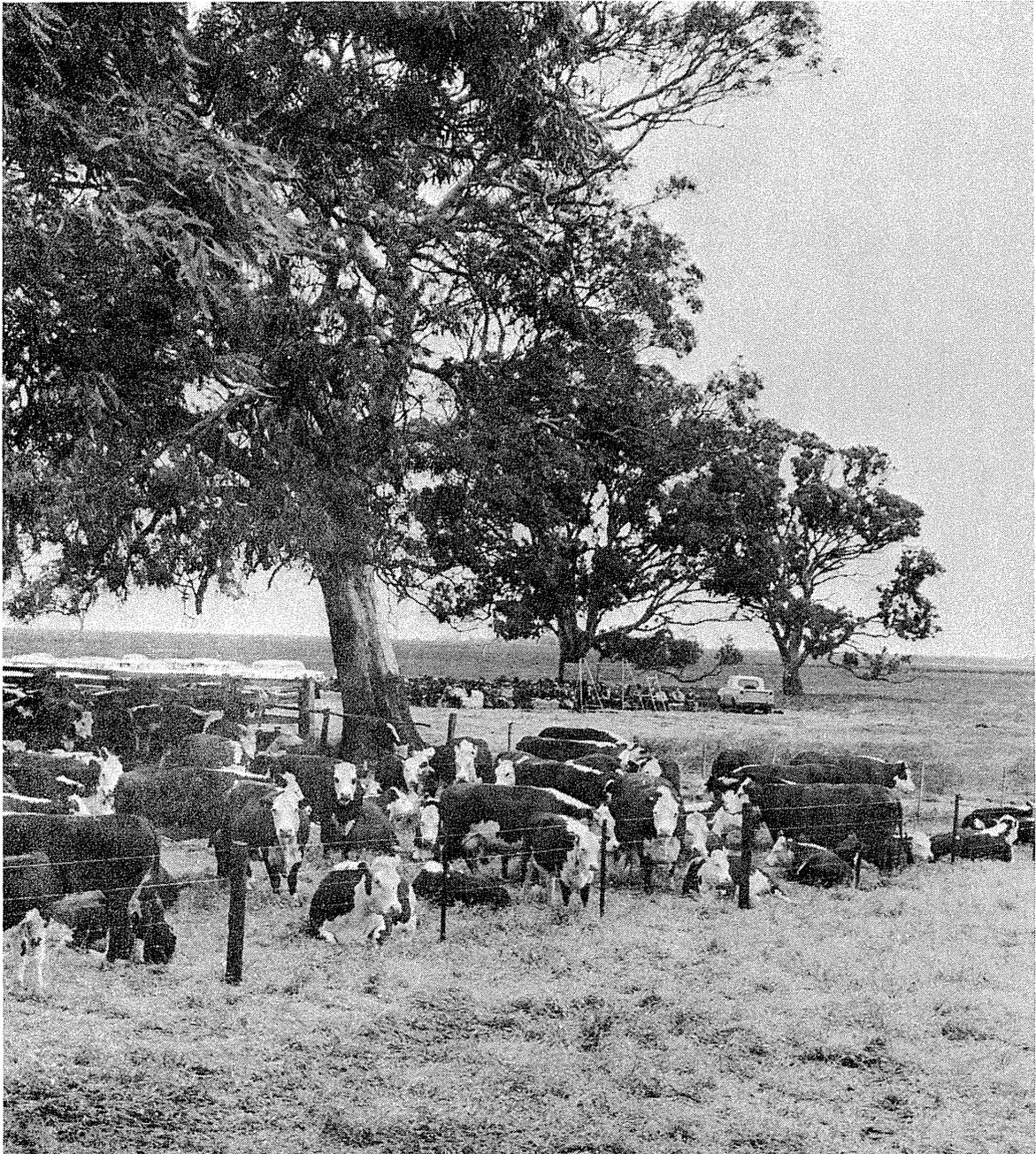


FRUM

STRUAN

BEEF RESEARCH CENTRE
FIELD DAY September 1970



Department of Agriculture, South Australia

Programme

OFFICIAL OPENING: Mr. Marshall R. Irving, Director of Agriculture

DEMONSTRATIONS:

- Cattle cross-breeding programmes
- Selection of beef sires

ADDRESS: Dr. Warwick, Director of the Animal Husbandry Research Division, U.S. Department of Agriculture.

"The future of cross breeding in the United States."



**Mr. Marshall R. Irving,
Director of Agriculture**

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Staff



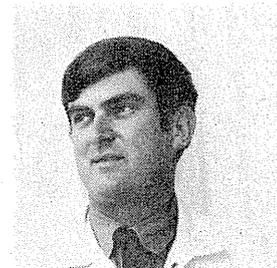
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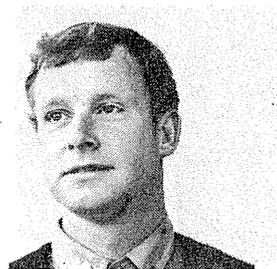
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Function of the Centre

The demand of the pastoral industry for a higher volume and quality of production at less cost requires the integration of many types of information.

The overall aim of Struan Research Centre is to do applied research on, and to demonstrate how, the various management factors can be integrated to the best advantage to the producer. Emphasis is placed on providing information which is directly applicable to the pastoralist's own situation. This information is disseminated direct to producers by the Centre as well as through normal extension channels.

Broadly the investigations cover:

1. Animal husbandry:

- (a) Beef Cattle — breeding
 - management
 - finishing
 - carcass evaluation
- (b) Sheep — Corriedale flock improvement
 - suitability of fine wool Merinos
 - comparison of sheep vs. cattle

2. Pasture production:

- suitable species
- fertilizer requirements
- grazing management

Struan Beef Research Centre

Location: The Centre is situated in the South-East of South Australia, nine miles south of Naracoorte on the Naracoorte—Mount Gambier road.

Area and soils: The area is approximately 2,000 acres, comprising:

1. Sand ridges on the eastern side of the property — 400 acres.
2. Red gum soils on the western slope between the sand ridges and flat — 800 acres.
3. Rendzina soils of the flats — 1,000 acres.

Rainfall: Average rainfall (past 10 years) — 21.94 in.
Rainfall to 31/7/70 — 11.63 in.

Pastures:

The original area of 1,100 acres is pastured to mixed strawberry clover, subterranean clover, phalaris and ryegrass and is adequately fenced and watered. Pasture renovation can only be done systematically at a rate of one or two paddocks per year and a long term programme is envisaged.

The drainage scheme on Mosquito Creek is complete, but the old creek requires some levelling.

Both flood and spray irrigation are used.

The land (1,000 acres), recently transferred from Welfare Department requires considerable pasture development and subdivision. The "flat" shall be established to phalaris, ryegrass, strawberry clover and subterranean clover mixtures. The sand ridges will be pastured with lucerne, cocksfoot and subterranean clover.

Livestock:

On hand at 30/6/70 were:

1. Beef cattle — 1,070 head.

240 heifers, (Shorthorns and Friesians, and Herefords) were purchased for large scale work on new breed testing and cross breeding trials. The first 70 Charolais cross calves were dropped in April 1970 and are probably the first large group of the new breed in Australia.

2. Sheep — Corriedales — 1,000
— Merinos — 600

Beef cattle investigations

1. BEEF SIRE SELECTION – BREEDING PROGRAMME, PURE HEREFORD HERD

In recent years emphasis has been placed on performance recording to enable selection of:

- (a) bulls on factors such as growth rate and carcass quality.
- (b) heifer replacements on factors such as high fertility and the ability to grow a calf.

The aim of the work on Struan is to evaluate the commercial worth of breeding (or purchasing) better bulls.

The Struan Hereford herd has been selected on growth rate and carcass quality for the past 13 years. Bulls are ranked on growth performance of dams, grazing after weaning and feed lotting. Selective ranking is based largely on post-weaning grazing performance. Each year new sets of "high" and "average" bulls are being mated to 200 commercial cows which, after mating, are run together as one mob.

Interim results

Table 1: Average liveweight gain weaning to yearling of calves from herd cows mated to high and average performance bulls.

Herd	1968 drop
A herd (mated to "high" bull)	71.2 lb.
B herd (mated to "average" bull)	64.9 lb.
Advantage of A over B is 6.3 lb. (9.7%)	

Illustration: Ranking of high and average bulls at different stages



Ranked on basis of:	High	Average
Weaning weight	3rd	18th
Yearling weight	3rd	21st
Gain from weaning to yearling	8th	24th
Feed lot performance	2nd	35th
Out of a total of 50 bulls.		

Sires for 1969 mating have been selected and ranked on performance. A change in performance ranking when these bulls were changed from pasture to feedlot is evident. Twenty three per cent of bulls which were below the average gain on grass were above average in the feedlot. A similar 23 per cent which were above average gain on grass switched to below average gain in the feedlot.

The Hereford herd at Struan is being expanded to 230 breeders and a breeding plan is being developed to maximize the improvement rate. This will allow a wider range of bull selection for sire indexing.

2. BREED INTRODUCTION AND CROSS BREEDING

Australian and overseas evidence suggests that substantial gains in output per head and per acre are possible through using both two and three way crosses between breeds.

The philosophy behind this approach is:

- Crosses between British beef breeds result in about five per cent improvement in such characteristics as fertility, calf survival and growth rate. Three way crosses may give even greater improvement.
- Exotic breeds such as the Brahman may give much greater gains than the above in their first crosses.
- The place of the dairy breeds either as pure bred or as half bred dams in the production of yearling beef shows potential,
e.g. On Struan in 1968, Friesian cross calves out of Shorthorn dams weaned at 560 lb. compared with pure Herefords at 476 lb.

All this may be disturbing to orthodox beef breeders, but remember that the existing breeds still have the major part to play in an expanding beef industry. In reality 600 pure bred cattle of three breeds are required.

Breeds new to the South Australian environment such as the Charolais, Brahman, South Devon, Banteng and Sahiwal have been introduced for evaluation initially as sires and later to test their female half breeds as dams. The suitability of dairy breeds (Friesian and Jersey) as beef producing dams is being tested.

Struan cross breeding plan

At Struan the initial stage of the cross breeding plan is to use the Charolais, Brahman and Hereford as sires. The dams are Hereford, Shorthorn, Jersey and Friesian-Shorthorn cross.

Thus there are 12 crosses each involving 20 dams to give a total of 240 dams.

Illustration 2: Dams and Charolais cross calves



Shorthorn dam with Charolais cross calf.



Jersey dam with her first calf — sired by Charolais.



Hereford dam with Charolais cross calf.

Table 2: Results of cross breeding trial 1969 – dam and calf details

BREED (Sire x Dam)	No. mated	Semen doses used	Calves born	Assisted live calves	Assisted dead calves	Non assisted dead at birth	MALE PROGENY				Average body wt. dam (lb.)
							Birth wt. (lb.)	Wt. at 60 days (lb.)	Wt. at 110 days (lb.)	Growth rate (lb. /day to 110 days)	
Charolais— Shorthorn	20	24	19	4	0	1	85	205	348	(8)* 2.7	Shorthorn dams 922
Hereford— Shorthorn	20	—	17	0	0	0	71	196	304	(7) 2.4	
Charolais— Hereford	26	38	24	1	1	2	87	160	270	(9) 2.3	Hereford dams 1044
Brahman— Hereford	21	35	19	1	0	0	86	139	218	(10) 2.0	
Hereford— Hereford	21	—	13	0	1	0	69	141	238	(7) 2.0	
Charolais— Jersey	20	31	17	1	0	0	71	161	286	(8) 2.4	Jersey dams 667
Hereford— Jersey	24	—	16	1	0	1	64	170	265	(10) 2.1	
Charolais— Friesian/Sh.	14	16	14	4	1	0	94	180	330	(6) 2.8	Friesian/ Shorthorn dams 818
Hereford— Friesian/Sh.	15	—	15	1	0	1	75	177	291	(7) 2.3	
TOTALS	181	—	154	13	3	6					

*No. of animals weighed
 Calving % to A.I. = 93
 Calving % to bull = 67
 Average calving % = 85

The major aim of this stage of work is to evaluate the Charolais and Brahman against the Hereford as sires.

The dam evaluation may be even more interesting and potentially more important.

Artificial insemination

In the 1969 mating season, artificial insemination using imported Charolais and Brahman semen was used on 105 dams to implement the cross breeding programme.

In the 1970 mating season, artificial insemination was used to cover practically all matings on Struan.

Techniques for the use of A.I. in beef herds on a large scale are being studied.

Interim results

Details for the 1969 calving are shown in Table 2.

Any conclusions drawn from this data should keep in mind the total numbers involved.

- A higher calving percentage was achieved with A.I. than with bulls.
- Greater assistance was given to Shorthorn and Friesian-Shorthorn dams than to other groups.
- The Jersey group had no difficulty calving to Charolais. This supports U.K. experience.
- Calves from Jersey dams were lighter at birth.
- Calves sired by Brahman compared with Charolais did not present a calving problem despite similar birth weight.
- Calves from the largest dams have not been the fastest growing calves.

3. BEEF CATTLE BREEDING HERD MANAGEMENT

Attention to detail in all facets of management is essential to a successful beef enterprise.

Observations of the following factors have been made on the Struan herd for several years to provide authoritative backing for management recommendations.

- Time of calving
- Age at mating
- Length of mating period
- Weaning age
- Fertility
- Time and age to market
- Finishing on supplements

Some interim results — Calving results 1969

% of cows calved/cows mated — 84
% of heifers calved/heifers mated — 82

4. HEIFER NUTRITION TRIAL

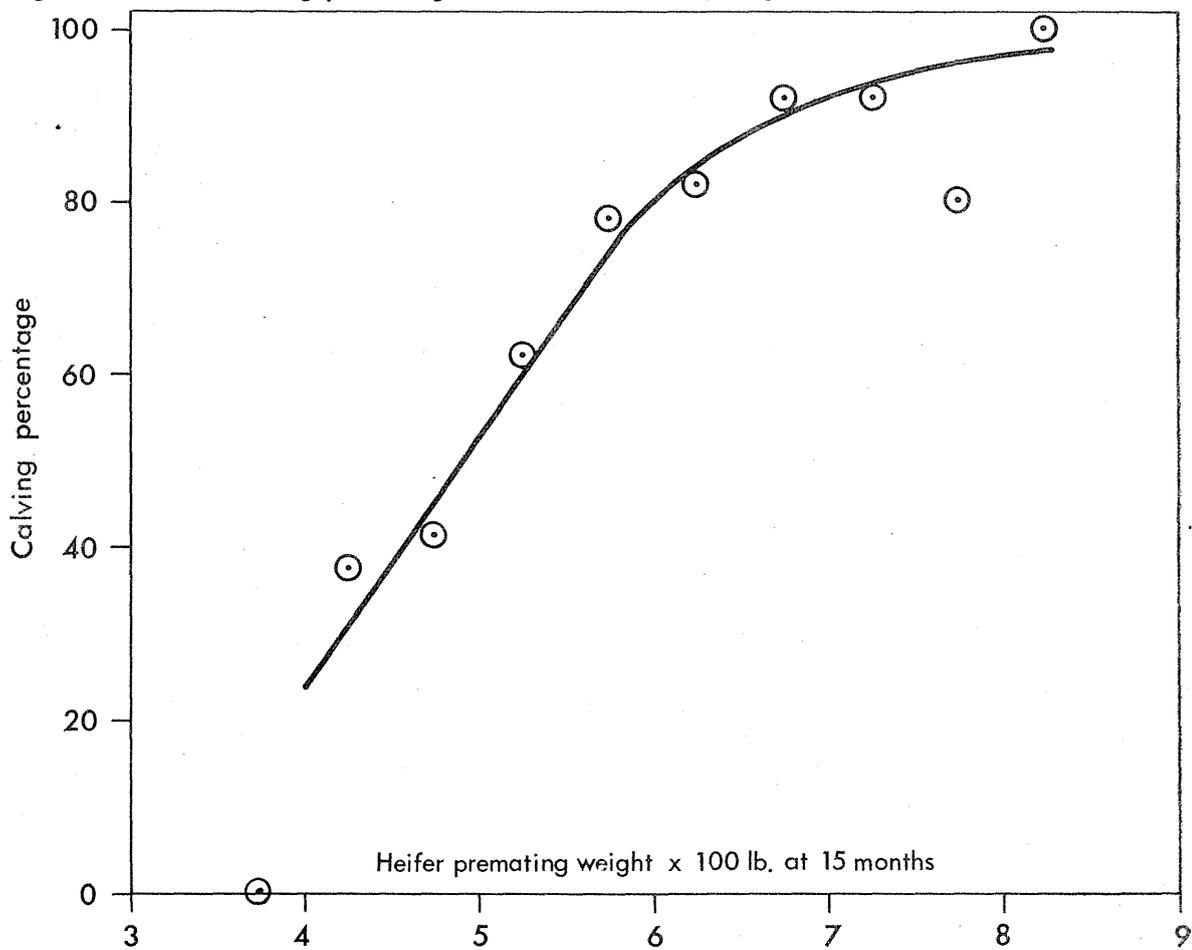
It is assumed that in the South-East environment calving at two years rather than three years will increase returns.

But calving down two-year old heifers has three main problems:

- low fertility
- difficult calving and death of mother
- calves dead at birth

These problems have been investigated in the Hereford herd at Struan under paddock feed conditions.

Figure 1: Heifer calving percentage in relation to bodyweight at mating



The features of Figure 1 are clear. For the heifer groups to produce an 80 per cent calving, the average liveweights of the heifers at the beginning of joining must be in the vicinity of 600 lb. It can be seen that only a small reduction in mating weights of heifers can cause a marked decline in heifer fertility. For instance, an average pre-mating weight of 540 lb. reduces the expected calving percentage to 60 per cent.

It must be emphasized, that while the optimal liveweight at mating is 600 lb. (or more), for heifers to reach this body weight at 15 months of age demands constant attention and high levels of feeding.

Further results are in South Australian Department of Agriculture Leaflet No. 3951 "Beef Heifers and Mating Management".

Table 3: Effect of pre-calving nutrition on calving difficulty in two year olds

	High nutrition	Low nutrition
No. in treatment	53	51
Days of treatment	102	102
Average liveweight at calving	932 lb.	813 lb.
Gain or loss	+109 lb.	-12 lb.
No. calved	42	42
Males	18	23
Females	24	19
Average birth date (from 1st February)	73rd day	75th day
Average birth weight	65.1	57.1
No. assisted births	14	7*
No. calves dead at birth	4	6**
No. caesarians	1	—
No. sold or destroyed due to calving injuries	3***	—
Liveweight of calves reared:		
240 days weaning weight	376	354
Yearling weight	530.8	515.8

- * 2 reverse presentations
- ** 1 reverse presentation
- *** 1 Prolapse, 1 paralysis, 1 Caesarian
(2 sold, 1 destroyed)

A pre-calving dam body liveweight difference of an average of 120 lb. caused by different levels of feeding resulted in a birth weight difference of 7 lb. per calf.

The reduction of calf bodyweight at birth by 7 lb. resulted in a reduction of 50 per cent in the assisted births. Increased calf deaths occurred in the low nutrition group but increased dam losses occurred in the high nutrition group. The effect of the pre-calving bodyweight difference of 120 lb. resulted in a calf weaning weight difference of 22 lb. and a weight difference of 15 lb. at the yearling stage.

5. MUSCULAR HYPERTROPHY IN BEEF CATTLE ("DOUBLE MUSCLING")

A genetic abnormality known as "double muscling" (D.M.) which results in greater than normal muscle development has been under study at Struan for four years. The carcasses have well developed muscle tissue and practically no fat. Double muscling is however associated with infertility and difficult calving.

The study's aims are to assess the significance of double muscling in carcass quality and to see if a fertile strain could be developed as a low fat, high muscle sire for yearling production.

Cows in the muscular hypertrophy project have completed three calvings. The herd is now composed of Angus, Red Poll and Angus cross females. All cows have been mated to a Santa Gertrudis bull with muscular hypertrophy.

A total of 26 cows were joined in 1969. Of these 11 have the muscular hypertrophy condition. Of the remainder, all of which appear normal, four have produced double muscle calves and another two are known to be capable of doing so, but are yet to calve.

Calving results strengthen the notion that D.M. females have low fertility.

Table 4: Calving results 1967-69

	1967	1968	1969	1970
No. mated	28	29	29	26
No. calved	18	17	20	18*
Calving %	64	59	69	72

* by pregnancy test

The low calving percentage is mainly due to failure of D.M. females to calve. This is particularly the case where D.M. females have been joined at 15 months to calve at two years of age. In this category only two from a total of eight matings have been successful. On pregnancy test a number of dry two year old D.M. females were reported to have infantile reproductive tracts.

D.M. bull x normal female matings appear to have a normal level of fertility.

Calving results from D.M. cows

A total of six D.M. cows have calved to the D.M. Santa Gertrudis sire. Two of the progeny

were D.M. at birth while the other four progeny developed the condition two to six weeks post-partum after being born visibly normal. One cow was destroyed after severe dystokia and post-calving paralysis and both calves which were D.M. *in utero* were assisted and died at birth.

Calving results from normal cows

A total of 23 calves have been sired by the D.M. Santa Gertrudis bull out of normal looking females. Six calves were D.M. at birth and two others developed the condition a few weeks post-partum. Only one of these eight calves was delivered without assistance, five died due to injury at calving. The remaining 15 calves were born normal and remained normal after calving, seven (50 per cent) required assistance at birth, but only one died because of injury at calving.

It is postulated that many of these apparently normal cows are in fact "carriers" of the muscular hypertrophy state, which if correct, would account for a number of double muscled progeny being produced in the group. It is hoped that with continued use of D.M. bulls in test matings the genetic make-up of the herd will become more clear and that managerial measures could then be employed to reduce the losses caused by difficult calving.

Generally, calves which were classified as double muscled at birth caused much more severe dystokia than those classified as normal at birth, but which developed the condition post-partum. As a result, calf and cow losses due to dystokia were largely resultant from *in utero* development of the condition.

It is hoped that with further study into the nutritional and genetic influences of the *in utero* development, some solution to the severe dystokia problem may eventuate. If necessary selection pressure may have to be applied so that only females which present normal calves at birth are retained in the herd. At the moment the problem is regarded as a result of both genetic and environmental influences.

6. PERFORMANCE AND CARCASS ACCEPTABILITY OF CASTRATED AND NON CASTRATED YEARLING CATTLE

The aim of this study is to see whether the known higher growth rates of entire male cattle can increase market returns as compared with castrated steers and artificial cryptorchids.

Artificial cryptorchids are produced within a few days of birth by returning the testicles into the body and retaining them by a rubber ring high on the purse.

The cattle are slaughtered at 12 months old, and marketed at a wholesale meat auction.

Table 5: Comparison of castrate and entire yearlings

	Entire	Artificial cryptorchid	Castrated
Liveweight gain from marking to slaughter	435.9	447.0	414.3
Increase over castrated (%)	5	7	
Carcass data:			
Fat thickness (cm.)	0.2	0.2	0.4
Price/lb. at meat auction (c.)	25	26.5	28

The entire and cryptorchid groups did not finish as well as the castrates. The price per pound reflected this also. Growth rates were superior in the entire and cryptorchids groups. However, overall returns were \$6 per head in favour of the castrate group. It would appear that nutrition levels for entire and cryptorchid would need to be higher to attain the desired level of finish.

7. FEEDLOT STUDIES

It is reasonable to assume that as the volume of beef produced increases so the preference by buyers for well finished animals will increase. Even now the price differential between unfinished animals requires the producer to look closely at his management practices. The fall in price of cereal grains prompted a critical examination of feedlot finishing of beef.

An observation to examine the suitability of wheat and other concentrates, was made at Struan.

Table 6: Performance on different grains and types of concentrate

Feed composition	$\frac{2}{3}$ oats and $\frac{1}{3}$ wheat	$\frac{1}{3}$ oats and $\frac{2}{3}$ wheat	Wheat Hay
Quantity of feed	Hay 5.5 lb. Oats and wheat 11.9 lb.	Hay 5.77 lb. Oats and wheat 8.80 lb.	Hay 5.67 lb. Wheat 8.39 lb.
Animal performance			
Liveweight gain	2.01	1.99	1.98
Conversion ratio	8.78	7.32	7.16

Wheat was readily accepted by the animals and performance was equal to oaten mixtures and it therefore could be included in feedlotting beef cattle.

Cost and return factors at the particular time would decide its use commercially.

Sheep investigations

1. CORRIEDALE FLOCK IMPROVEMENT STUDIES

Increases in meat returns can be achieved by selecting for lamb growth rate and in the case of ewes, for weaned weight of lambs.

At Struan lambing percentages in ewe flocks are beginning to show an upward trend. A group of ewes selected on the basis of weaned weight of lamb have marked 142 per cent. The normal average is about 110 per cent.

The practice of mating 12 month old hoggets is currently being examined. In 1968, 68 per cent lambs were weaned from ewes mated at this age. If these results can be repeated it would be a worth while practice. The ewes will be observed to determine the effects of early mating on their lifetime production.

2. FINE WOOL MERINOS

The Struan environment, despite its long growing season, has been regarded as difficult for breeding of fine wool Merinos.

A fine wool Merino flock has been established to test this theory.

3. COMPARATIVE STOCKING OF SHEEP AND CATTLE

The economic comparison of sheep and cattle occupies the minds of many graziers.

To gain some information on this important but difficult issue a pilot trial was set up in 1967.

Two areas of 20 acres each are used for the study of the comparative performance of breeding ewes and cows. One area is stocked with 80 Corriedale ewes mated to Dorset rams for a spring lambing, and the other with 10 Shorthorn cows mated to a Friesian bull for an autumn calving.

The above stocking rates have been adjusted by experience to give good comparable nutrition for acceptable commercial performance in terms of lamb growth and wool and beef production.

In 1968-69 the cattle gave a gross return of \$66 per acre, the sheep \$50 per acre. These results are only rough. But the pilot trial has given sufficient experience to set up a larger more critical and detailed trial as staff and facilities become available.

Pasture investigations

1. STOCKING RATE – PHOSPHATE RATE TRIAL

An experiment has been set up to determine the optimum economic phosphate application for a range of medium to high stocking rates of sheep on the black rendzina soils.

Two levels of superphosphate are used – one bag per acre and three bags per acre applied annually. At one bag per acre stocking rates of six and eight wethers per acre are used and at three bags per acre, eight and nine wethers per acre are used.

The one bag of superphosphate rate with six and eight wethers per acre has been maintained throughout the observation period. During the 1967 drought the eight wethers per acre were supplementary fed oats for a period of 28 days.

Table 7: Comparison of 6 and 8 wethers/acre at the 1 bag (187 lb.) superphosphate/annum

	Stocking rate	
	6 wethers	8 wethers
Wool cut/acre	82.2 lb.	98.4 lb.
Gross return	\$37.70/acre	\$46.00/acre
Feed costs 1967 drought	Nil	\$ 5.00/acre
Gross margin less feed costs	\$37.70	\$41.00

Visual observations of the six wethers per acre suggest the sheep are not utilizing pastures efficiently, whereas eight wethers are attaining a high degree of utilization.

2. PHOSPHATE RATES – RESIDUAL PHOSPHATE TRIAL

A trial commenced in 1968 is designed to determine the maintenance application of phosphate necessary for maximum pasture production. It also compares the grazing and cut remove treatments on pasture response to phosphate. No results are available to date.

3. PASTURE SPECIES TRIAL

An area of 105 acres has been sown down to separate areas of each of six perennial grasses together with strawberry clover. The six grasses used are: Australian phalaris, Currie cocksfoot, Brignole cocksfoot, Kangaroo Valley rye grass, Colac rye grass and *Demeter fescue*.

The pastures have developed to a stage where grazing trials to determine which grass is the best for beef production can begin.

Extension activities

HERD IMPROVEMENT SCHEME

In 1964 Struan commenced a scheme to assist producers to obtain and use performance records as an aid to herd improvement. Advice is also given on techniques of management and selection.

OTHER EXTENSION ACTIVITIES

Numerous groups of farmers inspect the Centre. Bureau and other farmer meetings are attended.

Several carcass competitions have been judged. Farm visits are made when necessary and radio talks given as required.

In these ways information is given direct to producers.

Map of Struan

