INTENSIVE MEAT AND WOOL PRODUCTION IN THE HIGHER RAINFALL AREAS OF OTAGO AND SOUTHLAND

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Summary

Details are given of intensive sheep farming on improved pastures in the higher rainfall areas of Otago and Southland. The main features of pasture and stock management used to achieve high levels of meat and wool production are described, and an outline is given of an all-grass, heavy stocking, farmlet study.

INTRODUCTION

INTENSIVE SHEEP FARMING is characteristic of approximately 1.6 million acres of rolling downland and flat land in south and west Otago and Southland. This area includes part of the Tuapeka and Wallace Counties and most of the Bruce, Clutha and Southland Counties and in 1969 supported a sheep population of approximately seven million (Fig. 1). Sheep are the main source of income, although some beef cattle are carried on most farms and on many up to 10% of the farm area may be sown in wheat. Much of the land has been developed and farmed for 50 years or more.

The growing of brassica crops, especially swedes and choumoellier, for winter feeding has been characteristic and, although there has been the development of all-grass farming systems in recent years, the growing of crops for supplementary feed on about 5 to 10% of the farm is still a feature of most sheep farms.

On the majority of farms, the carrying capacity is 5 to 6 ewe equivalents per acre. However, in recent years it has been demonstrated in trial areas and by progressive farmers that carrying capacities of 8 to 10 ewe equivalents per acre may be achieved. Some of the factors involved in such intensive sheep management are given in this paper.

CLIMATE

Climate data from the five meteorological stations shown in Fig. 1 are summarized in Table 1.

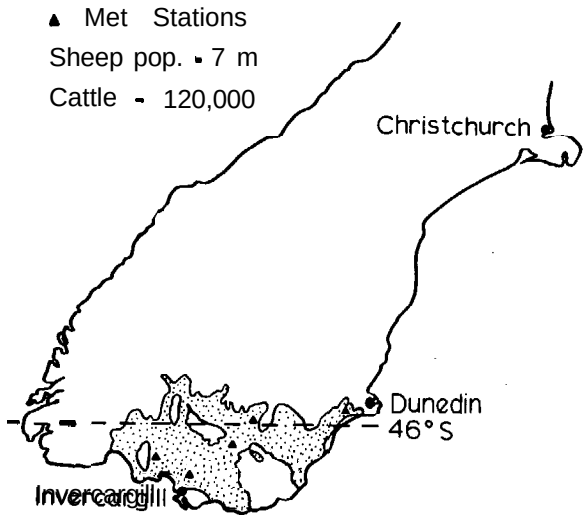

FIG. 1: Sketch ***nap showing*** locality ***of area and meteorological stations.***

Between sites annual rainfall varies between 34 and 43 in. except for Invermay (the northernmost) which, with 26 in., is somewhat drier than the rest although the distribution is similar.

The temperature nature of the climate is illustrated by a range of only 20" between the seasonal and annual mean minimum and maximum temperatures. About 60 days of screen frost and three or four falls of snow can be expected each winter, the snow seldom lying for more than a few days.

TABLE 1: MEAN SEASONAL AND ANNUAL METEOROLOGICAL DATA 1930-60

(Mean of 5 sites shown in Fig. 1)

	Spring	***Summer***	***Autumn***	Winter	*Annual*
Total rainfall (in.)	8.9	9.8	9.6	***8.2***	36.5
Mean daily temps. ("F) :					
Maximum	61	67	60	50	59
Minimum	40	47	41	33	40
Mean sunshine (hr per month)	159	180	120	105	1,693*

*Total sunshine hours.

SOILS

The soils are zonal intergrades between yellow-grey and yellow-brown earths, yellow-brown earths, or recent alluvial soils. Most are derived from greywacke pnrent material and are of a silt loam texture (N.Z. Soil Bureau, 1968).

DRY MATTER PRODUCTION

Given adequate phosphate and potash, insect control, and good grazing management pastures in this environment produce from 9,000 to 13,000 lb of dry matter per acre per annum. The pattern of daily dry matter production is shown in Fig. 2. The Invermay graph is derived from 16 years' rate of pasture growth measurements on rolling country at the Station, while the Southland graph has been derived from rate of pasture growth measurements taken on flat or easy rolling land in Southland during the past five years (J. T. Witchalls, pers. comm.).

MANAGEMENT FACTORS

PASTURES

On most farms more than 80% of the area is sown in permanent pasture. Perennial ryegrass (*Lolium* perenne L.) and N.Z. white clover (*Trifolium repens* L.) form the basis of most pastures, although cocksfoot (Dactylis

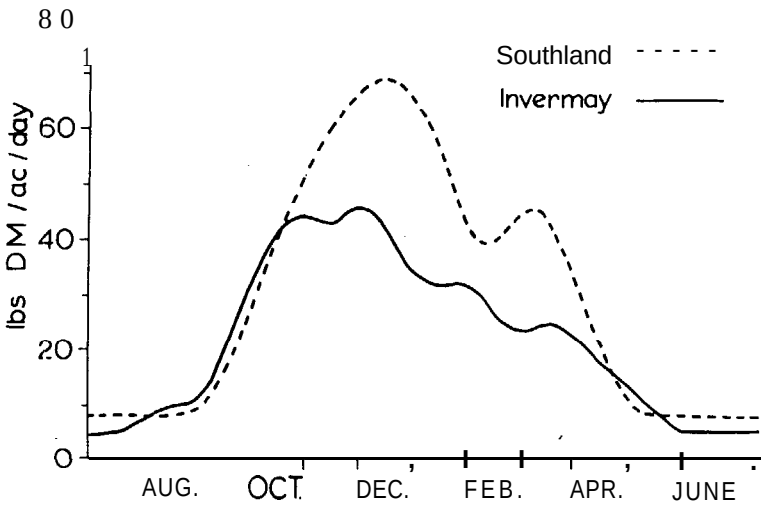

FIG. 2: Graphs of rate of growth of pastures at Invermay and *in Southland.*

glomerata L.), timothy (*Phleum* pratense L.) and Montgomery red clover (*Trifolium* pratense L.) are also frequently sown. Browntop (Agrostis *tenuis* Sibth), Yorkshire fog (*Holcus lanatus* L.) and other weed grasses usually invade the older pastures, and at moderate stocking rates most swards are renewed in rotation about every ten years. However, on farms with higher stocking rates and the concomitant grazing management, pastures are renewed less frequently.

Annual maintenance applications of 2 to $2\frac{1}{2}$ cwt per acre superphosphate are required on the majority of soils. Potassium chloride (up to 1 cwt per acre) is required annually on some of the yellow-brown earths. Molybdenum (as $2\frac{1}{2}$ oz sodium molybdate per acre) is recommended every four years on the downlands. One ton of carbonate of lime per acre is usually applied when sowing new pastures. Nitrogenous fertilizer is seldom applied.

DRAINAGE

Many of the soils are subject to waterlogging and poaching during winter and for this reason 50% or more of a farm's area may be drained by tile and/or mole drains.

INSECT PESTS

Porina caterpillar (Wiseana spp.) is the most important insect pest and is usually more serious on the pastures which have been leniently grazed during late spring and summer. Control is by organophosphates applied in autumn and winter. Grass grub (*Costelytra* zealandica) has been largely controlled by using DDT when sowing new pastures.

GRAZING AND PASTURE MANAGEMENT

The grazing animal can influence pasture production through treading (Edmond, 1964; Brown, 1968), defoliation and frequency of grazing (Brougham, 1957; Campbell, 1969), and excretion of dung and urine (Sears *et al.*, 1948). Hence, for the high pasture production required for intensive meat and wool production, grazing management must aim to minimize treading damage, particularly in the winter, and obtain complete utilization of feed without seriously checking stock performance or subsequent pasture production. It must also encourage an intensive even return of dung and urine. These aims are achieved by rotational grazing of stock in the summer and autumn.

At high stocking rates, rotational grazing of ewes and lambs in the spring also is becoming preferred to the set stocking practised at low and moderate rates. When rotationally grazing, ewes are concentrated at 80 to 100 per acre to achieve rapid uniform defoliation and even return of dung and urine. An after-grazing stubble of 1 to 1½ in. is recommended, with a four-week interval between grazings. During peak spring and early summer growth, pastures are not controlled sufficiently by stock and several paddocks may be closed for hay or silage and/or sown in forage crop.

Stock grazing is usually greatly reduced in the winter by the removal of most or all the sheep to wintering areas where hay, silage or forage crop supplements are fed. These wintering areas may be the driest 20% of the pastures, grain stubble, wintering pads of sawdust or straw, or forage crops. This removal of stock from most of the pastures in the late autumn and early winter allows grass to be carried through to provide high quality feed for the last four weeks of pregnancy in the late winter and early spring. The swards chosen for autumn- and winter-saved pasture are vigorous ryegrass swards having high nitrogen levels in order to withstand frosts and are 2 to 4 in. long by late winter.

Recently, a trend towards set stocking or slowly rotating the ewe flock around pastures in the winter and supplementing with hay when necessary has occurred at stocking rates of six and seven ewes per acre. For good grazing management 15 to 20 paddocks are needed.

Intensive meat and wool production requires a high level of conversion of pasture to salable produce. This requires a neat fitting of stock feed demand and feed availability. This management task is strongly influenced by not only the pattern but also the relatively inflexible nature of pasture production. Hence management tries to achieve a neat fit through manipulation of the stock demand by altering lambing, weaning, killing, and stock selling dates, and the ewes' feeding level, and by conserving surplus dry matter in the late spring and summer as hay, silage or forage crops for the winter deficit period.

As 75% of the annual grass crop is produced from October to March, maximum numbers of productive stock are required at this time of the year for conversion of grass to meat and wool. The aim of management is high output per acre rather than high output per head.

McMeekan (1956) and others since have shown that stocking rate is the most potent means of achieving high

per-acre output from pasture, hence high rates (8 and 9 ewe equivalents/acre) with only moderate per-head production-e.g., 10 lb of wool per ewe, 110% lambing, and 28 to 30 lb lamb carcasses-are features of farms with high per-acre output of meat and wool.

STOCKING POLICY AND MANAGEMENT

Most of the ewes belong to the Romney breed and are mated either to Romney rams or one of the "meat" sires. Border Leicester X Romney ewes with their higher fertility are common, particularly where replacements are bought in, while increasing interest is being shown in Perendale ewes because of their lower labour requirement.

Lambing usually commences at the beginning of September, although with higher stocking rates it is being delayed to late September-early October to avoid the occurrence of feed shortages shortly after lambing. Lambing percentages are 105 to 115% survival to sale. Lambs are weaned at 9 to 12 weeks of age and then sold at any time from December to April depending on their maturity and on feed availability.

Ewes need to be fed liberally only at critical times of the year. For example, Coop (1966) has demonstrated the importance of high levels of feeding prior to and during tupping, and Wallace (1948) has shown the need for an improved plane of nutrition during the four weeks prior to lambing. On high producing farms, every effort is made to satisfy the requirements at these two periods and during lactation. However, a feed restriction is often placed on ewes at productively less important periods-e.g., restriction in early winter will allow a carry-forward of late autumn-and winter-saved pastures to lambing time, while a restriction on the ewe's intake after weaning will enable lambs to be fattened and hay to be conserved.

On many properties, shearing is between mid-December and mid-February--i.e., after weaning. Some may shear during lactation but pre-lamb shearing is rare on the heavily stocked properties.

Internal parasites are a problem only in lambs and are usually controlled by drenching monthly with an anthelmintic from weaning until late autumn. In Southland, a me-weaning drench may be necessary in early November. Lambs usually receive selenium at weaning. Ewes often are drenched with selenium prior to tupping and lambing and are vaccinated against tetanus, blackleg, malignant

oedema and pulpy kidney immediately prior to lambing. Ewe death rates are normally 23 to 5%.

Farmers who have recognised and adapted these features to their own farms have achieved outputs exceeding 270 lb of meat and 100 lb of wool per acre from stocking rates of 8 ewe equivalents or more per acre. At Invermay, 260 to 300 lb meat and 100 to 110 lb wool per acre were produced in a trial carrying 8 ewes per acre (Scott, 1968). These figures are considerably in excess of the average figures of 168 lb meat and 66 lb wool per acre from 5 ewes per acre recorded by the Meat and Wool Boards' Economic Service survey of South Island intensive fattening farms in 1967-8.

During the past six or seven years, many farmers have seen the opportunity for increased stocking and its associated increased output of meat and wool. As a result, stocking rates have increased rapidly on some farms-in one case annual increases of ¾ of a ewe equivalent per acre were sustained for five years as the stocking rate increased from 4.5 to 8.3 ewe equivalents per acre (Monteath, 1965).

Such increases have required changes in traditional management methods and attitudes-stock do not look or produce so well as before, shepherding is less' intensive, more thorough forward planning of grazing, feeding, and escape routes are essential. They have also been accompanied by much debate and argument about the merits of heavy stocking and its cumulative effect on animals, profitability, pastures and soils, and about how rapidly and to what extent stocking rates should be increased.

INTENSIVE PRODUCTION RESEARCH AT INVERMAY

There is little objective information about such cumulative effects and in 1968 a farmlet study was established at Invermay Agricultural Research Centre to monitor soil, pasture, animal and production long-term trends under heavy stocking rates. Soil physical and nutrient status and pasture production and composition are being measured regularly. Data on ewe and lamb liveweights and ewe depreciation as well as lamb and wool production are being recorded. Stocking rates of 7, 8, 9, 10 and 11 Romney ewes per acre are being run on 20-acre "all-grass" farmlets whose rolling topography, soil, pastures and subdivision are similar to those found on much of the country referred to in this paper. The five stocking rates have been chosen to provide a straddle of the maximum per-acre production Situation.

Each farmlet is managed as efficiently as possible and management decisions are made by reference to a set of rules and a feed budgeting procedure which are common to all stocking rates. Pasture, grazing and stock management are similar to those described earlier for highly stocked properties.

As well as noting long-term trends, this study will assist in the definition of future intensive meat and wool production research priorities. Some managerially important fields of research have already become apparent.

(1) At high stocking rates of 8 ewes per acre and above (and the associated 80 per acre or greater stock concentrations associated with rotational grazing), urine patches are still very obvious in the spring and early summer. This indicates a nitrogen shortage and suggests dry matter production could be increased substantially by use of fertiliser nitrogen in this period. Research is needed to determine how this can be exploited.

(2) Farm managers require further knowledge about the effects certain grazing management techniques have on subsequent pasture production-e.g., the effect of different grazing heights and duration at various times and conditions on production in subsequent seasons.

(3) Likewise, the possible incidence of psychological or behavioural stress associated with different feeding and grazing methods may be worthy of study.

(4) Possibly the greatest improvement in production efficiency, however, would be a substantial lift in the flock lambing percentage through increased twinning. This would permit a better fit of stock demand and pasture production as a ewe with twins produces a much better agreement between annual demand and production than does a ewe with a single lamb. Also, a twin-bearing ewe is 50% more efficient in meat production than a single-bearing ewe (Coop, 1967).

Finally, a brief word about intensive beef production. To date, beef production has been of little consequence compared with sheep production (120,000 cattle v. 7 m. sheep), and there are no clearly defined or prominent beef producing systems on the well-developed land. However, an all-cattle farmlet stocked with 2.2 yearlings per acre and alongside the sheep farmlets at Invermay indicates that outputs of 400 lb of beef per acre or more are likely from

an intensive all-cattle, all-grass system. When this beef output is sold on the export schedule, its profitability can be equal to or better than that from the higher sheep gross margins. Hence, such intensive beef production could be an alternative intensive stock enterprise for the well-developed land in the higher rainfall areas of Otago and Southland in the future.

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DISCUSSION

Lancashire commented that an earlier paper had reported higher profitability from cattle than from sheep, while the present paper suggested there was little difference between the two. Monteath said that, based on the last year's performance, there had been $41 per acre from sheep and $40 from beef cattle. The gross margin from beef in the present year would be $81. O'Connor observed that the dry matter production curves for Southland and Invermay were different and he asked if the number of sunshine hours, particularly in summer, could have caused this. He also wondered if the cutting techniques for measuring pasture production were the same in both trials. Monteath replied that the sunshine hours were virtually constant for a range of five meteorological stations. The main variations were in rainfall. The cutting techniques had been the same for the Southland and Invermay trials. Duder asked if any difference in Pasture production had been found under cattle grazing compared with sheep. Monteath replied that the figures available were only for a two-year period, both very different years. Tentative figures

showed 25% less production on the cattle unit. To begin with, pastures on both units were approximately 45% ryegrass, 30% clover and 25% other grasses. There had been no marked changes in the sheep pastures, but on the cattle pastures the composition was now 25% ryegrass, 10% clovers and 65% other grasses. These had also opened up more than those grazed by sheep. Both areas had been rotationally grazed with a 35-day rotation. He considered that there was a much more uneven distribution of dung and urine with cattle than with sheep. To a question on poaching, he replied that there had been no problems. The areas were adequately served with tile and mole draining systems and sawdust pads were used during winter. He had no data on the use of nitrogen in the early spring to overcome any nitrogen deficiency indicated by urine patches. Browne (Ireland) asked if there was any preference for hay or for silage making for cattle, considering the even rainfall distribution throughout the year. Monteath said there was no hard and fast rule for hay or for silage. Silage had been made in November because the weather was unsuitable for hay which was made later in the season. Willis suggested the the use of winter feed pads might break the fertility cycle by not having the dung and urine returned to the pasture. Monteath agreed that this was most important and every endeavour was made to return dung and urine. The losses which did occur could be offset by the very definite advantage of protecting the pastures from severe treading damage.