# final report

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# Beef Production & Quality Trial on Old Man Saltbush

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## INTRODUCTION

The catalyst for this trial had been the experience of one of the members of the group, at Gulargambone in the Central Western Plains of New South Wales in 1993, with cattle in poor condition grazed on old man saltbush and then on green pastures and winter forage crop.

Fourteen of 62 cattle from a mob bought off the Queensland stock routes in March 1993 had averaged 312 kg when placed on a 6.8 ha plantation of old man saltbush in early April when conditions were also dry at Gulargambone. The same cattle weighed 50 days later had averaged 370 kg, a liveweight gain of 58 kg in 50 days of grazing of old man saltbush in which, after the first week, at a grazing rate equivalent to almost 10 beast per ha, there was no grass or herbage left in the paddock.

The 6.8 ha plantation of old man saltbush provided 3,100 cow grazing days, or 456 cgds per ha, equivalent to 1.25 beasts per ha year-long.

In the current trial 50 beasts, previously on green pastures, were weighed on 28/4/94 and placed with other cattle of similar age classes on three types of feed :-

(a) 10 beasts on native pastures (with indigenised medics),

(b) 30 beasts on a plantation of old man saltbush,

(c) 10 beasts on old man saltbush plus grain (oats) at an estimated 3 kg per day provided through a self-feeder able to ration the supply of grain to the cattle.

The groups of cattle on the three feed types have been weighed on six occasions since the initial weighing on 28/4/94 -- on days 29, 56, 90, 125, 165 and 193 days after the initial weighing --- the final weighing being on 8th. November, 1994

It had been proposed that two lots of 10 of the thirty beasts on old man saltbush would later be moved to a green feed crop or green pasture after different periods of grazing on the old man saltbush. However, there had not been sufficient rain in the latter half of 1994 in the Gulargambone district to warrant sowing a green feed crop nor to produce any green pasture, although the cattle had come off green pasture at the beginning of the trial.

Seasonal conditions throughout the trial have been such that the cattle on the native pastures (with indigenised medics) after gaining weight at the second and third weighings, had lost weight badly at the fourth weighing as the pastures dried off, even though they had been moved to a new paddock of fresh pasture. The owner became so concerned with their declining condition that he decided to feed hay to prevent them from deteriorating further and to enable them to maintain condition.

## A. FIELD STUDIES -- WEIGHINGS

The results of the weighings are shown in Appendix 1, each beast being denoted by an ear-tag number and a brief description, and the feed type to which it was allotted. Figs 1 and 2, and the tables from which they had been derived, summarise the results, these being discussed briefly below. The grazing history of each group is discussed in Section B below.

**TABLE 2a**

### Average Weights Kg

| | MAY | JUN | JUL | AUG | SEP | OCT | NOV |
|---|---|---|---|---|---|---|---|
| SALTBUSH | 327 | 315 | 305 | 320 | 334 | 343 | 348 |
| PASTURE | 347 | 358 | 363 | 342 | 353 | 352 | 352 |
| SALTBUSH\GRAIN | 367 | 377 | 385 | 413 | | | |

Appendix 2 expresses the results in Table 2a in graph form, showing the average weights for each group at the initial and subsequent weighings. It will be seen that the cattle on saltbush plus grain made fair weight gains -- from an initial 367 kg to 377 kg, 385 kg, and 413 kg at each weighing, a total weight gain of 46 kg in the 125 days of drought.

The group of 30 beasts on saltbush showed a 22kg drop in weight over the two weighings to 23/6/94, but then began to gain weight, putting on 43 kg over the remaining 137 days to 7/17/94 -- a slightly better (but non-significant) weight gain per day of 0.39 kg per day compared with the saltbush plus grain group at 0.37 kg per day over 125 days.

Looking back to the immediate gain in weight by the Queensland cattle on saltbush only in 1993, and the loss in weight over the first two weighings in this group, it would seem that the cattle coming off good quality green feed have not appreciated the change to saltbush, it usually takes cattle (and sheep) not used to saltbush several days to realise that the saltbush is there to be eaten. In contrast, it would appear that the Queensland cattle, which were poor and hungry, were able to go straight on to the saltbush to their considerable advantage, and subsequently had no problems moving from saltbush to green feed.

Another likely reason for the initial loss in weight for the Saltbush Only group was the fact that the 30 tagged and weighed cattle in this group were introduced to only old man saltbush after having very good green feed. Two weeks prior to the trial cattle being put onto the saltbush, 85 cattle had been purposely put in the trial paddock to clean up the grass and herbage, leaving nothing other than old man saltbush for the 30 tagged and weighed cattle to eat.

It should be noted that the cattle on saltbush only began to pick up in weight, when those on pasture lost weight due to the poor feed available from the dry pasture. The saltbush cattle also finished the trial heavier than the grass cattle did when compared to their starting weights.

It would seem from this result that the cattle on saltbush only put on good weight while the saltbush was making vigorous growth over the spring months. In the absence of rain to keep fresh growth coming on, the cattle on saltbush managed to maintain weight gain and remain in very good health.

The group of 10 beasts on native pastures gained weight for the first two subsequent weighings while the pasture feed was still reasonably nutritious, but then fell away to below the initial weight by the third weighing, even though they had been moved to a fresh paddock immediately after the June weighing. Pasture quality and quantity continued to deteriorate rapidly in the absence of effective rain to such a point that the owner become concerned about the well being of these animals. They looked so poor in appearance that the owner decided he had to supplement the cattle with hay rather than take the risk of possible death or a serious loss on them.

With continued hay supplementation, these animals picked up 11 kg from their June low and have managed to maintain weight to the November weighing but were still well below the July peak and only marginally ahead of their first weighing.

There are two other points to be made which don't show up in Appendix 1 or Table 2a.

(1) The cattle on pasture not only lost weight, but became very listless and with dull coats compared with the bright coats, bright eyes and active gait of those on the 2 saltbush treatments. The cattle on pasture picked up with the hay suppl-ement but were still well behind the others in general health and appearance.

(2) Under the drought conditions prevailing, native pastures had virtually disappeared from the district, landholders all around were hand-feeding sheep and cattle, or had them away on agistment. A further observation was that over the 3-4 days of very strong winds (4-7/11/94), dust was blowing off all native pasture paddocks, but the saltbush paddocks were free of blowing dust, even the leaf-less condition in to grazed saltbush paddocks providing enough cover to prevent wind lifting dust off the soil surface.

**STOCKING RATES** (Appendix 3)

These show stocking rates in beasts per hectare in relation to grazing time. The cattle on the saltbush, plus grain at 3kg/day, have been grazed at 10 beasts per ha for the four months that they were on the saltbush. The saltbush plantation which they came out of on 27/7 would have been ready for grazing again as from lst March, and been able to provide good green feed even if there had been no further rain.

Those on saltbush only, started off at 7.1 beasts per ha. All other cattle apart from the 30 trial cattle were removed which then left a grazing rate of 3 beasts per hectare. It must be pointed out that this stocking rate was too light a rate to enable the saltbush to be grazed to defoliation over two to three months as is normally required.

The cattle on native pastures were started off at nearly one beast per hectare while the feed was green and growing. As feed diminished the stocking rate had to be reduced to 0.25 beasts per hectare and even this stocking rate was too heavy to be sustained as it was necessary to supplement this group with hay to prevent them from deteriorating too much.

**DOLLARS RETURNED PER HECTARE** (Appendix 4)

This shows the true wealth aspect from any livestock operation when the return per hectare is evaluated. In this trial the stocking rate, weight gain and liveweight value of the animal were factored in.

Again the saltbush and grain produced the greatest dollar gain per hectare, peaking at $834 for August. Next was the straight saltbush block with a high in May of $463 per hectare due to the very high stocking rate. This paddock ended the trial with a dollar return rate of $208 per hectare. The pasture return was at its best in June at $64 per hectare and then declined to $17 per hectare in November.

The saltbush and grain produced nearly a 50 fold increase in earning capacity (no costing has been put on the grain at 3kg per day) over pasture while the straight saltbush produced a 12 fold increase in dollar earnings per hectare over pasture.

**TABLE 2 B** **Difference To Previous Weighings per Day**

| | MAY | JUN | JUL | AUG | SEP | OCT | NOV |
|---|---|---|---|---|---|---|---|
| SALTBUSH | 0 | (0.4) | (0.34) | 0,36 | 0.52 | 0,20 | 0.15 |
| PASTURE | 0 | 0.4 | 0.17 | (0.63) | 0.33 | 0.19 | 0.03 |
| SALTBUSH\GRAIN | 0 | 0.35 | 0.32 | 0.82 | | | |

This table has been prepared to show the daily weight gains between individual weighings. The best daily weight gain was with the saltbush plus grain group at 0.82 kg per day in the 34 days to 27/7/94. The saltbush only group gained 0.52 kg per day over the 35 days to 31/8/94.

## DISCUSSION.

The most significant feature of the trial has been that the cattle on saltbush plus grain have been able to reach the 400 kgs required for sale to an abattoir or feedlot during drought and within 109 days. This has been achieved at a time when cattle on pastures lost condition because of the poor feed caused by the drought conditions.

Seasonal conditions, and the absence of green feed or forage crops have forced a change in the direction of the trial in that it has not been possible to have treatments involving green pasture feed or green feed crop following saltbush as originally intended.

It would seem from the results from the saltbush-only cattle, in which weight gains were at the rate of 0.52 kg per day, after falling away when they first came on to the saltbush and then tailing off after the October weighing, that the producer aiming to use saltbush for conditioning and putting on weight needs to keep a close eye on how the cattle are doing -- and be ready to supplement with green pasture or crop feed, dry pasture feed or hay or grain in order to keep weight gains moving positively.

Results (without weighings) on other properties within the saltbush grazing group suggest that the most effective weight gains could be had when cattle have access to both saltbush and either green or dry other feed. It had been hoped to have one group of the saltbush-only cattle move on to saltbush plus hay, but hay supplies on the property, and in the district generally, had been depleted and were needed urgently elsewhere to keep stock alive during the drought conditions then prevailing.

## B. CARRYING CAPACITY CONSIDERATIONS.

As it has done elsewhere, the saltbush has demonstrated its ability to carry a lot of animals for a short time. Figure 2 and Table 3 show the carrying capacities used in each case.
To gain some idea of actual carrying capacity in cow grazing days per ha per annum (so that it can be compared with other sources of fodder) the grazing history of each group has been detailed hereunder.

### (a) Native Pasture Group

In this group there were 100 head of cattle, 10 cattle being tagged and weighed throughout the trial. This 100 head were placed on 100 ha of drying off native pasture for 56 days (till 23/6/94. They were then moved into another 100 ha of dried native pasture, losing weight markedly at the August weighing and being supplemented with hay from then on to help them maintain condition. The drying feed in the first paddock provided 56 Cgds pha. On the drier feed in the second paddock, these cattle had to be supplemented
to maintain weight.
The native pastures in this district are rated at about 1.8 sheep per ha, able to provide 1.8 x 365 = 657 sheep grazing days per ha per annum, equivalent to about 66 cow grazing days (Cgds) pha pa -- perhaps getting to 100 Cgds pha pa in a very good year.

### (b) Saltbush Only Group

There were 85 head in the saltbush only paddock of 16 ha for two weeks , these cleaning up all the grass and herbage which would have been in the rows between the saltbush. The 30 head of trial cattle were then brought in after the initial weighing, having come off green pasture. Because the other cattle had cleaned up all the grass and herbage, these latter cattle had to go straight on to saltbush without any transitional feed. It is probable that they refused to eat the saltbush for a few days, this and the need to adjust to the purely saltbush diet accounting for the loss in weight to the weighing on 27/7/94.

The 115 head spent 56 days in the 16 ha -- at a rate equivalent to 7.2 cows (x 0.8 DCEs#) = 5.8 DCEs per ha for 56 days
= 325 Cgds pha pa

# These "Cows" need to be adjusted for size to 0.8 DCEs.

But this paddock of old man saltbush will be ready for grazing again at about six months after taking the cattle out. If we allow a factor of 1.3 for the proportion of the extra grazing available over the twelve month period, total productivity of this saltbush only paddock would be about 325 Cgds x 1.3 = 420 Cgds pha pa -- equivalent to 11.64 sh/ha year long.

After the 115 cattle had eaten out the above saltbush paddock, the thirty head from the trial were placed in a new 10 ha saltbush paddock at the rate of 3 per ha. It will be noted that they immediately began to pick up in weight, probably because there was some grass (although very dry by this time) amongst the saltbush. These cattle stayed on this paddock until the end of the trial.

The thirty cows (at 0.8 DCEs = 24 DCEs) on 10 ha is equivalent to 2.4 DCEs pha for 137 days = 329 Cgds, which x 1.3 = 428 Cgds pha pa -- very close to the preceding paddock.

There is a further point to be considered in relation to this group. Reference to Appendix 1 shows that they slowed in putting weight on after the October weighing. It is considered that this was because they spent too much time walking in cleaning up the last of the saltbush -- to obtain the desired complete defoliation to maintain maximum vigour in the subsequent growth.. Normally they should have been on there long enough to clean up the saltbush in no more than 60 days -- requiring 30 x 137 / 60 = 68 cows instead of 30. This point provides another consideration in managing cattle on saltbush.

**(c) Saltbush plus Grain Group**

This group of 57 head (of which 10 were tagged and weighed) were on an area of 5.7 ha for 90 days, being also supplemented with 3 kg of oats per head per day. By that time they had put on 46 kg to reach an average of 413 kg and were taken off for slaughter -- having left quite a lot of saltbush foliage unused.

The 57 head (x 0.8 DCEs = 46 DCEs) for 90 days = 4140 Cgds on 5.7 ha = 726 Cgds pha.

The paddock was spelled for a month and another 50 cattle brought in, also being supplemented with 3 kg of oats per head per day. These were n the paddock for 9 weeks to clean up the saltbush. The 50 head (x0.8 DCEs = 40 DCEs) for 63 days = 2520 Cgds on 5.7 ha = 442 Cgds.

The per hectare value of the saltbush was calculated for the original 57 head having put on an average of 46 kg sold at $1.40 per kg for a total value of $3670 of meat added. From this, the cost of the grain needs to be subtracted
57 head x 3 kg = 171 kg per day for 90 days = 15,390 kg at $140 per tonne = $2150 for the 57 head sold.

This leaves a balance of $1,520 from 5.7 ha of saltbush equivalent to $267 per ha for that grazing. If the subsequent grazing in that saltbush paddock is then allowed for in proportion to the Cgds which the cattle spent there on each occasion, the per hectare return becomes $267 x 726 / 442 Cgds = $438 per ha.

Given that the above value determinations are based on the use of some assumptions, the determined value per ha needs to be regarded as potential earning capacity with beef cattle. Given also that these stands of saltbush have more than recovered their cost of establishment from previous grazings, a return of $438 pha every year is about three times the gross margin return possible from a 2-tonne pha crop of wheat -- which, in any case could not have even been sown in 1994, but, the cost of land preparation would have been a loss.

If the cost of establishment of the saltbush plantation is discounted at 8 per cent for evermore, the $64 from $438 leaves an annual gross margin of $374 -- over 2.5 times the gross margin possible from a 2-tonne per ha crop of wheat.

**Comparisons with other forage sources.**

The above forage yields from old man saltbush can be compared with forage crops as sources of forage -- but it needs to be kept in mind that it was not possible to grow a dryland winter forage crop in 1994.

In many areas of the western plains it was not possible to sow an irrigated winter forage crop either in 1994. There are many occasions on properties when it is not possible to grow a green feed crop because it is either too dry or two wet.

A dryland winter forage crop such as green feed oats or barley, in an area with an average annual rainfall of 500 mm, will provide about 140 Cgds of grazing pha (information from NSW Agriculture Department), perhaps to 200 Cgds if seasonal conditions are really favourable. A dryland summer forage crop such as sweet sorghum will provide about 200 Cgds pha, perhaps to 300 under very favourable seasonal conditions.

The above values of 420 Cgds from dryland old man saltbush, under conditions of severe drought when all pasture feed had dried off, (and lucerne in nearby paddocks had lost all leaf) was at a time when the old man saltbush was making active growth. This suggests that the old man saltbush as a feed source is about 3 times as good as winter forage crops, and about twice as good as summer forage crops for providing green feed. The big plus with old man saltbush, which was more than amply shown, is quality feed is available at any time of the year under any weather conditions. All that is needed is to make sure that there is 6 - 8 months recovery time between grazings.

The old man saltbush generally is twice as high in protein as cereal crops. However, the saltbush is (relative to protein levels) low in metabolizable energy although it is equivalent per unit volume to green feed crops, green pasture and grain. The high energy makes the old man saltbush an excellent maintenance and drought reserve diet, for which it has a well-established reputation. But for the purpose of putting on weight, an extra source of energy is required so that metabolizable energy in the total diet matches that of the protein available.

When old man saltbush is used as a resource for putting on weight, it would seem that care is needed to ensure :--

(a) that cattle going on to saltbush for the first time need to come off dry feed to be able to make the best adjustment to the saltbush (see paragraph three of Introduction),

(b) Cattle which have been on saltbush previously, will take to it readily and are able to get enough from the relatively small amount of non-saltbush feed to be able to adjust quickly. However, this is appropriate only to breeding cows, not normally to cattle being conditioned for sale.

(c) The cattle on saltbush alone showed that they were able to put on weight when there was plenty of saltbush ahead of them, with a small ration of other feed.

(d) Cattle using up the last of the forage in a saltbush plantation need to be stocked heavily enough to be able to take the last leaf out quickly. When saltbush blocks are stocked at the correct rate, this does not present a problem.

(e) To encourage cattle on saltbush to put on weight, the best strategy would appear to, firstly, move them off dry feed on to the saltbush, and supplement with hay or grain, or have a pasture of dry feed, or stubble in an adjoining paddock -- and to finish on green pasture or a green feed crop. If the latter is not available due to seasonal conditions, finish off on fresh saltbush with access to dry feed or stubble.

## C. CARCASE TESTING

### 1. Abattoir results

A Hereford beast from each of the three groups was killed at the Mudgee Regional Abattoir on 8th November, 1994, the animals being selected as the best animal of its bread available from each group. The animal selected from the pasture group, later supplemented with hay, was the only one considered near suitable for killing out of the total of 50 animals. The saltbush only group had six animals considered suitable for killing out of a total of 30. In the saltbush grain group all were judged to be in a suitable condition for killing, having been grazed on saltbush with a grain supplement for nine weeks.

The sample number from the saltbush only paddock was No. 143, those from the pasture plus grain and from pasture only not having been among the weighed animals.

Live weight, dressed weights and fat measurements made available by the abattoir were as set out in the table below.

| Animal | Live weight | Dressed weight | Per cent D.wt/Lv wt | Fat Mzmt |
|---|---|---|---|---|
| A. Pasture | 380 kg | 182kg | 48% | 2 mm |
| B. Saltbush only | 361 kg | 178 kg | 47% | 4 mm |
| C. Saltbush + Grain | 302 kg | 160 kg | 53% | 1 mm |

## 2. Butcher's comments

Having been hung for 10 days, the meat was then cut up by a Narromine butcher. He provided the following comments.

Based on their look when hung -- considering the way it looked, its colour, the ease of cutting and the tenderness of the eye muscle -- he rated the carcases as follows

A. Pasture only 5/10

B. Saltbush only 9/10

C. Saltbush + grain 8/10

He was surprised at the condition of the meat on the saltbush only animal, being such a well-muscled animal but with so little fat. It was his view that the saltbush only animal would be the best for eating. He considered the meat as good as would be expected from a pasture-fed animal in a normal season with plenty of green feed available.. The low fat measurement puzzled him in view of the condition of the muscle. But this matches the long-known condition of mutton fed on a saltbush diet.

He reported that both the saltbush animals hung well, but after 10 days, the pasture (and hay)-fed animal was at the end of its hanging life, the meat was quite sticky and needed to be cut up and frozen straight away. The pasture (plus hay) animal was a typical drought-affected animal which the butcher would not have bought for killing. When he does get one a beast like this, it is normal for it have a short "shelf-life" and so has to be moved quickly.

He considered that the saltbush + grain animal should have been left longer before killing. Again the good condition of the animal in relation to the low fat score puzzaled him

## D. TASTE TESTING.

The taste testing was conducted on Saturday 20th November, with a gathering of 32 people, 12 townspeople and 20 from rural holdings. Observations prior to cooking were made by four people with meat experience and came to the following consensus.

Sample A (pasture only) was darker in colour and not as tender.

Sample B (Saltbush only) was redder in colour and was the most tender to touch.

Sample C (Saltbush + grain) was a dark greyish colour and tender to touch

The same identical piece of rump from each animal was selected for the taste test. The three pieces of meat, labelled A, B and C, were cooked for a total of 6 mins on the one gas barbecue plate and then cut into equal-sized cubes. These were placed on three plates marked A, B and C as above.

All participants were given a questionnaire sheet to score the meat and took three pieces of each sample, they were instructed on the three characteristics to taste for and to comment on the sample they preferred. They were asked to give a ranking of one to five for flavour and tenderness, the juiciness of the meat being labelled as moist or dry.

The results from the questionnaire were as follows

| SAMPLE | FLAVOUR | TENDERNESS | JUICINESS | PREFERRED SAMPLE |
|---|---|---|---|---|
| A. PASTURE ONLY | 3 | 0 | Dry | 4 |
| B. SALTBUSH ONLY | 15 | 16 | Moist | 14 |
| C. SALTBUSH + GRAIN | 14 | 16 | Moist | 14 |

**Discussion of taste testing.**

The pasture only sample tested very poorly as could be expected from the butcher's comments and the fact that it had not been on green feed for several months, although it had been fed hay to maintain condition. The two saltbush animals were well ahead but proved there was little difference between them when assessed on eating quality.

## E. MEAT SAMPLING TESTS

Samples of a piece of rump steak were sent to Mr. David Hopkins, Senior Livestock Research Officer (Meat Science) with NSW Agriculture Department at Cowra Research Station for testing. A copy of his report, with explanations as to the symbols at the heads of the three final columns is attached as Appendix 5.

These tests showed up no significant differences in pH, tenderness and per cent loss in weight on cooking, likewise in measuring lightness and darkness. It seems that Sample C (Saltbush plus grain) was less red than other samples, as was Sample A (Saltbush only) in relation to Sample C (Pastures). The same order applied in respect of relative yellowness, with Sample C. being yellower than the other two.

Mr. Hopkins warns that these results cannot be used to credibly endorse any treatment over another, explaining that it would be necessary to have samples from 20 beasts to be able to determine significant differences. However, the numbers in the latter two tests confirm the expectations in respect of relative redness and yellowness.

## GENERAL DISCUSSION OF RESULTS

This trial has shown up the difficulty of endeavouring to present three comparable animals for meat sample tests and tasting. Had seasonal conditions stayed favourable, there was the problem of animals from various treatments being ready for killing at different times, whereas for meat and taste testing, the animals need to be delivered to the abattoir on the same day, via the same transport, and processed on the same chain, hung for the same time and frozen for the same time -- so that all antecedent conditions are as identical as possible. The difficulty here is having animals from different treatments ready for killing at the same time.

The main consideration for the future will be to find the best combination of saltbush and other forages to get the animals from a base weight up to a suitable killing weight, this being 400 kg or above for the weaner animals.

The field trials, although unsuccessful in achieving the original objectives because of deteriorating seasonal conditions, have, nevertheless, brought out several important considerations of value to the members of the group.

*THE GROUP NEEDS TO DECIDE WHETHER TO PURSUE SOME OR ALL OF THE ORIGINAL OBJECTIVES FURTHER. THE MAIN CRITERION WILL NOT BE SO MUCH THE DIFFERENCES IN WEIGHT GAINS BETWEEN THE TREATMENTS BUT THE BEST COURSE OF ACTION TO GET A GROUP OF ANIMALS FROM A CERTAIN WEIGHT UP TO THE REQUIRED WEIGHT FOR SALE.*

From previous experience (McKellar at Condobolin and Hunter at Gulargambone), old man saltbush only has shown itself capable of putting on weight from 0.5 to 1.0 kg per day.

It was considered by all involved in the trial that old man saltbush has a special ability to supply high protein feed and provide succulent green leaf at a time when few other plants could. From the trial it has shown clearly that this plant can create a feed reserve to carry a lot of cattle and build them up at a time when normal pastures would be totally depleted. It was also felt by the group that considerably more grazing and management flexibility for a property was supplied by the bush than could be assessed fully in the trial as structured.

Appendix 1

SALTBUSH GRAZING TRIAL: ROGER HUNTER

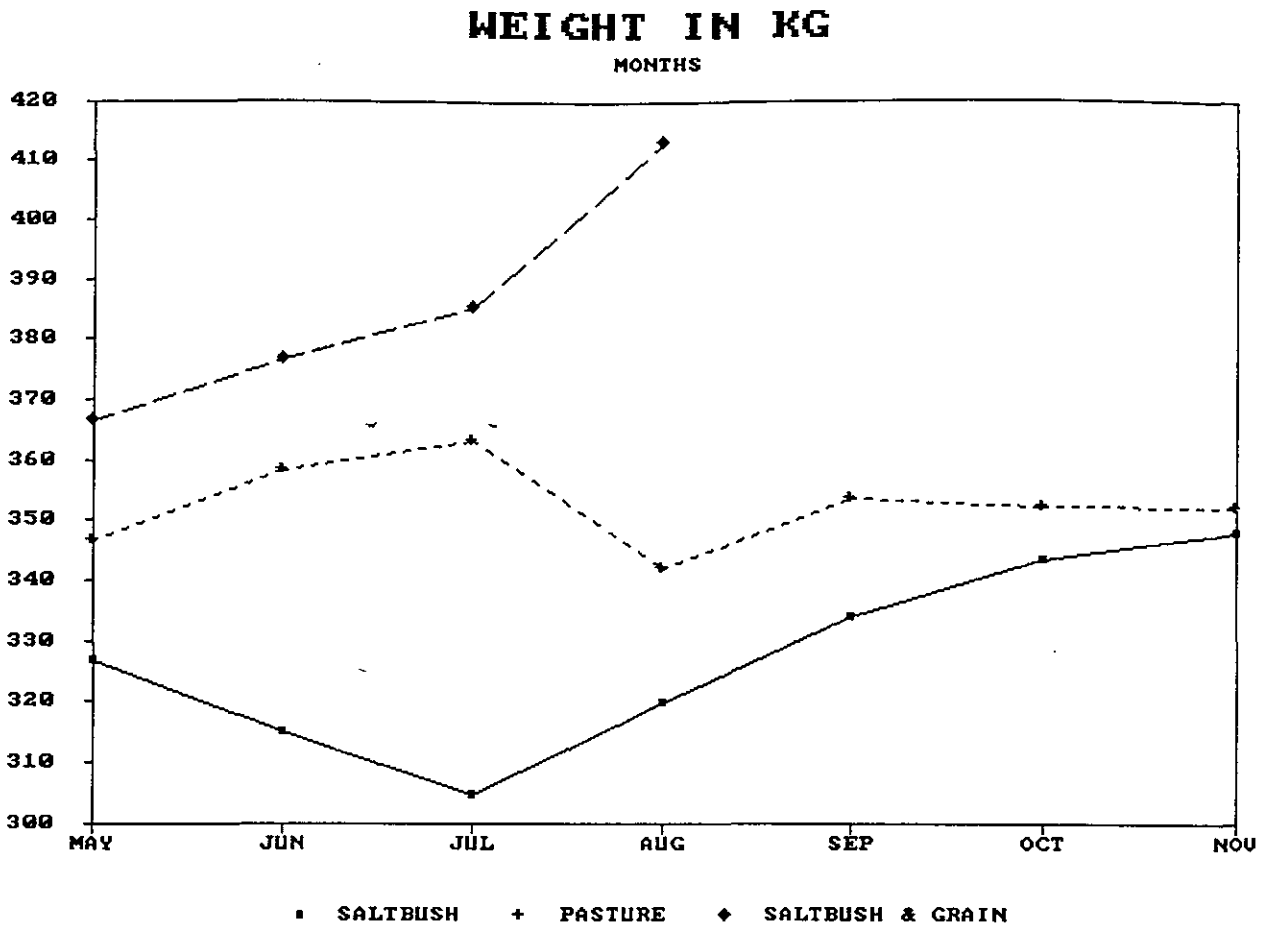
DATE STARTED 28/4/94

| TRIAL DAYS | 0 | 29 | 56 | 90 | 125 | 165 | 193 | | |
|---|---|---|---|---|---|---|---|---|---|
| | 28/4 | 27/5 | 23/6 | 27/7 | 31/8 | 10/10 | 7/11 | | |
| No | WGHT | WGHT | WGHT | WGHT | WGHT | WGHT | WGHT | PADDOCK | COMMENTS |
| 121 | 321 | 309 | 294 | 306 | 319 | 335 | 338 | SB | BLACK BALDY |
| 122 | 287 | 273 | 267 | 290 | 297 | 303 | 311 | SB | LIGHT BONE M\GREY |
| 123 | 283 | 278 | 271 | 281 | 299 | 306 | 319 | SB | M/GREY |
| 124 | 360 | 374 | 380 | 350 | 377 | 385 | 390 | P | M/GREY |
| 125 | 350 | 334 | 329 | 348 | 357 | 375 | 381 | SB | BLACK BALDY |
| 126 | 312 | 308 | 317 | 344 | 353 | 364 | 378 | SB | ABADEEN ANGUS |
| 127 | 355 | 353 | 348 | 331 | 330 | 345 | 348 | P | HEREFORD |
| 128 | 325 | 330 | 334 | 323 | 335 | 368 | 363 | P | M/GREY X |
| 129 | 358 | 342 | 328 | 357 | 371 | 355 | 380 | SB | AB/ANGUS X |
| 130 | 368 | 352 | 340 | 352 | 372 | 368 | 374 | SB | AB/ANGUS X |
| 131 | 330 | 319 | 311 | 321 | 324 | 342 | 342 | SB | HEREFORD |
| 132 | 363 | 375 | 380 | 362 | 363 | 382 | 390 | P | HEREFORD |
| 133 | 313 | 308 | 294 | 315 | 338 | 355 | 356 | SB | M/GREY X |
| 134 | 364 | 369 | 374 | 406 | | | | SBG | HEREFORD |
| 135 | 343 | 357 | 365 | 387 | | | | SBG | AB/ANGUS X |
| 136 | 387 | 404 | 413 | 374 | 398 | 403 | 398 | P | AB/ANGUS |
| 137 | 378 | 369 | 359 | 362 | 368 | 397 | 399 | SB | BLACK BLADY |
| 138 | 340 | 324 | 315 | 329 | 340 | 349 | 354 | SB | BLACK BALDY |
| 139 | 327 | 311 | 303 | 305 | 318 | 341 | 345 | SB | HEREFORD S/H |
| 140 | 328 | 313 | 307 | 306 | 326 | 340 | 342 | SB | HEREFORD X |
| 141 | 349 | 359 | 362 | 390 | | | | SBG | HEREFORD X |

| | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 142 | 385 | 393 | | 404 | | | 400 | | | | | | | | | SBG | AB/ANGUS X |
| | 143 | 348 | 337 | | 322 | | | 345 | | | 347 | | | 351 | | | 361 | SB | HEREFORD X |
| | 144 | 371 | 381 | | 392 | | | 430 | | | | | | | | | | SBG | BLACK BALDY |
| | 145 | 330 | 314 | | 292 | | | 327 | | | 338 | | | 372 | | | 376 | SB | M/GREY |
| | 146 | 374 | 367 | | 373 | | | 375 | | | 374 | | | 376 | | | 387 | SB | BLACK BALDY |
| | 147 | 380 | 391 | | 403 | | | 420 | | | | | | | | | | SBG | SHORTHORN |
| | 148 | 387 | 369 | | 360 | | | 351 | | | 366 | | | 374 | | | 375 | SB | BLACK BALDY |
| | 149 | 316 | 329 | | 338 | | | 313 | | | 333 | | | 335 | | | 331 | P | HEREFORD |
| | 150 | 316 | 307 | | 300 | | | 336 | | | 352 | | | 371 | | | 372 | SB | BLACK BALDY - DAI |
| | 151 | 332 | 353 | | 366 | | | 340 | | | 363 | | | 370 | | | 369 | P | M/GREY X |
| | 152 | 360 | 374 | | 386 | | | 355 | | | 370 | | | 380 | | | 382 | P | AB/ANGUS |
| | 153 | 368 | 361 | | 358 | | | 350 | | | 365 | | | 372 | | | 378 | SB | BLACK BALDY |
| | 154 | 318 | 310 | | 291 | | | 315 | | | 340 | | | 354 | | | 358 | SB | M/GREY X |
| | 155 | 291 | 287 | | 280 | | | 287 | | | 300 | | | 304 | | | 304 | SB | HEREFORD |
| | 156 | 318 | 306 | | 293 | | | 312 | | | 329 | | | 319 | | | 322 | SB | M/GREY |
| | 157 | 275 | 270 | | 268 | | | 286 | | | 303 | | | 322 | | | 328 | SB | M/GREY |
| | 158 | 364 | 378 | | 396 | | | 425 | | | | | | | | | | SBG | M/GREY |
| | 159 | 384 | 397 | | 401 | | | 406 | | | | | | | | | | SBG | HEREFORD |
| | 160 | 318 | 328 | | 335 | | | 324 | | | 340 | | | 348 | | | 349 | P | HEREFORD |
| | 161 | 305 | 293 | | 277 | | | 286 | | | 301 | | | 315 | | | 318 | SB | M/GREY |
| | 162 | 321 | 314 | | 290 | | | 317 | | | 333 | | | 333 | | | 329 | SB | HEREFORD |
| | 163 | 278 | 262 | | 255 | | | 276 | | | 290 | | | 308 | | | 312 | SB | M/GREY |
| | 164 | 294 | 279 | | 273 | | | 287 | | | 303 | | | 306 | | | 307 | SB | M/GREY |
| | 165 | 372 | 381 | | 388 | | | 445 | | | | | | | | | | SBG | HEREFORD |
| | 166 | 330 | 311 | | 301 | | | 324 | | | 353 | | | 350 | | | 349 | SB | M/GREY |
| | 167 | 361 | 352 | | lost tag | | | | | | | | | | | | | SB | BLACK BALDY |
| | 168 | 354 | 360 | | 367 | | | 421 | | | | | | | | | | SBG | HEREFORD |
| | 169 | 350 | 363 | | 350 | | | 345 | | | 325 | | | 328 | | | 330 | P | HEREFORD |
| | 170 | 289 | 270 | | 264 | | | 281 | | | 305 | | | 298 | | | 296 | SB | HEREFORD |

Appendix 2



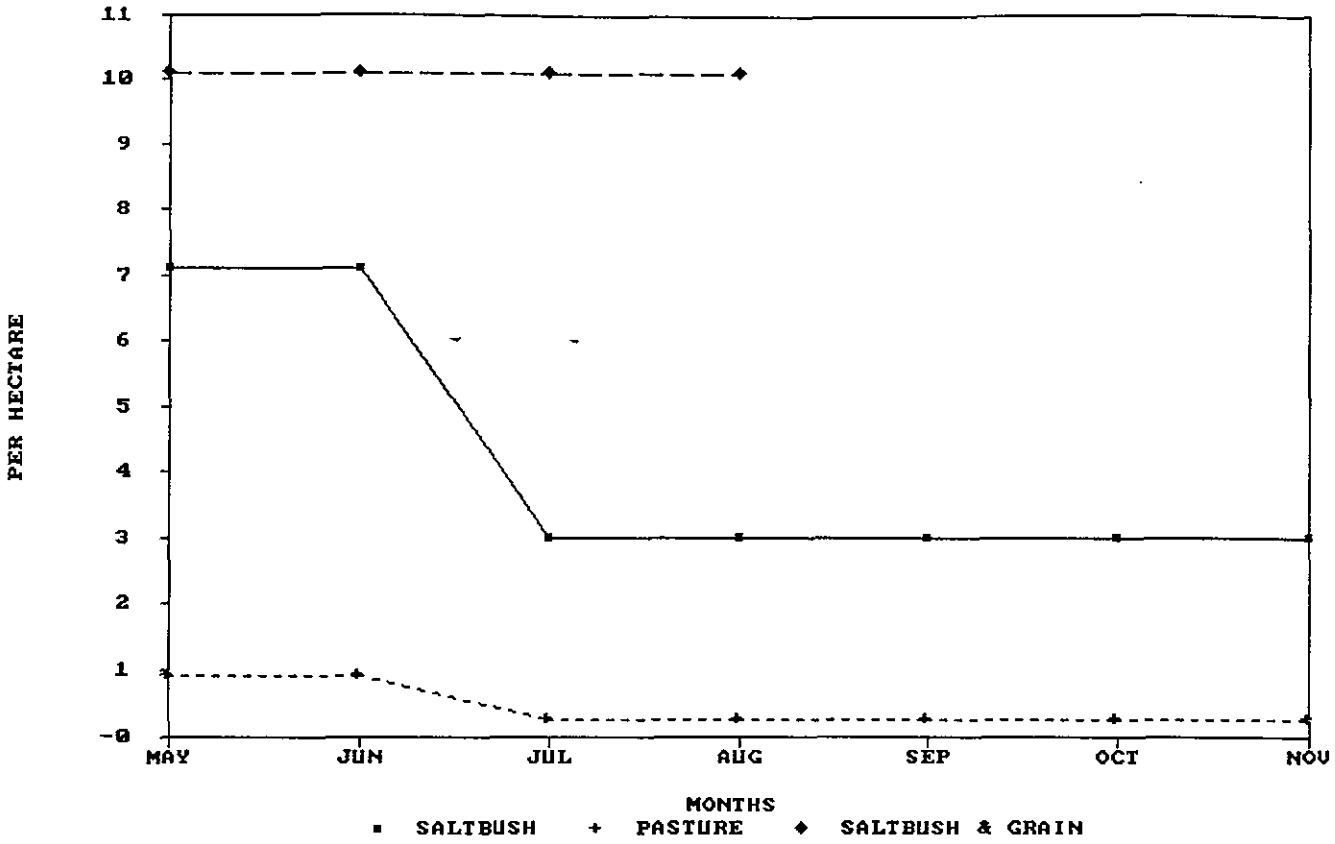

WEIGHT IN KG
MONTHS
420
410
400
390
380
370
360
350
340
330
320
310
300
MAY
JUN
JUL
AUG
SEP
OCT
NOV
SALTBUSH
PASTURE
SALTBUSH & GRAIN

Appendix 3



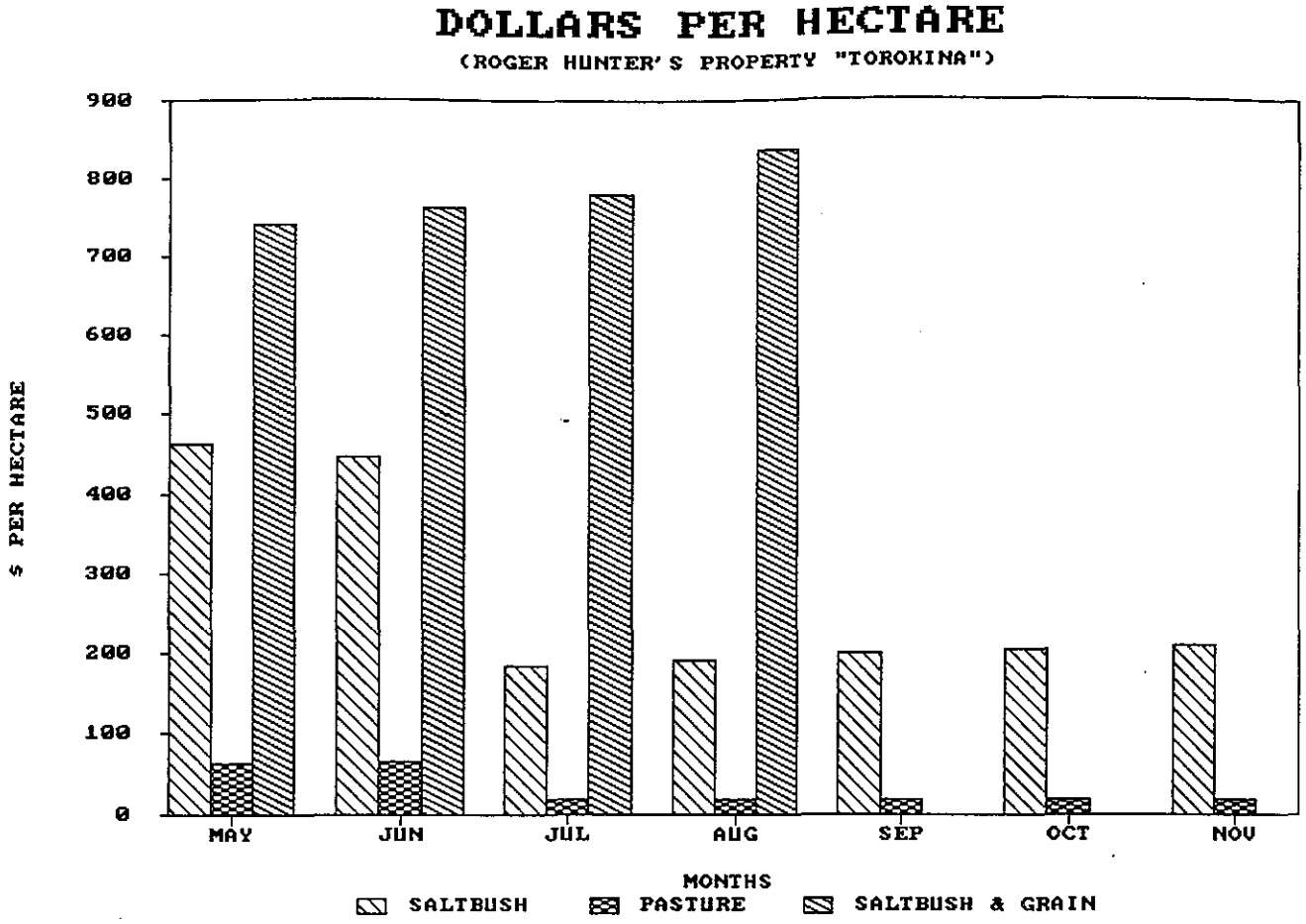
# STOCKING RATE PER HECTARE

ROGER HUNTER'S PROPERTY "TOROKINA"



Appendix 4





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PO Box 34
NARROMINE NSW 2821

16 December, 1994

APPENDIX 5. COPY OF REPORT FROM DAVID HOPKINS
SENIOUR LIVESTOCK RESEARCH OFFICER (MEAT SCIENCE)
NSW AGRICULTURE RESEARCH STATION, COWRA

Find the results for the 3 muscle samples you delivered below. The frozen samples were thawed at 6°C for 24 hours and then pH and meat colour measured (13 December 1994). The values are the average of 3 measurements.

| Sample | pH | Tenderness | Cooking loss % | L* RELATIVE LIGHT & DARK | a* RELATIVE REDNESS | b* RELAYIVE YELLOWNESS |
|---|---|---|---|---|---|---|
| A. SALTBUSH ONLY | 5.42 | 2.50 | 29.8 | 35.1 | 19.5 | 9.2 |
| B. NATIVE PASTURES | 5.62 | 2.20 | 29.4 | 36.5 | 22.4 | 11.0 |
| C. SALTBUSH & GRAIN | 5.55 | 2.20 | 30.4 | 35.5 | 16.4 | 8.2 |

Where A = loin from Body No. 2064R which weighed 88.6 x 2 = 177.2kg with a P8 of 4.0mm.

B = Loin from Body No. 2065L which weighed 91.6 x 2 = 183.2kg with a P8 of 2.0mm. (From the ticket ciphers this animal was older than the other 2 - YGS/M2.

C= Loin from Body No. 2063R which weighed 80.6 x 2 = 161.2kg with a P8 of 1.0mm.

These animals were slaughtered on the 8 November 1994 and I presume the carcasses were all treated similarly until sample collection and freezing.

Cooking loss is the average of 2 measurements for each sample and tenderness is the average of 14 measurements.

In terms of pH all 3 samples are within acceptable levels <5.80 and the colour measurements are also acceptable. It does seem that the sample C was less red (lower a* values) and this is



* P8 = Thickness of fat

probably a reflection of the lighter weight carcass from which it comes as this variable does tend to increase with weight/age.

All samples were very acceptable for tenderness and in fact at the lower end of the scale with values <5 being acceptable. This may indicate the samples were aged before freezing so I would be interested to know what the time period was between slaughter and freezing.

Overall the samples were acceptable and there is no indication of any significant differences between them.

I must stress that these results must be kept in context and they cannot be used to credibily endorse one treatment over another. A designed experiment with minimum numbers of samples per treatment is necessary before any conclusion can be drawn.

I trust you can follow the results and don't hesitate to contact me if you have any questions.

Yours sincerely

D L Hopkins
SENIOR LIVESTOCK RESEARCH OFFICER
(MEAT SCIENCE)

*C:\DATA\WPWIN\HOPKINS\SIPPEL.LET*