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**AN ANALYSIS  
OF LAMBING EWES THREE TIMES IN TWO YEARS IN SOUTHLAND.**

**A dissertation  
submitted in partial fulfilment  
of the requirements for the degree  
of  
Bachelor of Agricultural Science (Honours)  
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## SUMMARY

This study examines the management and profitability of three lambings in two years under Southland conditions, and how they compare with those of a conventional Southland farming system.

There has been little work done world wide but what overseas literature there is suggests that lambing ewes three times in two years (ie. a sustained 8 monthly lambing interval) is possible. It does however require the seasonal breeding nature of the ewe to be altered either by cross-breeding, selection, use of the 'ram effect', exogenous hormones or a combination of the above.

There has been no work done in New Zealand on three lambings in two years, so overseas information and New Zealand data on autumn lambing has been used in this study.

To analyse the conventional and three lambings in two years farming systems, a feed profile model has been used to determine stock numbers carried and lamb production under each of the conception and feeding regimes studied. Feasibility of each system is dependant on average pasture cover remaining above the minimum required pasture cover (to achieve desire intakes) at all times.

Results from feed profiling showed that the winter and early spring is the critical feeding period, thus determining the stocking rate. The conventional system wintered 19.4 SU/ha under all grass and hay wintering. However the use of a high yielding winter feed crop was necessary to maintain a stocking rate of 13.6 SU/ha through winter for a multiple lambing system.

For the prices received in the 1988/89 year, the financial result is that there is a lower return for three lambings in two years than for a high producing conventional Southland farm

(\$76 000 vs \$92 000 cash farm surplus). Thus there are no financial benefits to the farmer to compensate for the additional risk, and labour and management requirements associated with such a system.

Even with price conditions which favour the multiple lambing system (ie lower wool prices and higher prices for lambs sold in winter) the return is only slightly above that of the traditional farms - A return that is too low to warrant lambing ewes three times in two years in Southland.

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## OBJECTIVES

This study examines multiple lambing and the associated management practices required for 3 lambings in 2 years on intensive prime lamb properties in the Southland region. Standard Class 7 Farm<sup>1</sup> is used as a base.

The objective of the study is to assess how management and profitability of lambing 3 times in 2 years compares with those of a conventional Southland farming system, both for 1988/89 economic conditions and for the immediate future. Management strategies that may suit 3 lambings in 2 years are discussed and a comparison of returns between a conventional farm and one employing three lambings in two years will be made.

<sup>1</sup> Based on the MAF Farm Class 7 - intensive Finishing systems in the South Island and Class 7 from the New Zealand Meat and Wool Board Economic Service (NZMWBES) - South Island intensive finishing properties.

## INTRODUCTION

Southland as a province is primarily dependant on pastoral farming for it's prosperity. The majority of the population is either involved directly in the primary sector or in servicing it. Agriculture and it's future are therefore critical for the continued well-being of the province.

Farming began in Southland in 1854 when the first land was purchased from the local Maoris. 450 sheep were then bought in through the whaling port of Riverton. In 1883 the first frozen meat shipment left the port of Bluff. It was 1885 however when the first freezing works opened and thus marked the start of the meat industry in Southland, allowing the change from primarily the production of wool. From these beginnings farming has grown in Southland. Today an area of 1.5 million ha is involved in agriculture, supporting over 8.9 million breeding ewes, and over 266 000 beef cattle as well as some cropping, deer and goats (Syme 1989 Pers Comm). Most farms are firmly established as sheep units with cattle carried to complement the sheep enterprise.

Southland has become an important agricultural province primarily because of the favourable climate for pastoral production. Although the soils are not naturally fertile, drainage and regular applications of lime and fertiliser (phosphate and potash) mean that well managed improved pastures are able to produce in excess of 15,000 kg DM/ha/yr (Hay and Baxter 1984) and support high stocking rates. Reliable rainfall (1500 mm/yr) is the main reason for the high annual pasture growth. Soils do not often dry out over summer. High pasture growth rates therefore occur from spring until autumn (from September until April growth rates are between 30 and 70 kg DM/ha/day).

The reliable summer pasture growth rates somewhat compensate for the very low winter growth rates of 5 to 8 kg DM/ha/day due to the low winter temperatures in Southland. Although seasonal variation in pasture growth rate is high the year to year variation is lower than many parts of New Zealand. Seasonal variations are able to be predicted and managed for.

In Southland as with all environments where sheep are run, the main limiting factor to sheep meat production is the lamb output per ewe on an annual basis, or as Blaxter (1968) expressed, the average lack of fecundity of the ewe. Wilson (1968) estimated ewes had a 'biological ceiling' of 5 lambs per ewe per pregnancy and a potential mean lambing interval of 6 months. Ewes at present are performing far below their biological capabilities for annual lamb production. Farmers with high levels of sheepmeat output, around 350 kg/ha (Aglink FPP 842), at present may achieve an annual figures of 2.0 lambs per ewe per year from highly fecund flocks. The achievable levels, if more than 1 lambing per year were to take place and using high fecundity ewes, may reach almost 4 lambs per ewe per year, a 100% increase.

There are two factors which influence annual lamb output per ewe and these may be able to be manipulated to increase lambs born per year. They are ;

1. litter size.
2. frequency of breeding.

It is the latter of these that is investigated in this study, by considering reducing the lambing interval to eight months and lambing ewes 3 times in 2 years. The effect this has on litter size is also investigated.

## LITERATURE REVIEW

### CHAPTER 1 REPRODUCTIVE POTENTIAL THROUGHOUT THE YEAR.

The maximum number of lambs born is decided by both the fertility and fecundity of the ewe over the year. Fertility can best be described as the capability of a ewe to become pregnant if mated with a fertile ram. Fertility status changes throughout the year. Fecundity may be expressed as the maximum number of progeny a ewe can have from one pregnancy. This is determined by the number of eggs released from the ovaries at ovulation, ie. ovulation rate (Averill 1959). Both fertility and fecundity vary throughout the year.

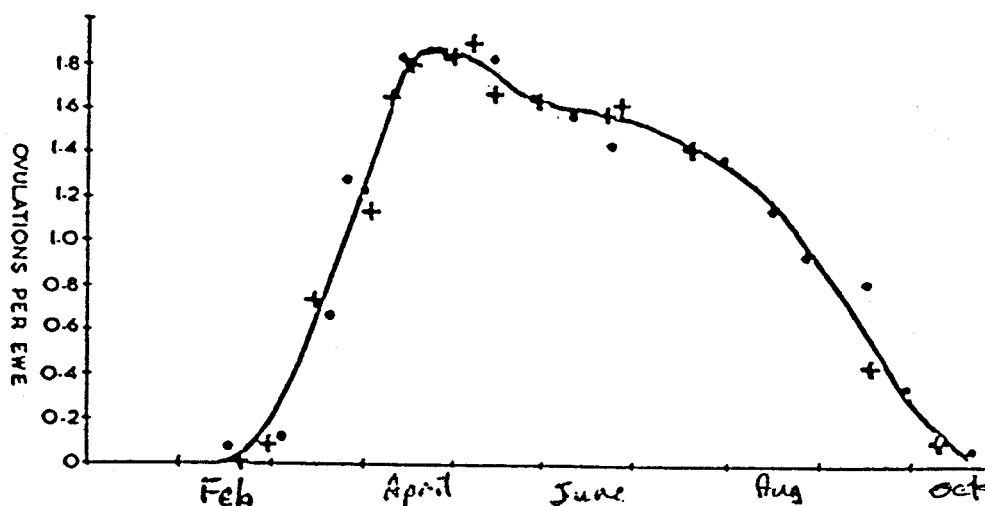


Figure 1.1: Ovulation rate throughout the breeding season per ewe ovulating.

(Source: Averill 1959)

Ovulation rate, varies over the breeding season. Averill (1959) stated that the average ovulation rate, for a flock of Romney ewes in Otago, rose from zero in early February to a peak of 1.85 in April, then slowly declined until September (figure 1.1). This trend was also found by Thompson et al. (1985). In practical terms this means that the highest numbers of multiple births would be achieved in flocks with an April mating or in the second or third oestrus of the breeding season (Thompson et al. 1985).

Ovulation rate may be modified by both the liveweight (static effect) and liveweight gain (dynamic effect) of the ewe at and prior to joining. Thompson et al. (1985) suggested that the dynamic effect was a maximum increase of 0.13 ovulations per 100 g/d liveweight increase in April. There is conflicting information as to the length the flushing period required before there is an increase in ovulation rate, but 17 days flushing appears to be the minimum period with pasture feeding (Hayman and Munro 1983). This may be as low as 5 to 6 days when flushing on high quality lupin grain (Oldham and Lindsay 1984). Gunn and Doney (1979) found that ovulation rate was positively related to body condition or body weight at mating. This finding is supported by many others (eg. Hunter 1968a, Montgomery et al. (1985).

The hormone Pregnant Mare Serum Gonadotrophin (PMSG) used in the breeding season can also increase the numbers of eggs shed at ovulation (Smith et al. 1989).

Fertility, as assessed by the exhibition of oestrus throughout the year has a distinct pattern. Averill (1959) found that in Otago less than 10% of the Romney ewes are cycling by the end of February, 50% had started by 19th of March, and all normal ewes were cycling by mid April. Cyclic ovulations continued between April and late August when the numbers of cycling ewes

decreased (figure 1.2). The decline continued until the end of September. Sporadic non-cyclic ovulations did occur in 2% and 8% (in the 2 years of the experiment) of the ewes in October and November.

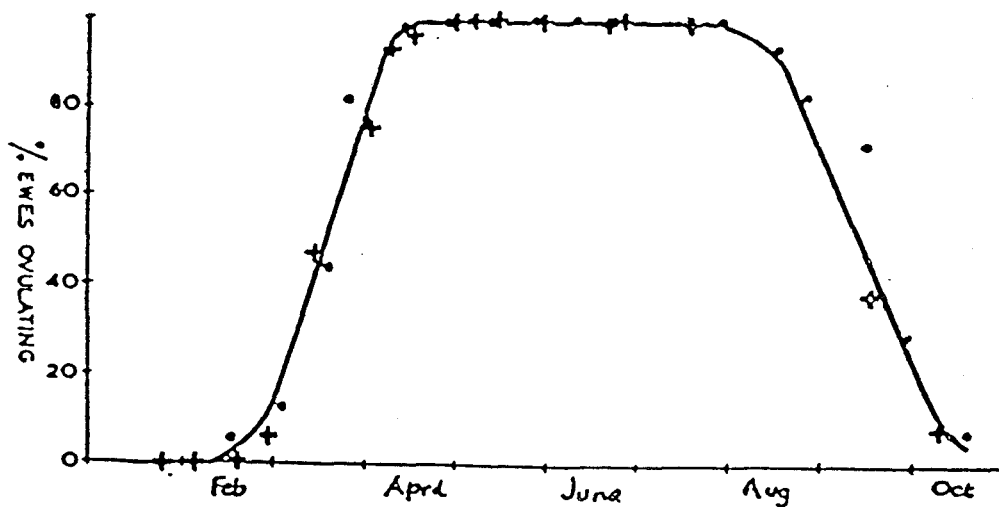


Figure 1.2: Ovulatory activity throughout the year in Romney ewes.

(Source: Averill 1959)

The time that ewes are fertile denotes the breeding season.

## CHAPTER 2 FACTORS CONTROLLING THE BREEDING SEASON.

Most ewes are seasonally polyoestrus with oestrus cycles generally commencing in late summer and early autumn. Oestrus cycles continue through until the start of spring unless pregnancy intervenes (Averill 1959, Gordon 1983). Initiation and cessation of the breeding season is under the control of several factors. These controlling factors are often interdependent and some, such as nutrition, are not fully understood as yet. The ram also is a seasonal breeder to an extent but the factors affecting its seasonality are not identical to those of the ewe.

Sheep have evolved into seasonal breeders to aid the survival of the species (Lincoln and Short 1980). Seasonal changes in temperature, rainfall and food availability are the environmental factors which dictate the survival of both adult and young, and are thus ultimately responsible for deciding the timing of the breeding season. Animals often rely on seasonal changes in the length of daylight hours to indicate the time of year (Lincoln and Short 1980). Daylight hours, referred to as photoperiod, is a major factor governing the onset of the breeding season but other factors are also very important. Factors at present recognised as affecting the breeding season and associated fecundity are :

1. Photoperiod
2. Breed
3. Nutrition
4. Age
5. Individual variation
6. Environmental temperature
7. Bodycondition of the ewe
8. Locality
9. Previous history of the ewe
10. Selection
11. Use of hormones

## 2.1 Photoperiod.

Gordon (1983) found that the breeding season in sheep is regulated by changes in daylight hours per day over the year. This photoperiodic effect acts via the hypothalamic pituitary axis and is mediated by the pineal gland. The pineal gland secretes the hormone Melatonin, whose release is inhibited by daylight, so is effectively only released at night. Melatonin acts on the hypothalamus of the brain which, amongst other functions, releases the hormones which regulate the ovulatory cycles of ewes (Smith 1989). Seasonal changes in photoperiod therefore have major influences in the sexual activity of the ewe and hence their breeding ability.

At high latitudes such as in England, Tasmania and the South Island of New Zealand, there are large seasonal variations in daylength to which the breeding season is closely related. At low latitudes the relationship is less pronounced. Near the equator there are no seasonal daylength fluctuations and any seasonal activity is conditioned more by factors such as rainfall, pasture and nutrition (Hafez 1952). Two peaks in sexual activity occur at the equator per year in sheep. Peaks correspond to the peaks in activity of ewes in both hemispheres.

Maximum sexual activity occurs in the autumn and early winter irrespective of the hemisphere, when daylength is declining to about 10 - 13 hrs/day (Hafez 1952). In some breeds though, such as Merinos, the onset of oestrus can be triggered by increasing daylength (Gordon 1983).

## 2.2 Breed.

Breed plays an immense role in determining the timing of the breeding season. The latitude at which the breed has evolved has

a major influence on the length and timing of the breeding season. Those breeds that evolved in the low latitudes ie. the tropics (Hafez 1952) usually have extended breeding seasons compared with those evolving nearer the poles. These breeds have had greater seasonal environmental changes to cope with and have become very seasonal breeders. An example of this is the Soay examined by Lincoln and Short (1980) which has developed off the coast of Scotland (58° N) and have a very seasonal breeding pattern. This can be compared with the Marwari sheep in India which have been observed to have 80-100% of the ewes in oestrus all year (Mittal and Ghosh 1980).

Breed differences in timing of the breeding season were shown by Kelly et al. (1976) working in Otago (N.Z. latitude 46° S). The breeds Romney, Coopworth, Perendale, Merino and Dorset Horn were compared. There was an overall range in onset of the 1st oestrus of about 28 days over the 5 breeds (table 2.1), while there was also a difference in duration of the breeding season in the breeds that were examined for duration. The earlier breeders tend to have a longer breeding season as shown in the Coopworth ewe.

Table 2.1. Normal oestrus periods (1st detection) in five ewe breeds in Otago.

BREED	DATE OF OESTRUS ONSET	DURATION OF OESTRUS CYCLES
Romney	25 March	123 days
Coopworth	19 March	137 days
Perendale	26 March	132 days
Merino	14 March	
Dorset Horn	27 Feb	

(Source : Kelly et al. 1976)

Differences between breed in breeding seasons also include crosses between breeds, generally the first cross is intermediate between the 2 parents (Hafez 1952) as represented in figure 2.1.

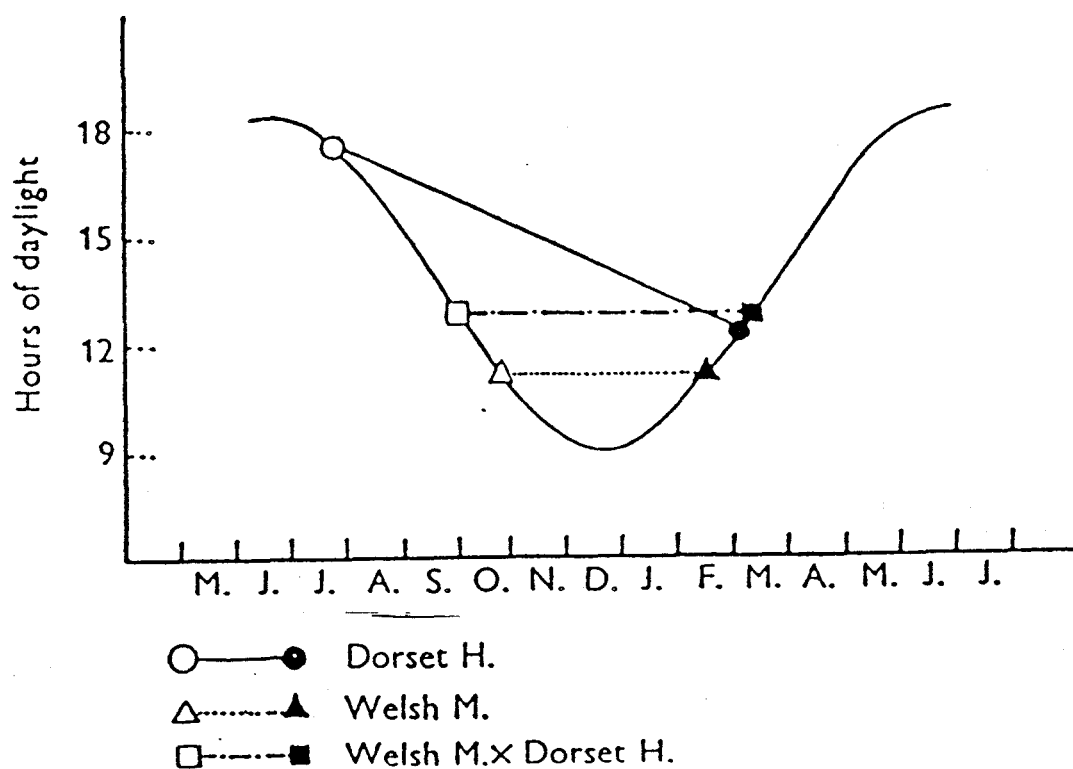


Figure 2.1. The effect of crossbreeding on the breeding season.

(Source:Hafez 1952)

Hafez noted that the cessation of the breeding did not relate very well to changes in daylength and that it was more variable than the onset of breeding season.

### 2.3 Nutrition.

Nutrition is important in determining the number of eggs shed but it is generally considered that the flushing effect does not speed the onset of the breeding season (Gunn *et al.* 1975). On the other hand malnutrition greatly delays the onset of the breeding season and results in the early cessation especially in

older or young sheep (Hafez 1952). At feeding levels substantially below maintenance the ovaries may become inactive (Hunter 1968).

#### 2.4 Age.

In many breeds age has been reported to have influenced the timing of onset of the breeding season (Hafez 1952). There are significant differences between the onset of breeding season in adult ewes and two tooth (2th) in some breeds eg. the New Zealand Romney (Hafez 1952). The differences are more pronounced between mature ewes and ewe lambs (figure 2.2). The breeding season of the ewe lamb is about a quarter to a third of that of the mature ewe.

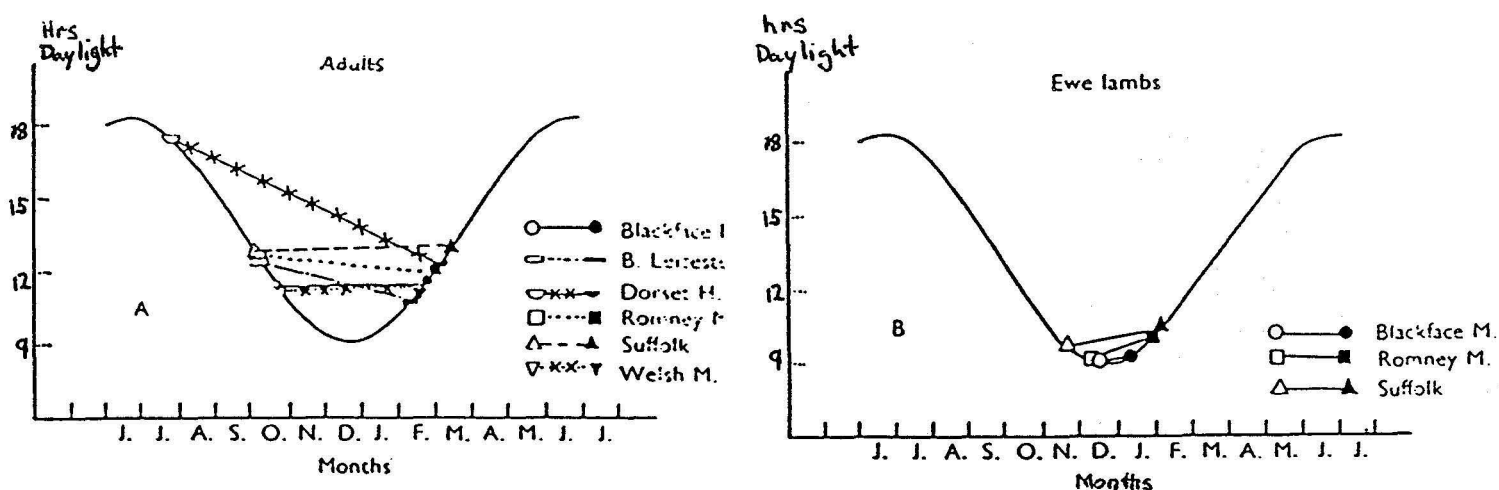


Figure 2.2. Date of onset and cessation of the breeding season in relation to the curve of daylight hours in mature ewes and ewe lambs.

(Source : adapted from Hafez 1952)

## 2.5 Individual Variation.

As with most traits there is variation within a population for both onset and duration of the breeding season and fecundity. This has been suitably illustrated by Averill (1959) where only 10% Romney ewes were cycling by February, 50% by 19th March and all normal ewes by mid April. Individual variation is also important in the cessation of the breeding season.

## 2.6 Environmental Temperature.

The precise role of environmental temperature is unclear, however it has been found that long term seasonal fluctuations in temperatures do not override seasonal changes in photoperiodicity but may modify it (Robertson 1977). Extremes in temperature may cause stress and therefore delay the breeding season (Hunter 1968).

## 2.7 Bodycondition of the ewe.

A high correlation between body condition at mating and both conception rate and litter size was found by Robertson (1974). Embryonic survival is increased if the body condition is high at mating and is maintained at an elevated level for at least one month. Ewes in poor condition do not come into oestrus as the ovaries become inactive at lower feeding levels (Hunter 1968). Poor condition therefore reduces the length of the breeding season.

## 2.8 Location.

Most breeds that are able to breed all year round are located between 35° N and 35° S, and have never acquired the capacity to

respond to variation in the length of daylight. When these breeds are moved to other locations they may or may not continue to exhibit the same lack of seasonality (Smith et al., 1989). It is likely that the peaks and troughs of sexual activity are enhanced as the latitude increases. At higher latitudes there may be a definite period when there is no breeding within the year, although it may only be a short period. This theory is supported by Hafez (1952) who said that ovarian rhythm is influenced by different latitudes in the same hemisphere. The breeding season of ewes gets gradually shorter nearer the poles.

## 2.9 Previous history of the ewe.

Hafez (1952) stated that not mating a ewe in one season would have no effect on the onset of its subsequent breeding season. Lowe et al. (1988) also found that the reproductive performance for a spring mating is not influenced by whether the ewe was wet or dry the previous spring. These results suggest that only the ewes environment in the current season influences the onset of oestrus and conception rates.

The current productive state is important when considering shortening the lambing interval. A ewe normally has about seven months between parturition and the next mating. This period is sufficient for recovery of the body from the effects of pregnancy and lactation, there is time for the complete involution of the uterus and the reabsorption or expelling of debris from the uterus. With shortened lambing intervals mating may be desired before these processes are complete. The immediate post-partum period is characterised by a gradual recovery of ovarian activity after the inactivity of the gestation period (Gordon 1983). There is some confusion though as to whether ewes can successfully conceive while lactating. It appears that ewes may cycle during lactation (Hunter 1968a quoting Quinlin and More 1931) as there

have been cases of ewes exhibiting oestrus within hours of giving birth. Ovulation does not occur with these early heats though.

The inability to conceive and implant while lactating is thought to be for a combination of reasons. They include hormones that are present due to parturition and suckling which prevent ovulation (Gordon 1983), incomplete involution of the uterus and debris, such as foetal membranes in the uterus or uterine horns inhibiting embryo development (Tervit 1983). These problems are likely to prevent a sustained 6 month breeding interval where mating is required 1 month after parturition but are usually not a problem 2-3 months after parturition (Tervit 1983).

It is accepted that lactational anoestrus is more pronounced at the end of the breeding season than the beginning (Gordon 1983) and that earlier weaning tends to shorten the post partum anoestrus. It is also accepted that involution takes longer in the non breeding season (Gordon 1983). This all suggests that the post partum anoestrus is longer in the non-breeding season but still should not be a problem for an 8 monthly lambing interval.

Lees (1969) found an average interval of 42 days between parturition and conception while still within the breeding season but when outside it there were two possible results. The first, no conception until the next breeding season, the second, conception about 42 days post partum. The difference is variation in the length of the breeding season. This suggests that it is easier to alter the mating period in breeds with extended breeding seasons and that selection may be useful.

**10 Selection and 11 Use of Hormones are covered in chapter 3  
Modifications to the Breeding Season.**

## 2.10 SEASONALITY OF THE RAM.

As with the ewe the ram also has a seasonal nature to fertility. The ram that is used must also be able to deliver viable semen to the ewe for conception to take place. Most data on British breeds suggests that rams are still quite capable of maintaining high mating vigour and acceptable semen levels during the spring and summer months (Gordon 1983). High temperatures in spring and summer may have some effect in tropical countries and may reduce the effectiveness of the ram (Gordon 1983).

## CHAPTER 3 MODIFICATIONS TO THE BREEDING SEASON.

### 3.1 Photoperiod.

There are two main types of artificial daylength controls which are capable of influencing ewe reproductive activity. A gradual decrease/increase in artificial daylength to simulate natural changes in daylength or subjecting ewes to an abrupt decrease on one day and maintaining that daylength at the new level will artificially influence the breeding season (Gordon 1983).

Responses to light manipulation are not immediate and may take months. Time of the year affects the response period and the greater the change in daylength the faster the effect. One disadvantage of light manipulation is that ewes show oestrus after varying interval due to individual variation in response, thus spreading the mating period.

Use of photoperiodic changes to modify the breeding season is impractical on a commercial basis. It involves housing the ewes in light proof buildings for all or part of the day to achieve the required lighting regime and involves intensive management. Both techniques are expensive and it is unlikely that the cost can be justified in a farm situation.

### 3.2 Ram Effect.

It has been known for many years that the presence of a ram can have the stimulatory effect of inducing ewes to cycle earlier in the breeding season. What has not been known until recently was the extent to which rams may be used to aid the onset of the breeding season and the actual cause of the ram effect. The Ram

or Teaser Effect has been found to be due to pheromones in the wool and wax of the rams (Henderson 1985, Knight 1985, Smith et al. 1989). The active component in the wool and wax has not yet been isolated (Smith et al. 1989).

Teasing, namely introducing a ram to a flock of ewes will encourage a group of ewes to start oestrus cycling in the transitional period between anoestrus and the breeding season (Henderson 1985, Gordon 1983). Three or four days after the ram is introduced the ewes respond by ovulating. This is a 'silent ovulation' as there are no signs of behavioural oestrus. In 40-60% of the ewes there is a true oestrus within 18 days of ram introduction. For the remainder there is a premature regression in the corpus luteum of the ovary, then a second 'silent ovulation'. These ewes exhibit oestrus about 23 days after the introduction of teaser rams. The majority of ewes will be served over an 8 to 10 day period from around 18 days after teaser introduction if fertile rams are introduced. Teasing compresses the lambing period to a 4 to 5 week period with the bulk of the ewes lambing in a two week period. The ram is only required to be in contact with the ewes for 24 hours to stimulate the ewes (Knight 1980).

The advances in the breeding season which may be induced by the ram effect is very variable. There have been large variations between years (Smith et al. 1989), possibly due to differences in light intensity around the teasing period. Lactation also influences the ram effect (Hunter 1968).

The breed of both ewe and ram are very important in influencing the magnitude of the ram effect. The Dorset ram has out performed the Romney ram in advancing the breeding season under New Zealand conditions (Tervit et al. 1977, Knight 1980). Dorset rams are now used as teasers for much of the 'out of season breeding' research in New Zealand. Recently however it has been found that Coopworth rams may be on a par with Dorsets

and are certainly superior to the Romney ram for advancing the breeding season (Scott 1988).

Overseas work quoted by Knight (1983) indicates that the ram effect could stimulate Merinos, Ile-de-France and Prealpe ewes to ovulate several months prior to their normal breeding seasons. All these breeds have 'light' anoestrus periods. They returned rapidly to anoestrus after stimulation though. For breeds with a more pronounced anoestrus period such as the Romney the ram effect is less marked. Knight (1980) found a maximum advancement in the breeding season of 14 days in the Romney. Coopworths could successfully be mated three weeks earlier than normal (Smith et al. 1988b). McQueen and Reid (1988) found that they could get Romney x Dorset ewes to cycle 4 months earlier than normal by teasing and intensive selection for autumn lambing over several years. It appears that the more intense the anoestrus of the breed the smaller the advancement in the breeding season from the ram effect.

In the past isolation of the ewes from both the sight and smell of rams has been advocated (Knight 1983, Henderson 1985). More recently however Knight has stated in unpublished papers quoted by Smith et al. (1989) that prior isolation from the ram is not necessary for the ram effect to work. The isolation though does affect the degree of synchrony of the ovulations. These findings are supported by Sealey (1988) in his practical findings.

There is evidence to suggest the ram effect is more effective if the rams have either been exposed to oestrus ewes prior to joining (Knight 1985), or a proportion of oestrus ewes are with the anoestrus ewes at joining (Smith et al. 1989). The breed of anoestrus ewe and the time of year affect the effectiveness of the ram effect in both cases. The use of oestrus ewes to stimulate anoestrus ewes is known as social facilitation.

Teaser rams are usually vasectomised well before the required period of use and should be tested for sterility just prior to joining the ewes. The best teaser rams have a high libido and usually have had previous mating experience. Androgenised wethers may also be used as teasers. This requires weekly injections of testosterone (100-150 mg) for three weeks, shortly before introduction to the ewes (Henderson 1985). Entire rams can be used as teasers but some synchrony of lambing is compromised. McQueen and Reid (1988) found that their Romney x Dorset flock could be stimulated by entire rams introduced at least 1 cycle before successful tupping was required.

As yet teasing gives somewhat variable results with large year to year variations (Smith et al. 1989). It is not suitable for true out of season breeding as yet, however new methods of prolonged teasing may stimulate even ewes in deep anoestrus (Henderson 1985), having the potential to be of great use in out of season breeding.

### **3.3 Selection and Cross Breeding.**

Individuals within several breeds possess the capability of year round breeding (Smith et al. 1989). By selecting for these individuals, or those with extended breeding seasons it is possible, over time, to alter the breeding season of a population. Trials in New Zealand have shown that it is possible to select for autumn lambing (Andrews and Taylor 1986, McQueen and Reid 1988).

Some breeds of sheep have extended breeding seasons, Dorsets (Andrews and Taylor 1986, Smith et al. 1989), Merinos, Ile-de-France, Prealpes (Knight 1983), Romanov (Hunter 1968a) and Finnish Landrace (Hafez 1952). The importing of sheep with extended breeding seasons may be of value for advancements in out of season breeding and the development of flocks lambing 3 times

in 2 years. Care must be taken when selecting breeds to import as some will not retain their extended breeding season. This has been shown with the importation of Finnish Landrace where the Finn x Romney progeny generated in New Zealand have not exhibited an extended breeding season (Smith et al. 1989).

Crossing breeds that have extended breeding seasons with those that have a shorter breeding season gives progeny with intermediate breeding capabilities. Andrews and Taylor (1986) demonstrated that Perendales, with no capability of mating in early summer, when crossed with Dorsets (34% able to be mated then) gave progeny with a 17% ability to be mated in early summer. This illustrates the ability of spring mating to be transferred from one genotype to another in conjunction with other desirable traits. Andrews and Taylor then selected for the offspring of the autumn lambing ewes. These were mated in spring again and showed a 50% autumn lambing ability. The proportion of ewes initially breeding out of season will influence the progress of selection hence the initial crossing with Dorset which naturally have a longer breeding season.

McQueen and Reid (1988) found that over time they could get a marked change towards autumn lambing. Heavy culling of the progeny of the spring lambing ewes and selection for 2ths from the autumn lambing ewes where possible, moved the average lambing date towards autumn. The replacement rams were also selected from the progeny of autumn lambing ewes. When these rams were used there was a marked advance in the autumn lambing ability of their progeny. (Figure 3.1 1982).

Both of the above experiments were carried out in the upper North Island of New Zealand (latitude 36° S). They demonstrate the ability of changing or extending the natural breeding season by intensive selection. It also shows that it is possible to get ewes 'in lamb' at the required times for a system involving 8 monthly matings.

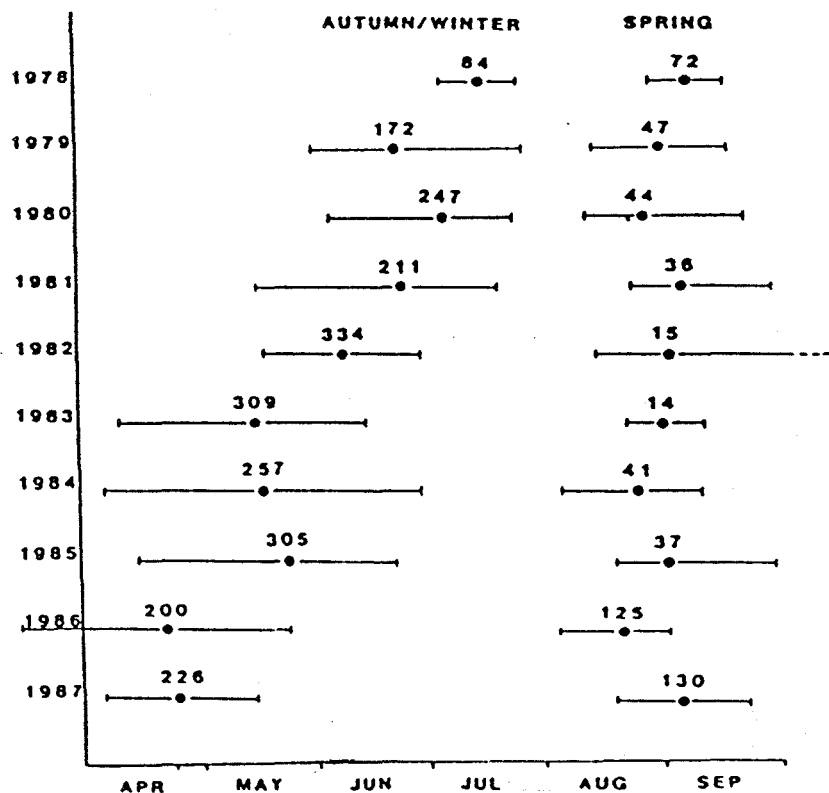


Figure 3.1. Changes in lambing date due to selection.

(Source McQueen and Reid 1988)

### 3.4 Exogenous hormones.

It is possible to induce oestrus in non-pregnant ewes at almost any time of the year by the administration of exogenous hormones. There are a number of hormones available for this purpose. All act either directly or indirectly on the corpus luteum of the ewes ovaries.

Inducing oestrus prior to the normal breeding season by the use progestogen pre-treatment followed by gonadotrophin administration has been known for the past 35 years (Smith *et al.* 1989). There has been little practical application of this though until the 1980s. There has been little work done in New

Zealand so there is a lack of information for our breeds and environmental conditions.

### 3.4.1 Progestogens.

Administration of progestogens typically involves the use of either polyurethane sponges or Controlled Internal Drug Release devices (CIDR). Both are progestogen impregnated and used intravaginally. They appear to be of equal overall effectiveness but the onset of oestrus is slightly quicker for CIDRs (Smith et al. 1989). More recently other intravaginal pessaries have become available.

Progestogens can also be used orally, as a series of injections or as a subcutaneous implant at the base of the ear (Tervit 1983). Intravaginal administration is preferred though as it only needs one application and administration can be ceased simply by removing the progestogen releasing device.

There are three main types of progestogens used. These are a. progesterone, b. Medroxy progesterone acetate (MAP) and c. Flurogestone acetate (FGA). There appears to be no real advantage of one type over another but dose rates do vary due differing progestogen potencies, 375 mg progesterone = 60 mg MAP = 30 mg FGA (Knight 1986).

#### 3.4.1.1. Progestogen plus the Ram Effect

Progestogens may be used with or without gonadotrophins. When used without gonadotrophins but in conjunction with the Ram Effect the breeding season can be advanced by 2-3 weeks more than the ram effect alone (Smith et al. 1988b). The progestogen converts the ram induced 'silent ovulation' into an ovulation plus overt oestrus where the ewes may be mated successfully. Effectiveness depends on year, location and breed (Smith et al. 1989).

Progestogens are administered 12 to 14 days prior to desired mating. The rams are introduced 12 days later at the time of device removal to achieve the best results (Smith et al. 1987). Taylor and Andrews (1987) found that 79-95% of their Perendale ewes conceived and lambed from the 1st and 2nd cycle after progesterone priming. This gave between 96% and 106% survival to sale compared to the 120% for the progeny of spring lambing ewes. Progestogen and the ram effect alone are not suitable for large changes in the onset of the breeding season, but are very useful for achieving early lambing.

#### 3.4.1.2. Progestogen plus Gonadotrophin.

Progestogen is administered 14 days prior to the start of mating. At device removal, 2 days prior to mating, an injection of gonadotrophin is given. This is usually in the form of Pregnant Mares Serum Gonadotrophin (PMSG). The PMSG induces oestrus and improves the synchrony of the oestrus and ovulation when administered in small quantities (Tervit 1983). In larger quantities PMSG causes superovulation which is undesirable unless embryo transfer is to take place. Dose levels of both progestogen and gonadotrophin, at any time of the year, are based more on intuition than fact at present (Smith et al. 1989). About 70 mg MAP and between 500-1000 iu PMSG now appears to give good results in most breeds.

Pre 1968 data (Hunter 1968b) suggested that a 40% conception rate for out of season breeding using progestogens and PMSG was considered a good result. As technology has been refined and better techniques for hormone administration have been developed conception rates are now much higher (75-90%). Smith et al. (1989) stated that 800 iu PMSG would ensure at least 90% of the Coopworth ewes could mate at any time of the year. Lowe et al. (1988) demonstrated a 75% conception from two cycles when mating in December. Andrews and Taylor (1986) however found lower

results when mating in early November. They obtained 40-45% conception in Romneys, Perendales and Coopworth ewes but Dorsets and Dorset x Perendale ewes had up to 90% conception rates.

Progestogen plus PMSG does induce oestrus and ovulation in the non-breeding season but those ewes that fail to conceive generally revert quickly to anoestrus (Smith *et al.* 1989). This statement is supported by the findings of Lowe *et al.* (1988) where 71% of the ewes conceived to the 1st cycle and only 4% to the second. Irish data from Gordon (1975) highlights this problem in practice and also shows how time of year affects hormone induction of oestrus (Table 3.1). Over the entire year an average of 60-70% of the treated ewes conceived in the 1st cycle and only increased to 80% when including the second cycle.

Table 3.1. Effect of the Season on Conception Rates.

	Spring	Summer	Autumn
% Pregnancy			
1st heat	34.7	64.0	75.3
1st+2nd heat	35.0	79.6	90.5

(Source Gordon 1975)

#### 3.4.3. Steroid Immunisation plus Progestagens.

As yet the possibility of increasing the number of lambs born out of season by the pre-treatment with steroid immunisation has not been fully investigated in New Zealand. The increased ovulation rate achieved suggests that immunisation with Fecundin\* could be a beneficial technique to employ either out of the breeding season or early in it (Smith *et al.* 1987).

### 3.4.2 Prostaglandins.

Oestrus can be synchronised through the use of prostaglandins. They are only useful though in animals that are already cycling so are of little use in the anoestrus period. They also have variable effect on fertility and are dangerous to administer.

### 3.4.3 Melatonin.

Administration of exogenous melatonin can alter the breeding season of ewes. Melatonin is produced naturally by the body at night and is involved in the animals response to photoperiodic changes.

Overseas it has been shown that melatonin treatment can advance the breeding activity of ewes and increase the lambing percent in the non-breeding season (Smith et al. 1989). Melatonin in the form of Regulin\*, administered during spring, is able to trigger a response resembling the autumn peak in reproductive performance. The subcutaneous implant at the base of the ear is made one month prior to joining and can be used effectively for flocks joined at any time between late October and late December (Williams et al. 1988). For optimum results the rams should be isolated from the ewes for at least 6 weeks to achieve the maximum ram effect.

In Australia crossbred ewes were able to be mated in mid November achieving 127% lambing, similar to that for spring lambing. Waller et al. (1988) found that when melatonin was used in conjunction with progestagen plus PMSG some of the ewes continued to cycle. Of the treated ewes 56% cycled at least twice. As more is learnt about melatonin it may become of great use for out of season breeding.

#### CHAPTER 4 DECREASING THE BREEDING INTERVAL.

At present there are three ways of effectively decreasing the breeding interval to eight months or less. These are photoperiodic changes, the use of hormones either progestogens or melatonin, or by selection.

Manipulating the photoperiod to alter the lambing interval is highly labour intensive and involves expensive housing. The affect on the ewes is variable and a compact lambing period could not be obtained. For this reason and the associated costs photoperiod manipulations are not suitable for a commercial venture.

The use of hormones is expensive but may be done on a commercial scale if returns are great enough. Gordon (1975) demonstrated that hormones could be used on a commercial basis for early lambing in Ireland. Hormones only stimulate the ewes for a short time so may be effective for one cycle or one mating period at the most. Therefore there is a continuing cost associated with the use of hormones for each attempted out of season mating.

The cheapest and most convenient method of shortening the breeding interval is to undertake selection for ewes with extended breeding seasons. This may involve crossing the desired breed with a breed capable of breeding well outside the normal breeding season as was done by McQueen and Reid (1988). It is highly conceivable that natural matings could be selected for to allow three lambings in two years (Thompson 1989 pers comm). This could be achieved even in Southland despite the strong photoperiodic influence, using well selected Romney x Dorset ewes. Due to the heavy selection towards a restricted autumn

mating period ewes in New Zealand have lost their ability to mate in late spring and summer (Thompson 1989 pers comm).

Selection takes many years and is initially costly but when the flock is able to breed at the required times less culling and selection are required and costs are not a great deal higher than a conventionally lambing flock. Smith et al. (1989) stated that all farmers who wish to be involved in out of season lamb production should identify animals with longer breeding seasons and use them in crossbreeding programmes.

#### 4.1. Parameters for a Reduced Lambing Interval Using Selection.

McQueen and Reid (1988) mated some spring lambing ewes the same summer and achieved only 8% less pregnancies with the shorter lambing interval. This demonstrates that selected ewes are able to take the ram after a short anoestrus period over spring without a large decline in conception rate.

There is a lack of information for the lambing percent and conception rates for reduced interval lambing. Little work has been done internationally on it and almost none except McQueen and Reids' brief work has been done in New Zealand. Figures for three lambings in two years are therefore based on the out of season work adapted to the shortened breeding interval. (Refer to chapter 7 The Model Farm for 3 lambings in 2 years).

## CHAPTER 5 FEED PROFILING MODEL

To assess the physical feasibility of the chosen scenarios (Chapters 8 and 9) a Feed Profiling Model was used. The model 'Feed plan Sheep Model version 1.0' developed Thompson (1989) at Lincoln College and is based on a Lotus 1-2-3 spread sheet.

The model is driven by net pasture production (kg DM/ha/d), animal intake (kg DM/ha/d) and the post-grazing pasture mass (kg DM/ha) required to achieve the desired intakes. Pasture Cover is used to assess if the system is in balance. Minimum Required Pasture Cover is generated from the post-grazing pasture masses set for each stock class and Average Pasture Cover is generated from the pasture grown and consumed. For the system to be in balance the average pasture cover should not drop below the minimum required pasture cover. Balance is manipulated by changing numbers of stock, timing of events such as lambing and weaning, and timing of conservation.

Net pasture production is given on a daily basis but is based on monthly averages. Net pasture production rates have been modified from data collected by Radcliffe (1974), (refer to Chapter 6 Class 7 Farm Model). Daily intakes per head have been based on feed tables from Geenty and Rattray (1987) and Ulyatt et al. (1980) and target liveweights for each class of stock. The calculated intakes account for changes in the quality of diet throughout the year, assessed as the megajoules of metabolisable energy per kg of feed DM (M/D).

To a large extent the M/D of pasture is affected by the Post Grazing Pasture Mass (PGPM). The lower the PGPM the more dead material and stem is consumed so the lower the M/D and therefore the lower the quality (Milligan et al. 1987). Values for the M/D have been based on Geenty and Rattray (1987).

In addition to the PGPM component associated with intake the PGPM is entered into the model on a monthly basis for each stock class to set the minimum mass that the animals are allowed to graze down to. PGPM's have been based on Rattray et al. (1987) and have been used in order to achieve the budgeted intake levels.

Once the basic data of pasture production, intake per head and PGPM has been set variables such as stock numbers and starting cover are adjusted in order to achieve a regime within the constraints of the system.

The balances that had to be met were:

1. Average pasture cover was always higher than the minimum required pasture cover (calculated from the average PGPM per month over all stock classes).
2. Of the annual pasture production only 500 to 3000 kg DM/ha was allowed to be unutilised (ie. Production/intake balance was between 500 and 3000 kg DM/ha.)

The output of the model is contained in Appendix 2.1 and consists of :

1. Input figures for stock numbers, pasture growth rates, initial pasture cover, and intakes per head. It also consists of the calculated figures of total pasture production, production/intake balance, pasture cover at the end of the year, and feed deficit and wastage.
2. Graph of the Average Pasture Cover vs Minimum Pasture Cover throughout the year.
3. Graph of Feed Supply vs Demand.

## CHAPTER 6 BASIC FARM MODEL

### 6.1 Physical Characteristics.

The model farm is based on an intensive Southland prime lamb producing property (Class 7, NZMWBES and MAF). Income figures though have been adapted for an all sheep property with substantially higher production reflecting the superior management required for running a multiple lambing flock.

The 180 ha (effective) farm is on high producing land in coastal Southland. It winters 3 500 S.U or 19.4 S.U/ha. All the sheep on this property are Romneys.

Table 6.1. Stock numbers and stock units wintered.

Class of stock	Numbers	S.U.
Ewes	2650	2916
Hoggets	632	556
Rams	36	29
	3318	3500

#### 6.1.1 The Ewe Policy

The ewes are mated in early April and lamb in late August and September, with a 125% survival to sale. There is a policy to replace 24% of the flock annually in December. About 550 ewes are culled after weaning each year, some on health and condition but most are culled as 5 year ewes. Ewes are shorn in January.

### 6.1.2 The Lamb Policy

Lambs are tailed in October with all ram lambs being wethered at that time. All lambs are weaned at the end of November. The ewe lambs that are not to be kept as replacement are sold prime to the works, when they reach about 33 kg live weight (15 kg carcass weight) between January and April.

Ram lambs are also sold prime. They are sold at the slightly heavier weights of 16-18 kg carcass weight or 34-38 kg live weight. All lambs are shorn in January prior to any sale. In total 1495 ram lambs and 855 ewe lambs are sold.

### 6.1.3 Replacement Policy

Replacements are selected and are set target weights throughout the year. At the time they are selected, about the start of January, they have been in average live weight of 28.5 kg. By the 1st of April their target is 42 kg, and by 1st of June 50 kg - maintained over winter then up to 60 kg by the time they enter the ewe flock on the 1st of December. In total 640 ewe lambs enter the replacement mob. Hoggets are shorn in January as lambs and then again in January after entering the ewe flock.

### 6.1.4 Ram Policy

Rams are culled during the year and replaced in December, with culls used as dog food. They are shorn in January to allow the 2th ram replacements to also be shorn.

### 6.1.5 Grazing Management and Feeding

The hogget flock is rotational grazed all year as is the ewe flock except over lambing when ewes are set stocked until weaning in late November. Ewes are used to graze rank pastures over the summer then go onto a fast rotation to help maintain pasture quality for the autumn. The rotation slows into autumn with four mating flocks. Feeding level is elevated 20 days prior to the planned start of mating to achieve a flushing effect in the ewes. After mating all ewes are combined and enter the slow winter rotation where supplements in the form of hay are fed as necessary. Approaching lambing the early lambers are split off and both groups have their planes of nutrition elevated 18 days prior to their respective planned lambing dates.

Rams are fed at maintenance for much of the year. They have an elevated allowance over summer and just prior to and during mating.

### 6.1.6 Pasture Production

Pasture is based on a Ryegrass and White Clover sward. The pasture growth rate used have been based on Radcliffe (1974) where the average of 11 years prior to 1972 were taken. The original measurements were taken at fortnightly intervals (Appendix 1), but have been converted to monthly periods to suit the model used (Table 6.2).

Heavy applications of fertilizer, drainage and improvement in pasture cultivars over this period would indicate that these growth rates should be higher. Research has shown that new pasture species/cultivars can lift pasture production by about 50-75% in winter while making little difference to summer growth. (Edgecombe, 1987). In addition to the improvement in pasture

species the winter pasture growth rate is elevated by the move to longer grazing intervals that occur in the winter under rotational grazing (up to 120 days). Baars (1981) found that increasing the grazing interval from fortnightly to monthly periods increased the pasture production in the winter and more particularly the spring months. There was a 25 % increase in August and 37 % increase in September.

Based on the work of Edgecombe and Baars the growth rates obtained by Radcliffe have been increased 25 % in the critical months of April through until September ( Table 6.2).

Table 6.2. Standard and modified pasture growth rates for the model farm.

MONTH	Average Daily Pasture Growth, Radcliffe (1974) (Low years growth)	Modified Pasture Growth (Ave years growth)
January	53.1 kg DM/ha/d	53.1 kg DM/ha/d
February	49.7	49.7
March	40.1	40.1
April	21.2	26.5
May	12.1	15.0
June	8.5	10.6
July	9.7	12.1
August	12.5	15.5
September	22.0	27.5
October	55.4	55.4
November	53.3	53.3
December	54.7	54.7

The modified growth rates are assumed to be an average years annual distribution of pasture production (the control), while Radcliffe's data illustrates the difficulties occurring in a year

with below average pasture production. Both possibilities are examined in chapter 8.

## 6.2 Financial Aspects.

Table 6.3 Cash Budget for the Class 7 Model Farm for 1988/89.

ITEM	MAF Farm Class 7 Figures	MAF Class 7 Figures Modified for Higher Production
<b>Income</b>		
Sheep	40 732	58 420
Wool	58 842	84 731
Cattle	10 340	0
Crop	292	0
Other	5 515	5 515
less		
Sheep Purch	1 451	2 400
Cattle Purch	6 803	0
<b>GFI</b>	<b>107 466</b>	<b>146 266</b>
<b>Expenditure</b>		
Wages	2 478	2 478
An Health	3 286	4 000
Crop Exp	73	0
Electricity	1 491	1 491
Feed	1 984	2 000
Fertiliser	6 429	6 429
Seed	605	605
Freight	3 321	4 000
Shearing	6 631	10 403
Weed & Pest	963	963
Vehicles	7 951	7 951
R & M	3 898	4 000
Admin	9 074	9 074
Other	907	907
<b>Cash Exp</b>	<b>49 089</b>	<b>54 301</b>
<b>Cash Farm Surplus</b>	<b>58 377</b>	<b>91 965</b>

GFI = Gross Farm Income

Table 6.3 compares the standard MAF Class 7 farm which can be considered as the average for the Southland region, with the high

producing model farm. It illustrate the increased cash surplus (\$58 400 to \$92 000 Cash Farm Surplus) generated by the high stocking rate. Calculations and assumptions for the income of the modified Farm Class 7 are contained in Appendix 4.1.

## CHAPTER 7 THREE LAMBINGS IN TWO YEARS.

Mating ewes to the ram at eight monthly intervals requires some method of reducing the breeding interval (refer to Chapter 3). In this study it has been decided that in order to achieve the shorter breeding interval a breed with a relatively long breeding season, the Polled Dorset will be crossed with the predominant breed in Southland, the Romney. The first cross is to be interbred and heavily selected for extended breeding season. After a period of 10 years or longer it is anticipated that the offspring of this flock will be capable of being mated successfully at any of the required tupping times ie. March, July and November with the aid of the ram effect. These dates lead to respective lambing dates of August, December and April. It is these lambing dates that are important as they have been chosen so that lambings occur as far from the times of minimum pasture production (ie. June and July) as is possible.

All matings will be synchronised by using teaser rams, but all matings are to be natural ie. no hormones are to be used to bring ewes into oestrus. It is expected that there will be lower conception rates in the July and November matings than the March mating (refer to Chapter 1). These lower conception rates will be reflected in the lower lambing percentages at the December and April lambings (Table 7.1). Any ewes that do not conceive at one mating will be moved to the next mating flock (Figure 7.1).

For the reasons of the rapid remating of ewes that do not conceive and more importantly to even the feed demand there are to be two flocks of ewes. Each flock will be mated at eight monthly intervals but they are mated four months apart. This effectively gives three lambings per year with one flock lambing twice and the other lambing once. For this exercise the ewes are in flock 1 for one year then move to mob two the next year and

vice versa for those ewes in flock 2. (This way only one year of data can be used for an accurate result). With two flocks those not conceiving can be moved to the other flock and still be mated within 12 months of the last successful mating.

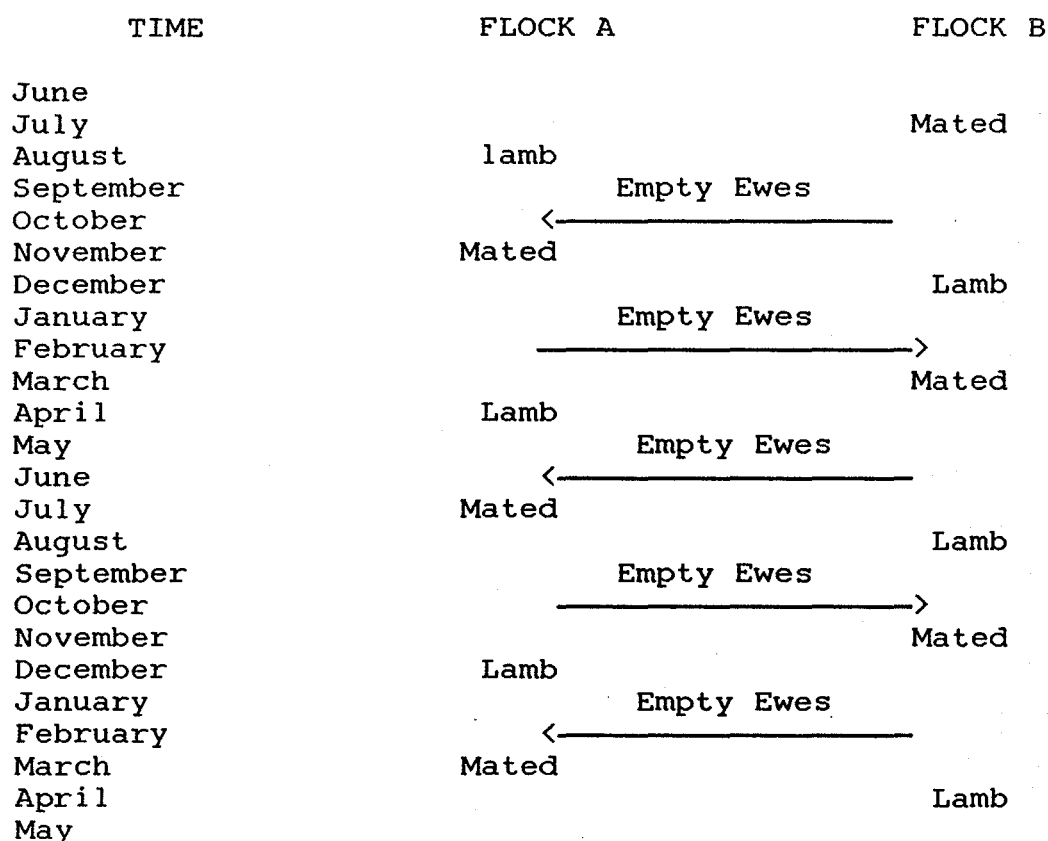


Figure 7.1 Breeding programme for the two ewe flocks.

It is assumed that appropriately selected Dorset x Romney ewes can be purchased as replacements because all lambs are sold from this system. It is assumed that these Dorset x Romney hoggets can be purchased on contract from local breeders at a margin above meat schedule prices. Dorset rams are used over the Dorset x Romney ewes because of its extended breeding season. If replacements were kept from the offspring then over time the dual purpose Romney influence would be diluted. It is also important in this system that all the lambs that can be sold because it is expensive (ie. lower stocking rate) to feed ewes at an appropriate level for three lambings in two years so the highest possible income from lambs is desired.

Alterations in the farming system from the Class 7 model farm are :

1. a drop in stocking rate from 19.4 SU/ha to 13.6 SU/ha.  
 2. use of the Ram Effect is required to synchronise matings and bring anoestrus ewes into oestrus, a high ram to ewe ratio is required so the ram numbers increase from 36 to 100.

3. no hoggets are reared on the farm.

4. shearing is to be under an 8 monthly regime one month before lambing (ie. mob A is shorn in July and March, while mob B is shorn in November). Shearing is done within one month of lambing because work by Salman and Owen (1986) and Armstrong et al. indicates that in late pregnancy foetus provides heat which the ewes uses to reduce the feed requirement for maintenance. Therefore by shearing near lambing the feed requirement is lower than shearing in early winter. Pre-lamb shearing also avoids shearing near mating or prior to weaning as would be the case if there was a set shearing in December or January. The lambs are shorn 5 to 6 months after they are born, ensuring that most lambs are shorn before they are sold but still yielding about 1 kg of wool/head.

5. Dorset rams are purchased from local studs.

Table 7.1 Lambing percents for lambs sold as a percentage of ewes mated, for both high and low lambing regimes and each of the three lambing dates.

Lambing Regime	Mated March to lamb August	Mated July to lamb December	Mated November To lamb April
High lambing %	120 %	120 %	110 %
Low lambing %	120 %	90 %	70 %

Two conception rate regimes have been examined for the three lambings. These are a high conception regime and a low regime

(table 7.1). These are considered to be the highest and lowest possible conception regimes for reasons discussed in Chapter 4. Both high and low lambing regimes are examined in Chapter 9.

## CHAPTER 8 CLASS 7 FARM SYSTEM.

There are two scenarios considered for the modified Class 7 Farm. Scenario 1 is assumed to be an average years pasture production pattern and is the control for the systems involving three lambings in two years. Scenario 2 is assumed to be a year with lower than average winter pasture production.

### **8.1 Scenario 1. The Average Year.**

Scenario 1 is based on the modified pasture production data (refer to table 6.2). This growth data is expected to be for an average year and is used as the control for all scenarios involving three lambings in two years (Chapter 9). The management and stocking rate for scenario 1 are described in Chapter 6.

The results of this regime are that it easily fits the feeding requirements with minimum pasture cover always being below the average pasture cover (Figure 8.1). Of the feed grown 1100 kg DM/ha is not utilised, however 92% utilisation is acceptable in this environment where the summer topping of pastures is a common practice. The result is that scenario 1 is physically possible. Refer to Appendix 2 for the output of this scenario.

### **8.2 Scenario 2. Below Average Winter Pasture Production.**

The low pasture production in scenario 2 illustrates what is likely to happen if there is below average winter pasture production in any year. It is used to demonstrate the feeding difficulties that such a year presents. Scenario 2 shows the difficulties for this farm carrying 19.4 SU/ha when depending on

Figure 8.1 Average vs minimum pasture cover with high winter pasture production

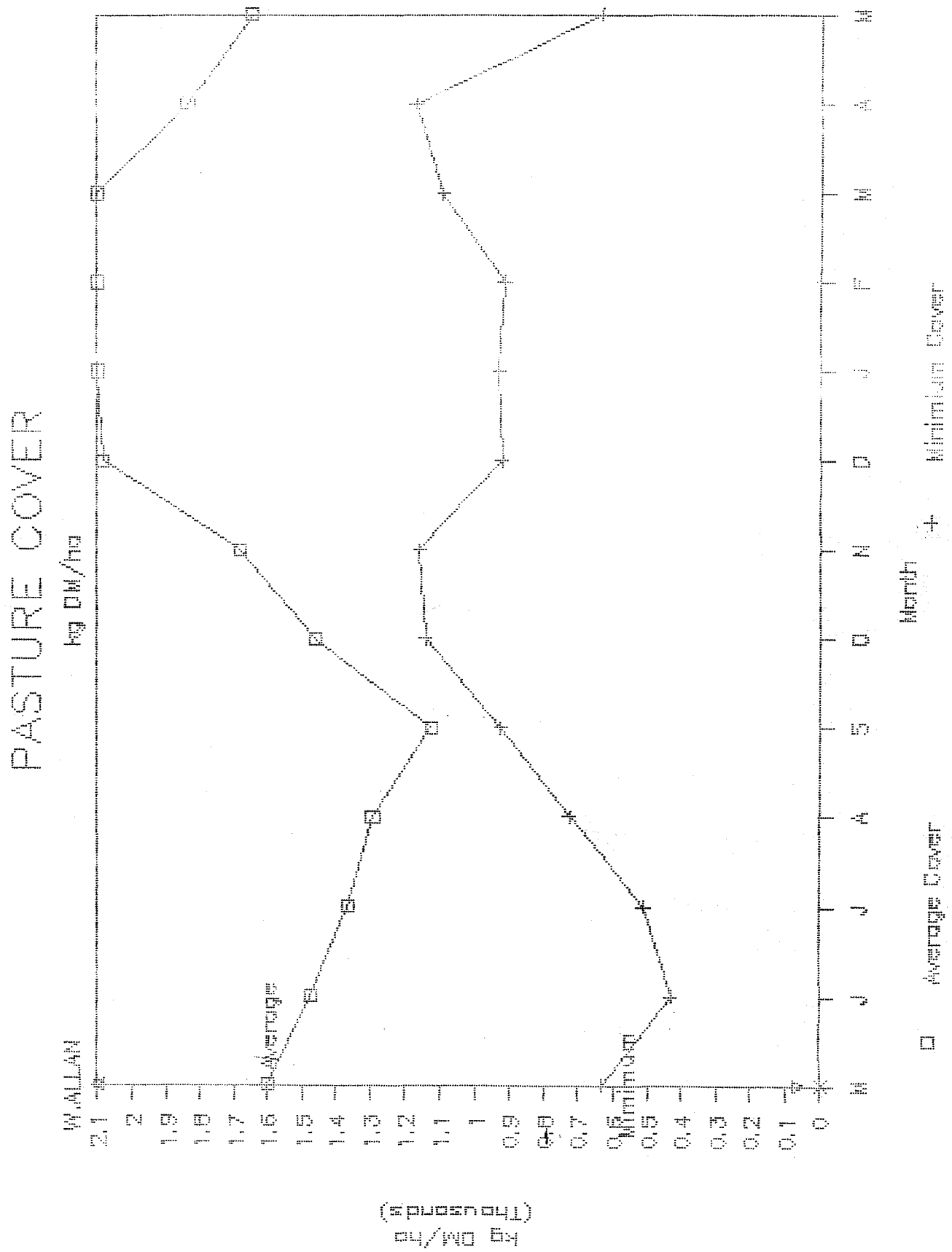
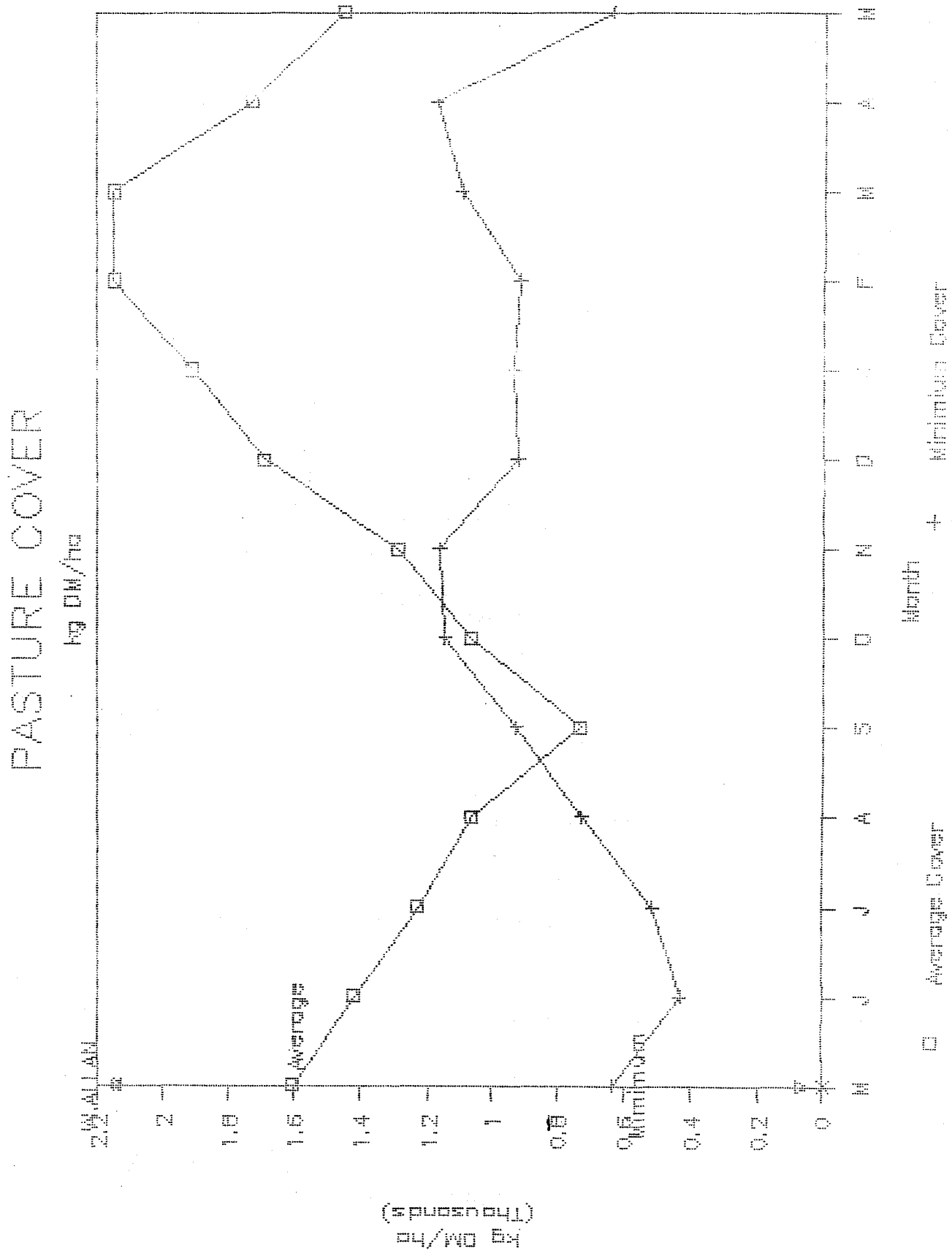


Figure 8.2 Average vs minimum pasture cover with low winter pasture production



only pasture and hay for winter feed. The average pasture cover drops below the minimum pasture cover required in the August and September period (Figure 8.2). By decreasing the PGPM of the hoggets through this period (ie. keeping them on maintenance for longer into spring) the minimum required pasture cover drops and it is possible to get through this feed shortage. This tactic may result in the lower tupping weights of the hoggets and subsequently lower reproductive performance so is not acceptable in the long term. For further detail of scenario 2 refer to Appendix 2.2.

## CHAPTER NINE SYSTEMS FOR LAMBING THREE TIMES IN TWO YEARS.

Six scenarios associated with three lambings in two years are investigated. The two lambing percentage regimes are examined under three feeding regimes to determine which feeding and flock management techniques best fit feed demand and feed supply.

The three feeding regimes investigated are :

1. All pasture wintering with hay supplements
2. Pasture and winter crops with hay supplements
3. All pasture wintering with hay supplement but 40% of the ewes lamb only once a year in August.

The scenarios investigated are :

9.1.1. High lambing percentages with all pasture and hay wintering.

9.1.2. High lambing percentages with pasture, winter feed crop and hay.

9.1.3. High lambing percentages with pasture and hay wintering but 40% of the ewes only lamb once/year in August.

9.2.1. Low lambing percentages with all pasture and hay wintering.

9.2.2. Low lambing percentages with pasture, winter feed crop and hay.

9.2.3. Low lambing percentages with all pasture and hay wintering but 40% of the ewes lamb only once a year in August.

## 9.1 Investigation of the highest anticipated lambing percentages

### 9.1.1 Scenario 3. High lambing percentages with all pasture and hay wintering.

The main feature of scenario 3 is that feeding hay and pasture in the winter leads to the average pasture cover dropping below the minimum required pasture cover in August and September (figure 9.1). There are also large quantities of pasture wasted in the summer months (1850 kg DM/ha). Also refer to Appendix 3.1.

Table 9.1 Statistics for scenario 3.

Class/Operation	Mob A	Mob B	Total
Stocking Rate			13.6 SU/ha
Ewe Numbers	1070	1070	2140
Ram Numbers			100
Ram Lambs Sold	643	595 (Apr) 645 (Dec)	1883
Ewe Lambs Sold	643	596 (Apr) 645 (Dec)	1883
Cull Ewes Sold	250 (Nov)	250 (Feb)	500
Rep Hoggs (Buy)	310 (Dec)	300 (Mar)	610
Rep Rams (Buy)			25
Crop Area (ha)			0

### 9.1.2 Scenario 4. High lambing percentages with pasture, winter crop and hay.

The main feature of this scenario is that in addition to the feeding of pasture and hay through the winter a feed crop of choumollier is also feed. Choumollier yields about 13 t/ha of drymatter while a greenfeed grass would yield a maximum of 4 t/ha over a similar growing period. The use of the choumollier crop

Figure 9.1 Average vs minimum pasture cover for scenario 3

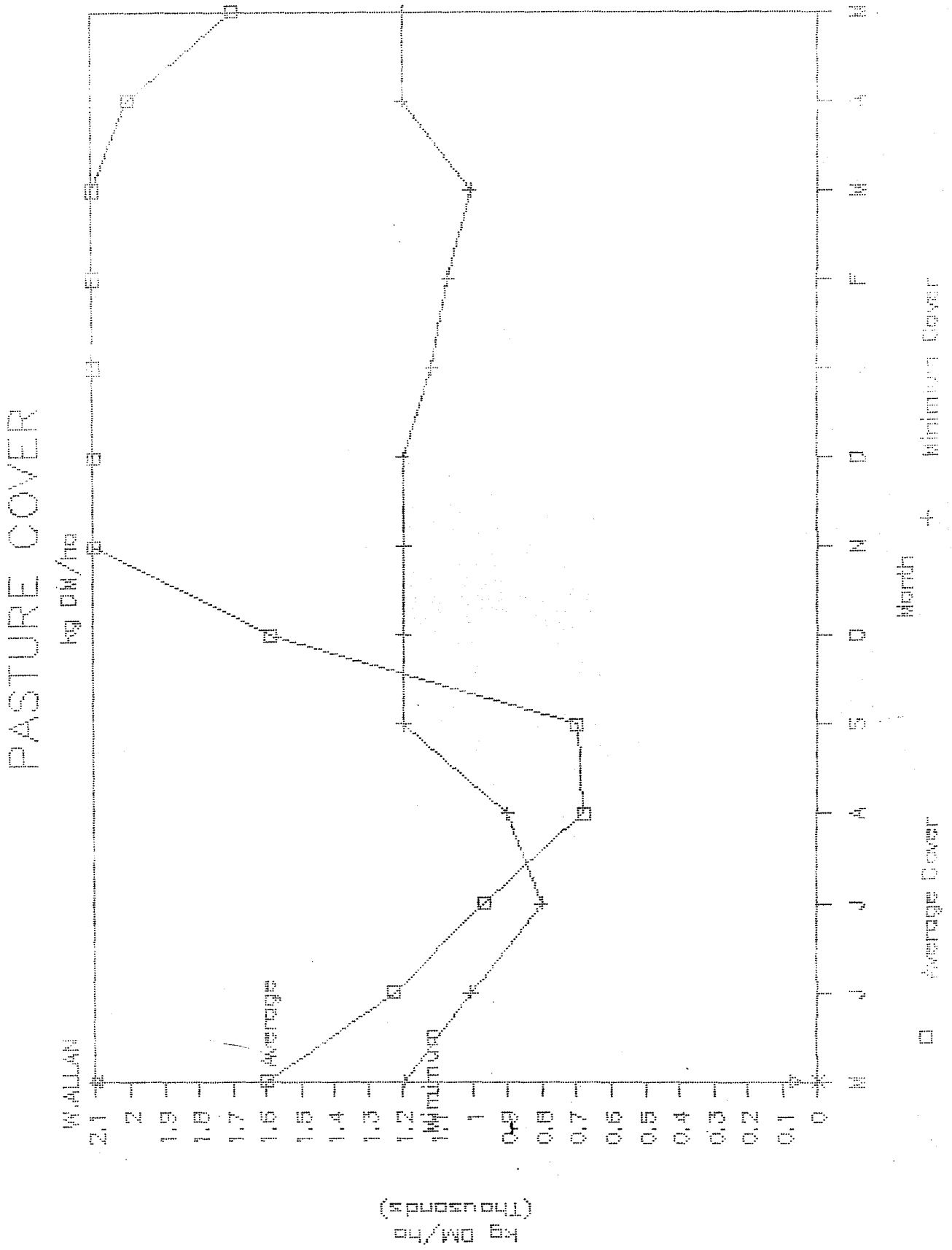
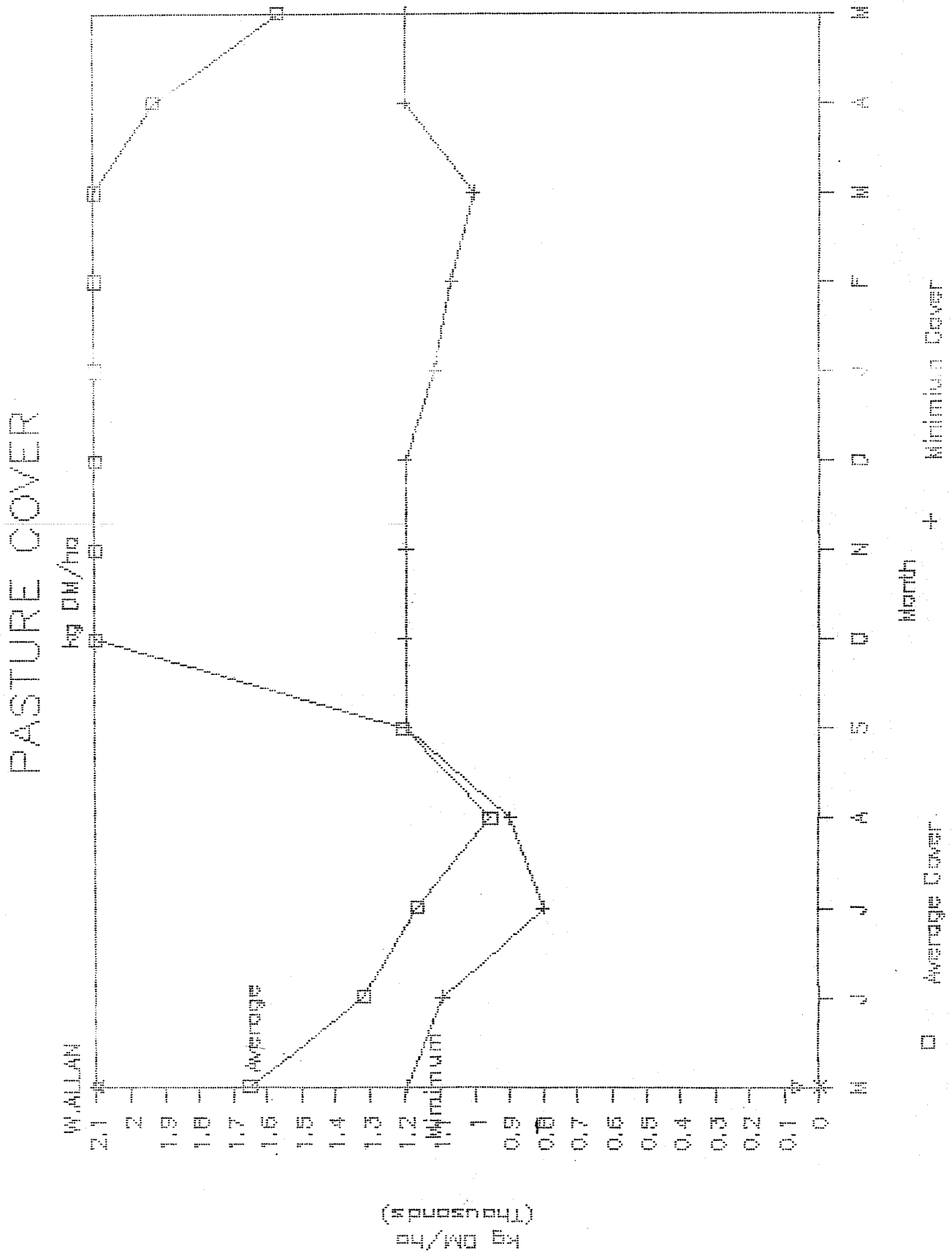


Figure 9.2 Average vs minimum pasture cover for scenario 4



means that there less pasture must be fed and thus maintains the average pasture cover at a level above the minimum required pasture cover (Figure 9.2). Large amounts of pasture are not utilised through the summer months in this scenario (1850 kg DM/ha) or an 86 % utilisation of the feed grown. Also refer to Appendix 3.2.

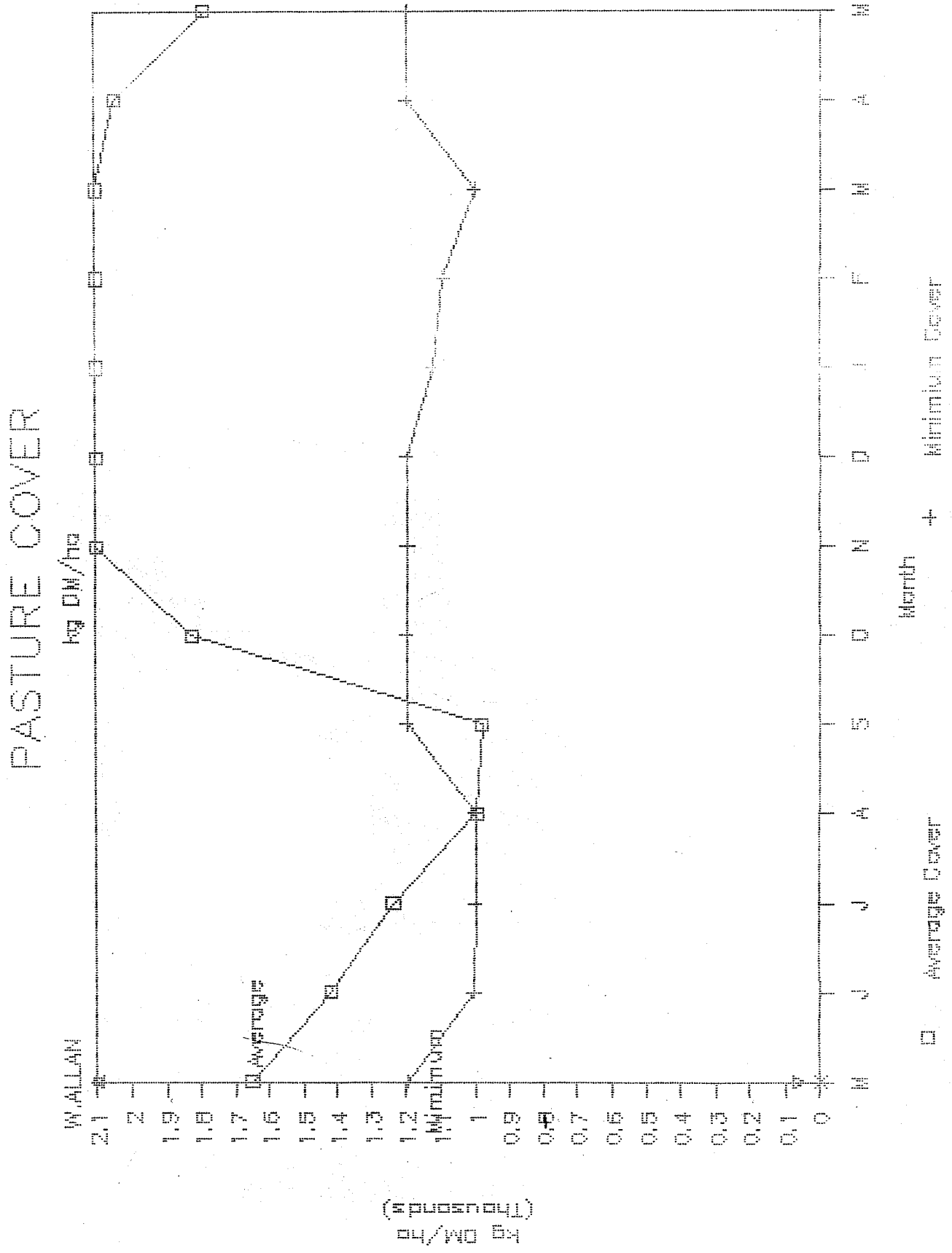
Table 9.2 Statistics for scenario 4.

Class/Operation	Mob A	Mob B	Total
Stocking Rate			13.6 SU/ha
Ewe Numbers	1070	1070	2140
Ram Numbers			100
Ram Lambs Sold	662	614 (Apr) 665 (Dec)	1938
Ewe Lambs Sold	662	614 (Apr) 665 (Dec)	1938
Cull Ewes Sold	250 (Nov)	250 (Feb)	500
Rep Hoggs (Buy)	310 (Dec)	300 (Mar)	610
Rep Rams (Buy)			25
Crop Area (ha)			13.3 ha

**9.1.3 Scenario 5. High lambing percentages with pasture and hay wintering but 40% of the ewes lambing only once a year in August.**

Scenario 5 has the same feeding regime as scenario 3 with only pasture and hay fed through the winter, however 40 % of the ewes with three lambings in two years have been substituted by ewes only lambing once a year in spring (mob C). This reduces the feed demand through winter by reducing the number of lactating ewes and their lambs and substitutes them with pregnant ewes which have a lower feed requirement. The result is a

Figure 9.3 Average vs minimum pasture cover for scenario 5



reduction in the winter feed deficit. Figure 3 shows that there is still a slight feed deficit in September. The system does not utilise the summer feed well as 2400 kg DM/ha is wasted. Also refer to Appendix 3.3.

Table 9.3 Statistics for scenario 5.

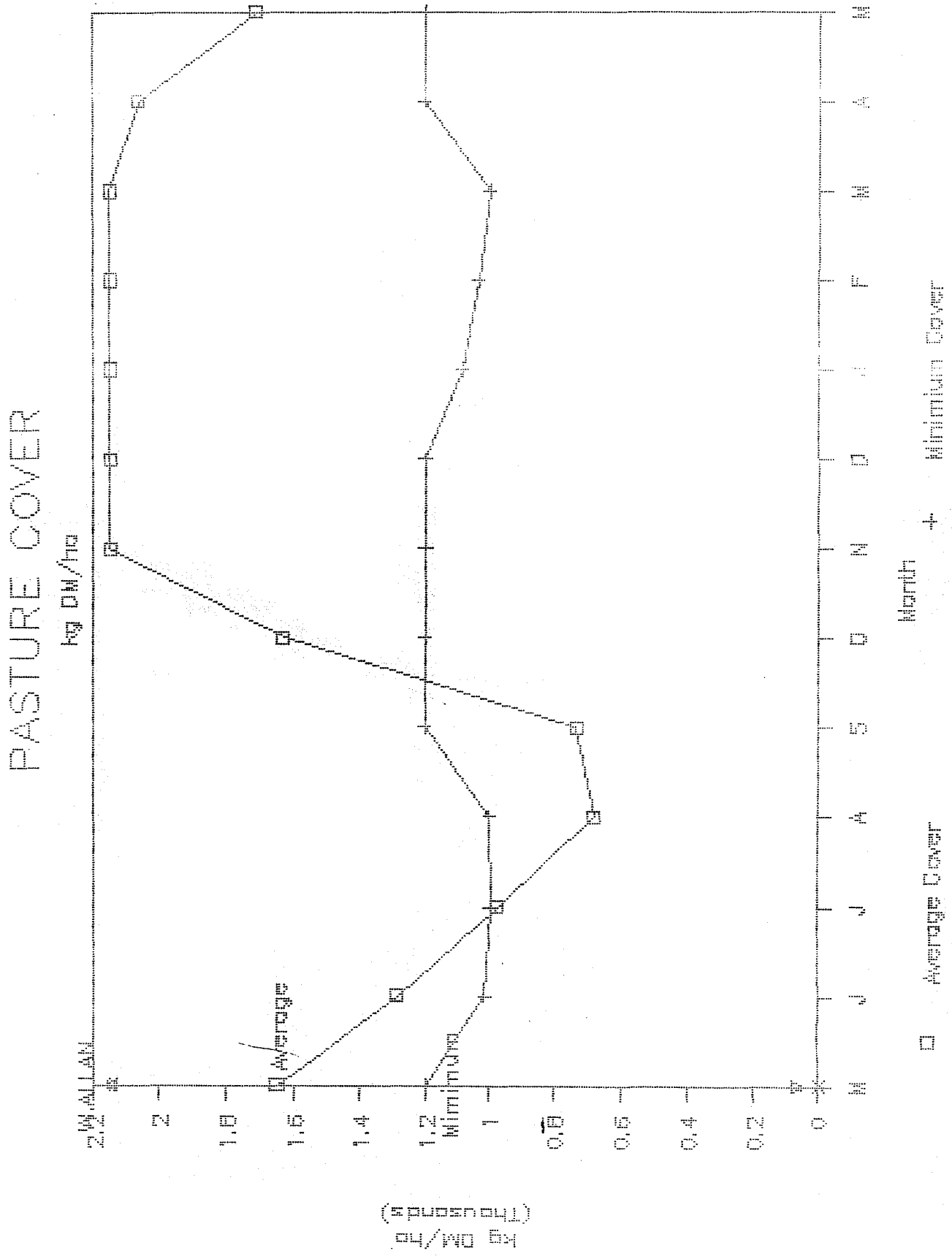
Class/Operation	Mob A	Mob B	Mob C	Total
Stocking Rate				13.6
Ewe Numbers	639	607	900	2146
Ram Numbers				100
Ram Lambs Sold	398	344(Apr) 360(Dec)	492	1594
Ewe Lambs Sold	398	334(Apr) 360(Dec)	492	1594
Cull Ewes Sold	180	180	200	560
Rep Hogs (Buy)	160	260	240	660
Rep Rams (Buy)				25
Crop Area (ha)				0

## 9.2 Investigation of the lowest anticipated lambing percentages

### 9.2.1 Scenario 6. Low lambing percentages with all pasture and hay wintering.

As in Scenario 3 scenario 6 involves the feeding of pasture and hay. The lowered lambing percentages mean that more feed is wasted in the summer than scenario 3 (2100 kg DM/ha vs 1850 kg) but there is still a feed deficit in August and September (figure 9.4). The lower conception rates also interrupts the flow of

Figure 9.4 Average vs minimum pasture cover for scenario 6



stock from year to year. There are a large number of ewes not conceiving in the December and July matings which must be changed to the next mating flock. Identification of the empty ewes is done by the use of harnessed infertile rams which are introduced to the ewes after the desired mating period. They will mark all ewes that are not pregnant and still cycling. Also refer to Appendix 9.4.

Table 9.4 Statistics for scenario 6.

Class/Operation	Mob A	Mob B	Total
Stocking Rate			13.6
Ewe Numbers	1070	1070	2150
Ram Numbers			100
Ram Lambs Sold	619	510 (Apr) 473 (Dec)	1602
Ewe Lambs Sold	619	510 (Apr) 473 (Dec)	1602
Cull Ewes Sold	260 (Nov)	240 (Feb)	500
Rep Hoggs (Buy)	500 (Dec)	140 (Mar)	640
Rep Rams (Buy)			25
Crop Area (ha)			0

### 9.2.2 Scenario 7. Low lambing percentages with pasture, winter crop and hay.

The main feature of this scenario is that there is feeding of choumollier in the winter months. The choumollier yields 13 t/ha of drymatter compared to a greenfeed grass which would yield 4 t/ha over a similar growing period. The use of choumollier means that less pasture must be fed and thus average pasture cover remains at a level above the minimum required pasture cover over the winter period (figure 9.5). There are large amounts of pasture unutilised in the summer months (2430 kg DM/ha). Also refer to appendix 3.5.

Figure 9.5 Average vs minimum pasture cover for scenario 7

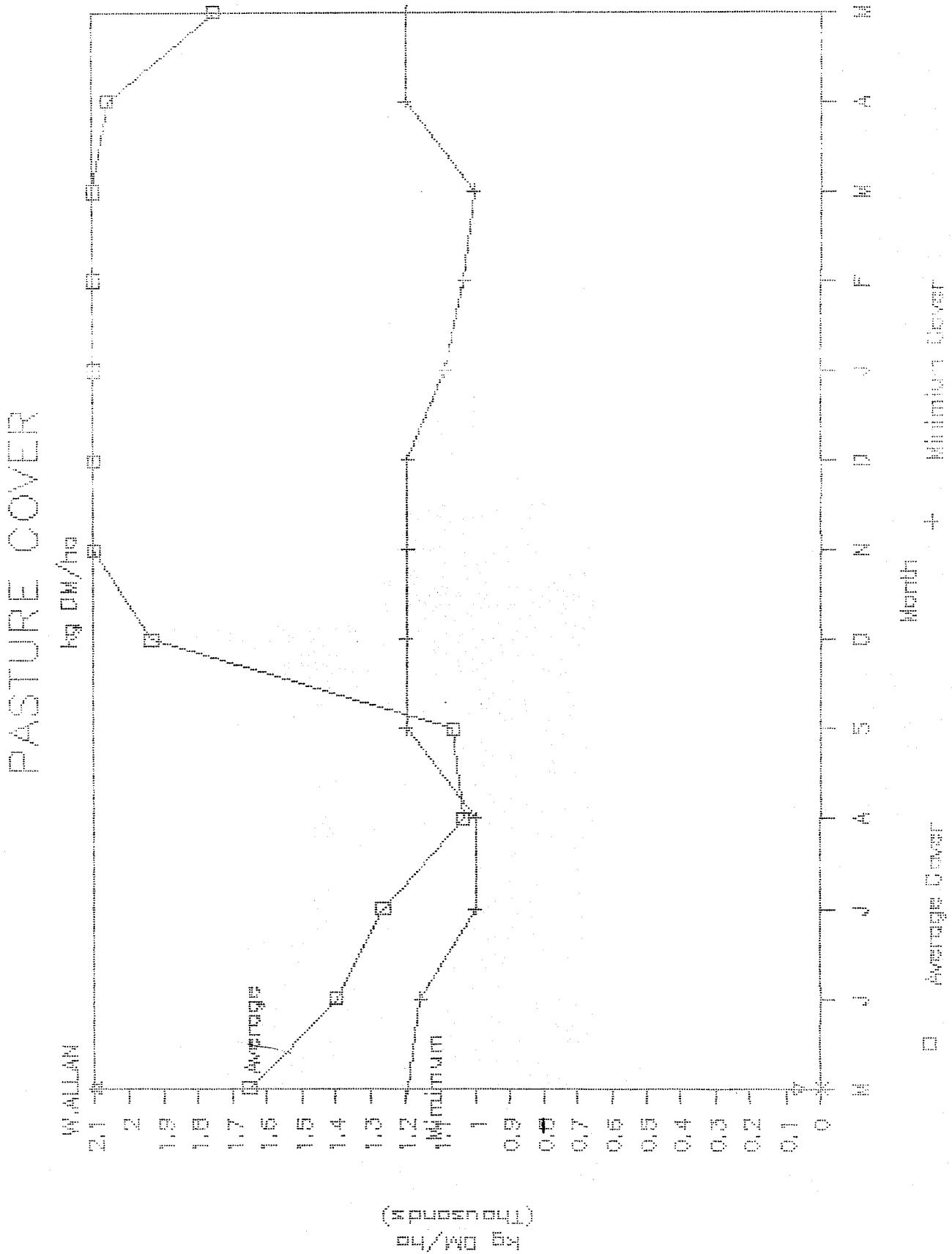


Table 9.5 Statistics for scenario 7.

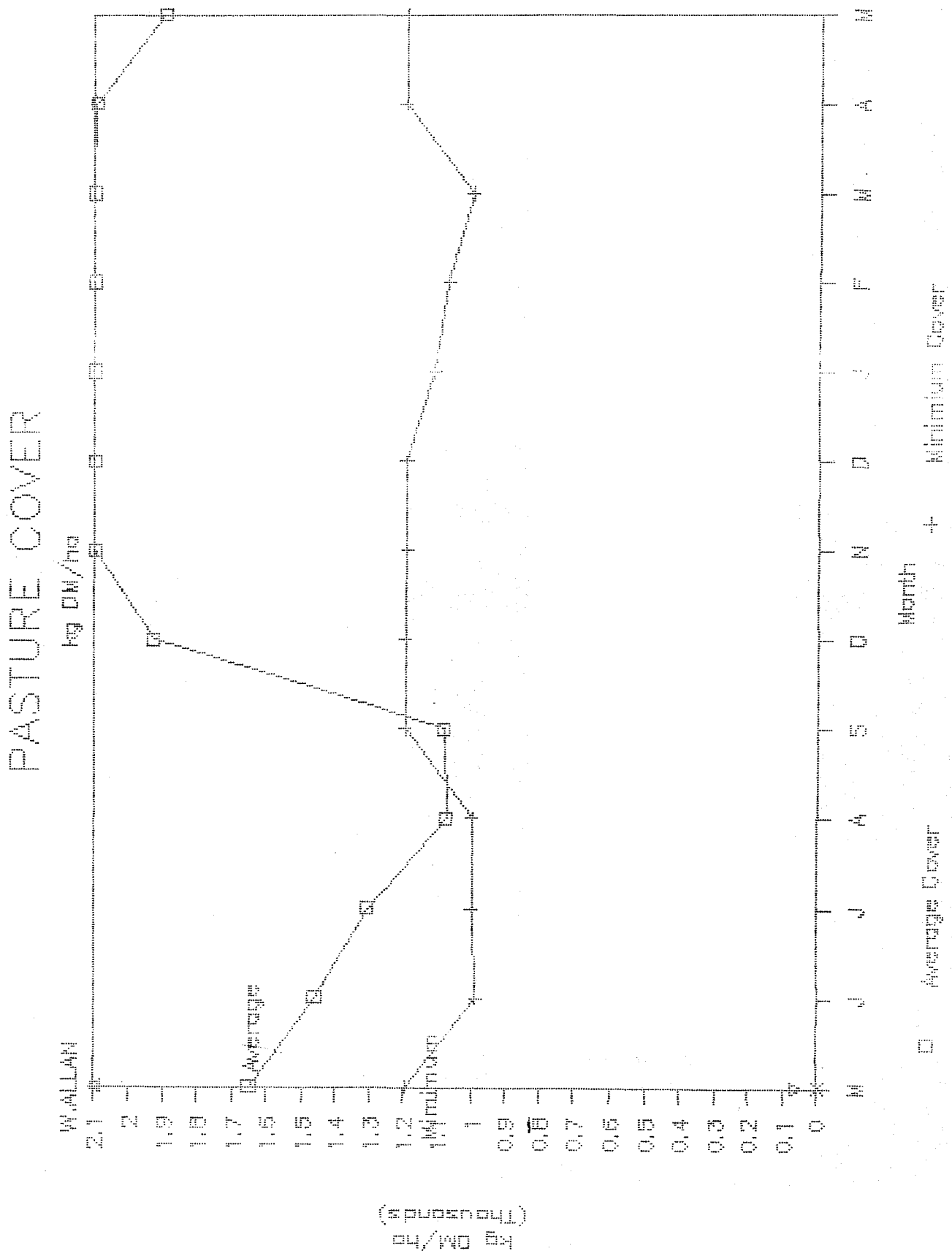
Class/Operation	Mob A	Mob B	Total
Stocking Rate			13.6
Ewe Numbers	1130	1020	2150
Ram Numbers			100
Ram Lambs Sold	619	510 (Apr) 450 (Dec)	1579
Ewe Lambs Sold	619	510 (Apr) 450 (Dec)	1579
Cull Ewes Sold	260 (Nov)	240 (Feb)	500
Rep Hoggs (Buy)	500 (Dec)	140 (Mar)	640
Rep Rams (Buy)			25
Crop Area (ha)			5.6 ha

9.2.3 Scenario 8. Low lambing percentages with all pasture and hay wintering but with 40% of the ewes lambing only once a year in Autumn.

Table 9.6 Statistics for scenario 8.

Class/Operation	Mob A	Mob B	Mob C	Total
Stocking Rate				13.6
Ewe Numbers	681	605	858	2144
Ram Numbers				100
Ram Lambs Sold	406	277(Apr) 280(Dec)	515	1478
Ewe Lambs Sold	406	277(Apr) 280(Dec)	515	1478
Cull Ewes Sold	130 (Nov)	150 (Feb)	220 (Nov)	500
Rep Hoggs (Buy)	335 (Dec)	35 (Mar)	253 (Dec)	623
Rep Rams (Buy)				25
Crop Area (ha)				0

Figure 9.6 Average vs minimum pasture cover for scenario 8



Scenario 8 is similar to scenario 5 as 40% of the ewes only lamb once a year in August, the difference is the lower lambing percents. The result that the average pasture cover drops below the minimum required pasture cover for only a short period in September (figure 9.6). This system however gives a large surplus of pasture (2680 kg DM/ha) in the summer which is unutilised under the proposed system. Also refer to appendix 3.6.

### **9.3 Utilisation of the summer feed surplus.**

In most scenarios there wastage of feed through the summer months. With a well managed property the manager would not leave this feed to waste. Options to utilise this feed include :

1. Purchase of store lambs to graze over the summer months and sold prime in February or March.
2. Purchase cattle to utilise the summer surplus.
3. Sell grazing to local farmers.
4. Make hay from the surplus pasture and sell it.

### **9.4 Conclusions**

Scenario 1 is the control for scenarios 3 to 8 and is feasible.

Scenario 2 is for a year with below average pasture production. It highlights the difficulties for a farm with high stocking rates if winter growth is only 2 to 4 kg DM less than an average year.

Scenario 3 is not feasible because of the severe feed shortage in August and September.

Scenario 4 is feasible.

Scenario 5 is not feasible as there is a slight feed shortage in August and September in an average year. In a year with low winter pasture production the feed deficit would be accentuated.

Scenario 6 is not feasible because there is a severe feed shortage in August and September.

Scenario 7 is feasible but the returns will be lower than for scenario 4 because less lambs are sold.

Scenario 8 is not feasible as there is a feed deficit in September which would be accentuated in a year with poor winter pasture production.

**CHAPTER 10 COMPARISON OF BUDGETS FOR MODEL CLASS 7 FARM AND A PROPERTY WITH THREE LAMBINGS IN TWO YEARS.**

**10.1 Comparison for the period 1st July 1988 to 31st May 1989.**

Table 10.1 Returns from Class 7 and Eight Monthly lambing properties for the 1988/89 year.

ITEM	MAF Class 7 Figures Modified for Higher Production	System of Three Lambings in Two Years
<b>Income</b>	(\$)	(\$)
Sheep	58 420	86 658
Wool	84 731	65 466
Cattle	0	0
Crop	0	0
Other	5 515	5 515
less		
Sheep Purch	2 400	26 741
Cattle Purch	0	0
<b>GFI</b>	<u>146 266</u>	<u>130 898</u>
<b>Expenditure</b>		
Wages	2 478	2 478
An Health	4 000	4 500
Crop Exp	0	300
Electricity	1 491	1 491
Feed	2 000	2 000
Fertiliser	6 429	6 429
Seed	605	700
Freight	4 000	4 500
Shearing	10 403	9 500
Weed & Pest	963	963
Vehicles	7 951	7 951
R & M	4 000	4 000
Admin	9 074	9 074
Other	907	907
<b>Cash Exp</b>	<u>54 301</u>	<u>54 793</u>
<b>Cash Farm Surplus</b>	<u>91 965</u>	<u>76 105</u>

GFI = Gross Farm Income

Lambing ewes three times in two years generates a lower cash surplus than a high producing class 7 property under a conventional management system. Table 10.1 illustrates that although there is a substantial increase in income from sheep with the 8 monthly lambing interval, wool income drops and other costs increase disproportionately.

The wool returns decrease because of the drop in ewe numbers and the drop in quantity/head. This drop is due to the use of Dorset x Romney ewes which are poorer wool producers than Romneys. All replacement ewes are purchased thus substantially increasing the cost of stock purchases in the 8 monthly lambing regime. The cost of replacement ewes is difficult to establish as they must be appropriately selected, this effort by the breeder must therefore be rewarded by higher prices. In this case there is a 30% premium paid over sale hogget/2ths at the time of purchase (ie. December and March). Other costs to rise are Animal Health (increased drenching of lambs), Crop Expenses (for planting the Choumollier) and Freight (increased sale lambs and hogget purchases).

Multiple lambing systems increase the risks involved and the labour and management resources required. Both production risks and market risks affect three lambings in two years. Production risks are associated with the uncertainty of the conception rates and thus the numbers of lambs born, and the risk of a year with low pasture production. A year of low winter pasture production would put pressure on the feed supply and possible lower future production (eg. lower conception rates and lower lamb sale weights). The labour input must increase as there are more mobs of ewes and lambs, three lambings per year with two flocks and more sales. The management input must also increase as feed planning and analysing the market becomes more important. There must therefore be a margin for risk and also an increased return to labour and management. To compensate a return of \$25 000 over

that from the high producing traditional lambing system may be required.

The impact of change in wool prices and winter prices for lamb are analysed in section 10.2.

### 10.2 Sensitivity Analysis.

Table 10.2 Sensitivity of the Cash Farm Surplus to changes in wool and winter lamb prices.

		Lamb Price		
		2/3s	Current	Double
Wool	Class7	\$75 238	\$75 238	\$75 238
	\$4.00/kg			
l	3 in 2	\$53 560	\$59 683	\$78 050
P	Class7	\$91 965	\$91 965	\$91 965
	Current			
r	3 in 2	\$69 982	\$76 105	\$94 472
i	Class7	\$104 978	\$104 978	\$104 978
	\$5.75/kg			
e	3 in 2	\$80 181	\$86 304	\$104 671

#### 10.2.1 Effect of wool price.

Change in the price of wool has large effects on the Cash Farm Surplus of both the high producing Class 7 farm and the property practicing 8 monthly lambing (table 10.2). The effect of changes in wool prices a slightly less significant under the 8 monthly lambing regime as wool makes a smaller contribution to

the farm income. It would however take a considerable drop in the price of wool before the 8 monthly regime shows a higher Cash Farm Surplus than the Class 7 farm.

#### 10.2.2 Effect of the price for Winter Lamb.

Some Freezing Companies do offer premiums for the supply of winter lambs (eg. Fortex). A change in the price received for winter lamb would only affect the 8 monthly lambing regime as in table 10.2 it is only lambs sold between June and November that the price is changed (Appendix 4.3). By doubling the price received for winter lamb (to an average of about \$37/hd) the Cash Farm Surplus of the 8 monthly lambing regime matches that of the Class 7 farm. This however may not give a true indication of the Cash Farm Surplus as if the price for winter lamb did double both farm systems would attempt to sell more lambs in the winter months. It is also probable that if lamb prices doubled through the winter then the prices for lamb throughout the year, hogget and ewe prices would also rise.

Table 10 illustrates that it unlikely that the Cash Farm surplus of the 8 monthly lambing regime is likely to greatly exceed that of the traditional lambing system.

## CHAPTER 11 CONCLUSIONS.

It appears that lambing ewes three times in two years in Southland has no financial benefits to a high producing farm. The two major obstacles that occur are :

1. There is insufficient winter pasture production to run enough ewes to make the system viable.
2. Premiums for lambs sold in winter and early spring are not high enough at present to warrant a multiple lambing system.

Although a multiple lambing system may give a higher cash surplus than an average Class 7 farm, the farmer probably does not have the management ability to run such a system. Three lambings in two years is therefore not an option for these farmers.

If the excess summer feed were to be utilised somehow (Chapter 9.4) then the Cash Farm Surplus for the multiple lambing option could be expected to improve. Even with this improvement it is unlikely to warrant a system of three lambings in two years.

It should also be considered that the scenario examined, (scenario 4), is under the highest conception rates likely to occur. It could therefore be expected that the Cash Farm Surplus would be less than calculated. This indicates that there is little or no compensation for the higher labour, management and risk involved in three lambings in two years.

These results do not imply that three lambings in two years is not feasible in other regions of New Zealand. Areas with high winter pasture production such as Northland may be able to run enough ewes through the winter to gain an adequate return from a

multiple lambing system. If higher premiums for lambs sold in winter were paid, three lambings in two years may become a viable and attractive alternative in these regions.

**CHAPTER 12 REFERENCES**

- Aglink FPP 842, 1985. Controlled grazing systems meat and wool farm production targets.
- Andrews, W.G.K. and Taylor, A.O, 1986. Autumn and winter lambing strategies in Northland. Proc. N.Z. Grasslands Assn. 45,81-84.
- Armstrong, J.R, Davis, G.H, Farquhar, P.A, Owens, J.L. 1987. Effect of pregnancy nutrition and pre-lamb shearing on lamb birth weight in prolific sheep. Proc. Aust. Soc. Reproductive Biology. 18,46.
- Averill, R.L.W, 1959. Ovulatory activity in mature Romney ewes in Otago. N.Z. J. Agric. Research. 2,575-583.
- Blaxter, K.L, 1968. Efficiency of farm animals in using crops and byproducts in production of foods. Proc. 2nd Conference in Animal Production, Maryland. 31-40 pp.
- Finlayson, J.D, 1989. A Simulation Study of Out of Season Lamb Production. (unpublished) Thesis. M.Agr.Sc. Lincoln College.
- Geenty, K.G, and Rattray, P.V, 1987. The energy requirements of grazing sheep and cattle in Livestock feeding on pasture. N.Z. Soc. Anim. Prod. occasional publication (10),39-53.
- Gordon, I, 1963. The induction of pregnancy in the anoestrus ewe by hormonal therapy. J. Agric. Res. Cambridge. 60,77-85.

- Gordon, I, 1975. Hormonal control of reproduction in sheep. Proc. Br. Anim. Prod. 4,79-93.
- Gordon, I, 1983. Controlled Breeding in Farm Animals. Pergamon Press.
- Gunn, R.G, Doney, J.M, Smith, W.F, 1979. Fertility in cheviot ewes. N.Z. Soc. Anim. Prod. 29,11-31.
- Hafez, E.S, 1952. Studies of the breeding season and reproduction of the ewe. J. Agric. Sc. Camb. 42,189-231.
- Hay, R.J.M, and Baxter, G.S. 1984. Spring management of pasture to increase summer white clover. Proc. Lincoln College Farmers Conference.
- Hayman, J.M, and Munro, J.M, 1983. Silage for flushing ewes. Proc. N.Z. Grasslands Assn. 44,196-202.
- Henderson, D, 1985. Control of the breeding season in sheep and goats. In; In Practice. 118-123 pp.
- Hunter, G.L, 1968a. Increasing the frequency of pregnancy in sheep. 1. Some factors affecting rebreeding during the post partum period. Anim. Breeding Abstracts. 36,347-378.
- Hunter, G.L, 1989b. Increasing the frequency of pregnancy in sheep. 2. Artificial control of rebreeding and problems of conception and maintenance of pregnancy during the post partum period. Anim. Breeding Abstracts. 36,533-553.
- Kelly, R.W, Allison, A.J, Shackell, G.H. 1976. Seasonal variation in oestrus and ovarian activity of five breeds of ewes in Otago. N.Z. J. Exp Agric. 4,209-214.

- Knight, T.W, 1980. Onset of mating activity in romney ewes after short periods of teasing. N.Z. J. Agric. Res. 23,277-280.
- Knight, T.W, 1983. Ram induced stimulation of ovarian and oestrus activity in anoestrus ewes - a review. Proc N.Z. Soc. Anim. Prod. 43,7-11.
- Knight, T.W, 1985. Are rams necessary for the stimulation of anoestrus ewes with oestrus ewes? Proc. N.Z. Soc. Anim. Prod. 45,49-50.
- Knight, T.W, 1986. MAF. Ram effect and drugs. In Out of Season Lamb Production. 37-47 pp.
- Lees, J.L, 1969. The reproductive pattern and performance of sheep. Outlook on Agriculture. 6, (2),82-88.
- Lincoln, G.A, and Short, R.V, 1980. Seasonal breeding : natures contraceptive. Recent Progress in Hormone Research. 36,1-53.
- Lowe, K.I, Canter, M.L, McCutcheon, S.N, 1988. Development of systems for out of season lambing at Limestone Downs. Proc N.Z. Soc. Anim. Prod. 48,95-102.
- McQueen, I.P.M, and Reid, P.C, 1988. The development of an autumn lambing flock of Dorset x Romney ewes without the use of hormones. Proc N.Z Soc Anim Prod. 48,87-90.
- Milligan, K.E, Brookes, I.M, Thompson, K.F, 1987. Feed planning on pasture. In Livestock feeding on pasture. N.Z Soc. Anim. Prod. occasional publication no (10),75-88.

- Mittal, J.P, and Ghosh, P.K, 1980. A note on annual reproduction rhythm in Marwari sheep of Rajasthan desert in India. *Animal Production*. 30,153-156.
- Montgomery, G.W, Scott, I.C, Johnson, P.D, 1985. Seasonal change in ovulation rate in Coopworth ewe maintained at different live weights. (origin unknown).
- New Zealand Farmer. 1988/1989. Net Lamb and Mutton Values, and Wool Prices. 110, (21)-111, (21).
- New Zealand Meat and Wool Boards Economic Service (NZMWBES). 1986/1987. The New Zealand Sheep and Beef Farm Survey.
- Oldham, C.M, and Lindsay, D.R, 1984. The minimum period of intake of lupin grain by ewes to increase their ovulation when grazing dry summer pasture. In Lindsay, D.R, Pearce, D.T, ed. *Reproduction in sheep*. Canberra, Australian Academy of Science and Australian Wool Corporation. 274-276 pp.
- Radcliffe, J.C, 1974. Seasonal distribution of pasture production II. *N.Z. J. Exp. Agric.* 2,341-349.
- Rattray, P.V, Thompson, K.F, Hawker, H, Sumner, R.M.W. 1987. Pastures for sheep production. In *Livestock Feeding on Pasture*. N.Z. Soc. Anim. Prod. Occasional Publication (10),89-103.
- Robinson, J.J, 1974. Intensifying Ewe Productivity. *Proc. Br. Soc. Anim. Prod.* 3,31-40.

- Salman, A.D, Owen, E. 1976. (The effect of the time of winter shearing on the performance of pregnant ewes) Fourth Scientific Conference, Scientific Research Council, Oct 23-28 1986. Proceedings of Agricultural Research vol.1 part 3 :1746-1757. From Animal Breeding Abstracts 56,2763. 1988.
- Scott, I, 1988. Ram effect does away with Drugs. The N.Z. Farmer. 110,(34c),21.
- Sealey, B, 1988. Waikato man holds key to early lambing - ram smell. The N.Z. Farmer. 110,(39),19.
- Smith, J.F, McGowan, L.T, McLean, K.S, Farquhar, P.A, 1987. The effect of steroid Immunisation on the seasonal pattern of oestrus, ovulation and ovulation rate in Coopworth ewes. Proc N.Z. Soc. Anim. Prod. 1987, 47,143-146.
- Smith, J.F, Cruickshank, G.F, McGowan, L.T, Parr, J, Montimer, B.J, 1988(a). Seasonal changes in oestrus, ovulation and conception of Coopworth ewes treated with CIDRs and PMSG. Proc. N.Z. Soc. Anim. Prod. 48,49-102.
- Smith, J.F, McGowan, L.T, Knight, T.W, McClean, K.S. 1988(b). Advancement of the breeding season in Coopworth ewes. Proc. N.Z. Soc. Anim. Prod. 48,103-107.
- Smith, J.F, Andrews, W.G.K, Knight, T.W, McMillian, W.H, Quinlivan, T.D, 1989. A review in technology used for out of season breeding with New Zealand sheep breeds. Pro 2nd International Congress for Sheep Veterinarians.
- Syme, D. (Personal Communication) 1989. NZMWBES.
- Taylor, A.O, and Andrews, W.G,K, 1987. Winter lambing of aged Perendale ewes on Northland farms. N.Z. J. Exp Agric. 15,45-50.

- Tervit, H.R, 1983. Synchronisation of oestrus in sheep. Proc Sheep and Beef Cattle Society. N.Z. Vet. Ass. 13,53-61.
- Thompson, K.F, Crosbie, S.F, Kelley, R.W, McEwan, J.C, 1985. The effect of live weight and live weight change on ewe ovulation rate at 3 successive oestrus cycles. N.Z. J. Agric. Res. 28,457-462.
- Thompson, K.F, (Personal Communication) 1989.
- Wilson,P.N, 1968. Biological ceilings and economic efficiencies for the production of animal protein. AD 2000 Chem. Ind. 899-902 pp.
- Waller, S.L, Hudgens, R.E, Diekman, M.A, Moss, G.E, 1988. Effect of Melation on induction of oestrus cycles in anoestrus ewe. J. Animal. Sci. 66, (1),459-463.
- Ulyatt, M.J, Fennessy, P.F, Rattray, P.V, Jagusch, K.T. 1980. Nutritive value of supplements. In Supplementary feeding. N.Z. Soc. Anim. Prod. occasional publication (7) Ed. Drew and Fennessy. 157-184 pp.

**CHAPTER 13 APPENDICES****APPENDIX 1. Southland Pasture Production.**

Winton daily pasture growth and standard error (kg DM/ha) at standard cutting dates throughout the year for 11 years.

Standard Date	Total Yield	
	Mean	SE
14 June	8.5	6.2
28 June	8.5	6.2
12 July	9.2	5.9
26 July	10.0	5.5
9 August	10.0	5.5
23 August	10.0	5.5
6 September	19.6	12.8
20 September	32.5	16.4
4 October	51.2	12.3
18 October	55.1	16.6
1 November	57.1	15.7
15 November	51.4	16.9
30 November	54.9	24.2
14 December	61.5	28.1
28 December	47.2	20.9
11 January	53.6	21.3
25 January	52.8	18.1
8 February	53.0	39.1
22 February	50.5	18.6
8 March	43.3	19.6
22 March	40.0	15.2
5 April	30.7	11.0
19 April	21.7	12.8
3 May	16.3	10.4
17 May	13.7	9.0
31 May	9.5	6.2
Annual	12 010	2290
Lowest	8 870	
Highest	16 000	

Source Radcliffe (1974)

**APPENDIX 2. OUTPUT FOR CLASS 7 FARM****2.1 Scenario 1 The Average year**

Pasture cover at start = 1600 kg DM/ha      Stocking rate (su/ha) = 19.5  
 Maximum pasture cover = 2100 kg DM/ha      Initial SR (su/ha) = 19.5

Pasture:      Crop:  
 Total pasture prod. kg DM/ha/year      12551      Yield t DM/ha      12.5  
 Production/intake balance (kg DM/ha)      577      Area eaten (ha)      0  
 Overall balance      0  
 Pasture cover at end of year      1646      Bought in Supplement:  
 Hay made (bales/farm)      M/D (MJ ME/kg DM)      12  
     Made = 4000      0.0 tonne DM  
     Used = 2744      Surplus/deficit = 1256

Month	J	J	A	S	O	N	D	J	F	M	A	M
PASTURE COVER at end of month and MINIMUM COVER (kg DM/ha)												
Past cover	1477	1366	1294	1126	1462	1684	2084	2100	2100	2100	1836	1646
Min. cover	450	511	727	929	1144	1160	524	936	916	1092	1170	633
EXTRA FEED REQUIRED (kg DM/ha/day) and PASTURE WASTED (kg DM/ha/month)												
Feed Waste	0	0	0	0	0	0	0	208	288	35	0	0

Please enter the following information.

Your name: W. ALLAN      Farmers name: CLASS7  
 Grazing area in hectares: 180

Number of stock:      Relative stocking:  
 Ewes      2651      1.1  
 Lambing %      120  
 Hoggets      632      0.88  
 Rams      36      0.9  
 Others2      0      0  
 Others3      0      0

If all else fails read your instructions!  
 Have a happy day.

Press <Enter> and select the next activity from the menu.

**PASTURE PRODUCTION**

Month	J	J	A	S	O	N	D	J	F	M	A	M
Days	30	31	31	30	31	30	31	31	28	31	30	31
Pasture Production (kg DM/ha/d)	10.6	12.1	15.5	27.5	55.4	53.3	54.7	53.1	49.7	40.1	26.5	15
Hay Bales/farm/month	0	0	0	0	0	0	2000	1500	500	0	0	0

Bale weight = 25 kg  
 M/D of hay = 9 MJ ME/kg DM

View the graph of pasture production by pressing <Enter> and selecting Graph-IP.

FEED DEMAND - Intake kg DM/animal/day												
Ewe Intake (kg DM/ewe/day)						Annual intake/ewe = 531 kg DM						
Month	J	J	A	S	O	N	D	J	F	M	A	M
Numbers	2651	2645	2639	2630	2619	2613	2691	2683	2677	2671	2664	2658
(adj for SR)	2651	2645	2639	2630	2619	2613	2691	2683	2677	2671	2664	2658
Intake	0.98	1.05	1.18	1.8	2.5	2.6	1.03	1.16	1.16	1.34	1.65	1.02

Hay silage	0.2	0.2	0.2									
Crop												
Bought suppl												
Pasture	0.81	0.88	1.01	1.80	2.50	2.60	1.03	1.16	1.16	1.34	1.65	1.02
Post. graze	400	500	750	1000	1200	1200	600	600	600	1000	1200	500

Intake/hogget since June = 454 kg DM Intake/hogget since weaning = 657												
Ewe hogget Intake (kg DM/hogget/day)												
Month	J	J	A	S	O	N	D	J	F	M	A	M
Numbers	632	630	628	626	624	622	0	0	640	638	636	634
adj for SR	632	630	628	626	624	622	0	0	640	638	636	634
Intake	0.89	0.89	0.89	1.5	1.92	1.92			1.65	1.76	1.92	1.67

Hay silage	0.2	0.2	0.1									
Crop												
Bought suppl												
Pasture	0.72	0.72	0.81	1.50	1.92	1.92	0.00	0.00	1.65	1.76	1.92	1.67
PGPM	600	600	650	850	1100	1200			1200	1200	1200	1000

Ewe lambs (kg DM/lamb/day) Intake/sale lamb = 22 kg DM												
Month	J	J	A	S	O	N	D	J	F	M	A	M
Numbers	0	0	0	0	0	0	1495	1300	600	550	150	0
adj for SR	0	0	0	0	0	0	1495	1300	600	550	150	0
Intake	0	0	0	0	0	0	1.12	1.46	1.36	1.38	1.39	0

Hay silage												
Crop												
Bought supplement												
Pasture	0.00	0.00	0.00	0.00	0.00	0.00	1.12	1.46	1.36	1.38	1.39	0.00
PGPM							1200	1200	1200	1200	1000	

Ram lambs Intake (kg DM/lamb/day) Intake/sale lamb = 144												
Month	J	J	A	S	O	N	D	J	F	M	A	M
Numbers	0	0	0	0	0	0	1495	1495	1250	1100	350	0
adj for SR	0	0	0	0	0	0	1495	1495	1250	1100	350	0
Intake	0	0	0	0	0	0	1.12	1.46	1.36	1.38	1.39	0

Hay silage												
Crop												
Bought supplement												
Pasture	0.00	0.00	0.00	0.00	0.00	0.00	1.12	1.46	1.36	1.38	1.39	0.00
PGPM							1200	1200	1200	1200	1000	

Rams Intake (kg DM/head/day)

Month	J	J	A	S	O	N	D	J	F	M	A	M
Numbers	36	36	35	35	34	34	34	40	39	39	38	37
adj for SR	36	36	35	35	34	34	34	40	39	39	38	37
Intake	0.87	0.87	0.87	8.1	8.1	8.1	0.87	0.94	0.94	0.93	1.11	0.93

-----  
 Hay silage

Crop

Bought suppl

Pasture	0.87	0.87	0.87	8.10	8.10	8.10	0.87	0.94	0.94	0.93	1.11	0.93
PGPM												

-----  
 Others2 Intake (kd DM/head/day)

Month	J	J	A	S	O	N	D	J	F	M	A	M
Numbers	0	0	0	0	0	0	0	0	0	0	0	0
adj for SR	0	0	0	0	0	0	0	0	0	0	0	0
Intake	0	0	0	0	0	0	0	0	0	0	0	0

-----  
 Hay silage

Crop

Bought supplement

Pasture	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PGPM												

-----  
 Others3 Intake (kd DM/head/day)

Month	J	J	A	S	O	N	D	J	F	M	A	M
Numbers	0	0	0	0	0	0	0	0	0	0	0	0
adj for SR	0	0	0	0	0	0	0	0	0	0	0	0
Intake	0	0	0	0	0	0	0	0	0	0	0	0

-----  
 Hay silage

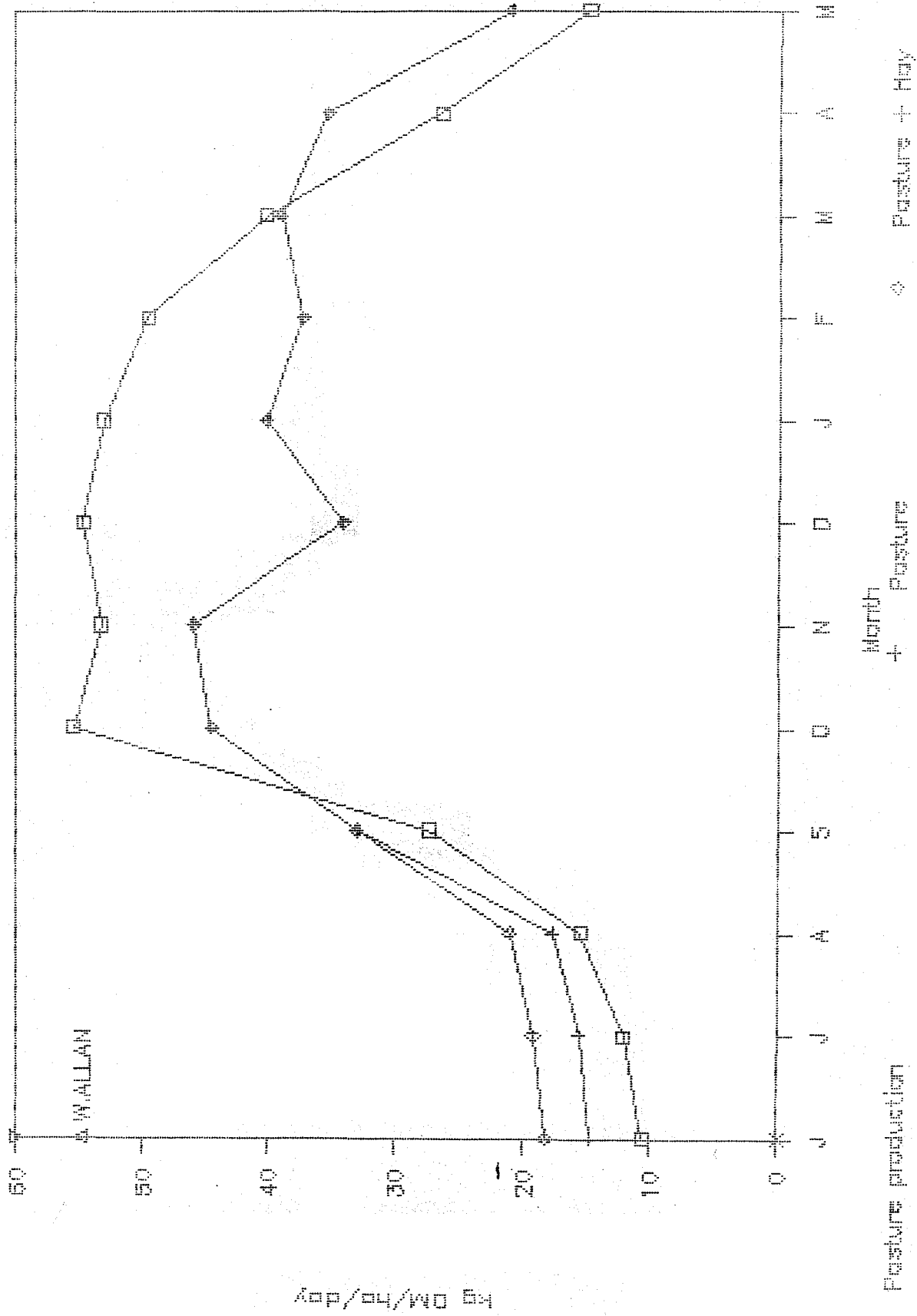
Crop

Bought supplement

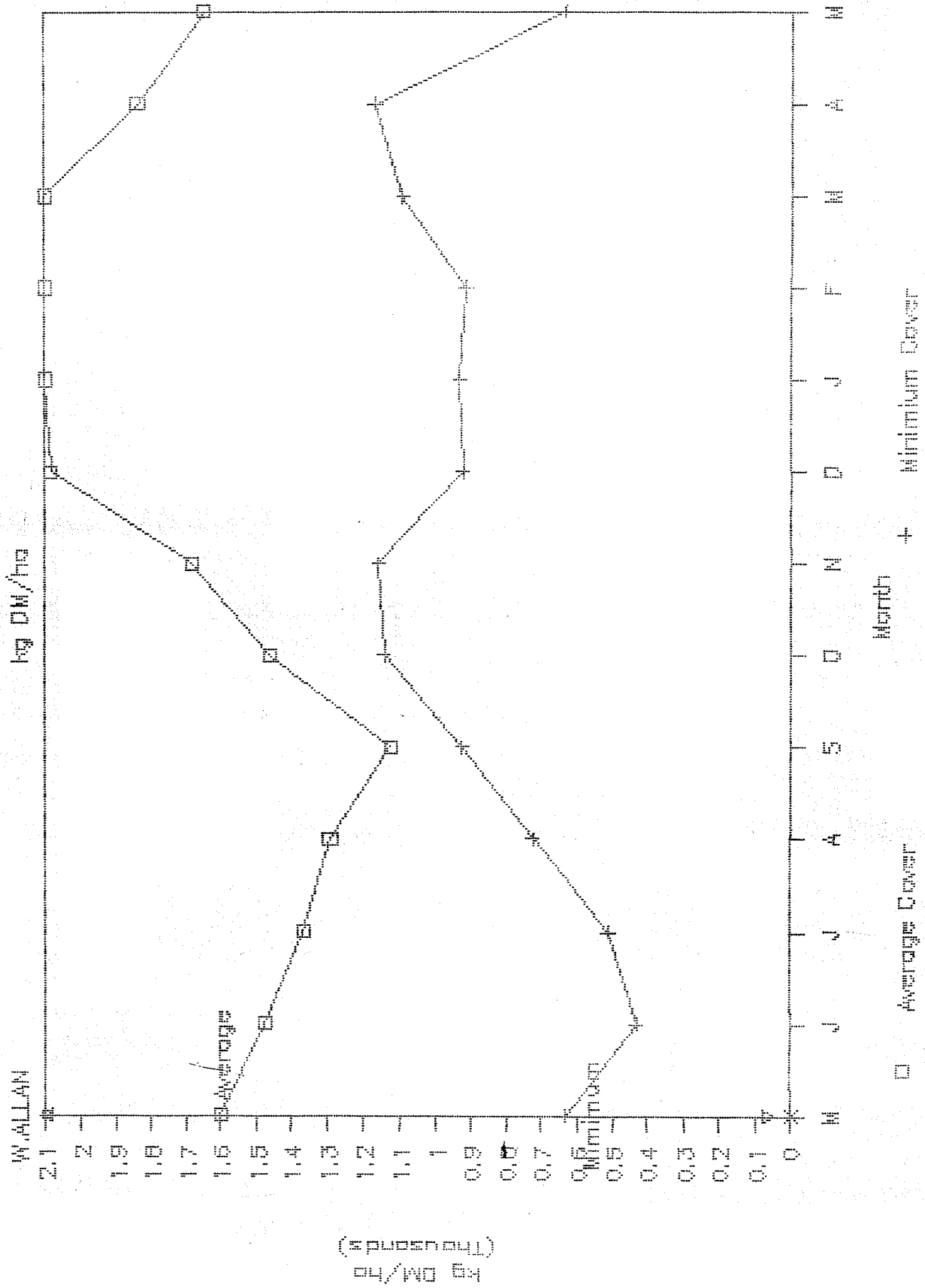
Pasture	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PGPM												

-----  
 Press <enter> and select the next activity from the menu.

# Pasture Production and Intake



# PASTURE COVER



## 2.2 Scenario 2 Below Average Winter Pasture Production

Students name: W.ALLAN

Farmers name: CLASS7

Pasture cover at start = 1600 kg DM/ha      Stocking rate (su/ha) = 19.5  
 Maximum pasture cover = 2150 kg DM/ha      Initial SR (su/ha) = 19.5

Pasture:

Total pasture prod. kg DM/ha/year    11907  
 Production/intake balance (kg DM/ha)   -68  
 Overall balance                            0  
 Pasture cover at end of year            1447  
 Hay made (bales/farm)  
   Made = 4000  
   Used = 2744      Surplus/deficit = 1256

Crop:

Yield t DM/ha    11.9  
 Area eaten (ha)    0

Bought in Supplement:

M/D (MJ ME/kg DM)    12  
 0.0 tonne DM

Month	J	J	A	S	O	N	D	J	F	M	A	M
PASTURE COVER at end of month and MINIMUM COVER (kg DM/ha)												
Past cover	1414	1229	1063	730	1066	1288	1689	1912	2150	2150	1727	1447
Mim. cover	430	511	727	929	1144	1160	924	936	916	1092	1170	635
EXTRA FEED REQUIRED (kg DM/ha/day) and PASTURE WASTED (kg DM/ha/month)												
Feed				7	2							
Waste	0	0	0	0	0	0	0	0	50	35	0	0

Please enter the following information.

Your name: W.ALLAN      Farmers name: CLASS7  
 Grazing area in hectares    180.

	Number of stock:	Relative stocking:
Ewes	2651	1.1
Lambing %	120	
Hoggets	632	0.88
Rams	36	0.9
Others2	0	0
Others3	0	0

If all else fails read your instructions!  
 Have a happy day.

Press <Enter> and select the next activity from  
 the menu.

### PASTURE PRODUCTION

Month	J	J	A	S	O	N	D	J	F	M	A	M
Days	30	31	31	30	31	30	31	31	28	31	30	31
Pasture Production (kg DM/ha/d	8.5	9.7	12.5	22	55.4	53.3	54.7	53.1	49.7	40.1	21.2	12.1
Hay	0	0	0	0	0	0	2000	1500	500	0	0	0
Bales/farm/month												

Bale weight = 25 kg  
 M/D of hay = 9 MJ ME/kg DM

View the graph of pasture production by pressing <Enter> and  
 selecting Graph-IP.

-----  
 FEED DEMAND - Intake kg DM/animal/day

Month	Ewe Intake (kg DM/ewe/day)					Annual intake/ewe = 531 kg DM						
	J	J	A	S	O	N	D	J	F	M	A	M
Numbers	2651	2645	2639	2630	2619	2613	2691	2683	2677	2671	2664	2658
(adj for SR)	2651	2645	2639	2630	2619	2613	2691	2683	2677	2671	2664	2658
Intake	0.98	1.05	1.18	1.8	2.5	2.6	1.03	1.16	1.16	1.34	1.65	1.02

Hay silage 0.2 0.2 0.2

Crop

Bought suppl

Pasture	0.81	0.88	1.01	1.80	2.50	2.60	1.03	1.16	1.16	1.34	1.65	1.02
Post. graze	400	500	750	1000	1200	1200	600	600	600	1000	1200	500

-----  
 Intake/hogget since June = 454 kg DM Intake/hogget since weaning = 657

Month	Ewe hogget Intake (kg DM/hogget/day)											
	J	J	A	S	O	N	D	J	F	M	A	M
Numbers	632	630	628	626	624	622	0	0	640	638	636	634
adj for SR	632	630	628	626	624	622	0	0	640	638	636	634
Intake	0.89	0.89	0.89	1.5	1.92	1.92			1.65	1.76	1.92	1.67

Hay silage 0.2 0.2 0.1

Crop

Bought suppl

Pasture	0.72	0.72	0.81	1.50	1.92	1.92	0.00	0.00	1.65	1.76	1.92	1.67
PGPM	600	600	650	850	1100	1200			1200	1200	1200	1000

-----  
 Ewe lambs (kg DM/lamb/day) Intake/sale lamb = 22 kg DM

Month	Ewe lambs (kg DM/lamb/day)					Intake/sale lamb = 22 kg DM						
	J	J	A	S	O	N	D	J	F	M	A	M
Numbers	0	0	0	0	0	0	1495	1300	600	550	150	0
adj for SR	0	0	0	0	0	0	1495	1300	600	550	150	0
Intake	0	0	0	0	0	0	1.12	1.46	1.36	1.38	1.39	0

Hay silage

Crop

Bought supplement

Pasture	0.00	0.00	0.00	0.00	0.00	0.00	1.12	1.46	1.36	1.38	1.39	0.00
PGPM							1200	1200	1200	1200	1000	

-----  
 Ram lambs Intake (kg DM/lamb/day) Intake/sale lamb = 144

Month	Ram lambs Intake (kg DM/lamb/day)					Intake/sale lamb = 144						
	J	J	A	S	O	N	D	J	F	M	A	M
Numbers	0	0	0	0	0	0	1495	1495	1250	1100	350	0
adj for SR	0	0	0	0	0	0	1495	1495	1250	1100	350	0
Intake	0	0	0	0	0	0	1.12	1.46	1.36	1.38	1.39	0

Hay silage

Crop

Bought supplement

Pasture	0.00	0.00	0.00	0.00	0.00	0.00	1.12	1.46	1.36	1.38	1.39	0.00
PGPM							1200	1200	1200	1200	1000	

-----  
 Rams

Intake (kg DM/head/day)

Month	J	J	A	S	O	N	D	J	F	M	A	M
Numbers	36	36	35	35	34	34	34	40	39	39	38	37
adj for SR	36	36	35	35	34	34	34	40	39	39	38	37
Intake	0.87	0.87	0.87	8.1	8.1	8.1	0.87	0.94	0.94	0.93	1.11	0.93

Hay silage

Crop

Bought suppl

Pasture	0.87	0.87	0.87	8.10	8.10	8.10	0.87	0.94	0.94	0.93	1.11	0.93
PGPM												

Month	J	J	Others2	A	S	O	N	D	J	F	M	A	M
Numbers	0	0	0	0	0	0	0	0	0	0	0	0	0
adj for SR	0	0	0	0	0	0	0	0	0	0	0	0	0
Intake	0	0	0	0	0	0	0	0	0	0	0	0	0

Hay silage

Crop

Bought supplement

Pasture	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PGPM													

Month	J	J	Others3	A	S	O	N	D	J	F	M	A	M
Numbers	0	0	0	0	0	0	0	0	0	0	0	0	0
adg for SR	0	0	0	0	0	0	0	0	0	0	0	0	0
Intake	0	0	0	0	0	0	0	0	0	0	0	0	0

Hay silage

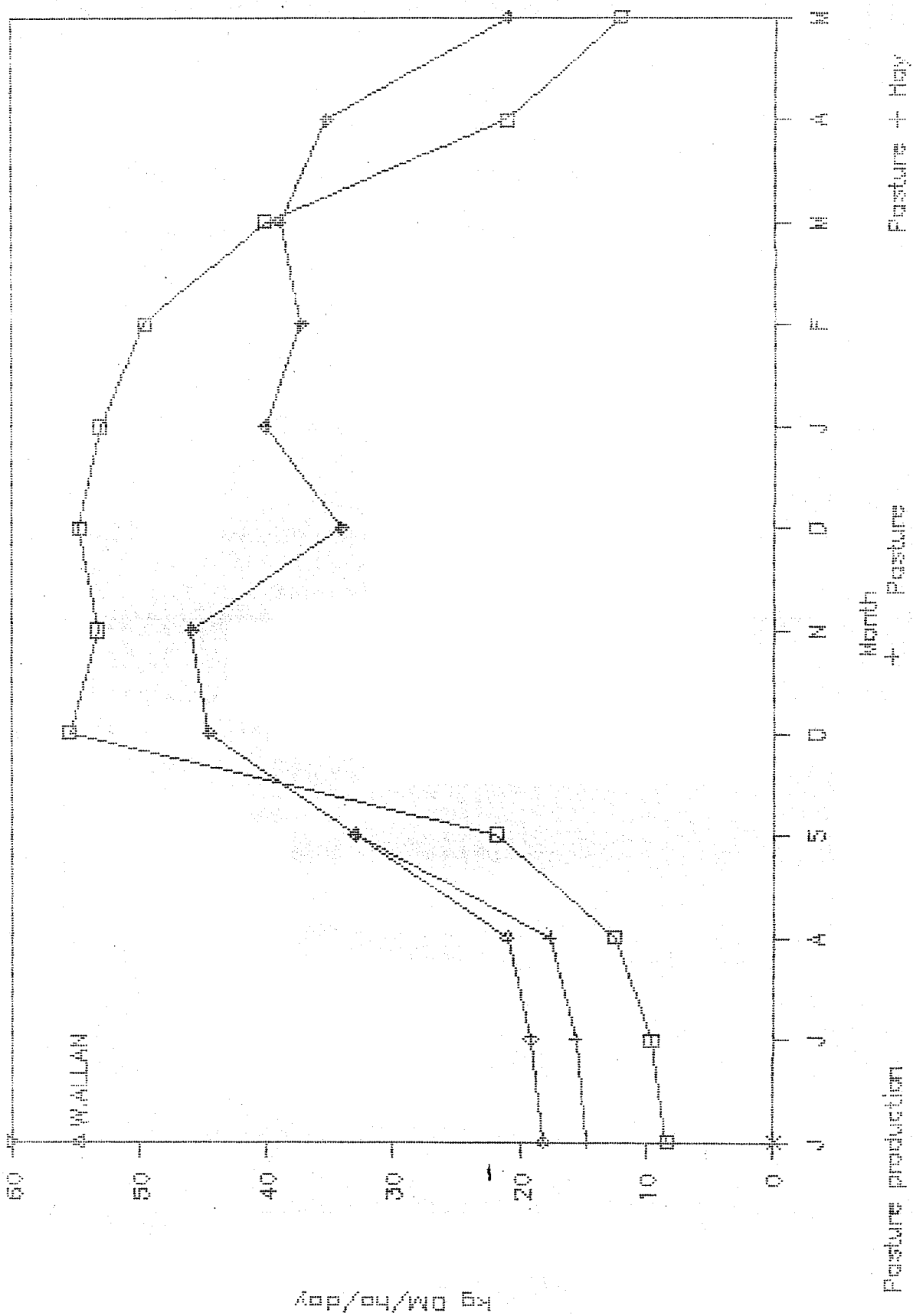
Crop

Bought supplement

Pasture	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PGPM													

Press <enter> and select the next activity from the menu.

# Pasture Production and Intake





-----  
 FEED DEMAND - Intake kg DM/animal/day

Month	Ewe Intake (kg DM/ewe/day)					Annual intake/ewe = 619 kg DM						
	J	J	A	S	O	N	D	J	F	M	A	M
Numbers	1073	1070	1064	1057	1054	1049	1100	1095	1090	1089	1082	1080
(adj for SR)	1075	1072	1066	1059	1056	1051	1102	1097	1092	1091	1084	1082
Intake	1	1.2	1.9	2.5	2.5	1.7	1.4	1.2	1.1	1.3	2	2.5

Hay silage 0.3 0.3 0.1

Crop

Bought suppl

Pasture	0.75	0.95	1.82	2.50	2.50	1.70	1.40	1.20	1.10	1.30	2.00	2.50
Post. graze	400	500	1100	1200	1200	1000	1000	800	600	600	1100	1100

-----  
 Intake/hogget since June = 402 kg DM Intake/hogget since weaning = 658

Month	Ewe hogget Intake (kg DM/hogget/day)											
	J	J	A	S	O	N	D	J	F	M	A	M
Numbers	100	100	100	100	100	100	100	100	100	100	100	100
adj for SR	100	100	100	100	100	100	100	100	100	100	100	100
Intake	1.1	1.2	1.2	0.9	1.1	1.2	1.2	0.9	1.1	1.2	1.2	0.9

Hay silage 0.2 1 0.2 0.1 0.3

Crop

Bought suppl

Pasture	0.93	0.37	1.20	0.73	1.10	1.20	1.20	0.90	1.10	1.20	1.12	0.65
PGPM	500	800	1000	500	800	1000	1000	500	800	1000	1000	500

-----  
 Ewe lambs (kg DM/lamb/day) Intake/sale lamb = 109 kg DM

Month	Ewe lambs (kg DM/lamb/day) Intake/sale lamb = 109 kg DM											
	J	J	A	S	O	N	D	J	F	M	A	M
Numbers	100	0	0	0	0	642	642	500	400	300	150	0
adj for SR	100	0	0	0	0	643	643	501	401	300	150	0
Intake	1.1	0	0	0	0	0.5	1.3	1.4	1.4	1.4	1.4	0

Hay silage

Crop

Bought supplement

Pasture	1.10	0.00	0.00	0.00	0.00	0.50	1.30	1.40	1.40	1.40	1.40	0.00
PGPM	900	0	0			1000	1200	1200	1200	1100	1000	0

-----  
 Ram lambs Intake (kg DM/lamb/day) Intake/sale lamb = 181

Month	Ram lambs Intake (kg DM/lamb/day) Intake/sale lamb = 181											
	J	J	A	S	O	N	D	J	F	M	A	M
Numbers	200	100	0	0	0	642	642	642	500	450	100	0
adj for SR	200	100	0	0	0	643	643	643	501	451	100	0
Intake	1.1	1.1	0	0	0	0.5	1.3	1.4	1.4	1.4	1.4	0

Hay silage

Crop

Bought supplement

Pasture	1.10	1.10	0.00	0.00	0.00	0.50	1.30	1.40	1.40	1.40	1.40	0.00
PGPM	900	900	0			1000	1200	1200	1200	1100	1000	0

-----  
 FLOCK2EWES Intake (kg DM/head/day)

Month	J	J	A	S	O	N	D	J	F	M	A	M
Numbers	1078	1076	1075	1072	1070	1064	1057	1054	1050	1090	1085	1080
adj for SR	1080	1078	1077	1074	1072	1066	1059	1056	1052	1092	1087	1082
Intake	2.7	1.8	1.4	1	0.9	1.2	2	2.9	2.9	1.9	1.5	1.1

-----  
 Hay silage 0.2 0.3

Crop

Bought suppl

Pasture	2.70	1.80	1.40	1.00	0.90	1.20	2.00	2.90	2.90	1.90	1.33	0.85
PGPM	1200	1000	800	500	500	1000	1200	1200	1200	1000	1000	500

	F2EWELBS					Intake (kd DM/head/day)						
Month	J	J	A	S	O	N	D	J	F	M	A	M
Numbers	0	595	400	300	300	250	200	0	0	645	450	250
adj for SR	0	596	401	300	300	250	200	0	0	646	451	250
Intake	0	0.5	1	1.3	1.4	1.4	1.6	0	0	0.5	1.3	1.4

-----  
 Hay silage

Crop

Bought supplement

Pasture	0.00	0.50	1.00	1.30	1.40	1.40	1.60	0.00	0.00	0.50	1.30	1.40
PGPM		800	900	1200	1200	1200	1200	0		1000	1200	1200

	F2RAMLBS					Intake (kd DM/head/day)						
Month	J	J	A	S	O	N	D	J	F	M	A	M
Numbers	0	595	500	500	500	500	450	450	0	645	550	300
adj for SR	0	596	501	501	501	501	451	451	0	646	551	300
Intake	0	0.5	1	1.3	1.4	1.4	1.6	1.6	0	0.5	1.3	1.4

-----  
 Hay silage

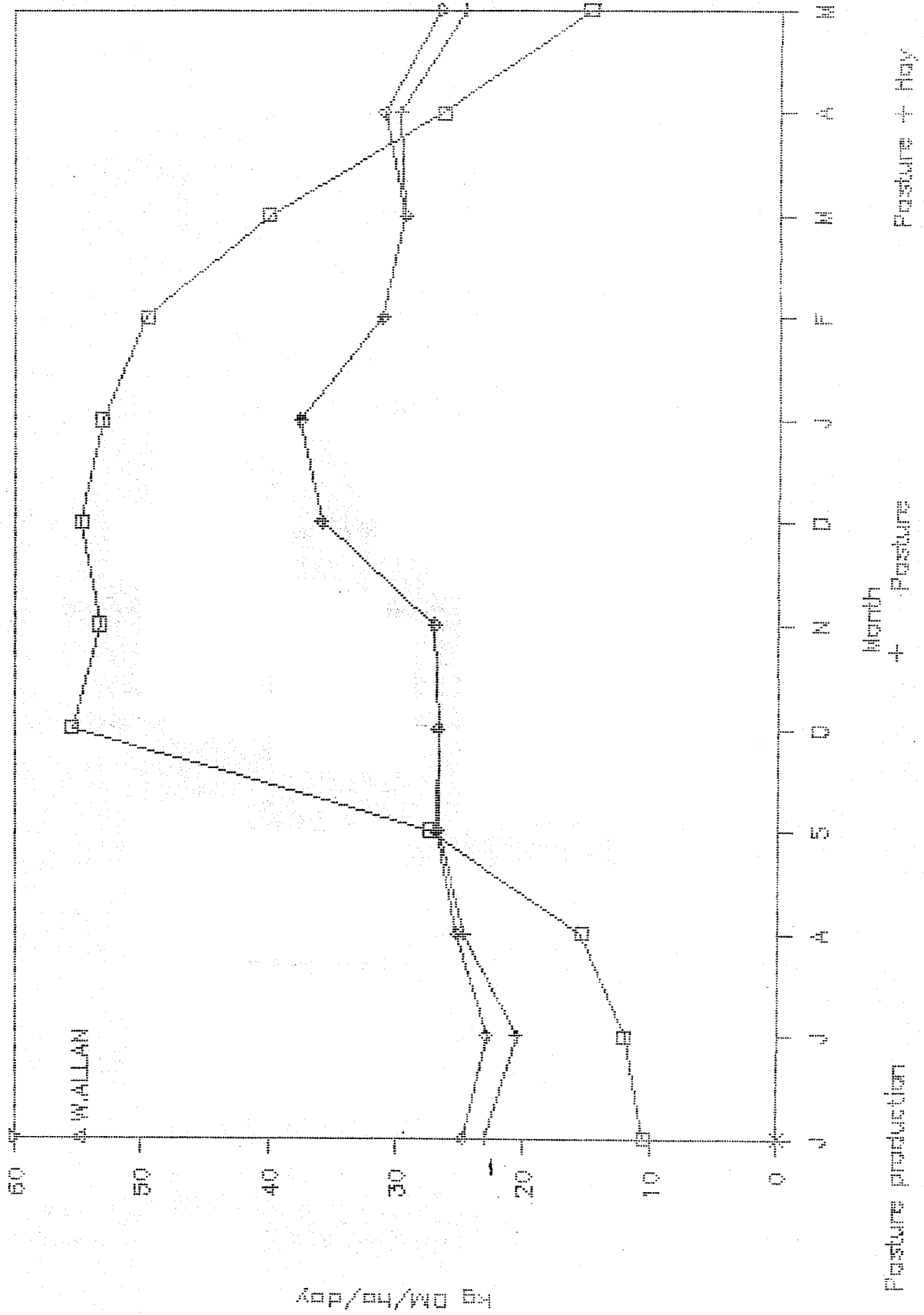
Crop

Bought supplement

Pasture	0.00	0.50	1.00	1.30	1.40	1.40	1.60	1.60	0.00	0.50	1.30	1.40
PGPM		800	900	1200	1200	1200	1200	1200		1000	1200	1200

-----  
 Press <enter> and select the next activity from the menu.

# Pasture Production and Intake



## 3.2 Scenario 4

Students name: W.ALLAN

Farmers name: THREE

Pasture cover at start = 1650 kg DM/ha      Stocking rate (su/ha) = 13.6  
 Maximum pasture cover = 2100 kg DM/ha      Initial SR (su/ha) = 13.6

## Pasture:

Total pasture prod. kg DM/ha/year 12551  
 Production/intake balance (kg DM/ha) 1875  
 Overall balance 0  
 Pasture cover at end of year 1565  
 Hay made (bales/farm)  
   Made = 3500  
   Used = 2117      Surplus/deficit = 1383

## Crop:

Yield t DM/ha 13  
 Area eaten (ha) 13.3  
 Bought in Supplement:  
 M/D (MJ ME/kg DM) 12  
 0.0 tonne DM

Month	J	J	A	S	O	N	D	J	F	M	A	M
PASTURE COVER at end of month and MINIMUM COVER (kg DM/ha)												
Past cover	1320	1167	956	1206	2100	2100	2100	2100	2100	2100	1928	1565
Min. cover	1095	801	700	1250	1700	1197	1199	1113	1064	999	1199	1107
EXTRA FEED REQUIRED (kg DM/ha/day) and PASTURE WASTED (kg DM/ha/month)												
Feed												
Waste	0	0	0	0	105	722	235	194	448	257	0	0

Please enter the following information.

Your name: W.ALLAN      Farmers name: THREE  
 Grazing area in hectares 180

Number of stock:	Relative stocking:
Ewes 1070	1.1
Lambing % 120	
RAMS 100	0.9
FLOCK2EWES 1070	1.1
F2EWELBS 0	
F2RAMLBS 0	

If all else fails read your instructions!  
 Have a happy day.

Press <Enter> and select the next activity from  
 the menu.

## PASTURE PRODUCTION

Month	J	J	A	S	O	N	D	J	F	M	A	M
Days	30	31	31	30	31	30	31	31	28	31	30	31
Pasture Production (kg DM/ha/d)	10.6	12.1	15.5	27.5	55.4	53.3	54.7	53.1	49.7	40.1	26.5	15
Hay	0	0	0	0	0	0	2000	1500	0	0	0	0
Bales/farm/month												

Bale weight = 25 kg  
 M/D of hay = 9 MJ ME/kg DM

View the graph of pasture production by pressing <Enter> and  
 selecting Graph-IP.

-----  
 FEED DEMAND - Intake kg DM/animal/day

		Ewe Intake (kg DM/ewe/day)											Annual intake/ewe = 619 kg DM		
Month		J	J	A	S	O	N	D	J	F	M	A	M		
Numbers		1073	1070	1064	1057	1054	1049	1100	1095	1090	1089	1082	1080		
(adj for SR)		1073	1070	1064	1057	1054	1049	1100	1095	1090	1089	1082	1080		
Intake		1	1.2	1.9	2.5	2.5	1.7	1.4	1.2	1.1	1.3	2	2.5		

-----

Hay silage	0.3	0.3	0.1												
Crop	0.5	0.8	0.7												
Bought suppl															
Pasture	0.25	0.15	1.12	2.50	2.50	1.70	1.40	1.20	1.10	1.30	2.00	2.50			
Post. graze	400	500	1100	1200	1200	1000	1000	800	600	600	1100	1100			

-----

Intake/hogget since June = 402 kg DM Intake/hogget since weaning = 658

		Ewe hogget Intake (kg DM/hogget/day)											
Month		J	J	A	S	O	N	D	J	F	M	A	M
Numbers		100	100	100	100	100	100	100	100	100	100	100	100
adj for SR		100	100	100	100	100	100	100	100	100	100	100	100
Intake		1.1	1.2	1.2	0.9	1.1	1.2	1.2	0.9	1.1	1.2	1.2	0.9

-----

Hay silage	0.2	1		0.2								0.1	0.3
Crop													
Bought suppl													
Pasture	0.93	0.37	1.20	0.73	1.10	1.20	1.20	0.90	1.10	1.20	1.12	0.65	
PGPM	500	800	1000	500	800	1000	1000	500	800	1000	1000	500	

-----

		Ewe lambs (kg DM/lamb/day) Intake/sale lamb = 109 kg DM											
Month		J	J	A	S	O	N	D	J	F	M	A	M
Numbers		100	0	0	0	0	642	642	500	400	300	150	0
adj for SR		100	0	0	0	0	642	642	500	400	300	150	0
Intake		1.1	0	0	0	0	0.5	1.3	1.4	1.4	1.4	1.4	

-----

Hay silage													
Crop		0											
Bought supplement													
Pasture	1.10	0.00	0.00	0.00	0.00	0.50	1.30	1.40	1.40	1.40	1.40	0.00	
PGPM	900	0	0			1000	1200	1200	1200	1100	1000	0	

-----

		Ram lambs Intake (kg DM/lamb/day) Intake/sale lamb = 181											
Month		J	J	A	S	O	N	D	J	F	M	A	M
Numbers		200	100	0	0	0	642	642	642	500	450	100	0
adj for SR		200	100	0	0	0	642	642	642	500	450	100	0
Intake		1.1	1.1	0	0	0	0.5	1.3	1.4	1.4	1.4	1.4	0

-----

Hay silage													
Crop													
Bought supplement													
Pasture	1.10	1.10	0.00	0.00	0.00	0.50	1.30	1.40	1.40	1.40	1.40	0.00	
PGPM	900	900	0			1000	1200	1200	1200	1100	1000	0	

-----

FLOCK2EWES Intake (kg DM/head/day)

Month	J	J	A	S	O	N	D	J	F	M	A	M
Numbers	1078	1076	1075	1072	1070	1064	1057	1054	1050	1090	1085	1080
adj for SR	1078	1076	1075	1072	1070	1064	1057	1054	1050	1090	1085	1080
Intake	2.7	1.8	1.4	1	0.9	1.2	2	2.9	2.9	1.9	1.5	1.1

---

Hay silage		0									0.2	0.3
Crop				1	0.9							
Bought suppl												
Pasture	2.70	1.80	1.40	0.00	0.00	1.20	2.00	2.90	2.90	1.90	1.33	0.85
PGPM	1200	1000	800	500	500	1000	1200	1200	1200	1000	1000	500

---

	F2EWELBS				Intake (kd DM/head/day)							
Month	J	J	A	S	O	N	D	J	F	M	A	M
Numbers	0	595	400	300	300	250	200	0	0	645	450	250
adj for SR	0	595	400	300	300	250	200	0	0	645	450	250
Intake	0	0.5	1	1.3	1.4	1.4	1.6	0	0	0.5	1.3	1.4

---

Hay silage												
Crop				0.7	0							
Bought supplement												
Pasture	0.00	0.50	1.00	0.60	1.40	1.40	1.60	0.00	0.00	0.50	1.30	1.40
PGPM		800	900	1200	1200	1200	1200	0		1000	1200	1200

---

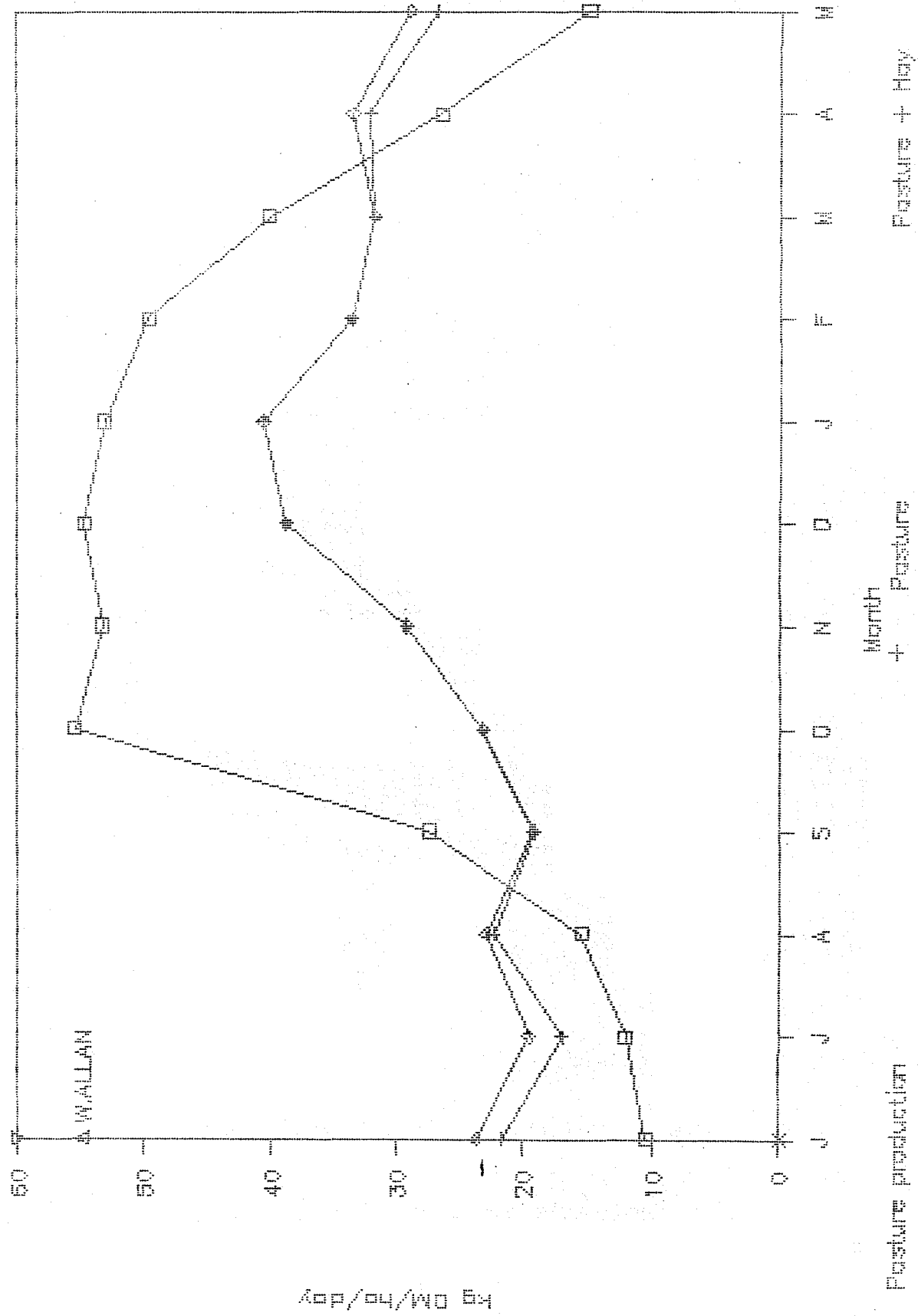
	F2RAMLBS				Intake (kd DM/head/day)							
Month	J	J	A	S	O	N	D	J	F	M	A	M
Numbers	0	595	500	500	500	500	450	450	0	645	550	300
adj for SR	0	595	500	500	500	500	450	450	0	645	550	300
Intake	0	0.5	1	1.3	1.4	1.4	1.6	1.6	0	0.5	1.3	1.4

---

Hay silage												
Crop				0.7	0							
Bought supplement												
Pasture	0.00	0.50	1.00	0.60	1.40	1.40	1.60	1.60	0.00	0.50	1.30	1.40
PGPM		800	900	1200	1200	1200	1200	1200		1000	1200	1200

Press <enter> and select the next activity from the menu.

# Pasture Production and Intake



## 3.3 Scenario 5

Students name: W.ALLAN

Farmers name: THREE

Pasture cover at start = 1650 kg DM/ha      Stocking rate (su/ha) = 13.6  
 Maximum pasture cover = 2100 kg DM/ha      Initial SR (su/ha) = 13.6

Pasture:

Total pasture prod. kg DM/ha/year      12551  
 Production/intake balance (kg DM/ha)      2406  
 Overall balance      0  
 Pasture cover at end of year      1788  
 Hay made (bales/farm)  
   Made = 3000  
   Used = 1924      Surplus/deficit = 1076

Crop:

Yield t DM/ha      12.5  
 Area eaten (ha)      0

Bought in Supplement:

M/D (MJ ME/kg DM)      12  
 0.0 tonne DM

Month	J	J	A	S	O	N	D	J	F	M	A	M
PASTURE COVER at end of month and MINIMUM COVER (kg DM/ha)												
Past cover	1422	1239	996	980	1828	2100	2100	2100	2100	2100	2047	1788
Mim. cover	1005	999	1000	1198	1199	1197	1198	1125	1094	999	1199	1198
EXTRA FEED REQUIRED (kg DM/ha/day) and PASTURE WASTED (kg DM/ha/month)												
Feed			0	7								
Waste	0	0	0	0	0	478	475	386	533	397	0	0

Please enter the following information.

Your name: W.ALLAN      Farmers name: THREE  
 Grazing area in hectares      180

Number of stock:	Relative stocking:
Ewes	639      1.1
Lambing %	120
RAMS	100      0.9
FLOCK2EWES	607      1.1
F2EWELBS	0
F2RAMLBS	0
Others4	897      1.1

If all else fails read your instructions!  
 Have a happy day.

Press <Enter> and select the next activity from the menu.

## PASTURE PRODUCTION

Month	J	J	A	S	O	N	D	J	F	M	A	M
Days	30	31	31	30	31	30	31	31	28	31	30	31
Pasture Production (kg DM/ha/d)	10.6	12.1	15.5	27.5	55.4	53.3	54.7	53.1	49.7	40.1	26.5	15
Hay	0	0	0	0	0	0	1200	1800	0	0	0	0
Bales/farm/month												

Bale weight = 25 kg  
 M/D of hay = 9 MJ ME/kg DM

View the graph of pasture production by pressing <Enter> and selecting Graph-IP.

-----  
 FEED DEMAND - Intake kg DM/animal/day

Month	Ewe Intake (kg DM/ewe/day)					Annual intake/ewe = 4452 kg DM						
	J	J	A	S	O	N	D	J	F	M	A	M
Numbers	665	664	660	655	653	636	630	627	626	623	617	613
(adj for SR	665	664	660	655	653	636	630	627	626	623	617	613
Intake	1	1.3	1.9	2.5	2.5	1.7	1.4	1.2	1.1	1.3	2	2.8

-----  
 Hay silage 0.3 0.2

Crop

Bought suppl

Pasture 0.75 1.13 1.90 2.50 2.50 1.70 1.40 1.20 1.10 1.30 2.00 2.80

Post. graze 400 600 1100 1200 1200 1000 1000 800 600 600 1100 1200

-----  
 Intake/hogget since June =5207 kg DM Intake/hogget since weaning =\*\*\*\*\*

Month	Ewe hogget Intake (kg DM/hogget/day)											
	J	J	A	S	O	N	D	J	F	M	A	M
Numbers	100	98	97	96	96	95	94	104	104	103	102	101
adj for SR	100	98	97	96	96	95	94	104	104	103	102	101
Intake	1.1	1.2	1.2	0.9	1.1	1.2	1.2	0.9	1.1	1.2	1.2	0.9

-----  
 Hay silage 0.3 0.3 0.3

Crop

Bought suppl

Pasture 0.85 0.95 0.95 0.90 1.10 1.20 1.20 0.90 1.10 1.20 1.20 0.90

PGPM 800 1000 1000 500 800 1000 1000 500 800 1000 1000 500

Month	Ewe lambs (kg DM/lamb/day)							Intake/sale lamb = 32 kg DM				
	J	J	A	S	O	N	D	J	F	M	A	M
Numbers	200	100	0	0	0	890	890	750	600	300	150	0
adj for SR	200	100	0	0	0	890	890	750	600	300	150	0
Intake	1.1	1.1	1.2	0	0	0.5	1.3	1.4	1.4	1.4	1.4	0

-----  
 Hay silage

Crop

Bought supplement

Pasture 1.10 1.10 1.20 0.00 0.00 0.50 1.30 1.40 1.40 1.40 1.40 0.00

PGPM 1000 1000 1000 1000 1200 1200 1200 1100 1000 1000

Month	Ram lambs Intake (kg DM/lamb/day)							Intake/sale lamb = 0				
	J	J	A	S	O	N	D	J	F	M	A	M
Numbers	250	100	0	0	0	890	890	800	700	500	300	0
adj for SR	250	100	0	0	0	890	890	800	700	500	300	0
Intake	1.1	1.1	1.2	0	0	0.5	1.3	1.4	1.4	1.4	1.4	0

-----  
 Hay silage

Crop

Bought supplement

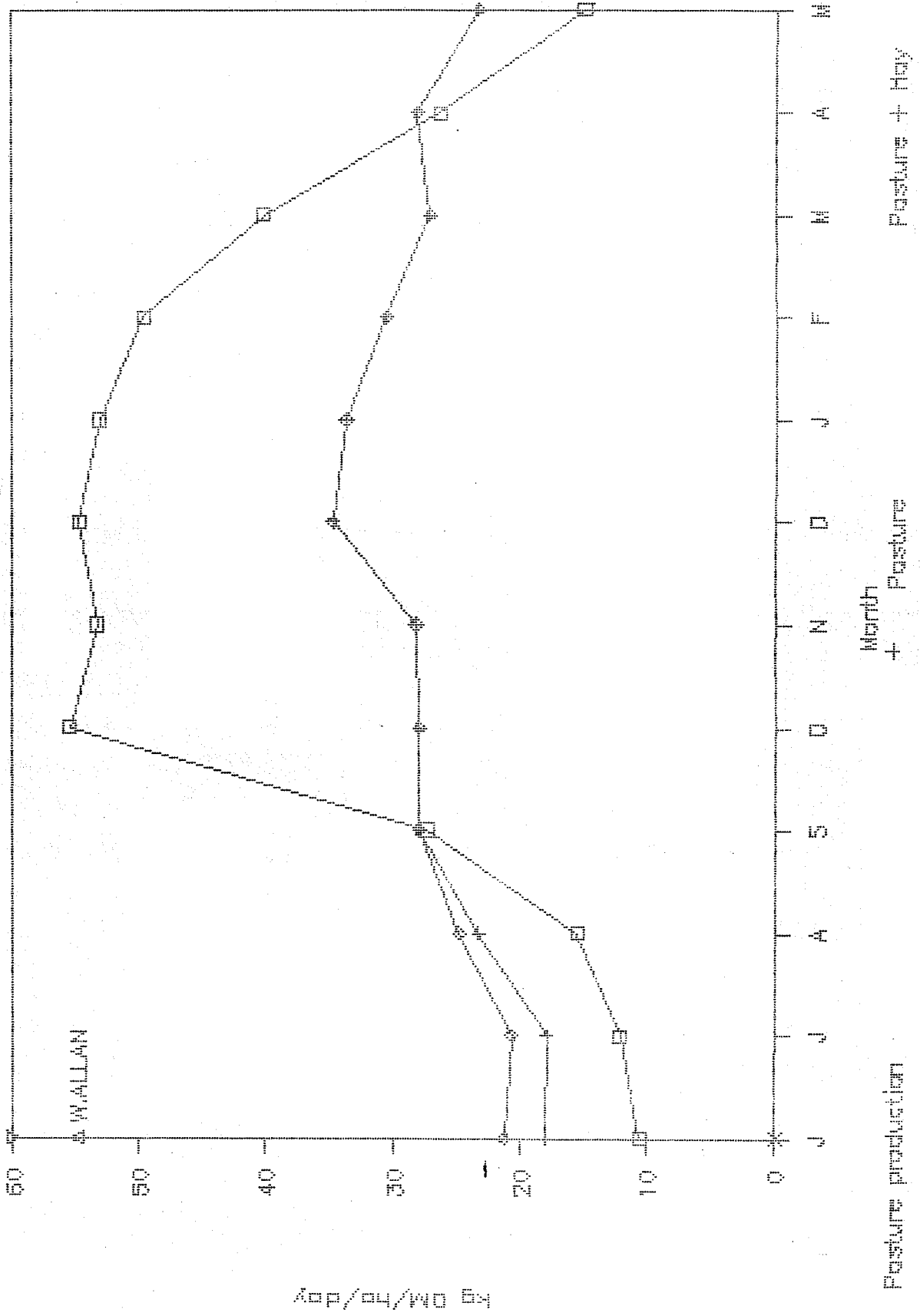
Pasture 1.10 1.10 1.20 0.00 0.00 0.50 1.30 1.40 1.40 1.40 1.40 0.00

PGPM 1000 1000 1000 1000 1200 1200 1200 1100 1000 1000

-----  
 FLOCK2EWES Intake (kg DM/head/day)



# Pasture Production and Intake





Month	J	J	A	S	O	N	D	J	F	M	A	M
Numbers	1012	1010	1005	1004	1002	945	940	936	932	1142	1139	1136
adj for SR	1012	1010	1005	1004	1002	945	940	936	932	1142	1139	1136
Intake	2.7	1.8	1.4	1	0.9	1.2	2	2.9	2.9	1.9	1.5	1.1

---

Hay silage				0.2							0.3	0.3
Crop												
Bought suppl												
Pasture	2.70	1.80	1.40	0.83	0.90	1.20	2.00	2.90	2.90	1.90	1.25	0.85
PGPM	1200	1000	800	500	500	1000	1200	1200	1200	1000	1000	500

---

	F2EWELBS				Intake (kd DM/head/day)							
Month	J	J	A	S	O	N	D	J	F	M	A	M
Numbers	0	510	510	400	400	200	100	0	0	473	473	250
adj for SR	0	510	510	400	400	200	100	0	0	473	473	250
Intake	0	0.5	1	1.3	1.4	1.4	1.6	1.6	0	0.5	1.3	1.4

---

Hay silage												
Crop												
Bought supplement												
Pasture	0.00	0.50	1.00	1.30	1.40	1.40	1.60	1.60	0.00	0.50	1.30	1.40
PGPM		1000	1000	1200	1200	1200	1200	1200		1000	1200	1200

---

	F2RAMLBS				Intake (kd DM/head/day)							
Month	J	J	A	S	O	N	D	J	F	M	A	M
Numbers	0	510	510	470	470	380	380	100	0	473	473	375
adj for SR	0	510	510	470	470	380	380	100	0	473	473	375
Intake	0	0.5	1	1.3	1.4	1.4	1.6	1.6	0	0.5	1.3	1.4

---

Hay silage												
Crop												
Bought supplement												
Pasture	0.00	0.50	1.00	1.30	1.40	1.40	1.60	1.60	0.00	0.50	1.30	1.40
PGPM		1000	1000	1200	1200	1200	1200	1200		1000	1200	1200

Press <enter> and select the next activity from the menu.

-----  
 FEED DEMAND - Intake kg DM/animal/day

Month	Ewe Intake (kg DM/ewe/day)					Annual intake/ewe =					631 kg DM	
	J	J	A	S	O	N	D	J	F	M	A	M
Numbers	1038	1035	1032	1028	1024	1340	1338	1335	1330	1022	1019	1014
(adj for SR)	1038	1035	1032	1028	1024	1340	1338	1335	1330	1022	1019	1014
Intake	1	1.3	1.9	2.5	2.5	1.7	1.4	1.2	1.1	1.3	2	2.8

Hay silage 0.3

Crop

Bought suppl

Pasture	0.75	1.30	1.90	2.50	2.50	1.70	1.40	1.20	1.10	1.30	2.00	2.80
Post. graze	400	600	1100	1200	1200	1000	1000	800	600	600	1100	1200

-----  
 Intake/hogget since June = 402 kg DM Intake/hogget since weaning = 729

Month	Ewe hogget Intake (kg DM/hogget/day)											
	J	J	A	S	O	N	D	J	F	M	A	M
Numbers	100	99	98	97	95	94	93	105	104	102	101	101
adj for SR	100	99	98	97	95	94	93	105	104	102	101	101
Intake	1.1	1.2	1.2	0.9	1.1	1.2	1.2	0.9	1.1	1.2	1.2	0.9

Hay silage 0.3 0.1

0.3

Crop

Bought suppl

Pasture	0.85	1.12	1.20	0.90	1.10	1.20	1.20	0.90	1.10	1.20	1.20	0.65
PGPM	800	1000	1000	500	800	1000	1000	500	800	1000	1000	500

-----  
 Ewe lambs (kg DM/lamb/day) Intake/sale lamb = 105 kg DM

Month	Ewe lambs (kg DM/lamb/day)					Intake/sale lamb =					105 kg DM	
	J	J	A	S	O	N	D	J	F	M	A	M
Numbers	150	75	0	0	0	619	619	500	400	300	150	0
adj for SR	150	75	0	0	0	619	619	500	400	300	150	0
Intake	1.1	1.1	1.2	0	0	0.5	1.3	1.4	1.4	1.4	1.4	0

Hay silage

Crop

Bought supplement

Pasture	1.10	1.10	1.20	0.00	0.00	0.50	1.30	1.40	1.40	1.40	1.40	0.00
PGPM	1000	1000	1000			1000	1200	1200	1200	1100	1000	1000

-----  
 Ram lambs Intake (kg DM/lamb/day) Intake/sale lamb = 192

Month	Ram lambs Intake (kg DM/lamb/day)					Intake/sale lamb =					192	
	J	J	A	S	O	N	D	J	F	M	A	M
Numbers	300	100	0	0	0	619	619	619	500	400	200	0
adj for SR	300	100	0	0	0	619	619	619	500	400	200	0
Intake	1.1	1.1	1.2	0	0	0.5	1.3	1.4	1.4	1.4	1.4	0

Hay silage

Crop

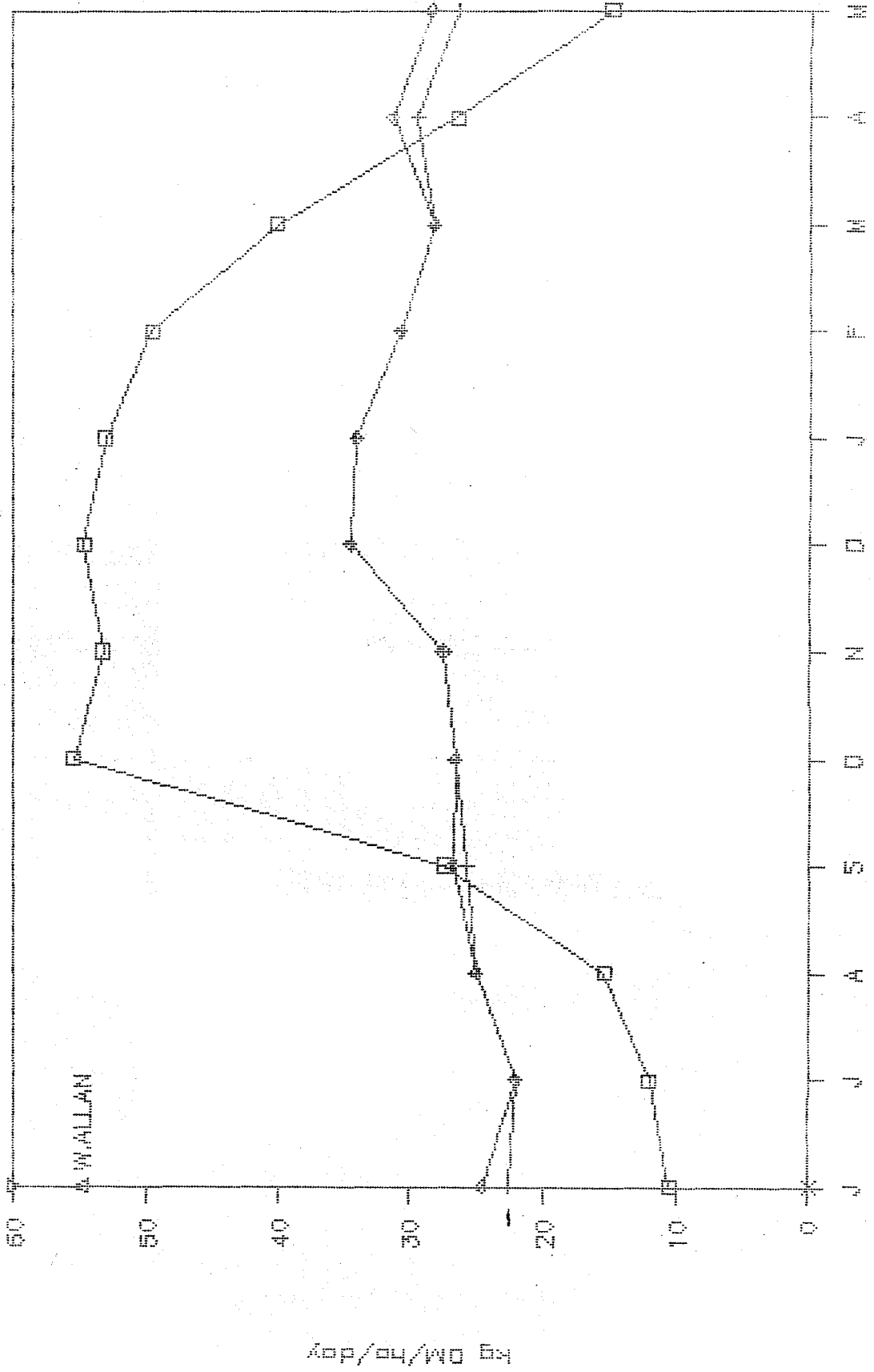
Bought supplement

Pasture	1.10	1.10	1.20	0.00	0.00	0.50	1.30	1.40	1.40	1.40	1.40	0.00
PGPM	1000	1000	1000			1000	1200	1200	1200	1100	1000	1000

-----

FLOCK2EWES Intake (kg DM/head/day)

# Pasture Production and Intake



kg DM/ha/day

WALLAN

Month + Pasture

Pasture + Hay



-----  
 FEED DEMAND - Intake kg DM/animal/day

Ewe Intake (kg DM/ewe/day) Annual intake/ewe = 625 kg DM

Month	J	J	A	S	O	N	D	J	F	M	A	M
Numbers	1038	1035	1032	1028	1024	1340	1338	1335	1330	1022	1019	1014
(adj for SR)	1038	1035	1032	1028	1024	1340	1338	1335	1330	1022	1019	1014
Intake	1	1.3	1.9	2.5	2.5	1.7	1.4	1.2	1.1	1.3	2	2.6

-----

Hay silage	0.3	0.3	0.1									
Crop	0.75	0.75	0.7									
Bought suppl												
Pasture	0.00	0.30	1.12	2.50	2.50	1.70	1.40	1.20	1.10	1.30	2.00	2.60
Post. graze	400	600	1100	1200	1200	1000	1000	800	600	600	1100	1200

-----  
 Intake/hogget since June = 402 kg DM Intake/hogget since weaning = 616

Ewe hogget Intake (kg DM/hogget/day)

Month	J	J	A	S	O	N	D	J	F	M	A	M
Numbers	100	99	98	97	95	94	93	105	104	102	101	101
adj for SR	100	99	98	97	95	94	93	105	104	102	101	101
Intake	1.1	1.2	1.2	0.9	1.1	1.2	1.2	0.9	1.1	1.2	1.2	0.9

-----

Hay silage	0.3	0.1										0.3
Crop												
Bought suppl												
Pasture	0.85	1.12	1.20	0.90	1.10	1.20	1.20	0.90	1.10	1.20	1.20	0.65
PGPM	800	1000	1000	500	800	1000	1000	500	800	1000	1000	500

-----  
 Ewe lambs (kg DM/lamb/day) Intake/sale lamb = 96 kg DM

Month	J	J	A	S	O	N	D	J	F	M	A	M
Numbers	150	0	0	0	0	619	619	500	350	150	0	0
adj for SR	150	0	0	0	0	619	619	500	350	150	0	0
Intake	1.1	0	0	0	0	0.5	1.3	1.4	1.4	1.4	0	0

-----

Hay silage												
Crop												
Bought supplement												
Pasture	1.10	0.00	0.00	0.00	0.00	0.50	1.30	1.40	1.40	1.40	0.00	0.00
PGPM	1000	1000	1000			1000	1200	1200	1200	1100	1000	1000

-----  
 Ram lambs Intake (kg DM/lamb/day) Intake/sale lamb = 189

Month	J	J	A	S	O	N	D	J	F	M	A	M
Numbers	300	100	0	0	0	619	619	619	500	400	150	0
adj for SR	300	100	0	0	0	619	619	619	500	400	150	0
Intake	1.1	1.1	0	0	0	0.5	1.3	1.4	1.4	1.4	1.4	0

-----

Hay silage												
Crop												
Bought supplement												
Pasture	1.10	1.10	0.00	0.00	0.00	0.50	1.30	1.40	1.40	1.40	1.40	0.00
PGPM	1000	1000	0			1000	1200	1200	1200	1100	1000	1000

-----

FLOCK2EWES Intake (kg DM/head/day)

Month	J	J	A	S	O	N	D	J	F	M	A	M
Numbers	1012	1010	1005	1003	1002	945	940	936	932	1142	1139	1136
adj for SR	1012	1010	1005	1003	1002	945	940	936	932	1142	1139	1136
Intake	2.7	1.8	1.4	1	0.9	1.2	2	2.9	2.9	1.9	1.5	1.1

---

Hay silage				0.2							0.3	0.3
Crop			0.5	0.3								
Bought suppl												
Pasture	2.70	1.80	0.90	0.53	0.90	1.20	2.00	2.90	2.90	1.90	1.25	0.85
PGPM	1200	1000	800	500	500	1000	1200	1200	1200	1000	1000	500

---

Month	F2EWELBS				Intake (kd DM/head/day)							
	J	J	A	S	O	N	D	J	F	M	A	M
Numbers	0	510	510	400	400	200	100	0	0	425	375	200
adj for SR	0	510	510	400	400	200	100	0	0	425	375	200
Intake	0	0.5	1	1.3	1.4	1.4	1.6	1.6	0	0.5	1.3	1.4

---

Hay silage												
Crop												
Bought supplement												
Pasture	0.00	0.50	1.00	1.30	1.40	1.40	1.60	1.60	0.00	0.50	1.30	1.40
PGPM		1000	1000	1200	1200	1200	1200	1200		1000	1200	1200

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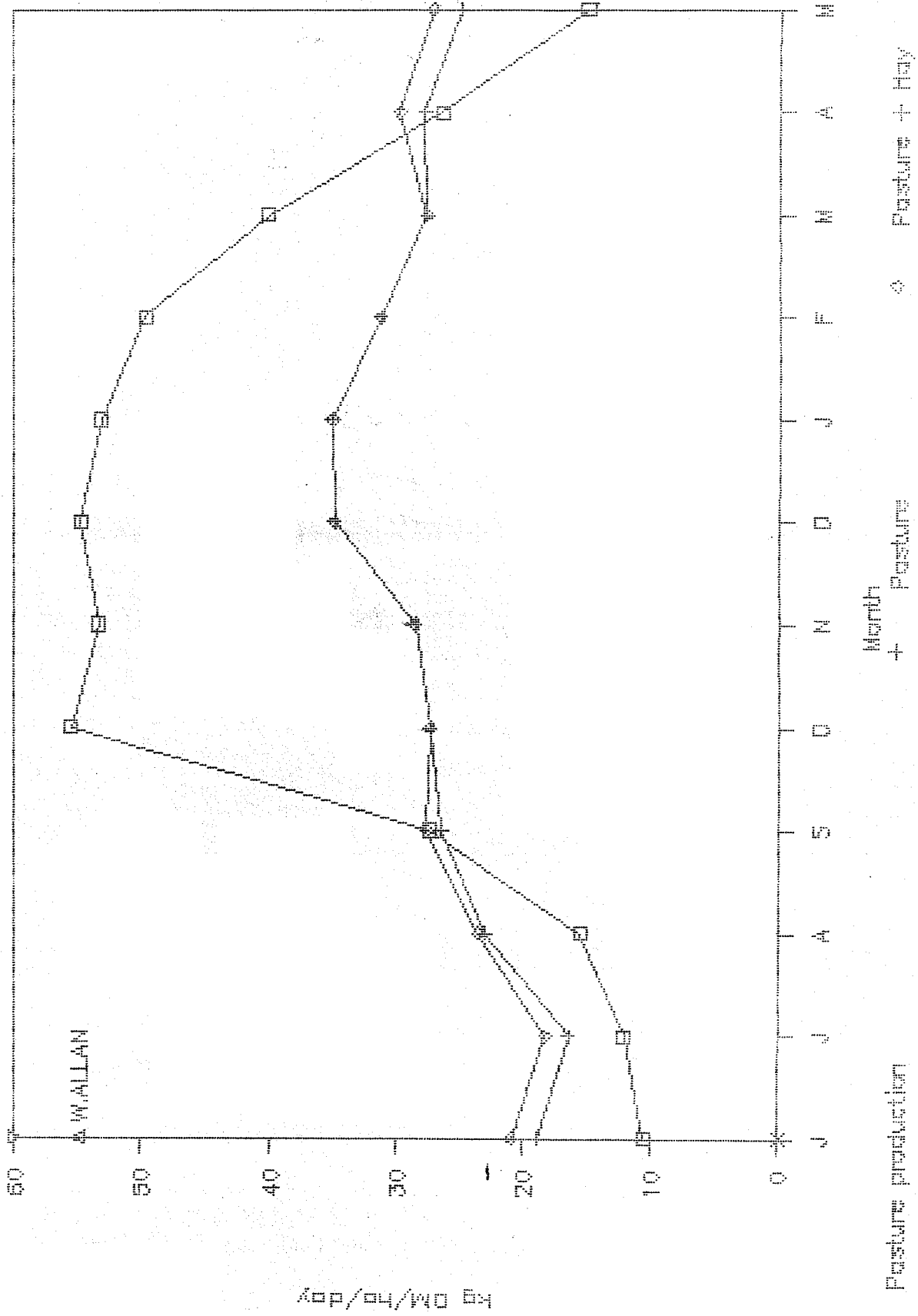
Month	F2RAMLBS				Intake (kd DM/head/day)							
	J	J	A	S	O	N	D	J	F	M	A	M
Numbers	0	510	510	470	470	400	300	100	0	450	450	300
adj for SR	0	510	510	470	470	400	300	100	0	450	450	300
Intake	0	0.5	1	1.3	1.4	1.4	1.6	1.6	0	0.5	1.3	1.4

---

Hay silage												
Crop												
Bought supplement												
Pasture	0.00	0.50	1.00	1.30	1.40	1.40	1.60	1.60	0.00	0.50	1.30	1.40
PGPM		1000	1000	1200	1200	1200	1200	1200		1000	1200	1200

Press <enter> and select the next activity from the menu.

# Pasture Production and Intake



## 3.6 Scenario 8

Students name: W.ALLAN

Farmers name: THREE

Pasture cover at start = 1650 kg DM/ha      Stocking rate (su/ha) = 13.6  
 Maximum pasture cover = 2100 kg DM/ha      Initial SR (su/ha) = 13.6

## Pasture:

Total pasture prod. kg DM/ha/year 12551  
 Production/intake balance (kg DM/ha) 2684  
 Overall balance 0

## Crop:

Yield t DM/ha 12.5  
 Area eaten (ha) 0

Pasture cover at end of year 1896

Hay made (bales/farm)

## Bought in Supplement:

M/D (MJ ME/kg DM) 12  
 0.0 tonne DM

Made = 2700

Used = 2481      Surplus/deficit = 219

Month	J	J	A	S	O	N	D	J	F	M	A	M
-------	---	---	---	---	---	---	---	---	---	---	---	---

PASTURE COVER at end of month and MINIMUM COVER (kg DM/ha)

Past cover	1465	1308	1077	1083	1927	2100	2100	2100	2100	2100	2095	1896
------------	------	------	------	------	------	------	------	------	------	------	------	------

Mim. cover	990	999	1000	1199	1198	1197	1198	1113	1071	999	1199	1198
------------	-----	-----	------	------	------	------	------	------	------	-----	------	------

EXTRA FEED REQUIRED (kg DM/ha/day) and PASTURE WASTED (kg DM/ha/month)

Feed				4								
------	--	--	--	---	--	--	--	--	--	--	--	--

Waste	0	0	0	0	0	580	481	408	543	426	0	0
-------	---	---	---	---	---	-----	-----	-----	-----	-----	---	---

Please enter the following information.

Your name: W.ALLAN      Farmers name: THREE

Grazing area in hectares 180

Number of stock:      Relative stocking:

Ewes 681      1.1

Lambing % 120

RAMS 100      0.9

FLOCK2EWES 605      1.1

F2EWELBS 0

F2RAMLBS 0

Others4 858      1.1

If all else fails read your instructions!

Have a happy day.

Press &lt;Enter&gt; and select the next activity from the menu.

## PASTURE PRODUCTION

Month	J	J	A	S	O	N	D	J	F	M	A	M
Days	30	31	31	30	31	30	31	31	28	31	30	31
Pasture Production (kg DM/ha/d)	10.6	12.1	15.5	27.5	55.4	53.3	54.7	53.1	49.7	40.1	26.5	15
Hay	0	0	0	0	0	0	1200	1500	0	0	0	0
Bales/farm/month												

Bale weight = 25 kg

M/D of hay = 9 MJ ME/kg DM

View the graph of pasture production by pressing &lt;Enter&gt; and selecting Graph-IP.

-----  
 FEED DEMAND - Intake kg DM/animal/day

Month	Ewe Intake (kg DM/ewe/day)					Annual intake/ewe = 4453 kg DM						
	J	J	A	S	O	N	D	J	F	M	A	M
Numbers	672	669	667	665	663	800	797	795	792	554	550	548
(adj for SR)	672	669	667	665	663	800	797	795	792	554	550	548
Intake	1	1.3	1.9	2.5	2.5	1.7	1.4	1.2	1.1	1.3	2	2.8

-----  
 Hay silage 0.3 0.3 0.1

Crop

Bought suppl

Pasture	0.75	1.05	1.82	2.50	2.50	1.70	1.40	1.20	1.10	1.30	2.00	2.80
Post. graze	400	600	1100	1200	1200	1000	1000	800	600	600	1100	1200

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 Intake/hogget since June =5208 kg DM Intake/hogget since weaning =\*\*\*\*\*

Month	Ewe hogget Intake (kg DM/hogget/day)											
	J	J	A	S	O	N	D	J	F	M	A	M
Numbers	100	98	97	96	96	95	94	104	104	103	102	101
adj for SR	100	98	97	96	96	95	94	104	104	103	102	101
Intake	1.1	1.2	1.2	0.9	1.1	1.2	1.2	0.9	1.1	1.2	1.2	0.9

-----  
 Hay silage 0.3 0.3 0.3 0.2

Crop

Bought suppl

Pasture	0.85	0.95	0.95	0.73	1.10	1.20	1.20	0.90	1.10	1.20	1.20	0.90
PGPM	800	1000	1000	500	800	1000	1000	500	800	1000	1000	500

Month	Ewe lambs (kg DM/lamb/day)							Intake/sale lamb = 31 kg DM				
	J	J	A	S	O	N	D	J	F	M	A	M
Numbers	150	100	0	0	0	921	921	750	600	300	150	0
adj for SR	150	100	0	0	0	921	921	750	600	300	150	0
Intake	1.1	1.1		0	0	0.5	1.3	1.4	1.4	1.4	1.4	0

-----  
 Hay silage

Crop

Bought supplement

Pasture	1.10	1.10	0.00	0.00	0.00	0.50	1.30	1.40	1.40	1.40	1.40	0.00
PGPM	1000	1000	1000			1000	1200	1200	1200	1100	1000	1000

Month	Ram lambs Intake (kg DM/lamb/day)							Intake/sale lamb = 0				
	J	J	A	S	O	N	D	J	F	M	A	M
Numbers	200	100	0	0	0	921	921	800	700	500	300	0
adj for SR	200	100	0	0	0	921	921	800	700	500	300	0
Intake	1.1	1.1		0	0	0.5	1.3	1.4	1.4	1.4	1.4	0

-----  
 Hay silage

Crop

Bought supplement

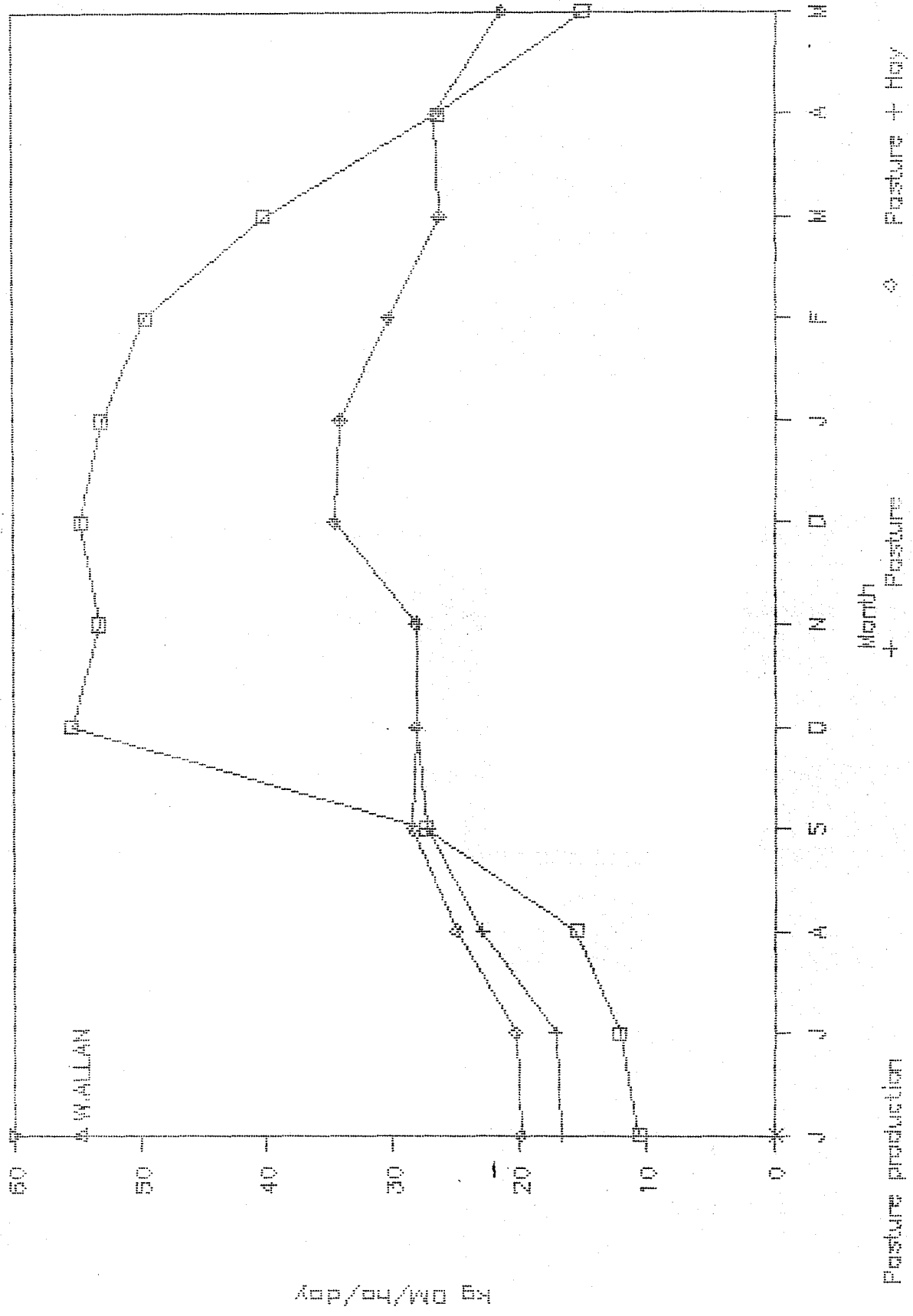
Pasture	1.10	1.10	0.00	0.00	0.00	0.50	1.30	1.40	1.40	1.40	1.40	0.00
PGPM	1000	1000	1000			1000	1200	1200	1200	1100	1000	1000

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FLOCK2EWES Intake (kg DM/head/day)



# Pasture Production and Intake



APPENDIX 4. PRICE AND YIELD ASSUMPTIONS AND CALCULATIONS.App 4.1 High producing Class7 Farm.

## Income.

Wool	2687 ewes @ 5 kg/hd	= 13 415 kg	
	36 rams @ 5.5 kg/hd	= 198 kg	
	2990 lambs 1.2 kg/hd	= 3588 kg	
	Assume an 80% yield of clean wool.		
	13613 kg course wool @ 496c/kg	= \$67 520	
	3388 kg lambs wool @ 508c/kg	= \$17 211	
			-----
			\$84 731

Cull Ewes 540 @ \$8/hd = \$4320

Lambs	Ewe	Jan	195 @ 13.5 kg @ \$18.85/hd	= \$3678
		Feb	55 @ 15 kg @ \$21.00/hd	= \$1155
		Mar	50 @ 15 kg @ \$22.30/hd	= \$1115
		Apr	400 @ 15 kg @ \$23.90/hd	= \$9560
		May	100 @ 15 kg @ \$22.70/hd	= \$2270
			50 @ 17.5 kg @ \$24.75/hd	= \$1238
				-----
				\$19 014

	Ram	Feb	245 @ 15 kg @ \$21.25/hd	= \$5206
		Mar	150 @ 15 kg @ \$21.25/hd	= \$3187
		Apr	550 @ 15 kg @ \$23.90/hd	= \$13 145
			200 @ 17.5 kg @ \$25.90/hd	= \$5180
		May	120 @ 15 kg @ \$22.75/hd	= \$3412
			200 @ 17.5 kg @ \$24.80/hd	= \$4960
				-----
				\$35 090

## Ram Purchases

8 @ \$300/hd = \$2400

**App 4.2 Three Lambings in Two Years.****Income.**

Wool Ewe	Jul (A)	1070 ewes @ 3 kg/hd @ 480c/kg = \$15 406
	Mar (A)	1089 ewes @ 3 kg/hd @ 494c/kg = \$16 139
	Nov (B)	1064 ewes @ 3 kg/hd @ 512c/kg = \$16 343
Ram	100 Dorset rams @ 4.5 kg/hd @ 496c/kg = \$2232	
Lamb	Jan (A)	1142 lambs @ 1 kg/hd @ 508c/kg = \$5800
	Aug (B)	900 lambs @ 1 kg/hd @ 505c/kg = \$4545
	Apr (B)	1000 lambs @ 1 kg/hd @ 500c/kg = \$5000
		-----
		\$65 465

Assume an 80% yield of clean wool.

Cull Ewes	Nov	250 @ \$8/hd = \$2000
	Feb	250 @ \$9/hd = \$2250

Lambs (A) Ewe	Jan	142 @ 13.5 kg @ \$18.85/hd = \$2677
	Feb	100 @ 15 kg @ \$21.00/hd = \$2100
	Mar	100 @ 15 kg @ \$22.30/hd = \$2230
	Apr	150 @ 15 kg @ \$23.90/hd = \$3585
	May	50 @ 15 kg @ \$22.70/hd = \$1135
		100 @ 17.5 kg @ \$24.75/hd = \$2475
		-----
		\$14 202

Ram	Feb	142 @ 15 kg @ \$21.25/hd = \$3018
	Mar	50 @ 15 kg @ \$21.25/hd = \$1295
	Apr	150 @ 15 kg @ \$23.90/hd = \$3585
		200 @ 17.5 kg @ \$25.90/hd = \$5180
	May	100 @ 17.5 kg @ \$24.80/hd = \$4960
		-----
		\$15 352

Lambs (B) Apr Ewe	Aug	195 @ 13.5 kg @ \$16.00/hd = \$3120
	Sep	100 @ 13.5 kg @ \$16.00/hd = \$1600
	Nov	50 @ 15 kg @ \$20.60/hd = \$1030
	Dec	50 @ 15 kg @ \$21.00/hd = \$1050
	Jan	50 @ 15 kg @ \$21.25/hd = \$1063
		150 @ 17.5 kg @ \$21.65/hd = \$3246
		-----
		\$11 109

Ram	Aug	95 @ 13.5 kg @ \$16.00/hd	= \$1520
	Dec	50 @ 17.5 kg @ \$21.00/hd	= \$1050
	Feb	50 @ 15 kg @ \$22.25/hd	= \$1113
		150 @ 17.5 kg @ \$23.50/hd	= \$3525
		250 @ 19 kg @ \$25.70/hd	= \$6425
			-----
			\$13 633
Lambs (B) Dec	Ewe	Apr	200 @ 13.5 kg @ \$20.40/hd = \$4080
		May	100 @ 13.5 kg @ \$22.50/hd = \$2250
			100 @ 15 kg @ \$24.7/hd = \$2470
		Jun	50 @ 13.5 kg @ \$15.55/hd = \$2470
			100 @ 15 kg @ \$17.40/hd = \$1740
		Jul	100 @ 15 kg @ \$22.70/hd = \$2270
			-----
			\$13 587
Ram	Apr	100 @ 15 kg @ \$22.70/hd	= \$2270
	May	100 @ 13.5 kg @ \$22.50/hd	= \$2250
		150 @ 15 kg @ \$24.70/hd	= \$3705
	Jun	100 @ 15 kg @ \$17.4/hd	= \$1740
	Jul	50 @ 15 kg @ \$22.50/hd	= \$1125
		50 @ 17.5 kg @ \$22.70/hd	= \$1135
	Aug	100 @ 17.5 kg @ \$23.00/hd	= \$2300
			-----
			\$14 525

#### Ram Purchases

25 Dorsets @ \$325/hd = \$8125

#### Hogget Purchases

Dec 310 @ \$28.50/hd = \$8866

Mar 300 @ \$32.50/hd = \$9750

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 Stock Purchases = \$26 741

**App 4.3 Sensitivity Analysis for Wool and Lamb Prices.**

**Wool**

Price	Stock Class	Class 7 Farm with High Production	Three Lambings in Two Years
\$4.00/kg	Ewe	\$53 660	\$38 676
	Ram	\$792	\$1 800
	Lamb	\$13 552	\$8 568
		<hr/>	<hr/>
		\$68 004	\$49 044
Current	Ewe	\$66 538	\$47 888
	Ram	\$972	\$2 232
	Lamb	\$17 211	\$15 345
		<hr/>	<hr/>
		\$84 731	\$65 465
\$5.75/kg	Ewe	\$77 136	\$55 597
	Ram	\$1 127	\$2 588
	Lamb	\$19 481	\$17 480
		<hr/>	<hr/>
		\$97 744	\$75 665

### Winter Lamb Prices

Winter lamb prices includes lambs sold between May and November.

Price	Month	Weight	Price/ head	Three Lambings in Two Years	
2/3 the Budget Prices	June	13.5	\$10.36	\$518	
		15	\$11.59	\$2 318	
	July	15	\$15.13	\$2 270	
		17.5	\$15.13	\$757	
	August	13.5	\$10.66	\$3 091	
		17.5	\$15.33	\$1 533	
	Sept	13.5	\$10.66	\$1 066	
	Nov	15	\$13.73	\$686	
					<hr/>
					\$12 244
1988/89 Budget Prices	June	13.5	\$15.55	\$777	
		15	\$17.40	\$3 480	
	July	15	\$22.70	\$3 405	
		17.5	\$22.70	\$1 135	
	August	13.5	\$16.00	\$4 640	
		17.5	\$23.00	\$2 300	
	Sept	13.5	\$16.00	\$1 600	
	Nov	15	\$20.60	\$1 030	
					<hr/>
					\$18 367
Double the Budget Prices	June	13.5	\$31.10	\$1 550	
		15	\$34.80	\$6 960	
	July	15	\$45.40	\$6 810	
		17.5	\$45.40	\$2 270	
	August	13.5	\$32.00	\$9 280	
		17.5	\$46.00	\$4 600	
	Sept	13.5	\$32.00	\$3 200	
	Nov	15	\$41.20	\$2 060	
					<hr/>
					\$36 734