to date (Elkton and Wintonian). An additional Angus bull was progeny tested and had calves in the 1956 calf crop.

Hereford: One set was completed and discarded due to dwarfism. One set nearing completion was discarded as a foundation line due to loss of the foundation sire. One bull being tested was discarded because he was a carrier of the dwarf gene. Three bulls were bred to form foundation sets of females in the 1956 breeding season. Progeny test on one additional bull completed in 1956 indicate the possibility of using him in a foundation line. Other bulls were bred to dwarf suspects in 1956 to check for dwarfism.

Shorthorn: Three foundation sets are now in production, although the low reproductive rate in one line may indicate this line should be culled in the near future. Matings were made in 1956 which should complete foundation sets for a fourth and fifth sire.

Carbonated Crude Phospholipids in Rations for Fattening Beef Cattle: The Shorthorn steers in the sire groups fed in the Performance test were randomized to treatment groups in a randomized block design and received various levels of carbonated crude phospholipids from cottonseed oil processing as additives to the basal ration. The results of this test along with others conducted at VPI indicate that this material has beneficial effects when fed at 0.75 and 1.50 percent of the total ration. Although results were not statistically significant, this material increased average daily gain, feed efficiency, carcass grade and carcass weight at the 0.75 and 1.50 percent level.

Dwarfism matings: Calves born in 1956 from two types of matings between dwarf carriers, and calves born in 1955 from three types of matings between dwarf carriers, strongly indicate that the same gene loci may be involved in dwarfism observed in conventional Herefords, comprest Herefords, and one kind of Angus. A research paper showing the results of this work has been approved for publication and is in press.

Influence of calving date and subsequent performance: Data on cows performance in consecutive years was analyzed to determine the effect of delayed calving date. Correlations between consecutive calving dates when the breeding season is limited to 90 days was in the range of 0.3 to 0.4. In addition, a linear relationship existed between calving date and percent of cows calving the following year, with each delay of 20 days in calving date there was a decrease of 6.9 percent in cows calving in the following year.

IV. Future Plans:

The number of breeding cows will be maintained at about 450 head with major emphasis on sire proving particularly in the Angus and Shorthorn herds, completion of foundation sets of females from proven herds and intense selection in the growth and type herds, and intense inbreeding in the closed herds formed from these foundation sets.

Performance testing will be continued with 45 purebred bulls (11 from outside sources) and 8 crossbred bulls, all dwarf-clean heifer calves raised at the station and 60 steers in 1956-57. It is expected that a number of bull calves of each breed can be purchased each year and that all steer calves raised can also be fed and/or grazed out.

The purchase of a package feed plant which will grind, mix and incorporate molasses in the ration is planned in the near future. This should simplify, improve and accelerate the mixing of experimental rations.

A pasture improvement experiment is planned which will permit a measure of the response of fast and slow gaining animals to pasture fertilization. It is assumed that the testing of sire progeny groups on various environmental conditions will provide a valid basis of selection, particularly of family groups.

Analysis of existing data is planned through the use of IBM methods to get needed information on such things as: effect of age of dam on calf performance when cows calve first at three year olds; better estimates of sex differences in calf performance; effect of weight of dam on calf performance; and phenotypic and genotypic correlation between many economic traits, particularly growth at different ages.

Studies to determine the value of apple pomace as feed for beef cattle are also contemplated. There is a need to determine how this material can be used and what supplementation is necessary for best results.

V. Publications During the Year:

Burris, Martin J. and B. M. Priode. Crossbred Dwarfs in Beef Cattle. Jour. of Heredity (in press)

Burris, Martin J. and B. M. Priode. Effect of Calving Date on Subsequent Calving Performance in Beef Cattle. Jour. of Ani. Sci. 15(4):1225.

Wiltbank, N. J., Martin J. Burris and B. M. Priode. The Occurrence of Lstrus and the Conception Rate in a Herd of 450 Beef Cows Bred During a Limited Breeding Season. Jour. of Ani. Sci. 15(4) 1216-1217.

Kincaid, C. M., W. S. Wilkinson, J. C. Taylor, B. M. Priode, Martin J. Burris. The Value of Certain Carbonated Crude Phospholipids As Additives to Rations for Fattening Beef Cattle. Jour. of Ani. Sci. 15(4):1262-1263.

Beef Cattle Research Station - Field Day and Bull Sale Catalogue. April 1956. Summary ROP Tests, mimeographed, 1956.

VI. Publications Planned:

Field Day and Sale Catalogue, Summary ROP, and Results of Analysis of Data as Completed.

PRODUCTION AND/OR SLAUGHTER DATA ON YEARLING AND OLDER CATTLE
NOT INCLUDED IN BREEDING HERDS IN 1956

Virginia (Front Royal) Station

Line or group designation	Rock Delus Foundation Sire: 057	Elkton Foundation Sire:420	Wintonian Founda. Sire:890	Inbred Eileenmere Sire: 59	Eileenmere Inbred Sire:917	Growth Sire:960	Type Sire:940	All Angus	Leader Foundation Sire: T44
Breeding:	Angus	Angus	Angus	Angus	Angus	Angus	Angus	Angus	Shorthorn
Sex:	Female	Female	Female	Female	Female	Female	Female	Female	Female
No.	14	7	9	1	3	1	2	37	12
Av. age 11-2-55	259	269	270	300	238	253	277	264	256
Av. wt. 11-2-55	481	470	494	506	420	502	419	475	411
Days on pasture	209	209	209	209	209	209	209	209	209
Av. gain on pasture	157	129	133	127	140	124	136	142	162
Days on feed (ROP) 1/	140	140	140	140	140	140	140	140	140
Av. wt. adjusted to 18 months of age 2/	772	748	777	725	700	821	670	757	711
Av. gain on feed (ROP)	179	190	194	154	166	228	167	184	182

1/ Method of feeding heifers on ROP in footnote to "Postweaning Performance of 1955 Calves."

2/ Weight adjusted to 18 months of age on basis of pasture gains and one spring and fall feeding.

PRODUCTION AND/OR SLAUGHTER DATA ON YEARLING AND OLDER CATTLE
NOT INCLUDED IN BREEDING HERDS IN 1956

Virginia (Front Royal) Station

Line or group designation	Eric Foundation Sire: 114	Leader Test Sire:988	Leader Test Sire:940	Growth Sire:1009	Type Sire: 969	A Inbred Sire:885	B Inbred Sire:663	All Shorthorn	M Royal Test Sire:52
Breeding:	Shorthorn	Shorthorn	Shorthorn	Shorthorn	Shorthorn	Shorthorn	Shorthorn	Shorthorn	Hereford
Sex:	Female	Female	Female	Female	Female	Female	Female	Female	Female
No.	5	8	2	8	5	4	2	46	12
Av. age 11-2-55	279	272	224	242	257	243	236	255	241
Av. wt. 11-2-55	438	476	402	397	438	414	327	422	382
Days on pasture	209	209	209	209	209	209	209	209	209
Av. gain on pasture	152	135	230	165	125	124	213	157	175
Days on feed 1/	140	140	140	140	140	140	140	140	140
Av. wt. adjusted to 18 months of age 2/	704	743	775	734	737	691	680	722	689
A Av. gain on feed (ROP)	173	180	172	205	209	181	181	187	179

1/ Method of feeding heifers on ROP in footnote to "Postweaning Performance of 1955 Calves".

2/ Weight adjusted to 18 months of age on basis of pasture gains and one spring and fall feeding.

PRODUCTION AND/OR SLAUGHTER DATA ON YEARLING AND OLDER CATTLE
NOT INCLUDED IN BREEDING HERDS IN 1956

Virginia (Front Royal) Station

Line or group designation	Capitan Test Sire:26	Larry Test Sire:31	Perfect Test Sire:310	Perfect Test Sire:322	All Hereford
Breeding:	Hereford	Hereford	Hereford	P.Hereford	Hereford
Sex:	female	female	female	female	
No.	9	4	3	3	31
Av. age 11-2-55	241	221	245	219	242
Av. wt, 11-2-55	409	332	433	404	391
Days on pasture	209	209	209	209	209
Av. gain on pasture	187	165	191	184	180
Days on feed (ROP) 1/	140	140	140	140	140
Av. wt. adjusted to 18 months of age 2/	734	636	740	761	707
Av. gain on feed (ROP)	176	148	159	191	173

1/ Method of feeding heifers on ROP in footnote to "Postweaning Performance of 1955 Calves".

2/ Weight adjusted to 18 months of age on basis of pasture gains and one spring and fall feeding.

POSTWEANING PERFORMANCE OF 1955 CALVES FULL FED AFTER WEANING
(or pastured for high gains)

Virginia (Front Royal) Station

Line or group designation	Angus	Heref.	Shorth	Growth Type A, Inbred B Sire:1009	Sire:969	Sire:885		Inbred Sire: 663	Leader Found. sire:T41	Eric Found Sire 114	Leader Test Sire 988	Leader Test Sire: 940
Location					Front Royal							
Breeding of calves				Shorth	Shorth	Shorth	Shorth	Shorth	Shorth	Shorth	Shorth	Shorth
Av. inbreeding (%)	.019	.049	.053	.028	.033	.0223	.194	.00	.00		.033	.045
Bulls, No.	15	15	16	2	2	2	2	2	2		2	2
Av. inbreeding (%)	.02	.00	.044	.00	.035	.174	.080	.00	.00		.016	.050
Av. weaning wt. (182 days)	433	452	393	413	414	398	357	375	403		408	374
Av. 12 month wt.	844	837	816	904	850	813	737	799	859		837	719
Length of feeding period	168	168	168	168	168	168	168	168	168		168	168
Feed per cwt. gain lbs 1/												
Concentrates	478	480	456	408	481	471	450	487	440		458	470
Roughage	346	348	330	296	348	341	326	353	318		332	340
Av. daily gain on test	2.32	2.21	2.58	2.97	2.58	2.44	2.45	2.50	2.73		2.85	2.10
Av. type score (12 mos)	12.2	11.7	11.5	10.6	12.9	10.8	11.7	11.4	11.2		13.1	10.6
Steers, No.			39	8	4	5	2	9	5		4	2
Av. inbreeding (%)			.064	.047	.037	.230	.310	.00	.00		.032	.037
Av. weaning wt.			346	373	330	345	313	342	330		364	335
Av. 12 month wt.			643	706	615	638	585	624	594		644	727
Length of feeding period			196	196	196	196	196	196	196		196	196
Feed per cwt gain (lbs) 1/			627									
Concentrates			End wt.	940	885	905	829	890	915		910	839
Roughage			393 age	458	482	477	483	482	501		481	441
Av. daily gain on test			2.35	2.52	2.31	2.38	2.07	2.27	2.36		2.29	2.47
Av. slaughter grade			LC	L-C	C	T-G	L-C	C	C		C	L-C
Carcass grade			L-C	C	L-C	L-C	L-C	L-C	L-C		L-C	L-C
Heifers, No.	37	31	47	8	5	5	2	12	5		8	2
Av. inbreeding (%)	.018	.073	.048	.016	.060	.236	.193				.039	.049
Av. weaning wt. (182 days)	365	340	339	337	347	324	294	336	322		366	361
Av. 12 month wt.	608	544	565	578	599	544	495	553	545		596	576
Length of feeding period	140	140	140	140	140	140	140	140	140		140	140
Concentrates & hay mix	458	484	455					264	264		264	264
Alfalfa Barley Silage	2187	1855	2121					191# hay, 2121# barley silage				

POSTWEANING PERFORMANCE OF 1955 CALVES FULL FED AFTER WEANING
(or pastured for high gains)

Front Royal, Virginia Station (con't. from preceding page)

Heifers											
Av. daily gain on test	1.31	1.24	1.32	1.48	1.50	1.10	1.28	1.30	1.23	1.28	1.23
Av. type score (12 mos)	11.8	11.1	11.3	11.5	11.9	10.7	9.3	11.3	11.8	11.6	10.2

1/ The feed mixture for bulls and steers was 60% ground ear corn, 15% ground orchard grass hay, 15% ground orchard grass, 15% ground alfalfa hay, 5% cottonseed meal and 5% linseed meal. Steers were randomized to treatment groups which received 0.0, 0.75, 1.50 and 3.00 percent of crude carbonated phospholipids added to the basal ration.

2/ The daily ration for heifers was 6 pounds of feed mixture used for bulls above and all the alfalfa-barley silage they would consume. Heifers were fed in groups of 15 to 24 head.

PERFORMANCE OF COW HERDS. 1956 CALVES

Virginia (Front Royal) Station

Line of group designation	1a	1a	Elkton	Wintonian	Cornwell	Eileenmere	Eileenmere	1a	1a
	Type	Test	Foundation	Foundation	Test	Inbred	Inbred	Test	Growth
Location				Front Royal					
Breed of sire	Angus 1019	Angus 1019	Angus 420	Angus 890	Angus 150	Angus 59	Angus 870	Angus 870	Angus 1046
Breed of dam	Angus	Angus	Angus	Angus	Angus	Angus	Angus	Angus	Angus
No. cows bred	8	5	36	33	15	16	(16)*	4	8
No. cows calving	8	5	35	32	15	3	3	3	7
No. calves raised	7	4	31	31	14	3	3	2	7
Av. inbr of dams(%)	.00	.00	.00	.00	.00	.000	.030	.000	.011
Av. inbr. of calves (%)	.126	.00	.00	.00	.00	.267	.139	.000	.122
Av. birth date	2/18	2/16	2/8	2/15	2/15	1/20	2/1	2/1	2/19
Av. birth wt. (lbs)									
Bulls	58	63	69	68	68	62	68	63	70
Heifers	62	61	60	66	64	64	68	78	65
Were calves creed fed?				NO					
Av. wt. at six months (lbs)									
Bulls	404	412	440	439	444	456	406	456	444
Steers									
Heifers	379	380	386	403	397	375	411	397	411
Av. weaning date:									
Bulls	9/24	9/24			9/24				
Steers									
Heifers	9/26								
Av. weaning wt:									
Bulls	489	529	540	528	542	594	504	569	489
Heifers	442	418	473	467	461	493	518	499	490
Av. weaning type score:									
Bulls	11.7	10.8	11.0	12.2	11.4	10.2	11.4	10.8	12.2
Steers		11.0	11.0	10.9	12.0				10.8
Heifers	11.2	11.9	13.4	11.6	12.7	12.2	11.4	11.2	11.9
Av. weaning condition score									
Bulls	10.4	10.0	10.3	10.9	10.4	9.8	9.8	10.0	10.0
Steers		10.0	10.2	10.4	11.4				10.8
Heifers	10.5	10.7	11.6	11.2	11.2	11.2	12.0	9.8	10.9

* Cows from previous herd. Angus 59 replaced by Angus 870 on 4-16-55.

PERFORMANCE OF COW HERDS. 1956 CALVES

Virginia (Front Royal) Station

Line of group designation	Test	Test	Test	Test	Test	Test	Test
Location	CMF Royal	Capital	CMF Flashy	L-1 Domino	S-Hillcrest	PF Mixer	Beau Rollo
				FRONT ROYAL			
Breed of sire	Hereford	Hereford	Hereford	Hereford	Hereford	Hereford	Hereford
	52	R26	357	1444	82	546	373
Breed of dam	Hereford	Hereford	Hereford	Hereford	Hereford	Hereford	Hereford
No. cows bred	31	3 & (31)*	(3)*	21	19	16	20
No. cows calving	3	2 & 25	1	19	16	15	15
No. calves raised	3	1 & 25	0	19	16	12	14
Av. inbr of dams (%)	.0	.0		.0	.0	.0	.0
Av. inbr of calves (%)	.08	.0		.0	.0	.0	.0
Av. birth date	1/29	3/2		2/13	2/28	2/15	2/13
Av. birth wt. (lbs)							
Bulls	69	78		74	74	73	72
Heifers	70	67		67	61	66	66
Were calves creep fed?				NO			
Av. wt. at six months (lbs)							
Bulls	432	425		475	460	434	498
Steers	280	365		391	419	417	401
Heifers	374	347		373	357	373	393
Av. weaning date							
Bulls				9/24			
Steers				9/26			
Heifers				9/26			
Av. weaning wt.							
Bulls	534	454		551	497	509	557
Steers	354	395		480	502	466	490
Heifers	476	395		454	406	450	484
Av. weaning type score							
Bulls	10.8	11.3		11.0	12.4	13.1	11.7
Steers	10.0	10.7		10.3	11.5	11.8	11.0
Heifers	10.6	10.8		10.7	12.1	12.5	12.2
Av. weaning condition score							
Bulls	10.4	10.0		10.4	11.0	11.6	11.0
Steers	8.0	9.2		9.7	11.1	11.1	10.0
Heifers	10.2	10.1		10.5	11.2	11.7	11.4

* Cows from previous herd: Hereford R26 replaced Hereford 52 on 4-29-55 and Hereford 357 replaced Hereford R26.

PERFORMANCE OF COW HERDS. 1956 CALVES

Virginia (Front Royal)Station

Line of group designation	Prince Erie Command Foundation	Foundation	Growth	Type	A Inbred	B Inbred	Leader Inbred
Location				FRONT ROYAL			
Breed of sire	Sh.114	Sh B287	Sh 1060	Sh 1049	Sh. 885	Sh. 663	Sh. T44
Breed of dam	Shorthorn	Shorthorn	Shorthorn	Shorthorn	Shorthorn	Shorthorn	Shorthorn
No. cows bred	33	34	28	21	17	17	6
No. cows calving	28	25	21	15	12	10	4
No. calves raised	27	25	17	14	10	6	2
Av. inbr of dams (%)	/1	/1	/1	/1	.111	/1	/1
Av. inbr of calves (%)	.00	.00	/1	/1	.246	/1	/1
Av. birth date	2/1-	2/1	2/18	2/28	2/1	2/16	1/17
Av. birth wt. (lbs)							
Bulls	76	68	69	76	73	70	74
Heifers	67	67	68	65	69	72	60
Were calves creep fed?			NO				
Av. wt. at six months (lbs)							
Bulls	416	408	377	434	421	330	366
Steers	365	375	362	399	392		
Heifers	375	374	389	349	387	366	285
Av. weaning date							
Bulls			9/25				
Steers			9/25				
Heifers			9/25				
Av. weaning wt:							
Bulls	515	514	442	465	539	310	478
Steers	426	469	395	456	484		
Heifers	445	461	464	399	476	448	372
Av. weaning type score							
Bulls	11.6	11.2	10.3	11.9	11.3	9.2	10.6
Steers	10.5	12.0	9.8	11.7	9.0		
Heifers	11.8	12.1	12.1	11.6	11.6	11.2	8.0
Av. weaning condition score							
Bulls	10.3	10.3	8.8	10.3	10.5	8.0	8.6
Steers	9.2	11.4	8.7	9.9	9.2		
Heifers	10.7	11.2	11.1	10.1	10.9	10.2	7.8

1/ Inbreeding not calculated.

SUPPLEMENT: Northern Virginia Pasture Research Station

The Northern Virginia Pasture Research Station, Middleburg, Virginia, maintains a purebred Aberdeen Angus herd of approximately 55 cows and 3 herd sires. These cows were purchased as weanling calves in the fall of 1949 in lots of half sibs from 8 herds in Virginia and Maryland. The entire calf crop is used each year in connection with grazing experiments on the station. All male calves remain as bulls until weaned when all are castrated except two or three of the top calves which show promise of becoming herd sires. Cows are bred to calve during June, July, and August in order that calves may be wean in time for the beginning of the grazing tests around the first of April.

Fifty of the 55 cow herd in 1954 calved in 1955 and 50 of them raised calves to weaning for a 91% calf crop. The performance of this cow herd for 1956 is shown in the table below.

Calves were allotted to four treatment groups (1) 6 calves received only their mother's milk during the winter, (2) 6 calves were creep fed grain plus their mother's milk, (3) 18 calves received hay and silage plus their mother's milk and (4) 18 calves received hay and silage plus grain plus mother's milk during winter. The average calves per group at weaning were as follows:

Treatment	Age	Wt.	Average Daily Gain	Adjusted[2] Daily Gain	Type[22] Score	Index Value
Milk only	226	344	1.27	1.30	9.2	79
Milk + hay	231	460	1.73	1.75	11.9	111
Milk + grain	233	500	1.89	1.92	13.7	127
Milk + grain + hay	237	517	1.93	1.94	13.6	127

[2]Gain adjusted for sex of calf and age of dam.

[22]Numerical scoring system adopted by S-10 where 16 is fancy, 13 choice, 10 good and 7 medium.

If the milk only and the milk plus hay groups were considered as non-creep and the other groups as creep fed, there would be a difference of about .3 of a pound of gain per day and two grade points on type in favor of the creep fed calves.

PERFORMANCE OF COW HERDS. 1956 CALVES

NOrthern Virginia Pasture Research

Line of group designation		
Location	Middleburg, Virginia	
Breed of sire	Angus	
Breed of dam	Angus	
No. cows bred	55	
No. cows calving	53	
No. calves raised	50	30 bulls and 20 heifers
Av. inbr. of dams (%)	Not calculated	
Av. inbr. of calves (%)	Not calculated	
Av. birth date	7/22/55	
Av. birth wt. (lbs)	61.6	
Bulls		61.9
Heifers		60.7
Were calves creep fed?	1/2 of calves were creep fed.	
Av. wt at six months (lbs)	378	
Bulls		386
Steers	-	-
Heifers		361
Av. weaning date	3/13/56	3/13/56
Bulls		-
Steers		
Heifers		3/13/56
Av. weaning wt.	474	
Bulls		487
Steers	-	-
Heifers		456
Av. weaning type score	12.5	
Bulls		12.2
Steers		-
Heifers		12.8
Av. weaning condition score:	Not scored	

I. Project Title: Project No. 93091. S-10 contributing.

Heterosis From Crosses Among British Breeds of Beef Cattle.

II. Objectives:

A. To measure heterosis obtained from crosses among Angus, Hereford, and Shorthorn beef cattle as shown by (a) growth rate, fattening ability and carcass quality up to approximately 20 months of age.

B. To measure productive ability of dams.

III. Accomplishments During The Year:

A. The cows were divided into six breeding groups. Five of these groups are now located at the McCormick Farm near Steeles Tavern; the sixth group is located in Blacksburg. Mating groups for Spring, 1956, are as shown in accompanying table. Calving should begin in January, 1957.

B. Research Results - None until first calf crop arrives in 1957.

IV. Future Plans:

A. Weaning of all calves born in 1957 will be accomplished about October 15. The heifer calves will be put on feed the day they are weaned and full fed in dry lot on a standard ration until the top end grade choice as slaughter cattle. Steer calves will be castrated soon after birth. They will be carried on fall pasture plus 2 to 3 pounds of concentrates per head per day from weaning to the start of winter feeding.

B. Birth weights will be obtained, and subsequent weights on all progeny in the program will be obtained at least every 28 days.

C. Grades on all calves raised in the herd will be obtained by averaging the scores of a competent committee of three or more persons.

D. Records of the feed consumption of each group where animals are group fed and each individual where animals are individually fed will be kept for all animals born and raised in the program.

V. Publications During the Year:

None.

VI. Publications Planned:

None in 1957.

MATING GROUPS SPRING 1956

I	II	III	IV	V	VI
Bull: A x H	Hereford	A x SH	Blacksburg Angus	H x SH	Shorthorn
Cows: 4	2	1	3	6	5
16	7	12	10	9	8
30	17-18	15	11	14	18
32	22	20	13	21	23
37	27	25	19	28	29
			24	31	
44	41	43	26	34	42
51	47	53	33	35	48
58	49	52	38	36	50
64	59	55	40	39-19	60
70	62	63			65
	68	69	46	45	
87	76	72	56	54	81
88	77	74	61	57	86
97	79	75	67	66	99
98	80	78	73	71	101
104					
106	89	84	82	83	111
108	91	85	86	94	113
112	103	92	102	95	116
114	107	100	115	105	117
119	110		120		118

1 - 40 = Angus; 41 - 8 = Hereford; 81 - 120 = Shorthorn.

I. Project Title: Number S.031.AH.551. S-10 contributing.

A Study of Dwarfism in Beef Cattle.

II. Objectives:

A. To investigate further the hereditary nature of dwarfism in beef cattle.

B. To determine whether the same mechanisms are responsible for the different types of dwarfism among different breeds.

C. To determine the gene frequency for dwarfism in Virginia.

D. To discover, if possible, the abnormal physiological action of the dwarf gene.

E. To find some method or procedure whereby the heterozygous animals may be accurately identified in order that the dwarf gene can be controlled or eliminated from the breeding herds.

III. Accomplishments During the Year;

A. Facilities and cattle

(1) Ten dwarf females of Hereford, Angus and Hereford X Angus breeding were mated to three dwarf bulls of Hereford, Angus, and Angus X Hereford breeding. They are due to start calving around March 1. These matings are an effort to help clarify the confusion that now exists regarding the genetic situation of bovine dwarfism within and among beef breeds.

(2) Ten breeders of purebred Hereford and Angus cattle are cooperating in an attempt to find some means by which the progenies of known carrier sires may be segregated into carrier and non-carrier groups. Segregation criteria include:

(a) Growth patterns from observations obtained at approximately three months intervals as follows:

(1) Body measurements, including height and chest circumference.
(2) Birth weight and periodic body weights from birth to maturity.
(3) Type scores, masculinity scores on young bulls, and/or other subjective characteristics which appear promising.
(4) Data are being collected from all herds in the Virginia BCIA performance testing program which will be used to (1) obtain estimates of the gene frequency for dwarfism and (2) for study of the variation in type and degree of expression of dwarfism.

B. Research Results

(1) Pathological studies: Necropsies have been completed on several additional dwarf and normal calves during the year and gross pathological findings recorded. Most of the glandular materials and other tissues have been prepared for microscopic examination. This work was interrupted in September when the person primarily responsible for it took a leave of absence to study in Sweden for several months.

(2) Biological Assays: Previous assay results indicated no significant differences between normal and dwarf calves in thyrotropic, gonadotropic, and ACTH potency of the pituitary glands. Results of growth hormone assays are conflicting. Recent assays indicated that method of drying the glands might greatly affect their potency. Air dried glands appear to be much more potent than acetone dried glands. It also appears that previous injections of glandular material might have been at too high a level for most satisfactory results. Indications are that growth hromone is a factor in bovine dwarfism but additional work on this phase of the study is needed.

(3) Field Observations: Growth data, conformation scores, masculanity scores on young bulls, and body measurements were collected in the herds of cooperating breeders. Additional data of this kind has been accumulated through the performance testing program of beef cattle on the farms.

IV. Future Plans:

A. All dwarf females mated to dwarf bulls will be checked for pregnancy during the next ten days. Those found to be pregnant will be watched carefully and every effort made to obtain live calves. If calving is successful this phase of this study will be continued.

B. It is hoped that microscopic examination of all glandular materials and other tissues collected from the necropsies can be completed and the findings reported during the year.

C. The growth hormone study will be continued in the light of the recent findings. Special emphasis will be placed on dose-response curves for both acetone and air dried glands and also for whole glands as well as the anterior lobe only. These findings will be used in future comparisons of dwarf vs normal pituitary glands for growth hormone potency.

D. The finding of the Missouri workers that dwarf and carrier cattle fail to respond to insulin injection the same as normal cattle will be checked at this station.

E. An analysis of the data collected under field observations above is planned in an attempt to find some means of segregating the progenies of known carrier sires into carrier and non-carrier groups.

V. Publications During the Year;

None

VI. Publications Planned:

A paper on the relation of growth hormones to bovine dwarfism.

I. Project Title: Project Number S-031-AH 542

Performance Testing of Beef Cattle on the Farms in Virginia.

II. Objectives:

A. To develop a state-wide on-the-farm testing program for beef cattle in Virginia in which the major emphasis shall be placed on selection criteria for such economically important traits as regular reproduction, heavy weaning weights, milking and mothering ability, ability to gain rapidly after weaning, desirable type and conformation, and longevity.

B. To investigate means of handling the field work through local personnel so that a large percentage of the breeding herds in Virginia could be included without requiring extensive travel and field work by personnel directing the program and handling the analyses of data.

C. To identify some of the non-genetic factors such as sex of calf, age of dam and nutritional level in order to develop methods of more precisely estimating true genetic differences among individuals and groups.

D. To obtain data from purebred and commercial herds handled under farm conditions in order to develop practical means of improving beef cattle through breeding methods.

E. To determine the effectiveness of selection in the improvement of beef cattle under farm conditions.

III. Accomplishments During the Year:

A. Calves were indexed on the farms of 95 breeders of Aberdeen Angus, Hereford and Shorthorn cattle in the performance testing program in 1956. A total of approximately 3700 calves and 600 yearlings were indexed. These calves were sired by 343 bulls of the three breeds. Approximately 75 percent of these cattle were out of registered cows and all were sired by registered purebred bulls.

B. Each breeder participating in the on-the-farm performance testing program was furnished the following information:

(1) An IBM listing by sire progeny groups of all his 1956 calves which showed the age, weight, type score, average daily gain from birth, gain adjusted for sex of calf and age of dam, and the index value for each calf.

(2) An IBM listing by dams showing the performance of each calf produced and the average performance of all her calves since she was entered in the program.

(3) An IBM listing of all calves by each sire with their individual and average performance since entering the program.

(4) A copy of the 1956 report of all cattle tested in the state. This report showed the average performance of all calves by each sire as well as the herd average. Herds in which calves were creep fed and/or nurse cows were used were listed separately from the non-creep fed herds.

C. The following table gives a breakdown by breeds, the number of breeders, number of sires and number of calves for both creep-fed and non-creep fed groups indexed during the year.

	ANGUS		HEREFORD		SHORTHORN		TOTAL OR AVERAGES	
	No Creep	Creep[2]	No Creep	Creep	No Creep	Creep	No Creep	Creep
Number Breeders	42	18	23	15	4	-	69	33
Number Sires	134	78	62	59	10	-	206	137
Number Calves	1591	555	838	637	74	-	2503	1192
Average:								
Age[22]	203	200	202	208	202	-	203	204
Weight	393	410	401	430	386	-	395	501
Adj. Daily Gain	1.69	1.79	1.72	1.80	1.67	-	1.70	1.80
Type Score	11.6	12.2	11.5	12.0	11.4	-	11.6	12.1
Index	107	114	108	114	105	-	107	114

2 If more than 50% of the calves by any sire were creep fed all calves by that sire were included in the creep fed column.

22 Age ranged from 120 to 300 days.

D. The Bland-Giles Hereford Association, Wytheville Hereford Association, and Wampler's Farm Sale of Aberdeen Angus cattle provided the buyers with performance data on all animals sold through their 1956 sales. Some individual consignors to other sales also provided performance data to buyers.

E. The Virginia Beef Cattle Improvement Association, formed in January, 1955, now has more than 100 active members. Their first annual meeting was held in February, 1956, with approximately 50 persons in attendance. The Association charges a membership fee and a small weighing and grading fee to help cover the cost of performance testing. As a result of the charge placed on the participants about 20 small breeders dropped out of the program during the year, however, 50 new breeders entered their herds.

IV. Future Plans:

Data gathered through this program are now being analyzed to study the influence of age of calf, sex of calf, age of dam, etc., on preweaning growth rate and type score of calves. The data will be studied carefully to determine if new adjustment factors are needed. Preparations are being made to establish one or more county associations with local personnel handling the field work. The program will be expanded to take in any additional breeders in the state who wish to participate.

V. Publications During the Year:

Marlowe, T. J., C. M. Kincaid, C. C. Mast and G. W. Litton. Performance Testing of Beef Cattle on the Farms in Virginia. Proceedings, Assoc. of Sou. Agri. Workers, February, 1956.

An Extension Service Circular has been prepared and should be printed in the near future. Several non-technical articles were published by The Breeder-Stockman, Virginia Angus Topics and other magazines. A 13-minute film covering various phases of the program is being made in color and with sound tract. Testing Virginia For Per-Formance, movie film, Va. Exp. Sta.

VI. Publications Planned:

A. At least two technical articles are planned for the Journal of Animal Science, one on the influence of age and sex of calf on the preweaning growth rate and type score of beef calves and the other on the influence of age of dam on the preweaning growth rate and type score of beef calves.

B. An Experiment Station Bulletin on the technical phase of the program is also planned.

E. J. Warwick.

S-10, IMPROVEMENT OF BEEF CATTLE FOR THE SOUTHERN REGION THROUGH BREEDING METHODS

- REPORT OF -

ANNUAL MEETING S-10 TECHNICAL COMMITTEE

HELD AT

GAINESVILLE, FLORIDA

September 1 - 4, 1957

State Experiment Stations of Alabama, Arkansas, Georgia, Florida, Kentucky, Louisiana, Maryland, Mississippi, North Carolina, South Carolina, Tennessee, Texas and Virginia in cooperation with the Animal Husbandry Research Division, Agricultural Research Service, U. S. Department of Agriculture. This report is intended for the use of administrative leaders and workers in developing the program and is not for general distribution.

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S-10 TECHNICAL COMMITTEE MEETING

September 1 - 4, 1957

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PROGRAM
1957 S-10 TECHNICAL COMMITTEE MEETING
UNIVERSITY OF FLORIDA, GAINESVILLE, FLORIDA
September 1 - 4, 1957

September 1, 1957

Assemble at Bartow, Florida in the afternoon and evening. Executive Committee meeting .... 7:00 p.m.

September 2, 1957

Drive from Bartow to Ona and spend the balance of the morning at the Florida Range Cattle Station. Leave about noon and drive to Gainesville via Brooksville, spending about 1-1½ hours at that station. Arrive at Gainesville about 8:00 p.m.

September 3, 1957

University of Florida, Gainesville.
Dr. R. A. Damon, Chairman, Technical Committee, presiding.

8:15 a.m. ... Welcome, Dr. J. R. Beckenbach, Director of Florida Experiment Station.
Response by Chairman.

8:30 a.m. ... Calving percentage in S-10 Experiment station herds based on survey of all stations. Dr. C. M. Kincaid, S-10 Coordinator.

9:15 a.m. ... Anatomical and physiological factors associated with low fertility in beef cattle. Dr. J. N. Wiltbank, Physiologist, Animal Husbandry Research Division, A.R.S. - U.S.D.A.

10:00 a.m. ... Recess.

10:15 a.m. .. Disease and pathological factors associated with reproduction performance in beef cattle. Dr. Alexis Kniazeff, Florida Livestock Board.

11:00 a.m. ... Endocrine factors influencing estrus, ovulation and fertilization in beef and dairy cattle. Dr. L. C. Ulberg, Associate Professor, North Carolina State College.

12:00 noon ... Lunch.

1:15 p.m. ... Nutritional factors associated with reproductive performance in beef cattle. Dr. A. C. Warnick, Associate Physiologist, University of Florida.

3:00 p.m. ... Tour of research facilities and cattle at Gainesville.

6:30 p.m. ... Dinner meeting. Gene Interaction and Breeding Plan. Dr. Fred H. Hull, Head Agronomy Department, Florida Agricultural Experiment Station.

September 4, 1957

Progress reports from states in S-10 8:15 a.m. to 11:00 a.m.
Kentucky
Maryland
South Carolina
Tennessee
Recess
Texas
Virginia
Recess
Business meeting from 11:00 a.m. to 12:30 p.m.

Adjourn. 12:30 p.m.

1957 S-10 TECHNICAL COMMITTEE MEETING

The 1957 S-10 Technical Committee meeting was held in Florida, September 1-4, 1957. Prior to the formal meeting at the University of Florida, Gainesville, Florida, the group made a tour which included three experiment stations with beef cattle breeding research and one large ranch with purebred and commercial cattle breeding operations. The tour was made on September 1 and 2 with a meeting of the Executive Committee at Bartow on the evening of September 1.

The first formal meeting of the group was called to order by Chairman R. A. Damon at 8:15 a.m., September 3. Chairman Damon introduced Dr. J. A. Beckenbach, Director of the Florida Experiment Station, who gave the group a cordial welcome to Florida for their meeting and discussed some of the highlights of Florida agriculture. He pointed out that 1,200,000 head of cattle were slaughtered in Florida last year with Florida ranking third among states east of the Mississippi and 14th in the nation.

Each person present was asked to introduce himself. The following Technical Committee members and guests were present: (Technical Committee members designated by *, acting by **)

*W. M. Warren, Ala. Agr. Exp. Sta., Auburn, Ala.
T. B. Patterson, Ala. Agr. Exp. Sta., Auburn, Ala.
G. B. Meadows, Ala. Agr. Exp. Sta., Auburn, Ala.
*Warren Gifford, Ark. Agr. Exp. Sta., Fayetteville, Ark.
C. J. Brown, Ark. Agr. Exp. Sta., Fayetteville, Ark.
*Marvin Koger, Fla. Agr. Exp. Sta., Gainesville, Fla.
R. W. Kidder, Fla. Agr. Exp. Sta., Belle Glade, Fla.
T. J. Cunha, Fla. Agr. Exp. Sta., Gainesville, Fla.
W. G. Kirk, Fla. Agr. Exp. Sta., Ona, Fla.
A. G. Lewis, Fla. Agr. Exp. Sta., Gainesville, Fla.
Lamar Reynolds, Fla. Agr. Exp. Sta., Gainesville, Fla.
A. C. Warnick, Fla. Agr. Exp. Sta., Gainesville, Fla.
H. L. Chapman, Fla. Agr. Exp. Sta., Belle Glade, Fla.
W. R. Prichard, Fla. Agr. Exp. Sta., Gainesville, Fla.
Alexis Kniazeff, Fla. Livestock Board, Kissimmee, Fla.
*B. L. Southwell, Ga. Coastal Plain Exp. Sta., Tifton, Ga.
W. C. McCormick, Ga. Coastal Plain Exp. Sta., Tifton, Ga.
Walter Neville, Jr., Ga. Agr. Exp. Sta., Experiment, Ga.
T. H. Clyburn, Ga. Agr. Exp. Sta., Reidsville, Ga.
J. L. Carmon, Ga. Agr. Exp. Sta., Athens, Ga.
*A. R. Parsons, Ky. Agr. Exp. Sta., Lexington, Ky.
D. G. Steele, Ky. Agr. Exp. Sta., Lexington, Ky.
*R. A. Damon, Jr., La. Agr. Exp. Sta., Baton Rouge, La.
*W. W. Green, Md. Agr. Exp. Sta., College Park, Md.
*C. E. Lindley, Miss. Agr. Exp. Sta., State College, Miss.
J. C. Taylor, Miss. Agr. Exp. Sta., State College, Miss.
*E. U. Dillard, N. C. Agr. Exp. Sta., Raleigh, N. C.
L. C. Ulberg, N. C. Agr. Exp. Sta., Raleigh, N. C.
Luis Rivera-Brenes, Puerto Rico Agr. Exp. Sta., Rio Piedras, P.R.
*E. G. Godbey, S. C. Agr. Exp. Sta., Clemson, S. C.
W. C. Godley, S. C. Agr. Exp. Sta., Clemson, S. C.
*T. C. Cartwright, Texas Agr. Exp. Sta., McGregor, Texas
**R. C. Carter, Va. Agr. Exp. Sta., Blacksburg, Va.
T. J. Harlowe, Va. Agr. Exp. Sta., Blacksburg, Va.

C. M. Kincaid, Regional Coordinator, AHRD, USDA, Knoxville, Tennessee
R. E. Patterson, Regional Administrative-Advisor, Texas Agr. Exp. Sta., College Station, Texas
M. J. Burris, SESD, USDA, Washington, D. C.
E. J. Warwick, AHRD, USDA, Beltsville, Md.
J. C. Burns, AHRD, USDA, West Central Fla. Agr. Exp. Sta., Brooksville, Florida
E. H. Vernon, AHRD, USDA, Iberia Livestock Exp. Farm, Jeanerette, Louisiana
B. M. Priode, AHRD, USDA, Beef Cattle Research Sta., Front Royal, Virginia
C. O. Harwin, Division of Animal Husbandry, Pretoria, South Africa

In addition to papers presented to the group and found elsewhere in this report, activities on September 3 included:

A short business session for presentation of matters that might need thought prior to discussion at the regular meeting to be held the next day.

A brief talk illustrated with slides by G. O. Harwin on cattle breeding and production in British South Africa. Mr. Harwin was visiting this country to study beef cattle breeding and production research in the United States and included this meeting in his schedule.

Dr. D. G. Steele showed the group colored pictures and slides made in Venezuela during his recent tour of duty there as consultant on horse breeding problems.

A field trip to see the cattle and facilities in the research program at Gainesville and vicinity.

A dinner meeting in the evening addressed by Dr. Fred H. Hull on Gene Interaction and Breeding Plans.

On September 4 progress reports were given by Kentucky, Maryland, South Carolina, Tennessee, Texas and Virginia. These reports were followed by the business meetings. (See text of this report for details of the state reports and minutes of the business meeting).

Mr. R. W. Kidder was in charge of the tour at the Everglades Experiment Station, Belle Glade, Florida, on the morning of September 1. He pointed out that Devon cattle were sent to the station in 1931 by the U. S. Department of Agriculture for cooperative work. Brahman cattle were added in 1944 and Angus in 1948. At the present time about 500 head of cattle are carried on a half-section of land. The present beef cattle research program by the Florida station includes Angus, Devon, Brahman, crosses and criss-crosses between the Brahman and Devon, and a herd of Brangus X Santa Gertrudis graded up to Angus. Dry-lot feeding, pasture investigations and nutrition studies were also part of an integrated beef cattle research program. This station is located on organic (muck) soil and Mr. Kidder indicated that St. Augustine was perhaps the most productive grass. Twenty acre units of St. Augustine

pasture provides an abundance of forage for 30 breeding cows throughout the entire year. Surplus forage was harvested from the grazed pastures and stored in bunker type silos as grass silage for winter feed.

The Sugarland Ranch owned by the United States Sugar Corporation, Clewiston, Florida, was visited on the afternoon of September 1 with Mr. S. L. Crochet in charge. This ranch contains about 10,000 acres of improved pasture planted to eight different varieties of grass suited to local conditions. According to Mr. Crochet, the best grasses for sand land were Pangola, Pensacola Bahia, Coastal Bermuda and Common Bahia with Pangola best. On organic (muck) land, St. Augustine, Carib, Para, Fescue and Pangola were utilized, with St. Augustine best. He indicated that under certain conditions each of these two better grasses were subject to damage by insects. This ranch is adjacent to Lake Okeechobee and a two-way water control system of canals and ditches is maintained for drainage and/or irrigation, depending on climatic conditions and the level of the water-table. In seasons with too much water the surplus is pumped off the land into the lake and during dry periods, water is pumped from the lake for sub-surface irrigation. Beef cattle breeding herds at Sugarland Ranch includes purebred Brahmans, purebred breeding of Charolaise, breeding of Charolaise on Charbray, cross-breeding of Brahmans with European breeds (Charolaise, Hereford, Angus and Shorthorn) with the development of first cross Brahman-European cows bred to European beef type bulls and the breeding of grade Brahman (Brahman X Native) cattle.

On the morning of September 2 at the Florida Range Cattle Station, Ona, with Dr. W. G. Kirk in charge, the group had an opportunity to observe beef cattle breeding and production from a variety of Florida pastures including Native range, improved pastures with fertilization and irrigation and a combination of these. The Range Cattle station, started in 1941, now contains 2830 acres, 750 acres of which are improved. The beef cattle herd on June 30, 1957 numbered 1009 head with Brahman and Shorthorn blood predominating. The purebred Brahman herd was established in 1942 and has served as the foundation stock for breeding programs now underway. Shorthorn bulls have been mated to these cows and cross-bred heifers from these matings have been back-crossed to bulls of the parental breeds giving varying proportions of Brahman and Shorthorn blood. The Commercial herd consists of grade cattle, mostly Brahman with a few Shorthorns, Santa Gertrudis, Angus, and Hereford; all tracing back on the female side to the Florida Native cow. In all, there are over 400 breeding cows in the herd at this station. Other work at the station included investigations with pasture and dry-lot feeding.

On the afternoon of September 2, the group drove from Ona to Gainesville with a visit to the Beef Cattle Station at Brooksville enroute. This station, owned by the Federal Government, is operated jointly by the U. S. Department of Agriculture and the Florida Agricultural Experiment Station. At this station the group had an opportunity to see the breeding cattle which included herds of Angus, Hereford, Brahman, Brangus and Santa Gertrudis. The entire calf crop which had been weaned a few days previously was available for observation as well as service-age bulls just put on feed in a cooperative feeding test with Florida breeders.

SURVEY OF REPRODUCTION IN S-10 BREEDING HERDS

by

C. M. Kincaid

A preliminary analysis of the data obtained in the survey of S-10 herds was made to estimate general influences of breed or strain, age and lactation on percent of calves born and weaned and on calf mortality. For this analysis cows were grouped on the basis of genetic background ignoring station herd and year. Two general genetic groups for classification by breed or strain within group were defined as follows: (1) British included Angus, Hereford, Shorthorn and crosses among these breeds. (2) Zebu included breeds and strains with at least some fraction of Brahman or Afrikander blood. Miscellaneous small herds that did not fall into either of the above main groups were omitted. In all, there were 9381 British cows and 4213 Zebu cows.

The percentage calf crop was computed from the total number of opportunities to be bred (number in herd at calving plus number removed for reproductive failure prior to calving); the number of cows that calved and the number that weaned calves. Table I summarizes these data by breed or strain and age. The calf crop born and calf crop raised was somewhat the same for British and Zebus with the British showing slightly higher percentages for both categories. Of 13,594 cows bred or exposed, 78% calved and 71% raised calves. In general, the percentage calf crop increased as age increased from yearlings to four-years old or over when bred. Conception rates tended to be lower for the younger cows but the big difference between them and the mature cows was in percentage of calves raised. The number of Zebus bred as yearlings were small but like the British yearlings, they show high calf mortality.

Calf mortality was more or less similar over all breeds and strains. These data are summarized by genetic group in Table II. Calf mortality at birth amounted to over 12% for yearlings; about 8% for two-year olds; over 5% for three-year olds, and about 4% for cows four-years old and over. Calf mortality from birth to weaning, based on total calves born, averaged slightly under 3% and showed no definite pattern with respect to age or breed. The average percentage mortality of all calves born was 8.44.

The influence of lactation on percentage calf crop borned and weaned was obtained by comparisons between wet and dry cows within breed subclasses. Table III shows the differences and weights obtained within each subclass which were used to obtain weighted average differences by age and breed for British and Zebu cows. The two genetic groups of cows behaved quite differently. Since the data for percentage of calves born and percentage of calves weaned was very similar for each of the subclasses, only that on calves born was included in this discussion. British cows on the average show lactating cows with 11% higher conception rates than dry cows. Zebu cows, on the other hand, show exactly the opposite with dry cows showing 14% higher conception rate than those lactating.

TABLE I. SUMMARY OF REPRODUCTIVE PERFORMANCE OF COWS AT ALL STATIONS BY BREED AND KIND

	Age of Cow When Bred or Exposed														
	1			2			3			4 & over			All Ages		
BRITISH	No.	% C	% WC	No.	% C	% WC	No.	% C	% WC	No.	% C	% WC	No.	% C	% WC
Spring															
Angus	128	77	48	449	69	65	413	77	72	1324	85	80	2314	80	74
Hereford	308	77	62	1066	80	73	853	78	71	2688	81	76	4915	80	74
Shorthorn	28	86	61	224	73	58	163	80	72	510	74	64	925	75	64
Brit x Brit	0			23	83	83	26	75	75	126	76	71	175	78	74
Brit x other	3	33	33	47	62	47	54	76	67	418	82	76	522	80	72
Total & Ave.	467	77	58	1809	76	69	1509	78	71	5066	81	76	8851	79	73
Fall															
Hereford & Angus	20	50	50	148	59	47	139	71	64	223	83	81	530	72	66
Total & Ave. Both Seasons	487	76	58	1957	74	67	1648	77	70	5289	81	76	9381	79	72
ZEBU															
Purebred Brahman	2	100	50	109	75	54	99	70	57	220	84	67	430	79	61
Brangus	--	0	---	155	76	69	130	63	58	528	78	71	813	75	69
Santa Gertrudis	1	0	0	82	70	61	22	41	41	120	61	51	225	62	72
Afrik-Angus	1	0	0	44	89	75	35	71	66	238	78	73	318	79	72
Brahman Cross	53	83	70	493	83	78	410	70	68	1471	76	71	2427	77	72
Total or Average All with Zebu Blood	57	81	65	883	80	72	696	68	63	2577	77	70	4213	76	69
GRAND TOTALS	544	77	59	2840	76	69	2344	74	68	7866	80	74	13594	78	71

No. - Number cows bred
C - calved
WC - weaned calves

TABLE II. CALF MORTALITY SUMMARIZED BY AGE AND KIND OF DAM. ALL STATIONS COMBINED.

Age of Dam	BRITISH	ZEBU	TOTALS Wt. & Ave.
Yearling			
No. born	369	46	415
% dead at birth	12.63	13.04	12.68
% died birth to wean	2.17	4.35	2.41
% total	14.80	17.39	15.09
Two-year olds			
No. born	1457	705	2162
% dead at birth	8.44	6.81	7.91
% died birth to wean.	1.72	3.26	2.22
% total	10.16	10.07	10.13
Three-year olds			
No. born	1270	474	1744
% dead at birth	6.06	3.59	5.39
% birth to wean.	2.75	3.37	2.92
% total	8.81	6.96	8.31
Four & over			
No. born	4300	1974	6274
% dead at birth	3.81	4.09	3.90
% died birth to wean.	2.51	4.26	3.06
% total	6.32	8.35	6.96
All Ages (wet & dry)			
No. born	7396	3199	10595
% dead at birth	5.85	4.75	5.52
% died birth to wean.	2.50	3.91	2.93
% total	8.35	8.66	8.45

TABLE III. WEIGHTED AVERAGE DIFFERENCE[1] BY AGE AND BREED BETWEEN LACTATING AND DRY COWS WHEN BRED FOR PERCENTAGE CALF CROP BORN.

BRITISH	Age of Dam at Breeding: 2 Yrs W	2 Yrs D	3 Yrs W	3 Yrs D	4 Yrs W	4 Yrs D	ΣW	ΣWD
Angus	65	11.2	87	15.1	208	13.0	360	13.18
Hereford	173	- 2.4	150	14.7	392	10.6	715	7.37
Shorthorn	25	-16.3	39	1.1	96	19.3	160	9.30
Brit x British	--	--	6	8.3	28	15.3	34	14.06
Fall Calves								
Angus, Hereford	35	43.1	33	2.3	33	13.3	101	20.03
ΣW & $\frac{\Sigma Wd}{\Sigma W}$	305	5.09	329	11.99	833	12.91	1467	11.08
ZEBU								
Brahman	4	-52.1	23	-21.4	51	.9	78	- 7.98
Brangus	-	--	24	-11.7	81	-18.7	105	17.10
Santa Gertrudis	-	--	1	-61.9	27	16.7	28	13.90
Afrik-Angus	-	--	8	-43.5	53	-12.2	61	-16.30
Brahman X Cows	37	-16.8	67	-16.4	306	-17.5	410	-17.09
TOTAL	41	-20.24	123	-18.55	518	-13.55	682	-14.86

(1) $W = \sum \left(\frac{N_1 \ N_2}{N_1 + N_2} \right)_i$

$\left[\frac{N_1 \ N_2}{(N_1 + N_2)} (d_i) \right]_i$

Where, in the i^{th} station-breed-age subclass at breeding N_1 is the number of lactating cows, N_2 is the number of dry cows, and d_i is the difference (lactating -- dry) between the percent calf crop from the two kinds of cows.

MEETING OF THE EXECUTIVE COMMITTEE OF THE SOUTHERN REGIONAL BEEF CATTLE BREEDING PROJECT.

PROJECT S-10. BARTOW, FLORIDA. SEPTEMBER 1, 1957

The Executive Committee of the Technical Committee S-10, Southern Regional Beef Cattle Breeding Project met at the Oaks Hotel, Bartow, Florida, 6:30 p.m., September 1, 1957. Dr. R. A. Damon, Jr. presided. Those present were: R. A. Damon, Jr., W. V. Green, Warren Gifford, C. H. Kincaid, R. E. Patterson, E. J. Warwick, Martin J. Burris and Marvin Koger. The planned program for the September 2, 3, and 4 meetings of the Technical Committee were reviewed by Dr. Koger and the well prepared directions sent to committeemen were supplemented.

Dr. Warwick proposed that some consideration be given to a regional and/or a national publication reporting the findings of the 10-years research in the regional beef cattle breeding project. After some discussion of the proposal, Dr. Green moved that the Executive Committee recommend to the Technical Committee that the S-10 Region prepare for publication, previous to the next annual meeting, a publication or publications of a technical nature, pertaining to certain aspects of the research work that have been conducted. The coordinator shall have the responsibility for reviewing the scope and making the recommendations concerning the areas of the report. The motion was seconded by Dr. Kincaid and the motion carried.

Dr. Patterson moved that the Executive Committee recommend to the Southern Region S-10 Technical Committee that they agree to cooperate in the preparation and publication of a national publication on beef cattle breeding. This publication is to be of "handbook or semi-popular" type and include information on beef cattle breeding based on published information. It is understood that the national publication will in no way discourage the preparation of regional publications on certain phases of S-10 in which sufficient progress has been made. The motion was seconded by Dr. Green and the motion carried.

Dr. Warwick reported that Charles Bell had presented a plan to the W-1 Regional Technical Committee meeting to call a meeting of the representatives of the regional research workers, one representative from each region, one representative from the extension animal husbandry workers from each region and the secretaries from the various purebred beef cattle breed associations for a discussion of the various methods of measuring performance in the various regions and to give consideration to the formulation of more uniform methods for measuring performance in the beef cattle performance testing programs. He further reported that Mr. Bell had already invited the secretaries of some of the associations to the meeting to be held in Chicago at the time of the Society of Animal Production meetings.

Following a lengthy discussion as to whether or not it was fitting and proper to request a director of a station in the Region to approve travel expenses for such a meeting, a motion was made by Dr. Koger to recommend to the Technical Committee that they consider the following: The S-10 Technical Committee request the chairman of the committee to appoint a member of the Technical Committee to represent the S-10 Region at the above mentioned national meeting. The motion was seconded by Dr. Green. The motion carried.

The meeting adjourned at 11:55 p.m.

MEETING OF THE TECHNICAL COMMITTEE
OF THE
SOUTHERN REGIONAL BEEF CATTLE BREEDING PROJECT
PROJECT S-10
GAINESVILLE, FLORIDA

Minutes, September 4, 1957

The Technical Committee of the Southern Regional Beef Cattle Breeding Project (S-10) met in the Conference Room, Agricultural Building, 11:00 a.m., University of Florida, Gainesville, Florida. The Chairman, Dr. R. A. Damon, Jr., called the meeting to order and requested a roll call of the members. The following were present:

W. M. Warren, Ala. Agr. Exp. Sta., Auburn, Ala.
Warren Gifford, Ark. Agr. Exp. Sta., Fayetteville, Ark.
Marvin Koger, Fla. Agr. Exp. Sta., Gainesville, Fla.
B. L. Southwell, Ga. Coastal Plain Agr. Exp. Sta., Tifton, Ga.
A. R. Parsons, Ky. Agr. Exp. Sta., Lexington, Ky.
R. A. Damon, Jr., La. Agr. Exp. Sta., Baton Rouge, La.
W. W. Green, Md. Agr. Exp. Sta., College Park, Md.
C. E. Lindley, Miss. Agr. Exp. Sta., State College, Miss.
E. U. Dillard, N. C. Agr. Exp. Sta., Raleigh, N. C.
L. Rivera-Brenes, Puerto Rico Agr. Exp. Sta., Rio Piedras, P. R.
E. C. Godbey, S. C. Agr. Exp. Sta., Clemson, S. C.
T. C. Cartwright, Texas Agr. Exp. Sta., McGregor, Texas
R. C. Carter, Va. Agr. Exp. Sta., Blacksburg, Va.
C. M. Kincaid, Regional Coordinator, USDA, Knoxville, Tenn.
R. E. Patterson, Regional Administrative Advisor, Texas Agri. Exp. Sta., College Station, Texas
M. J. Burris, USDA, Washington, D. C.
E. J. Warwick, USDA, Beltsville, Md.

The Chairman stated that the purposes of the meeting were to discuss current problems or problems that may confront the Committee during the coming fiscal year.

A report of the Executive Committee was given with reference to a proposed publication or publications for the region.

A motion was made by Dr. Green that the S-10 Region prepare for publication previous to the 1958 annual meeting, a publication or publications of a technical nature on certain aspects of the research work that has been conducted. The coordinator shall review the scope of the research completed and make recommendations for and assist with the preparation of materials for publication. The motion was seconded by Dr. Dillard. Motion carried.

Dr. Patterson called the Committee's attention to the records of the 1956-57 meeting which recommended the preparation of a publication on the cross-breeding research, particularly the Brahman-British crosses. It was agreed by the Committee that such a publication should be first in order and the problem of reproductive efficiency should be considered as another area for publication.

Mr. Southwell made a motion that the S-10 Committee go on record as favoring the national publication in general, and reserve specific action with reference to publication until more information is obtained. The motion was seconded by Dr. Green. Motion carried.

A motion was made by Dr. Cartwright to add to the list of proposed publications a publication on procedures for performance testing. The motion was seconded by Dr. Green and the motion carried.

Dr. Warwick made a brief report, on a request from Charles Bell, concerning the appointment of a Technical Committeeman to attend a national conference in Chicago, at the time of the Society of Animal Production Meetings, to consider the formulation of uniform methods and procedures for the performance testing of beef cattle. A motion was made by Dr. Patterson that the S-10 Regional Projects send a representative to the meeting in Chicago on an informal basis. Motion was seconded by Dr. Green. Motion carried.

The Resolutions Committee, composed of Dr. Godbey, Dr. Cartwright and Mr. Southwell, made the following resolutions and moved their adoption. The motion was seconded by Dr. Dillard. Motion carried.

REPORT OF RESOLUTIONS COMMITTEE - S-10

The S-10 meetings held in Florida during the period 9-1 to 9-4, 1957, was one of the better Committee meetings that the group has held. Much effort was made in planning the program and arranging the trip over the state. For these things we wish to thank the following:

1. The Program Committee for arranging an excellent program.
2. All those who took part on the program. The discussion and presentation were very informative and helpful to the over-all program being carried on by the states..
3. The Animal Husbandry staff of the University of Florida and especially to Marvin Koger for providing facilities, arranging tours and for all the individual courtesies shown those in attendance.
4. Dr. Palmer, the Animal Husbandry Staff, and the Block and Bridle Club for the most excellent barbecue lunch served Tuesday noon.
5. Mr. Kidder and the Animal Husbandry group at the Belle Glade Station for the tour on Sunday morning.
6. Mr. S. L. Crochet and Mr. Vaughn for the tour of the beef cattle operation of the United States Sugar Corporation on Sunday afternoon.
7. Dr. Kirk and his staff at the Range Cattle Station of Ona for the tour of the station on Monday morning. Also, Dr. Kirk and his group for providing the very good lunch served the group at the station.
8. W. C. Burns and the staff at the Brooksville Station for the tour of the station on Monday afternoon.
9. Dr. Fred Hull for his talk on Recurrent Selection and Overdominance during the dinner meeting on Tuesday evening.

10. The officers of the S-10 Committee for their efforts in our behalf during the past year.
11. To Dr. J. R. Beckenbach, Director of Florida Experiment Station for the welcome address and for the courtesies shown by his entire staff.
12. We request that a copy of these resolutions be spread on the minutes of the meeting and that a copy be sent to each individual mentioned.

T. C. Cartwright
E. G. Godbey
B. L. Southwell

Chairman Damon called for suggestions or invitations for a meeting place for the 1958 annual meeting of the Committee. Arkansas, Georgia and South Carolina offered facilities and invitations to meet at their stations.

A motion was made by Mr. Southwell that the selection of the location and the general area of subject matter be included in the program placed in the hands of the Executive Committee. The motion was seconded by Dr. Dillard. Motion carried.

Dr. Patterson introduced R. W. Bledsoe, Associate Director of the Florida Station.

Dr. Koger suggested that in the future the program committee consider allowing more time for state reports.

Dr. Burris reported that SESD has compiled a list of projects concerned with beef cattle research and are available for research workers. He also recommended that each worker review the project outline that had been approved and give consideration to revision should there be research programs now under way that were not included in the outline. One example may be the study of dwarfism on certain stations.

Dr. Patterson reported on some new policies announced recently by the Administrator, B. T. Shaw, concerning the projects of the Animal Husbandry Research Division. All project outlines are to be submitted to the Technical Committee for review and approval. Such projects will be regular contributors to the S-10 project. He suggested that this plan was the formalizing of the program that has been underway.

Dr. Patterson further commented that the S-10 project is now in its 10th year. He stated that the 10 years of research had brought significant progress and we are seeing a revolution in the beef cattle breeding programs in the region as evidenced by the type of livestock, meat being sold, and the method of production.

Dr. Kincaid requested that each committeeman check the cattle numbers reported and other statistics. He suggested the possibility of the exchange of animals between stations to study adaptation and environmental effects.

Dr. T. C. Cartwright was elected to the Executive Committee to succeed Dr. R. A. Damon, Jr., whose term of office expires January 31, 1958.

The meeting was adjourned by the Chairman at 12:30 p.m.

State	Cattle Inventory July 1, 1957*						Cattle Fed After Weaning Under Test 1956-57					
	Cows 2 yrs & over	Yearling heifers	Calves under 1 yr.	Bulls over 1 yr.	Steers 1 yr. & over	% Used on Project	Bulls Fed Ind.	Bulls Fed Group	Steers Fed Ind.	Steers Fed Group	Heifers fed Ind.	Heifers fed Group
Alabama	162	39	113	16	17	100%	-	54	-	8	-	59
Arkansas	230	73	167	35	6	97%	63	-	-	-	0	46
Florida State Sta.	252	79	140	18	8	97%	-	-	-	51	-	-
Fed. Sta. Brooksville	204	37	132	26	50	100%	-	100	-	57	-	35
Kentucky	-	-	-	-	-	-	-	30	-	-	-	-
Georgia	672	173	535	29	-	72%	-	59	-	-	-	47
Louisiana State Sta.	398	71	254	12	-	100%	-	-	-	60	-	-
Fed. Sta. Jeanerette	260	110	168	29	-	100%	20	5	-	63	-	-
Maryland**	71	16	51	3	28	75%	47	47	15	13	10	10
Mississippi	516	69	292	20	25	68%	-	-	-	-	-	-
N. Carolina	285	68	166	19	55	57%	-	17	-	35	-	30
S. Carolina	57	-	52	1	-	89%	-	-	-	-	-	-
Tennessee	1075	338	851	100	245	85%	-	55	33	-	12	217
Texas	466	91	302	45	8	98%	-	408	-	104	-	129
Virginia State Sta.	169	11	131	10	11	80%	-	-	-	16	-	20
Fed. Sta. Front Royal	509	140	338	35	-	100%	44	8	-	60	-	140
TOTAL	5326	1315	3692	398	453		127	783	48	467	22	733

* Includes all cattle of each station, whether owned by state, Animal Husbandry Research Division.
** Does not include cattle in an outside cooperating herd.

SOME PHYSIOLOGICAL AND ANATOMICAL FACTORS AFFECTING FERTILITY IN BEEF CATTLE

by
J. N. Wiltbank

The reasons for a low calf crop in beef cattle are many and varied. However, the causes for reproductive failure can be classified under two general headings. These are (1) failure to breed or lack of heat and (2) repeat breeding. Before we can attack the problem of low calf crop in beef cattle intelligently we need to know the basic causes for failure. In this paper I would like to point out the importance of both lack of heat and repeat breeding in infertility in beef cattle and factors which affect them.

For the past two years an attempt has been made at Front Royal to ascertain the breeding dates of all the cows. This was done by painting the brisket of the bulls with a pigmented grease and checking cows for grease marks. The length of the breeding season was approximately 75 days and the size of the breeding herd varied from 10 to 43 cows.

The percentage of cows pregnant the two years did not differ markedly except in the case of Shorthorns (Table I). At least part of this difference here is due to the presence of vibrio foetus in two Shorthorn herds in 1957. The breeding pattern of the cows which were open at the end of the breeding season shown in Table II.

A large proportion of the Angus cows (37%) and Shorthorn cows (30%) which did not settle had vibrio. This disease was encountered both years in the Angus herd but only in 1957 in the Shorthorn herd.

In the three breeds the reason for reproductive failure in the heifers and dry cows is repeat breeding (Table II), while in the cows nursing calves the reason for failure differs somewhat according to breed. Of the 15 Angus cows nursing calves only one (6.7%) failed to show heat, three others (20%) were bred once while the remaining 11 cows (73.3%) were bred 2 or more times. The most important reason for failure here is repeat breeding. Eight (28.6%) of the 28 open Hereford cows nursing calves showed no heat during the breeding season. Another 10 (35.7%) had only one heat period and 10 (35.7%) were bred 2 or more times. Four of the ten cows which were bred once had their heat period in the last 30 days of the breeding season, so that a long interval between calving and first heat was an important reason for reproductive failure in the Hereford. In the open Shorthorn cows nursing calves there were 4 cows (13.3%) which did not show heat during the breeding season, 8 (26.7%) were bred only once and 18 (60.0%) were bred two or more times. Again we have a problem of both lack of heat and repeat breeding with repeat breeding being the more important.

In summary from these data it would seem that repeat breeding is the main cause of lowered calf crop in all three breeds. However, long intervals between calving and first heat contributed quite markedly to a lowered calf crop in the Hereford cows which were nursing calves and to a lesser extent in the Shorthorn cows.

Heat checks were carried out at the Iberia Livestock Station during the 1956 breeding season. The breeding season lasted 75 days and breeding herds varied in size from 12 cows to 26 cows. Results are shown in Table III.

The breeding pattern of the open cows is shown in Table IV. Because of the small numbers involved the breeding strains have been combined. Again the reason for reproductive failure in the dry cows appears to be repeat breeding. In the heifers there were 2 (13.3%) which never showed heat. This could be because they never reached puberty or it may be an observational error. In the cows nursing calves, 12 (32.4%) showed no heat during the 75 days of the breeding season. Five others only came in heat soon enough to be bred once. So we have a problem here of both repeat breeding and long interval between calving and first heat. In a group of low fertility cows at Florida, Warnick and co-worker (10, 13) pointed out that 12.8% did not show heat during the experimental breeding period before slaughter.

Other data from Beltsville and Wisconsin point out the importance of both lack of heat and repeat breeding in herds where year around breeding was practiced. In the herd of beef Shorthorns formerly maintained at Beltsville, the average length of the interval from calving to first heat was 84.2 days and the time from first breeding to conception averaged 36.5 days (Table V). When our goal is a calf every year the service period has to average approximately 83 days. It can be seen from Table V that 36.1% of the intervals from calving to first heat were over 90 days in length. It can also be seen that almost half of the service periods required more than one service for conception, so that both repeat breeding and a long interval from calving to first heat were important in lengthening the service period.

In data from Wisconsin the service period averaged 87.8 days in the Angus cows (Table VI). This would give you a calf on the average about every year, while the Shorthorn cows would average a calf about every 13 months. The service period in the Shorthorn cows was lengthened because of 15.7 days longer between calving and first heat and 11.4 days longer between first breeding and conception. Much of the difference between the two breeds of cattle in interval between calving and first heat can be explained on the basis of a lengthened period from first corpus luteum to first heat.

Some heifers do not get bred because they do not reach puberty at an early enough age. There are a few heifers that never reach puberty. There are no reports of the exact proportion of this type. The average age at puberty has not been too well established in beef cattle. However, there are limited data from Idaho (5), Florida (12) and Wisconsin. From these data it would appear that if heifers are first bred at two years of age almost all of them would have reached puberty (Table VII). But if heifers are bred first as yearlings we could expect a lowered calf crop because some heifers had not reached puberty. This would be true especially in the Brahma and Brahma crosses.

Where cows are bred during a limited breeding season the length of the interval between calving and first heat becomes important. With the data from Front Royal we attempted to estimate the proportion of cycles over a certain length. This was done by utilizing cows which did not show heat during the first 24 days of the breeding season and assuming any heat after that time was the first heat since calving. These data show that only a small percentage of the Angus cows nursing calves have an interval between calving and first heat over 80, 90, or 100 days in length (Table VIII), while in the Hereford cows at least 21.1% of the intervals were over 80 days, 14.7% over 90 days, and 11.8% over 100 days. The percentage of Shorthorn cows with intervals over 80, 90, or 100 days in length was 16.4, 13.6, and 7.0. It appears from this that the length of interval between calving and first heat in Angus cows is short enough not to be a major factor in reproductive failure but in the Hereford and Shorthorn cow it could play an important part.

Lasley and Bogart (9) reported that the length of the interval from calving to first heat was 80.2 days in a group of Hereford cows in the Southwest. Guilbert and McDonald (7) reported that in a group of Hereford cows 30% came in heat 20-40 days after calving, 30% 40-60 days after calving and 40% 60-100 days after calving.

Clapp (6) observed in a Holstein herd that a cow that is suckled or one that is milked four times a day has a longer interval between calving and first heat than a cow milked twice a day. This interval was 69.4 days for cows milked four times a day, 71.8 days for cows nursing calves and 46.4 days for cows milked twice a day.

When the records kept by herdsmen during the years 1934 to 1955 at Beltsville for Milking Shorthorns were analyzed they tended to confirm Clapp's observations. The average interval from calving to first observed estrus was 74.1 days in the milked cows and 104.3 days in the nursed cows(Table IX). For the past year and a half we have palpated and checked heat more closely in these Milking Shorthorn cows. The apparent interval between calving and first heat decreased during this period of time due to the more intensive heat check (Table X). The interval from calving to first heat was 59.1 days for the milked cows and 80.8 days for the cows nursing calves. If we break the interval from calving to first heat into the interval from calving to first corpus luteum and the interval from first corpus luteum to first heat we find that most of the difference in these two groups of cows is due to the fact that the ovaries of cows which are suckled become active later than the ovaries of cows which are milked; so that suckling slows down ovarian activity. This could be the result of a decreased gonadotrophic hormone or an ovary which is not sensitive to gonadotrophic hormone.

The effect of age on the occurrence of estrus is not known. Some data from the Iberia Livestock Station point out the effect of age on percent of calf crop. Because of work done at Florida which shows that cows suckling calves do not come in heat, I have chosen to assume that the influence of age on fertility in these data at least was caused by lengthening the interval between calving and first heat.

The percent calf crop in the two year old heifers and dry cows did not differ significantly (Table XI). There was no significant difference between years for either the dry cows or the two year old heifers. Age did not have a significant effect on the calf crop in the dry cows. However, there was a significant age difference in the cows nursing calves. Certain ages of cows tended to perform alike so they were combined. Three age groups within the nursed cow were formed. These were cows 3 and 4 years old; cows 5 through 10 years old; and cows over 10 years of age. The percent calf crop for different age cows within each of these groups did not differ significantly. The calf crop for the cows five through ten years of age was much the same as that for the dry cows and two-year old heifers in every year except 1951 and 1956. There was a significant effect of year on calf crop for cows 5-10 years of age. Most of this effect was due to the extremely low calf crop in 1951. The calf crop for the three and four year old cows was considerably lower than that of all other groups except for cows over 10 for the years 1949 through 1952. After 1952 there was a marked improvement in total calf crop. Starting with 1953, all cows were on improved pasture. This pasture improvement materially increased the calf crop in the three and four year old cows, so that nursing affected the younger cows more than the older cows when on poor pasture. In the Milking Shorthorn data the older cows also tended to have shorter intervals between calving and first heat.

Other workers have shown the effect of age on calf crop. Lasley and Boga (9) pointed out that two and three-year-old cows have lower calf crop than older cows (Table XII). Brown, et al, (2) showed that as cows get older the calving interval tended to shorten. Burke (3) found that two and three-year-old cows had lower calf crop than the older cows.

Some of the causes of repeat breeding are genital abnormalities, ovulation failure, fertilization failure and embryonic death. In the low fertility cow the potential calves lost because of genital abnormalities ranged from 6.0% to 12.4% (Table XIII), while ovulation failure ranged from 11.9% to 27.5%. The percentage of potential calves lost from fertilization failure varied from 41.89 in Dairy cows to 10.0% in the English beef breeds in Florida. Embryonic death accounted for the greatest loss of embryos in all groups of cows.

In control cows the number of calves lost from genital abnormalities and ovulation failure was low. The number of potential calves lost because of fertilization failure depended on whether they were bred to a bull of high or low fertility. When cows were bred to low fertility bulls the percentage of calves lost was comparable to those lost in low fertility cows. The embryonic death rate in the control cows was lower in all cases than it was in the low fertility cows.

SUMMARY

Lowered calf crop in Angus cows and in cows and heifers of all breeds seem to be the result of repeat breeding, while in Hereford, Shorthorn, Brahma and Brahma cross cows suckling calves and bred during a limited breeding season, the calf crop is lowered materially because cows do not come in heat during the breeding season or come in heat too late. Some factors which influence the length of the interval between calving and first heat are suckling, age, and nutrition. The most important cause of repeat breeding is embryonic death between the 3rd and 34th day.

TABLE I

RESULTS OF 1956 and 1957 BREEDING SEASON
AT FRONT ROYAL, VIRGINIA

	ANGUS		HEREFORD		SHORTHORN	
	1956	1957	1956	1957	1956	1957
Number	160	174	134	142	173	167
No. Pregnant	140	156	117	124	148	130
% Pregnant	87.5	89.6	87.3	87.3	85.6	77.8

TABLE II

BREEDING PATTERN OF COWS OPEN AT THE END OF BREEDING SEASON - FRONT ROYAL
1956 - 1957

	ANGUS				HEREFORD				SHORTHORN			
	Heifer	Dry Cow	Wet Cow	Total	Heifer	Dry Cow	Wet Cow	Total	Heifer	Dry Cow	Wet Cow	Total
Total No.			38				35				61	
Vibrio + herds				14				0				14
Vibrio - herds	5	4	15	24	3	4	28	35	7	10	30	47
No. no heat			1	1			8	8		1	4	5
No. bred 1 time	1	1	3	5		2	10	12		2	8	10
No. bred 1 time in last 30 days of breeding season			1	1			4	4			5	5
No. bred 2 or more times	4	3	11	18	3	2	10	15	7	7	18	32

TABLE III

RESULTS OF 1956 BREEDING SEASON AT JEANERETTE

	Brahma-Angus	Africander-Angus	Brahma
Number of cows	133	58	35
Number pregnant	87	48	28
Percent	65	83	80

TABLE IV

BREEDING PATTERN OF COWS OPEN AT END OF BREEDING SEASON
IBERIA LIVESTOCK STATION - 1956

	Heifers	Dry Cows	Cows nursing calves	Total
Number open	15	11	37	6
Number not bred	2 (13.3%)	0	12 (32.4%)	1
Number bred one time	6 (40.0%)	3 (27.3%)	13 (35.1%)	2
Number bred one time in last 30 days of breeding season	0	0	5	
Number bred 2 or more times	7 (46.7%)	8 (72.7%)	12 (32.4%)	2

TABLE V

REPRODUCTIVE PERFORMANCE OF BEEF SHORTHORNS AT BELTSVILLE 1933 - 1948

	CALVING TO 1ST HEAT			1ST BREEDING TO CONCEPTION	
Number of days	No. intervals	% of intervals		No. intervals	% of intervals
0	0	0		223	56.4
1-9	2	0.5		1	0.2
10-19	4	1.0		9	2.3
20-29	12	3.0		28	7.1
30-39	24	6.1		10	2.5
40-49	28	7.1		22	5.6
50-59	49	12.4		13	3.3
60-69	49	12.4		13	3.3
70-79	42	10.6		8	2.0
80-89	42	10.6		12	3.0
90-99	27	6.8)		7	1.8
100-109	30	7.6)		5	1.3
110-119	12	3.0		5	1.3
120-129	17	4.3)	36.1	8	2.0
130-139	18	4.6)		5	1.3
140-149	10	2.5)		5	1.3
Over 150	29	7.3)		21	5.3
Total No. Intervals	395			395	
Average Length	84.2			36.5	
Standard Deviation	40.82			64.72	

TABLE VI

REPRODUCTIVE PERFORMANCE OF COWS AT WISCONSIN

	Angus Av.No. days	Shorthorn Av. No. days	Difference
Calving to First Corpus Luteum	41.5 (16.3)	44.7 (18.1)	3.2
First Corpus Luteum to First Heat	14.9 (24.7)	27.4 (36.9)	12.5
Calving to First Heat	56.4 (29.4)	72.1 (38.0)	15.7
First Breeding to Conception	31.4 (50.2)	42.8 (66.8)	11.4
Total Service Period	87.8 (53.4)	114.9 (59.9)	27.1
Number Service Periods	47	15	

Numbers in parentheses are Standard Deviations.

TABLE VII
AGE AT PUBERTY

	Number of Heifers	Average age in days	Average Weight
HEREFORD			
Idaho	16	378	635 lbs.
Florida	5	456	500 lbs.
Wisconsin	14	361	---
ANGUS			
Idaho	9	353	525 lbs.
SHORTHORN			
Idaho	10	383	555 lbs.
BRANGUS			
Florida	7	463	549 lbs.
BRAHMAN			
Florida	7	511	675 lbs.
SANTA GERTRUDIS			
Florida	15	---	603 lbs.

TABLE VIII

INTERVAL FROM CALVING TO FIRST HEAT 1956 AND 1957 BREEDING SEASON AT FRONT ROYAL

	Angus	Hereford	Shorthorn
Number cows nursing calves	245	204	213
Intervals			
Over 100 days	9 (3.7%)	24 (11.8%)	15 (7.0%)
Over 90 days	14 (5.7%)	30 (14.7%)	29 (13.6%)
Over 80 days	22 (9.0%)	43 (21.1%)	35 (16.4%)

TABLE IX

REPRODUCTIVE PERFORMANCE OF MILKING SHORTHORNS FROM 1934 TO 1955 FROM RECORDS KEPT BY HERDSMEN

	No. Service Periods	Calving to 1st heat Av. No. days	1st breeding to conception Av. No. days	Service Period Av. No. days	Av. No. Services per conception
Cows nursing calves	266	104.3	47.3	151.6	1.84
Milked cows	139	74.1	20.2	94.3	1.54
Difference		30.2**	27.1**	57.3**	0.3**

** Significant at 0.01 level

TABLE X

REPRODUCTIVE PERFORMANCE OF MILKING SHORTHORNS SINCE 1955

	Milked cows	Cows nursing calves	Difference
No. of service periods	36	37	
Av. days - calving to first Corpus Luteum	35.7	55.2	19.5**
Av. days - first Corpus Luteum to first heat	23.4	25.6	2.2
Av. days - calving to first heat	59.1	80.8	21.7**
Av. days - calving to involution	43.6	55.4	11.8**

** Significant at 0.01 level.

TABLE XI

PERCENT CALF CROP IN VARIOUS TYPES OF COWS IN DIFFERENT YEARS AT IBERIA LIVESTOCK STATION

	Total of all years	1949	1950	1951	1952	1953	1954	1955	1956	1957
Total calf crop	74.1	71.0	77.4	61.6	75.1	86.3	73.3	73.8	70.2	83.5
Two year old heifers	75.3	70.3	84.2	90.0	81.8	80.0	78.0	73.0	66.1	88.9
Dry cows, all ages	78.2	87.0	82.1	89.7	75.8	85.7	60.0	67.4	69.4	84.0
Cows nursing calves										
3-4 years old	60.2	38.5	48.1	38.7	51.7	88.0	76.3	87.5	58.7	78.5
5-10 years old	78.7	80.0	84.2	52.4	82.7	89.1	73.3	87.5	81.4	87.0
Over 10 years old	60.3	11.1	75.0	42.8	88.9	88.9	63.5	100.0	100.0	60.0

TABLE XII

FERTILITY IN A GROUP OF HEREFORD COWS FROM LASLEY AND BOGART

Age of Cow	Number of Cows	Number inseminations per calf	Percent Calf Crop
2-3	115	2.37	66.1
3-5	325	1.83	77.2
5-6	51	1.36	86.2
6-7	208	1.49	82.2
7-8	261	1.64	78.2
8-9	264	1.69	77.7
9-10	78	2.09	69.2

TABLE XIII

FATE OF POTENTIAL CALVES IN COWS AND HEIFERS OF POOR FERTILITY

	Loss caused by			
	Genital abnormalities precluding fertilization failure	Ovulation failure	Fertilization failure	Embryonic death by 34th day after breeding
Dairy cows (Wisconsin) (4)				
No. calves lost	6		39.3 (41.8%)	32.5 (59.4%)
No. potential calves left per 100 cows	94		54.7	22.2
Dairy heifers (Penn State) (11)				
No. calves lost	12.4		28.3 (32.3%)	27.3 (46.0)
No. potential calves left per 100 cows	87.6		59.3	32.0
Beef animals (10, 13)				
Zebu or crosses (Fla.)				
No. calves lost	4.1	11.4(11.9%)	23.0 (27.2%)	28.7 (46.7)
No. potential calves left per 100 cows	95.9	84.5	61.5	32.8
English breeds				
(Florida)				
No. calves lost	8.3	25.0(27.5%)	6.7 (10.0%)	31.4 (52.3)
No. potential calves left per 100 cows	91.7	66.7	60.0	28.6
(Front Royal)				
No. calves lost	7.2	1.6(1.7%)	19.2 (21.0%)	41.6 (57.8)
No. potential calves left per 100 cows	92.8	91.2	72.0	30.4

TABLE XIV

FATE OF POTENTIAL CALVES IN COWS AND HEIFERS OF NORMAL FERTILITY

	Loss caused by			
	Genital abnormalities precluding fertilization failure	Ovulation failure	Fertilization failure	Embryonic death before 34th day after breeding
HIGH FERTILITY BULLS				
Cornell (1)				
No. calves lost	0	0	3.4 (3.4%)	10.5 (10.9%)
No. potential calves left per 100 cows	100	100	96.6	86.1
Wisconsin (8)				
No. calves lost	0	0	0 (0%)	25.5 (25.5%)
No. potential calves left per 100 cows	100	100	100	74.5
LOW FERTILITY BULLS				
Cornell (1)				
No. calves lost	0	0	23.1 (231.1%)	19.2 (25.0%)
No. potential calves left per 100 cows	100	100	76.9	57.7
Wisconsin (8)				
No. calves lost	0	0	28.1 (28.1%)	14.9 (20.7%)
No. potential calves left per 100 cows	100	100	71.9	57.0
BEEF CATTLE (Florida) (13)				
No. calves lost	1.8	10.0 (10.2%)	15.8 (17.9%)	0
No. potential calves left per 100 cows	98.2	88.2	72.4	78.8

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ENDOCRINE CONTROL OF REPRODUCTION

by

L. C. Ulberg

It is well established that the endocrine system is important in the control of reproductive processes in farm livestock. This system is apparently very complex and difficult to measure therefore, not well understood at this time. It is known, however, that there are a number of hormones involved and that they are produced in various places in the animal body.

It may be well to consider some basic concepts in this field. First, hormones are stimuli which act on tissues, directly or indirectly, that have the ability to respond to cause a reaction. This reaction can be prevented by either or both a decrease in the receptivity of the tissue or a decrease in the hormone level. It is also known that ratios between hormones are important in control of reproductive processes.

There are four primary hormones concerned with reproduction directly. Two are produced in the ovary, progesterone from the corpus luteum and estrogen from the follicle and are commonly called the gonadal hormones. Two others are produced by the anterior pituitary. These are the luteinizing hormone (LH) and follicle stimulating hormone (FSH) commonly called the gonadotropins. All four hormones change in levels from day-to-day during the estrous cycle. Apparently they have to change in the proper amount; in the proper sequence and at the proper time. The way these changes occur are not well understood at the present time. Also, theories to explain them are highly contradictory. These hormones apparently are so interrelated that a change in one may cause a change in any or all of the other three. It is further apparent that the addition of a certain hormone may not cause the same outward reaction for all days of the estrous cycle.

It has become well established that the nervous system as well as many other factors such as the blood supply to the target organ and other hormone systems of the body play an intricate part in reactions to the hormone stimulus.

These few over-simplified statements as a background may help explain some of the day-to-day observations noticed in cattle. An attempt will be made to point out the possible role of the endocrine system as the cause of abnormal reproductive behavior which in turn have an effect on calving percentages.

It becomes difficult to divide the reproductive process up into phases since all phases are interdependent, however the discussion will be in terms of estrus; ovulation; fertilization and gestation. Estrus (heat) can be defined as the willingness of the cow to stand for the mounting of another animal. This condition is brought about by the proper amount of estrogen at the proper time. Cows differ from other farm livestock in that they ovulate after the cessation of heat. The theory used to explain this reaction is that cows become refractory to a high level of estrogen. Abnormalities of estrus occur that range from no estrus (anestrus) to near continuous estrus (nymphamania). Anestrus can be due to inactive ovaries or there can be normal ovarian activity but with no expression of heat. Sheep normally have a period of anestrus during early spring. Certain cows produce calves only every other year which could be due to the stimulus of suckling interfering with the hormone system. This is also normal for certain species. Heifers tend to ovulate without heat at the time of puberty. Among other things anestrus appears to be caused by is an insufficient amount of estrogen.

On the other end of the scale the estrogen level is too high due to a cystic follicle. A cow with such a follicle may become a nymphomaniac. There has been interest in the control of time of estrus in cows. This can be accomplished by simply keeping the progesterone level in the body high by making daily subcutaneous injection of the hormone. Where 50 mg. of the material is injected daily the cow will come in heat 5 to 6 days after the last injection. The conception rate from breedings at this heat is very low. Lower levels of injected progesterone result in more variation in time of onset of estrus but conception rate is increased. Addition of estrogen show some promise of decreasing variation in time of onset of estrus following low dosages of progesterone and also maintain a normal conception rate.

Ovulation is brought about by the gonadotropins. The FSH stimulate follicular growth, LH then stimulates ovulation. In the event LH fails to cause ovulation the follicle continues to grow and become cystic. A sudden increase in the gondadrotropin level by injections into the blood stream, is often used as a treatment for this condition. More than the normal number of ovulations (superovulation) can be brought about by increasing the amount of gonadotropins at the time of heat.

Fertilization rate is generally high and may not be seriously affected by hormones. However, hormones are important in fertility of the male and thereby affect fertilization rate. The gonadotropins are believed by some to influence spermatogenesis and testosterone production.

That phase of reproduction which needs study at present is that of gestation. It is known that the rate of movement of the fertilized ova can be changed with estrogen and progesterone. Also progesterone is necessary for the maintenance of a pregnancy while estrogen will cause an abortion. Since a large portion of potential young are lost at a very early stage of gestation the possibility exists that an improper ratio of these two hormones fail to set up a proper uterine environment for the development of the very young embryo.

ABSTRACT

NUTRITIONAL FACTORS ASSOCIATED WITH REPRODUCTIVE PERFORMANCE IN BEEF CATTLE

A. C. Warnick

The objective of workers in this general field should be to determine the effect of the quality and quantity of specific nutrients on: the endocrine system, estrus, libido, gamete production, fertilization and embryonic survival. Low levels of energy appear to delay puberty in both the heifer and bull. Yearling heifers receiving less than 30 percent protein of the N. R. C. requirement showed delayed puberty. Estrus and ovulation were completely inhibited in yearling heifers on 10 percent protein of the N. R. C. requirement.

Supplementing range cows during the winter with cottonseed oil meal, in most instances, showed a significant increase in calving percentage. Florida lactating range cows of approximately 1/2 Brahman and 1/2 Native breeding that grazed clover-grass pastures had a 44 percent higher calf crop than comparable cows grazing straight grass pastures. This beneficial effect of the clover in pastures, on reproduction, is especially marked in young lactating cows 3, 4, and 5 years of age. Protein supplementation, during the winter, of the heifers and cows grazing on grass pasture markedly increased reproductive performance, whereas there was no advantage in reproduction, in cows grazed on clover-grass pasture.

A deficiency, or low level of calcium does not appear to influence reproductive rate in beef cattle. Phosphorus supplementation in deficient areas increased calving percentage 21 to 29 percent and there was a higher percentage of consecutive calving of individual cows. The low reproductive level of mature dairy cows on a phosphorus deficiency ration was due to aborted and dead calves, rather than a failure of estrus and ovulation.

Low levels of Vitamin A or carotene, in bulls, resulted in decreased libido, increased percent abnormal spermatozoa, decreased motility and development of cystic pituitaries. Supplementation of these deficient bulls with Vitamin A restored semen quality and libido while Vitamin C supplementation failed to modify reproductive deficiencies. Suboptimum levels of carotene to dairy cattle for 2 or 3 generations resulted in damaged pituitary, adrenals and testes.

KENTUCKY STATION
BY
A. R. Parsons

Performance testing of bulls at the Kentucky station has been mostly with bulls from the herds of cooperating breeders. The charge to cooperators is $125 per head. Individual feeding is practiced with two sets of 15 each tested each year. One test starts in the fall and ends in the spring to be followed by a test started in the spring and ended in the fall. There is a preliminary adjustment of 10 to 14 days with the official test period of 154 days. It has been observed that in general, gross feed efficiency decreased with age. Average daily gain has ranged from 1.8 to over 3 pounds per day.

Bulls from these performance tests are in use on Red Poll and Hereford cows in beef cattle investigations at one outlying station. Cooperative work with Meriworth Farm also involves use of performance tested bulls on heifers in their herd. This farm feeds out most of the steers they produce and the arrangement provides data on feetlot performance of steers from these breeding tests.

The development of breeding herds is just getting started with 30 purebred Hereford cows acquired recently for use at a new field station.

The University of Kentucky recently acquired the Cold Stream Farm near Lexington and this farm will be used for purebred herd steer feeding and other beef cattle research.

MARYLAND REPORT, S-10 TECHNICAL COMMITTEE 1957

Research relative to beef cattle at the University of Maryland is conducted under four projects, each of which is contributing to the S-10 Regional Project: Project C-14. "A study of the productiveness of purebred beef cattle in Maryland". Sub-project C-14-a. "Effects of early weaning on the duration of maternal influences in beef calves". Sub-project C-14-b. "Type classification as an aid in selection of beef breeding cattle". Sub project C-14-d. "Group vs individual feeding of weaned beef calves". Purebred Aberdeen-Angus and Hereford herds of the University as well as Aberdeen-Angus of cooperating herd owners or managers are used for source cattle. Frequently, the same animals are used for more than one project, especially projects C-14 and C-14-b. The last sets of measurements taken under Project C-14-c (now closed) have been appended to Project C-14-a. Project C-14-d includes the securing of scores and measurements as an outgrowth of work done under the priorly established projects.

The data secured from the 1949-1954 calves weaned at either 90 or 180 days of age and fed individually are now in the process of analysis. Analyses are based on the results of successive 28 day periods starting at 90-118 days and 202-230 days, respectively, for the 90 and 180 day weaned calves and terminate with the 346-370 day period. Where applicable, the age periods of 90-202 and 202-370 days are also used. Correlation and regression studies are being made from the "within bulls, within year", and "total" line figures of covariance analyses. Weaning age and sex groups are analyzed separately and later combined if justification is demonstrated. Using the equation, $F = aw^b e^{kg}$ (where f = TDN consumed; w = average weights, as a measure of "maintenance"; g = gain; and e = 2.71828) where B_o = log a, B_1 = b, and B_2 = k log e of an equation of $Y = B_o + B_1 X_1 + B_2 X_2$, "b" values for the ten 28-day periods of the combined data of the 90 day weaned steer and heifer calves were, respectively: .0.47, 0.69, 0.74, 0.85, 0.93, 0.73, 1.09, 0.92, 1.16, and 0.99. The values increased progressively during the periods between 90 and 230 days. Values of "b" for the periods corresponding to the last six just given but for the combined data of steers and heifers weaned at 180 days were, respectively: 0.82, 0.67, 0.98, 1.06, 1.01, and 0.98. Close agreement was found between the two weaning age groups and after 258 days, the values fluctuated near to 1.0. Values of $R_{Y \cdot X_1 X_2}$ did not show any trends, were similar for both weaning age groups, and ranged from 0.6 to 0.8.

Preliminary analyses indicate that the effects of age of dam and month of birth of the calf on weight and gain decrease with age of the calf.

In the study involving group vs individually fed calves, 19 Aberdeen-Angus and 21 Hereford calves were weaned and started on a feeding trial on October 11, 1955 (at which time they averaged 7.5 months in age and 493 pounds in weight) and fed until May 22, 1956. The group fed calves by breed and sex gained from .12 to .33 pounds more per day per head than the calves fed individually but consumed slightly more TDN/CWT gain.

A repetition of this trial was started on October 9, 1956 with 20 Aberdeen-Angus and 26 Hereford weaned calves, (which averaged approximately 8 months of age and 457 pounds in weight) and terminated on May 21, 1957. The results of the first and second year's work were similar in that calves fed in groups on the average gained more rapidly than those fed individually. This was true both years in each of the four sub-groups (namely Aberdeen Angus steers, Aberdeen-Angus heifers, Hereford steers, and Hereford heifers.) The 1956 group fed calves gained an average of 1.83 pounds per head daily and the individually fed calves gained an average of 1.71 pounds per head daily during the 224 days they were on trial. Gains of the 1955 calves were 1.71 and 1.53 pounds per head daily for group and individually fed calves respectively.

Although group-fed calves gained 0.12 pound per head per day more than the individually fed calves they consumed 41 pounds more feed per hundred pounds of gain plus maintenance than those fed individually.

Detail scores and measurements of the calves were secured at the beginning and end of the feeding trial. These scores and measurements will be studied in relation to rate and economy of gain. There will be approximately 45 calves started on a gain-test trial on October 8, 1957 which will complete the feeding trials for this project.

SOUTH CAROLINA REPORT S-10 TECHNICAL COMMITTEE MEETING 1957

The Use of Purebred and Crossbred Cows in the Production of Slaughter Calves

E. G. Godbey, E. D. Kyzer, L. V. Starkey and W. C. Godley

In 1948 a crossbreeding experiment was started at the South Carolina Station. The results of this study, involving 281 calves sired by Brahman, Hereford or Angus bulls and out of Angus or Hereford females, indicated that crossbred calves were heavier at birth and at weaning than purebreds. Purebred calves of Hereford and Angus breeding average 67 pounds at birth. Crossbred calves sired by British bulls out of British cows averaged 72 pounds and calves sired by Brahman bulls out of British cows averaged 80 pounds at birth. At 210 days of age, purebred calves weighed 467 pounds. Crossbred calves sired by a British bull out of British cows weighed 519 pounds, and calves sired by Brahman bulls and out of British cows average 517 pounds at 210 days of age. The crossbreds were approximately 50 pounds heavier at 210 days of age than were the purebreds. There was no difference in the market grade or carcass grade of any of these calves. Neither was there any difference found in the dressing percentage of the purebreds or crossbred calves.

Since the crossbreds were heavier at weaning, it seemed advisable to compare the productivity of some of the females produced in the different groups.

The objectives of this test are to determine the birth and weaning weights, market and carcass grades and dressing percentages of fat calves sired by a Shorthorn bull and out of purebred Angus cows, and crossbred calves obtained from the following crosses: (1) Brahman x Hereford, (2) Brahman x Angus and (3) Hereford x Angus.

The results of the tests are summarized in Table I. One hundred and sixty-nine calves have been produced. Thirty-four of these were purebred Angus and 135 were out of the Angus or crossbred dams and sired by a Shorthorn bull. The same bull was used on all of the cows and during each year of this test.

The uncorrected data show that the birth and weaning weights of the purebred Angus were approximately as high as in the best of the crossbred lots. This has not been true in other work where a larger number of calves were used.

The birth weight of the calves sired by the Shorthorn bull were heaviest when the Hereford x Angus dams were used. The heavier weaning weights were in the groups of calves out of Brahman x Angus or Brahman x Hereford dams.

The calves out of the Brahman x Hereford dams had a slightly higher dressing percentage than those from the other groups. There were small differences in the cattle or carcass grades.

TABLE I. MEANS OF TRAITS STUDIED (FROM UNADJUSTED DATA)

Breeding of Calves	Sex Calves	No. Calves	Birth wt.	Weaning wt.	No. Calves	Grade Calf	Grade Carcass	Dressing %
Purebred	F	19	67.8	496.7	15*	--	--	--
Angus	M	15	71.5	531.8	8	--	--	--
	Total	34	69.4	508.9	23	--	--	--
Shorthorn	F	15	60.9	432.4	11	G+	C-	59.0
on	M	21	65.3	478.3	14	G+	C-	58.6
Angus	Total	36	63.5	458.1	25	G+	C-	58.8
Shorthorn	F	16	66.0	446.2	13	G+	G+	58.9
on	M	22	74.3	487.7	15	G+	G+	58.9
H X A	Total	38	70.8	468.5	28	G+	G+	58.4
Shorthorn	F	25	63.6	488.2	17	C-	C-	59.5
on	M	12	66.8	546.6	11	G	G+	57.0
B X A	Total	37	64.7	511.1	28	G+	C-	58.5
Shorthorn	F	8	66.9	477.4	5	G+	G+	60.0
on	M	16	63.7	507.8	8	C-	G+	60.5
B X H	Total	24	64.8	496.1	13	C-	G+	60.3

* Weaning weights have not been obtained on 1957 calves.

TENNESSEE REPORT, S-10 TECHNICAL COMMITTEE 1957

C. S. Hobbs and H. J. Smith

Beef cattle breeding research under the Southern Regional Beef Cattle Breeding Project is being conducted at several locations in the state with herds at Knoxville, Alcoa (cooperative with the Aluminum Company of America), Oak Ridge (U.T.-A.E.C. Agricultural Research Program), Greeneville, Crossville, Spring Hill, Springfield, and Grand Junction (Ames Plantation). The breeding program with Hereford and Angus herds at Knoxville includes a study of the effectiveness of selection based on type, performance and progeny testing in improving productivity. At Alcoa the Hereford herd is being used primarily for progeny testing of prospective herd sires and in the evaluation of methods for herd improvement. The herds at Oak Ridge include a Polled Hereford herd being developed by the best known methods of selection and a grade Hereford herd used in Hereford sire and line evaluation studies. A Polled Hereford line is being developed at Greeneville and horned Hereford lines at Spring Hill and Springfield. Performance selection will be emphasized in these lines with inbreeding kept as low as possible. The Angus herd at Ames Plantation will be used in sire testing, evaluation of Angus lines and in studies on performance selection. At Crossville the Angus herd is being used in a study and comparison of the effects of inbreeding, outbreeding and linecrossing on performance. In projects at some stations, the effect of creep feeding on evaluation of calf performance, cow productivity, and sire performance is being investigated. The value of calf gains, grades, and indexes at 120 days as criteria for evaluation of calf performance and cow productivity is included as a part of the project at each station. Overall selection and culling procedures are similar for all stations.

Performance and Progeny Testing of Bulls and Heifers

During the fall and winter of 1956-57 the Tennessee Station group-fed 17 Hereford and 14 Angus bulls under test conditions for 126 days on a mixed ration of chopped hay and concentrates plus about 10 pounds of silage per head daily. The bulls tested were selected from the calf crops of purebred herds at the various locations on the basis of a productivity index which gives equal importance to type grade and daily gain from birth to weaning. The feeding test was conducted at Knoxville under drylot conditions. The bulls were sorted within breeds on the basis of weight into groups of about 6 bulls. At the end of the test, the most promising bulls were selected on the basis of weaning index and performance on post-weaning gain evaluation tests for development for use in progeny tests at two years of age. The results of the 1956-57 gain evaluation tests are shown in Table 1.

Table 1. Performance of Bulls on Gain Evaluation Tests-1956-57

	Hereford Bulls	Angus Bulls
No. of bulls	17	14
No. of days on test	126	126
Average initial weight	535	531
Average final weight	815	792
Average daily gain	2.22	2.07
Range of daily gains	1.80 - 2.76	1.66 - 2.56
Average type grade	11.4	11.9
Average condition grade	8.7	9.1

Approximately 200 heifers were fed on high roughage-limited grain rations on post-weaning gain evaluation tests during the winter of 1956-57. Rations within locations consisted of either silage, hay, or winter pasture plus 3-5 pounds of concentrates. Post-weaning gains and grades are used along with weaning indexes to select heifers to go into the breeding herds or to develop heifers for use in the breeding herds as replacements.

Evaluation of prospective herd sires was continued in 1956-57 with the progeny testing within locations of 12 Angus and 26 Hereford and Polled Hereford bulls in 1956. This progeny test data contributes information of value to the overall objectives of the project and is of specific value in selecting herd sires for the development of herds and lines. Results of these progeny tests show considerable differences between the progeny of bulls bred to comparable groups of cows within locations.

During 1956-57, a study of the birth weights, daily gains from birth to weaning, type grades and condition grades at weaning of about 2600 calves born during the years 1952-56, inclusive, was made to determine the influence of sex of calf and age of dam on these traits. Differences between sexes and ages of dams were computed within location, breed, age of dam and year. The influence of sex of calf on the various traits are shown in Table 2. There was no consistent trend in the average differences between sexes for the various ages of dams so that the results are the average overall ages of dams. Age of dam effects were most pronounced for daily gain from birth to weaning and are presented in Table 3. The growth rate of calves increased with age of dam up to 6 years, remained relatively constant from 6 to 10 years and dropped off thereafter. Birth weights of calves increased with age of dam up to 3 years of age and then were very similar for dams 4 years of age and older. Calves from 2 and 3 year old dams weighed about 5 and 2 pounds less, respectively, than dams 4 years of age and older. Type grades of calves from 2-year old dams and dams over 10 years of age were about one-sixth of a full grade lower than type grades of calves from 3 to 10 year old cows.

The repeatability of cow performance in herds at various locations was calculated for the years 1952-56 inclusive. Repeatability was estimated by two methods: (1) intraclass correlation of calves by the same dam, and (2) correlation between performance records of calves of the same cow calving in successive years. The results of this study are given in Table 4. Repeatability estimates obtained for birth weight, daily gain from birth to weaning and type grade fall within the range of estimates obtained by other workers. Repeatability estimates were very similar for both Hereford and Angus cattle.

Table 2. Influence of Sex of Calf on Various Traits*

		Steers	Heifers	Difference
Av. birth weights, lbs.				
Angus		65.7	60.9	4.8
Hereford		70.4	66.2	4.2
	Total	69.7	65.4	4.3
Av. daily gain, lbs.				
Angus		1.64	1.51	0.13
Hereford		1.57	1.48	0.09
	Total	1.59	1.49	0.10
Av. weaning type grade				
Angus		11.68	11.63	0.05
Hereford		11.31	11.41	-0.10
	Total	11.38	11.46	-0.08
Av. weaning condition grade				
Angus		10.04	10.69	-0.65
Hereford		8.84	9.70	-0.86
	Total	9.04	9.86	-0.82

* These values are not adjusted for age of cow, season of birth or other factors. Differences were computed within location, age of dam and year.

Table III. SUMMARY OF PROGENY OF BULLS MATED TO KNOWN CARRIER COWS

Bull No.	X-ray type of bull	Progeny No. of calves	Progeny Pheno. type
-274	C	4	Normal
-334	C	4	Normal
A455	C	5	Normal
A451	C	4	Normal
-114	B_4	5	Normal
-424	B_3	5	Normal
A459	B_4	3	1 dwarf
-434	B_3	5	Normal
A637	B_5	4	2 dwarf

Table IV. TESTED PROGENY OF CARRIER PARENTS

X-ray Classifications	Total Progeny	Proven Carrier	Estimated Yet to find as Carriers*
C	11	1	2
B	37	9	14
	48	10	16

* Based on the assumption that approximately 55% of the 48 animals were carriers, since all animals had at least one carrier parent and both parents of some were carriers.

Table 3A. Estimates of Age of Dam Effects

Age of Dam	Pounds to be added[1]	Percentage[2]
2	0.23	15.6
3	0.16	10.4
4	0.10	6.2
5	0.06	3.7
6	0.03	1.8
7	0.01	0.6
8	0.00	0.0
9	0.01	0.6
10	0.02	1.2
11	0.05	3.0
12	0.09	5.6
13	0.14	7.3

1 - Derived by curvilinear regression analysis.
2 - Based on an average sex-adjusted daily gain of 1.70 lbs. for 8-year-old dams.

Table 3B. Tennessee Correction Factors - Correction Factors to be Used in Adjusting Daily Gains from Birth to Weaning[1]

Age of Dam	Males	Females
2	1.15	1.22
3	1.10	1.17
4	1.06	1.13
5	1.03	1.10
6	1.00	1.07
7	1.00	1.07
8	1.00	1.07
9	1.00	1.07
10	1.00	1.07
11	1.02	1.09
12	1.05	1.12
13	1.08	1.15

1 - These correction factors adjust for age of dam and sex of calf.

To adjust type grades to a mature dam and male equivalent basis add .5 grade (1/6 of a full grade) to the grades of calves from cows 2, 11, 12, and 13 or more years of age.

Table 4. Repeatability Estimates at Various Locations

Locations	Breed	Birth weight	Daily gain	Type grade
a. Estimated by intraclass correlation.				
Crossville	Angus	.094	.424**	.030
Knoxville	Angus	.129	.461**	.224
Alcoa	Hereford	.211**	.396**	.114*
Oak Ridge	Hereford	----	.758**	.003
Oak Ridge (Grade)	Hereford	----	.482**	.219**
Greenville	Hereford	.383**	.683**	.264*
Springfield	Hereford	.367**	.606**	.564**
Spring Hill	Hereford	.124	.528**	.134
Average Estimate		.218	.542	.194
b. Estimated by correlation between performance in successive years.				
Crossville	Angus	.154	.378**	.277**
Knoxville	Angus	.249	.550	.113
Alcoa	Hereford	.191**	.100	.200**
Oak Ridge	Hereford	----	.622**	.103
Oak Ridge (Grade)	Hereford	----	.595**	.277**
Greeneville	Hereford	.324*	.520**	.731**
Springfield	Hereford	.250	.403*	.249
Spring Hill	Hereford	.113	.621**	.237
Pooled Correlation		.176**	.365**	.306**

* P = <.05 >.01
**P = <.01

THE DETECTION OF ANIMALS HETEROZYGOUS FOR RECESSIVE BOVINE DWARFISM

By
Joe W. High, H. J. Smith, C. S. Hobbs and C. M. Kincaid

INTRODUCTION

This paper deals with the type of dwarfism first described by Johnson et al (1950). Emphasis in research has been to find some method of detecting at an early age animals that are carriers of the dwarf gene. For the past four years the University of Tennessee has made investigations of several methods including: body measurements, head profiles and X-rays of the lumbar vertebrae of young calves (see A.H.-Vet. Sci. Mimeo). The work at this station for the past year has been primarily an evaluation of the X-ray. Recently, blood studies were initiated as another possible criteria for detecting carrier animals.

PROCEDURE

Radiographs are made of the lumbar vertebrae of young calves, usually before two weeks of age. From the radiographs the calves are classified as either C, B, or A. These classifications are based on vertebrae abnormality[a]. Animals with a normal vertebrae were classified as C. Animals with extreme vertebrae abnormality typical of dwarf calves were classified as A. Animals with abnormal vertebrae ranging between C and A were classified as B. The B classification was divided into seven sub-groups, B_2 through B_8. The B_2 type vertebrae were apparently only slightly abnormal and the B_8 type vertebrae had extreme abnormality approaching that of typical dwarf vertebrae. To check the accuracy of the X-ray method progeny tests were conducted. Heifers X-rayed as calves were mated to dwarf bulls and bulls X-rayed as calves were mated to known carrier cows (cows that had produced dwarf calves).

Reports from other stations suggest that insulin stress produces blood changes that have possibilities for identifying the genotype of the animal with respect to "snorter" dwarfism. The changes in the number of white blood cells and other unidentified cells were reported to follow a trend during a two hour period after insulin injection. Studies were initiated earlier this year at this station to investigate this method as a means of identifying carrier animals.

RESULTS AND DISCUSSION

To date, radiographs of the lumbar vertebrae of approximately 1500 calves have been made. Table I[b] gives a summary of the X-ray classification of the calves X-rayed to date. The calves were summarized by X-ray classification and the dwarfism status of their parents. Under the hypothesis that carriers of the dwarf gene have a B type vertebrae and non-carriers have a C type vertebrae, the percent of animals classified as B is too large (see Table I). However, in general, as the frequency of the dwarf gene goes down in parents so does the percent of calves classified as B. This would indicate a general relationship between the X-ray classifications and the actual genotype of the calves with respect to "snorter" dwarfism. Work at this station indicate that vertebrae abnormalities are influenced by line differences. This may account for the variability of apparent accuracy of X-ray classification among herds.

[a]Classifications were made according to a system used by Dr. L. N. Hazel of Iowa State College.

[b]Does not include progeny of test matings and some miscellaneous calves.

The X-ray method has been very accurate in identifying dwarf calves. Only one dwarf calf out of some 30 dwarfs that have been X-rayed in Tennessee was incorrectly classified. This particular dwarf had a vertebrae that was a borderline between a B8 and a dwarf classification.

To check the accuracy of the X-ray,some 90 heifers X-rayed as calves were mated to dwarf bulls. Table II gives the X-ray classifications of the progeny from these matings. The X-ray classifications of the progeny are summarized by the X-ray classification of the dam and the dwarfism status of her sire. One heifer with a C type X-ray produced a dwarf calf. It should be pointed out that this heifer was 21-days of age when X-rayed. Previous work done at this station (see A.H.-Vet. Sci. Mimeo 110) has shown that as a calf becomes older the vertebrae abnormalities present at birth tend to disappear. Therefore, it is entirely possible that had this heifer been X-rayed at birth she may have shown some vertebrae abnormalities and would have been classified as a carrier.

Since the progeny of the heifers shown in Table II were all sired by dwarf bulls, any normal claf would be a carrier of the dwarf gene. Of the 74 normal calves (definitely not dwarf phenotypes), fourteen had normal vertebraes and were classified as C.

In addition to the heifer test matings, 9 bulls (4 C type and 5 B type) were mated to known carrier cows. Table III gives the results of these matings. All the bulls with the exception of bulls -424 and -434 were sired by known carrier sires. Bulls -424 and -434 were sired by a pedigree clean bull; however, their dams were sired by a bull that proved to be a carrier. None of the C type bulls have sired a dwarf calf. Two of the three B type bulls sired by carrier bulls have been proven carriers (produced dwarf calves). This is the approximate expectation at the present level of testing if all three were actually carriers.

Table IV gives a summary of tested progeny of carrier parents. The estimate of carriers yet to find are approximate figures.

The blood work on animals under insulin at this station to date has shown little or no relation between the blood constitutents observed and the genotype with respect to "snorter" dwarfism.

SUMMARY

Of 84 carriers produced by using A dwarf parent, or proved to be a carrier by a progeny test, 69 or 82% were classified as B type.

Approximately 62.5% of the progeny of presumed non-carrier (pedigree clean) Hereford matings were classified as C type. This estimate is based on 200 animals representing several different lines of breeding. Theyvaried a great deal among herds. The X-ray appeared less accurate in predicting the genotypes of Angus progeny (see Table I).

PROGENY TESTS

Approximately 73% of animals with C type vertebrae are really non-carriers. This estimate is based on the one proven carrier and two estimated carriers yet to find out of the 11 animals classified as C's (see Table IV).

Approximately 62% of the animals with B type vertebrae are really carriers. This estimate is based on the 9 proven carriers and the 14 estimated carriers yet to find out of the 37 animals classified as B's (see Table IV).

TABLE I. SUMMARY OF CALVES SIRED BY HEREFORD BULLS

Dwarfism Status of Bull	% of Carrier Cows in Herds	No. of Calves	X-Ray Classification (% of total) C	B2	B3	B4	B5	B6	B7	B8	A
Carrier	29.2[b]	327	18.7	37.0	16.8	10.7	5.8	1.2	1.5	1.2[a]	7.0
Unknown	0-39[c]	612	39.9	33.5	12.2	5.6	4.4	2.5	1.3	0.6	--
Ped. Clean----------		200	62.5	25.5	8.5	2.5	0.5	0.5	--	--	--
		Calves Sired by Angus Bulls									
Unknown	Unknown[d]	241	53.1	32.0	7.5	3.7	0.4	--	--	--	--

[a] One dwarf calf.

[b] Approximated from the number of dwarfs produced.

[c] Estimated.

[d] Presumed non-carrier.

Table II. Summary of X-ray Classification of Calves Sired by Dwarf Bulls 1956-57

X-ray Classification of dam	Dwarfism status of dam	Total no. of progeny	X-ray Classification of Progeny C	B_2	B_3	B_4	B_5	B_6	B_7	B_8	A
C	Carrier Sire	7	2	2	-	2	-	-	-	-	1
B_2	Carrier Sire	27	2	8	3	2	2	1	2	-	7
B_3	Carrier Sire	4	-	2	1	-	1	-	-	-	-
B_4	Carrier Sire	3	-	-	-	1	1	-	1	-	-
		41	4	12	4	5	4	1	3	-	8
C	Carrier Grand Sire	1	1	-	-	-	-	-	-	-	-
B_2	Carrier Grand Sire	3	-	2	-	-	-	-	-	1	-
B_3	Carrier Grand Sire	2	-	-	-	1	1	-	-	-	-
B_4	Carrier Grand Sire	1	-	1	-	-	-	-	-	-	-
		7	1	3	--	1	1	-	-	1	-
C	Ped. clean	19	5	7	1	1	3	2	-	-	-
B_2	Ped. clean	9	3	2	2	1	1	-	-	-	-
B_3	Ped. clean	5	1	3	-	1	-	-	-	-	-
B_4	Ped. clean	1	-	1	-	-	-	-	-	-	-
		34	9	13	3	3	4	2	-	-	-
	SUMMARY OF ALL GROUPS										
C		27	8	9	1	3	3	2	-	-	1
B_2		39	5	12	5	3	3	1	2	1	7
B_3		11	1	5	1	2	2	-	-	-	-
B_4		5	-	2	-	1	1	-	1	-	-
		82	14	28	7	9	9	3	3	1	8

TEXAS REPORT, S-10 TECHNICAL COMMITTEE 1957

T. C. Cartwright

The project leaders and principle workers are:

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Sylvia Cover, Home Economics Dept., College Station
O. D. Butler, Animal Husbandry Dept., College Station.
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H. O. Kunkel, Biochemistry & Nutrition Dept., College Station.
A. A. Melton, Balmorhea.
J. P. Smith, Panhandle.
George Ellis, Jr., Panhandle.
T. C. Cartwright, McGregor.

Project 607, which is concerned mostly with gain testing, was carried out at four locations this year with 683 cattle on five separate tests. Every beef breed known by the writer to be present in Texas, except the Sussex, was represented in the tests. Entry of Sussex cattle in next year's test is likely. Four bulls, all Santa Gertrudis belonging to two cooperators, have been tested which gained over 500 lbs. in the 140-day (3.7 & 3.8 lbs. per day) tests. These two cooperators have large herds, conduct their own gain tests and select on gain records. Weaning weights will be required of all entries in coming tests to supply more data concerning the relationship of growth at different periods. Interest is increasing in gain tests and at least three additional Extension Service supervised tests will be added this year. The Extension Service has developed a very active "weaning weight" program based on the results of S-10 research.

Data have been summarized on the performance of 147 offspring of 14 individual gain-tested bulls grouped as high, medium and low-gaining offspring in 4 of five years. Average daily gains for the high, medium and low-gaining sires were 3.03, 2.52 and 1.89 pounds, respectively. Adjusted weaning weights for the progeny of the three groups of sires were 437.7, 430.3 and 417.8 pounds, respectively. Final weights, after a feeding period, adjusted to an average age of 420 days, were 759.9, 722.0 and 703.5 pounds, respectively. For each half-pound difference in gain of sires on test, there was an average difference of 9.34 pounds in weaning weight of calves and 29.86 pounds final weight. There was no relationship in this study between the conformation of the sire and the performance of his offspring. There also was no significant difference between the dressing percentage and the carcass grade of the calves sired by high, medium and low-gaining sires.

Project 650 is conducted at McGregor and College Station and is the main breeding and selection project of the Station. Selecting for higher gains to weaning and in the feed lot and measuring adaptability to hot weather are continuing. At present, the major emphasis is being placed on carcass and meats evaluation since there are no sound objective standards available around which to set up goals and little data reported concerning the influence of heredity on these characters. A total of 409 cattle have been slaughtered and their carcasses and meat thoroughly studied.

A repeatability study indicated that data collected from one side was sufficiently accurate to predict entire carcass values. The difference in dressing percentages between Hereford (60.25) and Hereford-Brahman (62.98)steers was found to be almost entirely due to difference in the contents of the digestive tract and

that was mainly i[illegible] e paunch. A study of the relationshi[illegible] of fatness to juiciness and tenderness revealed that variation in fatness accounted for about 10% of the variance in tenderness and 25% in juiciness for broiled loins. For braised bottom rounds variations in fatness accounted for 30% of the variance in tenderness and 5% in juiciness.

It was found that breed of sire (Brahman or Hereford) had a significant effect on the juiciness of some steaks but no significant effect on tenderness. Sire within breeds had no significant effect on juiciness but their effect on tenderness was statistically significant. Heritability estimates calculated for each measure of tenderness were as follows:

	Broiled Loin	Braised Loin	Broiled Bottom Round	Braised Bottom Round
Tenderness scores	71%	119%	37%	28%
Shear force value	74%	102%	86%	100%

These estimates were based on intra-sire ($\frac{1}{2}$ sib) correlations and some are obviously biased upward indicating confounding of inheritance and environment.

Crossbred steers (F_1 HXB) had slightly higher carcass weights per day of age than Herefords due mostly to heavier birth and weaning weights as well as higher dressing percents. The scores or grades of the crossbreds, generally considered of less desirable conformation because of drooping rumps, longer legs and general ranginess, tended to improve more than the Herefords from weaning until slaughter. The Herefords tended to deposit more fat at more locations, but the fat deposition pattern is apparently different for the crossbreds since they deposited more fat at some locations. The crossbreds tend to be more of the meat type steer than do the Herefords. Differences due to sires were not statistically significant except for separable lean in 9-10-11 ribs per day of age for which heritability was estimated to be approximately 5%. Visual live animal appraisal of performance, percent of high price cuts, or carcass quality other than mere fat was practically useless.

A correlation study indicated that birth weight, weaning weight and gain in the feed lot are all indications of growth potential and that weaning weight had the most marked influence on final weight at slaughter. Growth at any period was positively correlated with scores or grades taken subsequently. Size of ribeye, weight of cushion round and other cuts change percentage-wise with changes in fatness but at the same degree of finish are markedly influenced only by differences in weight of the steer suggesting that selection for rate of gain is effective in increasing weight of cuts or size of ribeye and that differences in proportions are very small regardless of appearance either on foot or on the hook. This work suggests that heritability estimates of the size of ribeye are largely reflection of heritability of rate of gain.

In an effort to more fully evaluate the influence of heredity on tenderness more emphasis has been placed on study of this character in recent months. The tenderness of the meat from 49 steers which were approximately 15 months of age, raised at McGregor and slaughtered at College Station was measured in the Food Research Laboratory of the Home Economics Department. Represented were Hereford (H); Brahman (B); F_1, $\frac{1}{2}$H-$\frac{1}{2}$B (B sires); backcross, 3/4H-$\frac{1}{4}$B; and backcross, 3/4B-$\frac{1}{4}$H; from 5 Hereford and 6 Brahman sires. Loins and bottom rounds were cooked by broiling to 61°C. and 80°C. and by braising to 85°C. and 100°C. Four judges scored the meat for softness, friability and connective tissue. Mechanical shear force values

were obtained. Of the 8 possible "temperature and cut" categories the number with significant differences due to breed of sire was as follows: softness, 1; friability, 2; residual connective tissue, 0; and shears, 3. The number of significant differences due to sires within breeds was as follows: softness, 3 for Brahman sires; friability, 2 for Brahman sires; residual connective tissue, 4 for Brahman sires and 2 for Hereford sires; and shears, 1 for Brahman sires. Earlier work indicated high but variable heritability estimates for shears and tenderness scores based on similar small numbers. This work continues to indicate that the heritability of certain eating quality characters may be of a magnitude to allow effective selection. There was more variability among the Brahman sire groups sampled than among the Hereford sire groups. Progeny of some Brahman sires equalled or excelled in tenderness those of some Hereford sires, but this was not true for all Brahman sires. More work is needed to establish a basis for selection of tenderness of beef.

The major difficulty in implementing selection for better eating qualities in beef appears to be in the fact that at present, progeny testing is necessary and the evaluations are tedious and time consuming. Bulls born in '52, gain tested in '53, bred in '54, get offspring in '55, have progeny slaughtered in '56 and have progeny's meat evaluated in '57 may run up a $1000 board bill alone waiting for the verdict.

Two projects, 714 and 959, are under the direction of H. O. Kunkel in the Biochemistry and Nutrition and Animal Husbandry Departments. The first project "Methods for Measuring Potential Rate of Gain and Efficiency of Feed Utilization in Immature Beef Cattle" has more recently been conducted to develop standardized methods of laboratory analyses of greater precision. Previous chemical determination data are being examined by multiple regression methods to gain insight into the contribution of protein-bound iodine, glutathione, hemoglobin, serum globulins and serum phosphatase to rate of gain and efficiency records.

Linear relationships have been desultory in some cases. The only significant correlations between phosphatase level and rate of gain are in Brahman cattle. Both significant positive and significant negative correlations between BPI and gain have been obtained. The relation between PBI and gain may be influenced by breed, sex, nutrition and other environmental forces, and selection pressures. The blood glutathione level may be related to gain in a curvilinear fashion in young Brahman, Charbray, and Angus cattle. Investigations of PBI, phosphatase, and glutathione will be continued.

The second project, "Biochemical and Physiological Anomolies of Bovine Dwarfism and Their Use in Detection of Heterozygotes", continues to place emphasis on biochemical factors related to connective tissue metabolism in view of increasing evidence that the "snorter" type of dwarfism is a form of osteo- or chondrodystrophy or an achondroplasia. Blood levels of glycine, glutamic acid, and glucuronic acid have been investigated under conditions of varying periods of fasting and with insulin administration. Significant differences in metabolism have not been found, although there is some indication that glycine metabolism may be anomalous in the dwarf.

The responses of dwarfs and phenotypically normal animals to insulin induced stress, as measured by blood glucose levels, have shown little differences in preliminary experiments at the Texas Station. Subsequent experiments using crystalline zinc insulin have shown physiological differences between the dwarf and dwarf carrier animals and the phenotypically clean animals with respect to a neutrophilia developing after the insulin injection. This may provide evidence of a physiological difference between carriers and clean animals, but as yet does not verify the "insulin test" for the dwarfism characteristic.

VIRGINIA REPORT, S-10 TECHNICAL COMMITTEE 1957

Beef cattle breeding research was carried out at the Beef Cattle Research Station, Front Royal in cooperation with the U. S. Department of Agriculture; at the Shenandoah Valley Research Station, Steeles Tavern, and at the main station at Blacksburg. Breeding herds of purebred Angus, Herefords and Shorthorns are maintained at Front Royal and a grade herd of Angus, Herefords and Shorthorns at Steeles Tavern. A small herd of dwarf cattle is maintained at the main station.

The long time plan for the Front Royal Station envisages comparison of inbred lines and crosses among them with lines developed by mass selection in each of the three breeds, Angus, Hereford and Shorthorn. It is planned to establish from four to seven closed lines, a line selected for type alone and a line selected for growth rate alone in each of the three breeds. Progress to date in establishment of these lines has been as follows:

Shorthorns - Three inbred lines, designated as A, B and T-44, have been established together with the type and growth rate selection lines. Sufficient foundation females will be available by the 1958 breeding season to establish two more closed lines together with increments for the selection herds, based on the bulls Prince Eric and Britomac Prince Command. Foundation matings for the establishment of a sixth line based on Ranson Clipper of F.R. 6 were made in 1957.

Angus - Foundation sets of 32 daughters each have been completed for the bulls K.B. Eileenmere 32d and Rock Delus. Closed lines of 16 females each have been established and increments of 8 females from each to the two selection herds have been made. Sufficient daughters of two more foundation sires, Blackcap Stamp of Elkton 2d. and Blackwood Bandy of F.R. 4 will be available by the 1958 breeding season to complete the requirements for lines based on these sires. Additional young bulls are being tested.

Hereford - Progress in establishment of foundation sets of Herefords has been delayed by the presence of the dwarf gene in several potential foundation sires. One set of 32 daughters of Capitan Domino 25 will be complete by 1958. Matings to establish foundation sets from two additional bulls, R.F. Perfect 62d. and Coastal Beau Rollo 9th are being made in 1957. Several other bulls are being progeny tested prior to selection as foundation sires.

Calving Record 1957

A total of 470 cows of the three breeds were assigned to 22 herds in the 19 breeding season. A total of 372 calves were raised to midsummer 1957 from these matings. A very complete study of the reproductive performance of the various her during the 1956-57 season was made by Dr. Wiltbank and will be separately reported at this meeting.

R. O. P. Testing

A total of 45 bull calves, 139 heifer calves and 60 steer calves of the 19 calf crop were fed out on performance tests during the winter of 1956-57. The bul were full fed a fattening ration for 168 days, the heifers full fed silage with a limited amount of grain for 126 days and the steers full fed for 196 days. The steers were slaughtered at Beltsville and complete carcass records obtained. Details of the steer feeding are given elsewhere in this report.

A study of the vital statistics of four Shorthorn lines, A and B and the type and growth selection herds was made and is reported below.

Crossbreeding Project

The first calf crop from the crossbreeding project carried out at the Steeles Tavern Station was born in the spring of 1957. A summary of the calving record and growth performance of the calves to midsummer by different groups is given below.

On the Farm Performance Testing

The performance testing program carried out on cooperating farms by the Virginia Beef Cattle Improvement Association continued to grow during the past year. Details are given in the report below by Dr. T. J. Marlowe.

A study of the effects of various fixed environmental effects including sex of calf, season of birth, age of calf and age of dam was completed during the year by Drs. Marlowe and Gaines and is reported in detail below.

Dwarfism

Research on the genetics, physiology and pathology of dwarf and normal beef cattle was conducted at the main station and in cooperating herds. Details are presented below.

Repeatability of Cow Performance

A study of repeatability of cow performance with respect to birth weights, daily gains and grades of calves was completed during the past year. This is reported separately below.

PREPARATION OF RATIONS FOR STEERS ON PERFORMANCE FEEDING TESTS

B. M. Priode, Martin Burris, D. C. Meyerhoeffer, John Thornton

Sixty steers representing 10 sire progeny groups were fed on performance tests for 196 days at the Front Royal Station in 1956-57. Three different ration preparations were used and the steers assigned at random from within sire progeny groups to the three rations. There were three replicates, each breed group constituting a replicate.

The composition of the ration was the same for all groups as given below and the three treatments differed only in its physical preparation. The ration was made up of the following.

1200 lbs. corn and cob meal
100 lbs. cottonseed meal
100 lbs. linseed meal
600 lbs. orchard grass hay

The ration preparation was as follows:

Group I. The grain and hay were ground in a hammer mill and the entire ration mixed and fed ad lib. This has been the standard ration for the ROP bull feeding at Front Royal for several years.

Group II. Received the same ration as Group I, but the feed was pelleted and fed free choice. It was necessary to grind the feed somewhat finer than that fed in Group I to get a good job of pelleting.

Group III. The same hay was fed free choice as long hay without further preparation. The grain mixture was restricted so that the proportion of grain to hay consumed was the same as the other two lots.

The results are shown in Table I.

The performance of the steers on the ground and pelleted feed was practically the same when the three breed groups were averaged. The steers on the pelleted feed averaged about 1 lb. less feed per lb. of gain than did those on the ground feed. Whether this was due to less waste of the pelleted feed or to greater efficiency of utilization is not clear. Those working with the cattle believe there was greater waste with the ground feed.

The hay fed was not particularly high in quality or palatability. Those fed the long hay did not consume as much of it as was consumed when it was ground or pelleted. Since the ratio of grain to hay was held constant these cattle did not receive as much total grain as did the other two groups although the feed required per pound of gain was essentially the same as in the ground hay group.

COMPARISON OF GROUND, PELLETED, AND LONG HAY RATIONS FOR BEEF STEERS, FRONT ROYAL STATION 1957 (Feeding period Nov. 14-May 29)

Breed	No. Steers	Beginning Weight	Final Weight	Total Gain	Av. Daily Gain	Slaughter Grade	Lbs. Feed Per Day	Feed Per lb. Gain
Group I: Ground Hay and Grain Mixed.								
Angus	5	540	958	418	2.13	12.8	23.9	11.2
Hereford	7	486	905	419	2.13	10.7	21.0	9.8
Shorthorn	8	467	870	409	2.05	12.1	22.1	10.8
Average	20	493	907	414	2.10	11.8	22.2	10.7
Group II: Pelleted Feed.								
Angus	5	529	924	395	2.01	12.4	20.4	10.1
Hereford	7	485	897	412	2.10	11.1	18.2	8.6
Shorthorn	8	468	902	436	2.22	11.9	21.2	9.5
Average	20	489	906	414	2.11	11.7	19.9	9.4
Group III: Long Hay and Grain.								
Angus	4	565	914	349	1.78	11.8	19.3	10.8
Hereford	7	485	835	350	1.78	9.4	18.1	10.0
Shorthorn	7	478	824	346	1.76	10.6	20.6	11.7
Average	18	500	854	348	1.77	10.4	19.3	10.8

VITAL STATISTICS OF THE FRONT ROYAL SHORTHORN INBRED HERDS

"A" Line Shorthorns

Breeding Season

	1950	1951	1952	1953	1954	1955	1956	1957
Cows in Line	16	15	16	14	12	15	13	15
Cows & Heifers Added		1			4	3	4	4
Death Losses					1	1		
Culled Barren						4	1	
Culled Other Reasons	1		2	2			1	1
Calves Born Female	2	3	5	5	5	5	5	
Calves Born Male	1	6	4	7	7	5	6	
Calves Stillborn		2				2	3	
Cows Not Calving		5	5	1	3	1		
Calves born alive/ cow exposed	.2	.6	.6	.9	.8	.6	.6	
Av Inbreeding Cows	.064	.065	.057	.061	.108	.132	.156	.165
Herd Sire Used	522	522	868	885	885	885	885	885

Herd Sires

522 Waverleys Statesman F = .168
868 B.P. Statesman of F.R. 4th F = .076
885 C. Statesman of F.R. 4th F = .257

"B" Line Shorthorns

Breeding Season

	1950	1951	1952	1953	1954	1955	1956	1957
Cows in Line	16	13	12	11	11	15	14	16
Cows & Heifers Added		3			10	3	2	2
Death Losses		1			1			
Culled Barren		3	1		5	3		
Culled Other Reasons	3					1		2
Calves Born Female	4	8	3	3	3	5	6	
Calves Born Male	3	3	3	5	5	1	5	
Calves Stillborn					1	4	1	
Cows Not Calving	6	1	5	3	6	4	4	
Calves born alive/ cow exposed	.4	.7	.5	.7	.4	.3	.7	
Av Inbreeding Cows	.073	.069	.074	.080	.086	.084	.059	.199
Herd Sire Used	671	663	663	663	663	663	1176	1176

Herd Sires

671 Baron Justice F = .172
663 Baron Kinsman F = .072
1176 F. R. Baron B 1176 F = .117

VITAL STATISTICS OF THE FRONT ROYAL SHORTHORN SELECTION HERDS

	Shorthorn Type Selection Herd — Breeding Season								Shorthorn Growth Rate Selection Herd — Breeding Season							
	1950	1951	1952	1953	1954	1955	1956	1957	1950	1951	1952	1953	1954	1955	1956	1957
Cows in Line	16	15	13	11	8	13	19	16	16	15	15	14	12	23	13	18
Cows or Heifers Added		2			7	8	2	8		1			12	5	8	6
Death Losses	1	2		1	1										3	
Culled Barren			2	2	1	1	4			1	1	2	1	8	4	
Culled Other		2				1			1			1		7		
Calves Born Alive Female	3	6	4	2	5	9	7		4	9	4	7	7	6	6	
Calves Born Alive Male	7	3	2	1	7	6	8		3	5		1	10	13	6	
Stillborn Calves		1				1	2						1	3	1	
Cows Not Calving	6	3	5	6	1	3	0		8	1	10	3	5	0	1	
Calves born alive/ cow exposed	.6	.5	.5	.3	.8	.7	.7		.4	.9	.3	.6	.7	.7	.6	

HETEROSIS AMONG BRITISH BREEDS OF BEEF CATTLE

W. H. McClure, J. A. Gaines, R. C. Carter and C. M. Kincaid

This project, which is a contributing project to S-10, is carried out at the Shenandoah Valley Station at Steeles Tavern and at the main station at Blacksburg. The breeding herd of 120 cows, 40 each of Angus, Hereford and Shorthorns, is kept at the Steeles Tavern Station. The cows are bred each season to a different set of bulls, one each purebred Angus, Hereford and Shorthorn and crossbred Angus x Hereford, Angus x Shorthorn and Hereford x Shorthorn, so as to obtain approximately equal numbers of purebred, 2-breed cross, 3-breed cross and backcross calves. This will permit comparisons of different levels of heterosis among the calves not confounded by heterosis in the dams.

The first calf crop from these matings was dropped in the spring of 1957. The calving performance and average growth rates of the calves from birth to July 18 are shown in the table below.

	Cows Bred	Calves Born	Calves Stillborn	Died to 7/18	Calves Raised	Av. Birth Date	Av. Birth Weight	Daily Gain Birth - 7/18
Purebred Matings	30	22	1	1	20	3/21	66.4	1.55
2 Breed Crosses	30	27	4	0	23	3/22	68.6	1.57
3 Breed Crosses	30	25	0	0	25	2/13	61.9	1.63
Back Crosses	28	24	0	2	22	3/4	64.7	1.59
Total or Average	118	98	5	3	90	3/7	65.3	1.59

It should be noted that the purebred and two breed cross calves averaged 3 to 4 weeks later in birth date than did the 3-breed and backcross calves. This may be explained in part by the fact that one of the purebred bulls was sterile and had to be replaced late in the breeding season and another was slow in settling his cows. All the 3-breed and backcross calves were sired by crossbred bulls which were fully fertile and potent. The late calving date combined with a severe drought in midsummer may have unequally handicapped the purebred and 2-breed cross calves.

An interesting and perhaps important occurrence noted was the distribution of cases of difficult parturition, difficult being defined as any case in which assistance was necessary to deliver the calf. Of the ten cases of difficult parturition recorded, eight were with Angus cows bred to bulls of a different breed. The other two cases were with Hereford cows, one bred to a Hereford and the other to an Angus x Hereford bull.

PERFORMANCE TESTING OF BEEF CATTLE ON VIRGINIA FARMS

by
Thomas J. Marlowe

Performance testing of beef cattle on the farms of the breeders in Virgini hasbeen underway for the past five years. It has grown from a small beginning wi nine herds and approximately 300 calves to approximately 125 herds with approxima ly 6,000 cows entered in 1957. The objectives of this project were set forth in the 1956 Annual Report of S-10. Some of the traits selected for include: (1) regular reproduction,(2) rapid growth rate, both before and after weaning, (3) desirable type, (4) longevity, (5) milking and mothering ability in the females, and (6) ruggedness and strong feet and legs in the bulls. Some of these traits are selected for directly, such as rapid growth rate, desirable type and conformation and regular reproduction. Others are selected for indirectly; for example, in selecting calves that grow the fastest up to weaning time one is automatically selecting for milking and mothering ability in the females.

Tremendous variations in performance have been found between farms and among animals on the same farm. For example, the herd averages in 1956 ranged in index values from 56 to 145; in growth rate from 1.03 to 2.25 lbs. per day; and i type scores from 7.2 (medium) to 14.7 (low fancy). Differences in performance of sire progenies on the same farm ranged from .00 to .45 lbs. per day or from 0 to 95 lbs. per calf at seven months of age. The average difference for those herds in which two or more bulls were used was about 45 lbs. per calf at seven months of age. There were differences as great as 300 lbs. among calves at weaning time in the same herd, out of cows mated to the same bull. In one herd of approximate 200 cows the top fourth of the calves weighed 146 lbs. per head heavier on the average at seven months of age than the bottom fourth.

Table I below shows the number of calves indexed prior to weaning during the last four years along with their average age, weight, adjusted daily gains, type score, and index value. This does not include the yearling cattle which have been indexed through this program. In 1956, 577 head of yearling cattle were indexed.

TABLE I. THE PRE-WEANING PERFORMANCE OF BEEF CALVES ON VIRGINIA FARMS BY YEARS

Year	No. Breeders	No. Sires	No. Calves	Av. Age in Days	Av. Wt.	Adjusted Daily Gain	Type Score	Index Value
1953	9	36	308	186	391	1.79	11.4	110
1954	26	112	648	179	373	1.78	12.1	114
1955	70	241	2482	199	389	1.70	11.7	108
1956	96	342	3632	203	403	1.73	11.8	110

The program has recently been expanded to include the performance testing of young bulls from 12 to 24 months of age.

The information provided the breeder enables him to (1) make a direct comparison of the breeding value of the sires used, (2) compare cow performance, (3) compare the performance of his herd with other herds in the program, and to

(4) do a more effective job of selecting herd replacements.

Performance testing is a cooperative undertaking by the Virginia Agricultural Experiment Station, Virginia Beef Cattle Improvement Association, and the Virginia Division of Markets.

THE INFLUENCE OF SEX, AGE, AND SEASON OF BIRTH OF CALF AND AGE OF COW ON PRE-WEANING GROWTH RATE AND TYPE SCORE ON BEEF CALVES

by

Thomas J. Marlowe and James A. Gaines

The purpose of this study was to compute least squares estimates of differences in pre-weaning growth rate and type score of beef calves due to sex, age, and season of birth of calf and age of cow. These estimates are now being used to adjust performance records of cattle tested on farms of Virginia breeders. The data included 4,166 calves taken from records of cattle tested on farms of breeders over a four-year period, 1953-1956, which had received no supplemental feed. All calves were weighed and scored for type between 90 and 300 days of age. Average daily gains were calculated by subtracting birth weight from pre-weaning weight and dividing by age in days.

Sex of calf influenced growth significantly, but showed less effect on type score. Least squares estimates of means for average daily gains were 1.77, 1.70, and 1.58 pounds for 511 bulls, 1540 steers, and 2115 heifers, respectively. Type scores were 11.65, 11.21, and 11.72, for these groups.

Age of calf showed little influence on daily gains, but significant effect on type scores up to 240 days of age. Averages for age groups by 30-day intervals from 90 to 300 days were 1.69, 1.68, 1.67, 1.66, 1.64, 1.60, and 1.49, for daily gains and 10.9, 11.2, 11.4, 11.6, 11.9, 11.6, and 11.6 for type scores respectively.

Season of birth was an important source of variation in both growth rate and type score. Seasons were divided as follows: (1) December 16 - March 15, (2) March 16 - May 31, (3) June 1 - August 31, and (4) September 1 - December 15. Averages by periods were 1.65, 1.69, 1.56, and 1.53, for growth rate and 11.7, 11.6, 10.7, and 11.6 for type score.

The most important source of variation in growth rate and type score found was age of cow. Least squares estimates of means were 1.44, 1.57, 1.63, 1.66, 1.70, 1.74, 1.66, 1.73, and 1.67 pound per day for 2, 3, 4, 5, 6, 7, 8, 9, and 10 years old and older cows, respectively. Mean type scores for same cow groups were 10.9, 11.4, 11.5, 11.7, 11.7, 11.8, 11.7, 11.5, and 11.5.

The least squares estimates of these various effects are shown in Table II. The results of this study indicated quite clearly that the adjustment factors for age of dam that we had been using the past were quite inadequate. The estimates for influence of sex of calf are almost identical to our previous estimates. This study confirms previous findings at this Station that calves grow at about the same rate from three to eight months of age. Based on these findings, a new set of weight adjustment factors have been adopted for the Virginia BCIA performance testing program. These factors are shown in Tables III and IV.

TABLE II LEAST SQUARES ESTIMATES OF THE EFFECTS OF AGE, SEX AND SEASON OF BIRTH OF CALF AND AGE OF COW ON PREWEANING GROWTH RATE AND TYPE SCORE OF BEEF CALVES

Effects Studied	Number of Calves	Average Daily Gains			Average Type Scores		
		Unadj. Means	Mean Differences Unadj.	Mean Differences L.S. Est.* & S.E.	Unadj Means	Mean Differences Unadj	Mean Differences L.S. Est.* & S.E.
Age of Calf (Days)							
90 - 120	201	1.69	0.03	0.03 ± .02	10.67	-0.96	-0.77 ± .13
121 - 150	607	1.70	0.04	0.02 ± .01	11.16	-0.47	-0.39 ± .10
151 - 180	932	1.70	0.04	0.01 ± .01	11.42	-0.21	-0.23 ± .08
181 - 210	1074	1.66	0.00	0.00 ±	11.63	0.00	0.00
211 - 240	785	1.63	-0.03	-0.02 ± .01	11.85	0.22	0.22 ± .09
241 - 270	459	1.54	-0.12	-0.06 ± .02	11.57	-0.06	0.01 ± .11
271 - 300	108	1.42	-0.24	-0.17 ± .03	11.41	-0.22	-0.08 ± .19
Season of Birth**							
Dec 16-Mar 15	2163	1.65	0.00	0.00	11.67	0.00	0.00
Mar 16-May 31	1425	1.70	0.05	0.04 ± .01	11.29	-0.38	-0.07 ± .08
Jun 1-Aug 31	146	1.54	-0.11	-0.09 ± .02	10.55	-1.12	-0.93 ± .16
Sep 1-Dec 15	432	1.50	-0.15	-0.12 ± .02	11.66	-0.01	-0.05 ± .11
Sex of Calf							
Bulls	511	1.79	0.09	0.07 ± .01	11.72	0.51	0.63 ± .09
Heifers	2115	1.58	-0.12	-0.12 ± .01	11.66	0.45	0.48 ± .06
Steers	1540	1.70	0.00	0.00	11.21	0.00	0.00
Age of Dam (Years)							
0 - 2.5	311	1.46	-0.28	-0.30 ± .02	10.72	-1.05	-0.86 ± .13
2.5 - 3.5	607	1.58	-0.16	-0.17 ± .02	11.29	-0.48	-0.40 ± .11
3.5 - 4.5	657	1.63	-0.11	-0.11 ± .02	11.41	-0.36	-0.32 ± .11
4.5 - 5.5	655	1.66	-0.08	-0.08 ± .02	11.62	-0.15	-0.11 ± .11
5.5 - 6.5	525	1.70	-0.04	-0.04 ± .02	11.80	0.03	0.10 ± .11
6.5 - 7.5	408	1.74	0.00	0.00	11.77	0.00	0.00
7.5 - 8.5	275	1.68	-0.06	-0.06 ± .02	11.68	-0.09	-0.07 ± .14
8.5 - 9.5	217	1.73	-0.01	-0.01 ± .02	11.42	-0.35	-0.31 ± .15
Over 9.5	514	1.67	-0.07	-0.07 ± .02	11.57	-0.20	-0.26 ± .12
Total & Means	4166	1.65		1.71 ± .02	11.50		11.57 ± .11

* Least Squares estimate (L.S. Est.) of the mean differences were obtained by solving a set of 20 simultaneous equations

** Average birth date by groups was Feb. 6, Apr 13, Jul 7 and Oct. 20, respectively.

TABLE III. 1957 WEIGHT ADJUSTMENT FACTORS FOR VIRGINIA BCIA PERFORMANCE TESTING PROGRAM

Age of Dam	WAF	Age of Calf	WAF
2	1.20	(1) 90-120	1.00
3	1.10	(2) 121-150	1.00
4	1.06	(3) 151-180	1.00
5	1.04	(4) 181-210	1.00
6-10	1.00	(5) 211-240	1.00
11-13	1.05	(6) 241-270	1.03
14 & over	1.15	(7) 271-300	1.10
Season of Birth	**WAF**	**SEX OF CALF**	**WAF**
(1) Jan. 1 - May 31 (1 - 151 day)	1.00	(1) Bulls	0.96
(2) June 1 - Dec. 31 (152 - 365 day)	1.06	(2) Heifers	1.07
		(3) Steers	1.00

TABLE IV. COMBINATIONS OF WAF'S FOR INFLUENCE AGE OF DAM, SEX OF CALF, AND SEASON OF BIRTH

Sex of Calf		1		2		3	
Season of Birth		1	2	1	2	1	2
Age of Dam	2	1.15	1.22	1.27	1.36	1.20	1.27
	3	1.06	1.12	1.17	1.25	1.10	1.17
	4	1.02	1.08	1.13	1.20	1.06	1.12
	5	1.00	1.06	1.11	1.18	1.04	1.10
	6-10	0.96	1.02	1.07	1.13	1.00	1.06
	11-13	1.00	1.07	1.12	1.19	1.05	1.11
	14 plus	1.10	1.17	1.22	1.30	1.15	1.22

A STUDY OF DWARFISH IN BEEF CATTLE

by
Thomas J. Marlowe

This study was started in the fall of 1954 to investigate the hereditar nature, gene frequency, abnormal physiological actions and mechanism responsib for different types of dwarfism in beef cattle.

Approximately 50 dwarf calves were assembled. Ten females and 3 males were retained for breeding tests and the remainder, along with 7 normal calves were autopsied. Four dwarf calves from dwarf X dwarf matings are now in the herd. Glandular materials and other tissues have been prepared for microscopi examination from the autopsied animals.

Blood samples from groups of dwarf and normal calves have been analyzed for serum protein-bound iodine, glucose, calcium, phosporus, magnesium and phosphatase activity. No significant differences were found between dwarf and normal calves in these blood constituents. Some of these results are shown in Tables V and VI.

TABLE V. BLOOD ANALYSIS FOR PROTEIN-BOUND IODINE CONTENT OF DWARF AND NORMAL CALVES

Trials	1	2	3	4	5
Date Taken	May '53	Jan. '54	Apr. '55	June '55	Oct. '55
No. Sample*	21	20	24	22	18
PBI (Mgms/100 cc Serum)					
Normal calves	5.6	7.2	5.4	3.5	3.2
Dwarf Calves	6.3	9.6	3.6	3.3	3.7

*There was an equal number of samples from dwarf and normal calves except for trial 1 in which there were 16 dwarf and 5 normal samples.

TABLE VI. CALCIUM, MAGNESIUM AND PHOSPHORUS CONTENT OF THE BLOOD FROM DWARF AND NORMAL HEREFORD CALVES AND THEIR DAMS

Type of Animal	No.	Calcium (Mgms %)	Magnesium (Mgms %)	Phosphorus (Mgms %)
Dwarf Calves	14	10.35	1.58	8.54
Normal Calves	7	10.75	1.80	8.71
"Carrier" Cows	15	9.19	1.87	6.41
Normal Cows	9	9.79	1.94	4.89

Study is now underway to check the sensitivity of the various genotypes (Dwarf, carrier and clean) to insulin stress as measured by the changes in white blood cell counts.

TABLE VII. THYROID WEIGHTS OF DWARF AND NORMAL BEEF CALVES

CLASSIFICATION	No. of Calves	Av. Calf Age (mos.)	Av. Calf Wt.	THYROID WEIGHTS IN MGMS. Actual	Per 100# Live Body Wt.
Normal Calves					
Hereford	11	4.6	306	7.54	2.46
Angus	7	4.6	307	7.00	2.28
Dwarf Calves					
Hereford	37	3.1	115	6.14	5.33
Angus	14	4.2	155	11.84	7.65

TABLE VIII. WEIGHT OF PITUITARIES AND GLANDULAR PITUITARY POWDER FROM DWARF AND NORMAL BEEF CALVES

CLASSIFICATION	No. of Calves	Av. Calf Age (mos.)	Av. Calf Wt.	Wt. of Pituitary Mgms.	Per 100 lbs. live weight
			PITUITARY GLANDS		
Dwarf calves	49	3.3	125	480	384
Normal Calves	22	4.7	327	1027	314
			GLANDULAR POWDER		
Dwarf Calves	66	4.3	172	113	65.7
Normal Calves	33*	4.3	299	155	51.9

* These normal calves were all under 7 months of age.

Ten breeders of Hereford and Angus cattle have been cooperating in an attempt to find some means of segregating the progenies of known carrier sires into carrier and non-carrier groups. Growth data, type scores, body measurements and masculanity ratings on bull calves have been collected on more than 1000 calves sired by 50 known carrier bulls through the Virginia BCIA performance testing program.

REPEATABILITY OF PERFORMANCE IN THE BEEF COW

J. C. Taylor, R. C. Carter and J. A. Gaines

In order to make effective selection toward improving the productive performance of beef cattle it is important to know to what extent the dam influences such characters as birth weight, daily gain from birth to weaning, and grade at weaning.

The data used in this study were collected from the experimental herds of the Virginia Agricultural Experiment Station, Blacksburg and the Beef Cattle Research Station, Front Royal. The cows in the Blacksburg herd were an unselected group of grade Herefords and were used for progeny testing bulls in a sire selection study (Kincaid and Carter, 1955). The bulls were registered Angus, Hereford, Shorthorn, selected for extreme rapid or slow rates of gains on performance feeding tests. Records on 330 calves from 103 cows born over a five-year period (1949-54) sired by 38 bulls were available from the Blacksburg herd.

The Front Royal cows were all registered Angus, Hereford, and Shorthorn. The Shorthorn herd consisted largely of cows that had been moved to the station from the Agricultural Research Center at Beltsville, Maryland, and was relatively homogeneous in breeding. The Angus and Hereford herds were assembled from diverse sources and were relatively heterogeneous in breeding. Records on 900 calves from 364 cows of all breeds born over a 7-year period (1950-56) were available for the study from the Front Royal herds. Only cows that reared their first calf at the Front Royal Station were included.

Since the bulls used in the Blacksburg herd were highly selected, i.e. for high or low rates of gain, it was believed necessary to adjust the performance of the calves for the gain level of the sire. The Blacksburg data were also adjusted for the effects of sex and breed of sire. Least squares estimates of the effects of sex, breed of sire and gain level of the sire were used for the adjustments in the Blacksburg data. These estimates and their standard errors are shown in Table IA. The unadjusted phenotypic means for the Blacksburg data are shown in Table IB. The Front Royal data were adjusted only for sex of calf as it influenced birth weights and daily gains. These adjustments are shown in Table II. The effects of sex on feeder grades were negligible.

Table I Blacksburg Data

A. Least squares estimates for fixed environmental effects with their standard err

	Birth weight	Weaning gain	Weaning grade
Angus minus Shorthorn	1.12 ± 1.49	0.10063 ± .04	0.0699 ± .33
Hereford minus Shorthorn	-1.02 ± 1.45	-0.03526 ± .04	-0.4130 ± .31
Shorthorn	.00	.00	.00
Steers minus heifers	4.14 ± .827	0.1140 ± .021	-0.2461 ± .18
Heifers	.00	.00	.00
High minus low gaining sires	1.82 ± .834	0.06586 ± .022	0.3763 ± .18
Low gaining sires	.00	.00	.00
Estimate of the mean	69.75 ± 1.45	1.54505 ± .038	11.551 ± .31

B. Unadjusted phenotypic means

	Birth weight	Weaning gain	Weaning grade
Angus	74	1.74	11.7
Hereford	72	1.60	11.3
Shorthorn	73	1.63	11.6
Steer calves	75	1.71	11.4
Heifer calves	71	1.60	11.6
High gaining sires	74	1.69	11.7
Low gaining sires	72	1.62	11.3
Overall mean	73	1.66	11.5

Table II

Adjustments to the Front Royal data due to the influence of sex

	Birth weight	Gain to midsummer	Gain to weaning
Angus heifers	+ 4.0	+ 0.174	+ 0.195
Hereford heifers	+ 5.0	+ 0.172	+ 0.243
Shorthorn heifers	+ 4.0	+ 0.073	+ 0.143

The traits studied at both stations were birth weight, daily gain from birth to weaning and feeder grade at weaning. At the Front Royal Station all calves are weighed and graded in midsummer at the time the calves average about 120 days of age to provide a basis for preliminary bull selection. At this time a portion of the bull calves are castrated. In addition to the above mentioned traits, daily gains from birth to midsummer and midsummer grades were studied in the Front Royal data only.

Estimates of repeatability of cow performance for the traits studied at the Blacksburg station were obtained by each of the following methods.

1. Intraclass correlation derived from analysis of variance. In this method the cows were placed in groups born in the same year and calving in the same subsequent years. The variances from the separate group analyses were pooled to obtain an estimate of the variance components.

2. Regression of the record of the second calf on the first.

3. Regression of the average of subsequent calves (one or more calves later than the first) on the record of the first.

4. Correlation of the record of the second calf with that of the first.

5. Correlation of the average of subsequent calf records with the record of the first calf.

6. Dividing cows into high and low halves on basis of 1st record and obtaining regression of 2nd records from the first toward the herd average (Lush et al 1941, J. Dairy Sci. 24: 695).

The resulting repeatability estimates from the Blacksburg data are shown in Table III.

Table III

Repeatability estimates for Blacksburg data with standard errors

Method	Birth weight	Weaning gain	Weaning grade
Intraclass correlation	.16 ± .005	.26 ± .005	.20 ± .005
Regression 2nd on 1st	.17 ± .09	.31 ± .11	.26 ± .10
Correlation 2nd on 1st	.20 ± .10	.27 ± .10	.26 ± .10
Regression av. sub. on 1st	.22 ± .08	.26 ± .09	.25 ± .07
Correlation av. sub. on 1st	.29 ± .10	.31 ± .10	.35 ± .10
Regression 2nd records from 1st toward herd av.	.06	.38	.30

Estimates were obtained from the Front Royal data only by intraclass correlation from analysis of variance for which the cows were grouped as at Blacksburg, and by regression and correlation of the average of subsequent calf records on the record of the first calf. Separate estimates were obtained for each breed, however, and are shown by each method in Table IV.

Table IV

Repeatability estimates from Front Royal data with standard errors

Method	120 days			Weaning	
Intraclass Correlation	B.W.	D.G.	F.G.	D.G.	F.G.
Angus	.37 ±.006	.42 ±.006	.21 ±.007	.41 ±.006	.12 ±.007
Hereford	.28 ±.006	.32 ±.006	.23± .006	.38 ±.006	.27 ±.006
Shorthorn	.27 ±.005	.27 ±.005	.34 ±.005	.38 ±.005	.37 ±.005
Regression av. Subsequent on 1st					
Angus	.31 ±.11	.24 ±.07	.29 ±.08	.38 ±.08	.04 ±.09
Hereford	.23 ±.10	.58 ±.09	.21 ±.07	.55 ±.11	.22 ±.08
Shorthorn	.32 ±.11	.43 ±.12	.37 ±.09	.34 ±.13	.33 ±.12
Correlation av. Subsequent on 1st					
Angus	.33 ±.12	.41 ±.11	.40 ±.12	.52 ±.11	.06 ±.13
Hereford	.26 ±.11	.59 ±.09	.32 ±.11	.51 ±.10	.31 ±.11
Shorthorn	.33 ±.12	.41 ±.11	.44 ±.11	.31 ±.12	.32 ±.12

Repeatability estimates for the Blacksburg data were 0.18 for birth weight, 0.30 for weaning gain, and 0.27 for weaning feeder grade after averaging all six methods enumerated above.

In general the repeatability estimates calculated for the Front Royal data were higher than for the Blacksburg data. Repeatability of birth weight was very close for all three breeds and was of the order of 0.30. An average of the methods used showed repeatability of gain from birth to midsummer to be 0.50 for the Herefords, and 0.36 for both the Angus and Shorthorn. Repeatability of feeder grade at midsummer was in the neighborhood of 0.30 for all three breeds. Repeatability of gain from birth to weaning averaged 0.48 for the Herefords, 0.44 for the Angus, and 0.34 for the Shorthorns. There was little difference between repeatability of grade at midsummer and at weaning for the Hereford and Shorthorn. On the other hand there was marked difference in the Angus, repeatability of grade at weaning being 0.07 as compared with 0.30 at midsummer. No explanation is apparent for this difference.