

ADJUSTMENT OF SEASONAL FEED-SUPPLY TO 'SEASONAL REQUIREMENTS OF ANIMALS.

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BECAUSE of the differential growth of herbage plants throughout the year and because of weather hazards, the most difficult problem of the stock-raiser is the provision of an adequate supply of feed for every day in the year. Worthy efforts have been made to facilitate the provision of feed, generically grouped under the title of "making two blades of grass grow where only one grew previously," either by better strains of grass, by better methods of sowing, establishing, and managing, by top-dressing, or by other means. While on the whole these have been successful, there are those who have failed to get the best advantage from them, but have nevertheless been able to run stock successfully.

Before proceeding further it may be helpful to set out in tabular form the amount of pasture-growth each month and the feed requirements of different classes of stock each month as a percentage of the total for the year.

Table showing Monthly Production of Grass (Average, Maximum, and Minimum) and Monthly Feed Requirements of Stock-All Percentages of the Total for the Year.

Month.	Grass-growth.			Feed Requirements.				
	Average.	Maximum.	Minimum.	Cow giving 300 lb. of Butterfat without Change of Live-weight.	Cow giving 200 lb. of Butterfat with Changes of Live-weight.	Ewe and her Lamb fat at End of Four Months.	Ewe and her Lamb fat at end of Seven Months.	
							No Change; in Ewe Live-weight.	Change in Ewe Live-weight.
August . . .	2	6	1	10.3	6.2	6.9	6.6	4 "
September . . .	5	10	1	11.1	7.9	9.5	8.3	8.9
October . . .	15	30	10	10.5	15.8	12.0	9.7	13.2
November . . .	25	35	10	9.9	16.6	13.4	10.7	13.6
December . . .	20	30	10	9.3	16.7	15.1	11.2	11.2
January . . .	7	40	2	8.6	5.0	6.3	10.8	10.7
February . . .	5	20	2	8.4	3.6	6.3	9.0	8.2
March . . .	8	20	2	8.0	11.4	6.3	10.0	9.9
April . . .	4	10	0	7.6	7.8	6.3	6.0	7.6
May . . .	3	10	0	4.9	2.8	6.3	6.0	5.0
June . . .	2	10	0	5.4	3.2	6.3	6.0	8.3
July . . .	2	6	1	6.4	2.8	6.6	6.3	4.2

From the above table it is evident that the high-producing well-nourished animal that does not change in weight requires a distribution of feed that is defined within narrow limits, and subject, for a stated performance, to only slight variations due to warm dry or wet cold weather; that nature on the average, provides a distribution of feed that makes no attempt to fit the animal's requirements, even if the average were dependable; and that the average distribution is widely departed from in every month of the year; finally, the animals that do change in weight thereby

change their feed requirements to fit the average pasture-growth, or, more accurately, that changes in pasture-growth cause the animal to adjust its weight accordingly, abundant pasture permits the storing of fat, short rations force the animal to use its body reserves and so to lose weight. In the process of feed adjustment this process might reasonably be placed first.

USING THE ANIMAL AS A STOREHOUSE.

There is probably no process more widely used nor any so indispensable as this in the feeding of stock. Without it drought conditions would destroy stock periodically in almost every part of the world-lazy or inexperienced stockmen would lose more stock than they reared. It is used efficiently and appropriately to combat short spells of insufficient feed, and on country where it is difficult or impossible to have other reserves, especially where the level of stock-production is low. It is used conveniently and less appropriately on paddock farms, where its mistaken costlessness presents it as an easy substitute for better ways of providing feed. Where animals lose weight they must regain it, and this they do when feed is abundant in spring. Three consequences result from this. First, production-feed that could be sold as fat-lamb carcasses or butterfat is stored as ewe body-weight or cow body-weight. Next, the animal storing weight and producing at the same time eats to stomach capacity, and may consume the spring surplus to such an extent that there is little left for putting by as reserves of hay. A repetition of the process in the following year is thus not prevented. Finally, where stock are hungry for long periods there is difficulty in maintaining good grass, and many of the failures of improved strains and of better methods of utilization are directly due to failure in making adequate feed provision for times of scarcity. On the whole the use of this process should be confined to cheap and natural conditions. Its elimination from conditions of artificial high production would mean the better exploitation of all processes of advanced husbandry.

THE PRODUCTION AND SALE OF PRODUCE AT AND DURING THE PEAK OF PASTURE-PRODUCTION.

The natural increase by birth and maximum production of meat or other animal products are everywhere arranged to coincide with the peak of pasture-production. This usually coincides with spring and summer. The selling of butterfat and of fat lambs and all surplus stock by the beginning of early autumn are of similar import in adjusting feed-supply-to-stock-numbers. Appreciation of the part played by the sale of finished produce has led some stockowners to use the market extensively, wintering as few sheep as possible, stocking up to capacity in early spring, and selling everything that fattens when it is ready. As a national policy it is impossible for every one to pick the plums-if plums they be-in this way, and it is opposed to that stability of progress so essential in all stock projects. Where supplementary crops are grown excessively, the market has to be used excessively. It is probable that most lambs fattened after the end of March, in the

South Island are bought lambs, and, since these represent about half of the killings for the South Island, this practice appears to be quite important—a link between the high country and the paddock farms. Whereas the high-country sellers are rightly using the markets to facilitate the adjustment of their feed-production, buyers of store lambs are actually doing the very opposite. They have created an abnormal feed-supply in autumn, and have to buy sheep to eat it. This has two direct consequences—(1) It reduces the area of grass and consequent summer capacity; (2) on most farms the fattening lambs use some grass that would otherwise be ewe-feed, and in so doing often cause shortages of ewe-feed, with consequent poor ability to produce in spring, punishment of grass that makes renewal necessary, and lambs of slow growth that require further supplementary crops.

HAVING STANDING RESERVES OF FEED (KHAKI GRAZING).

Next to the processes outlined above, this is probably one of the most important throughout the world. It is the wild animal's method of wintering, moving from higher to lower levels in winter and oppositely in summer. The nomad introduced some refinement in that he eliminated the factor of topography and grazed wherever suitable feed was to be found. Range grazing in Western United States of America and the grazing of fenced areas at special times in many places the world over are still further refinements. High-country grazing in New Zealand is not dissimilar to the natural grazing by the wild animal. Having standing reserves is the obvious cheap and efficient method of smoothing out the feed-supply under conditions of low production where the country is rough. Its cheapness and efficiency have established it in a modified form as a practice on most paddock farms. Its use here levels out the variations in growth due to variable rainfall, and when it is combined with suitable top-dressing it has been all-sufficient on farms of high-producing capacity. It lends itself to sheep more than to cattle. Sheep have a higher peak production in spring. The amount of spring surplus is therefore less, and not sufficiently generous to warrant its being saved as hay. Dairy cows, with a low peak requirement, leave a surplus that can be cut for hay. Again, sheep are virtually in store condition for six to seven months of the year, whereas cows are thus for three or four months only. Standing reserves may feed sheep adequately while they are not producing heavily, and so provide as much as half the animals' requirements for the year.

Measurements made at Lincoln College indicate the probability that paddocks shut up for three months and grazed at the end of this time provide as much store feed for sheep as they would have provided productive feed if grazed in the young-leaf stage. The selection of grasses that would hold their leaf long past maturity would appear to be a point worth considering where it is desirable to hold large quantities of khaki grazing in reserve.

HAVING RESERVES AS HAY OR SILAGE, ETC.

This is the time-honoured, positively organized method of saving the summer plenty for the periods of winter scarcity. It is, a costly safe insurance by comparison with other methods, and a practice

that is steadily growing in New Zealand, the figures for grass hay, and silage being as follows : 1920, 117,000 acres ; 1927, 288,400 acres ; 1934, 470,000 acres. The figures for the Auckland Province are even more striking—44,000, 91,000, and 180,000 acres for the years 1920, 1927, and 1934 respectively.

The making of hay is usually more popular on dairy-cow country than where sheep are raised, for the reasons already mentioned. It has no reactions or bad consequences resulting from it, and amongst the processes of adjusting feed-supplies it must be placed first as the most positive, orthodox, and organized of methods. Reserves amounting to 10 tons of hay, of chaff, or its equivalent per 100 ewes for 120 days feeding in winter is about the maximum that is kept, but even this provides only about half their requirements. One ton per cow would be a small amount, yet this should provide all the maintenance for 120 days' feeding.

THE GROWING OF SUPPLEMENTARY CROPS.

Like the saving of hay, this has come to be the recognized and widely accepted method of providing winter feed. Unlike hay, however, supplementary crops, while valuable for their costless-storage attribute, are not capable of being stored for more than a limited time. Again, whereas hay must be always more costly than the grass from which it grew, supplementary crops may be much cheaper than grass when yields are heavy, or they may be very much more costly when yields are light. They are especially grown with grain, or where hay is impossible, usually because of low rainfall. They are often grown for the convenience with which they fit into the grass-renewal practice, but sometimes their being grown too frequently becomes the prime cause of the renewal of grass. The growing of supplementary crops is closely associated with the buying and selling previously discussed.

THE USE OF TOP-DRESSING.

The use of manure was traditionally associated with the production of harvested crops, and was applied to grassland most usually for the production of hay. Manure gives its peak of response about two to three months after application, and for hay-production it was rightly applied in August or September. These months are also the convenient times to apply it on most mixed farms, where team work is slack at this period of the year, and so top-dressing was thoughtlessly and wrongly done at this time of the year. Enlightened farmers appreciated that it often gave a flush of feed when there was already too much, and explored the possibilities of applying top-dressing in other months of the year. Top-dressing has its greatest value when it gives growth in the off-season, and where it is applied in December, January, February, or other non-spring months its proper function appears to be appreciated. If the year is divided into quarters it would appear from observations at Lincoln College that pasture-production is least variable and lowest in the quarter ending 30th September (7 per cent. to 10 per cent. of the year's growth takes place in this quarter). Top-dressing in any other quarter of the year, but more especially in the quarters ending April and July, consistently increase the September yield

up to 14 per cent. to 18 per cent. of the year's growth, and brings it within striking distance of the animal's feed requirements of 15 per cent. to 20 per cent. By top-dressing appropriately as regards time and amount and by the intelligent use of other factors some sheep-farmers in the South Island have profitably dispensed with the growing of supplementary crops. Good grass well sown and well managed is certainly the key to the maximum exploitation of top-dressing.

THE USE OF DIFFERENT KINDS OF GRASS.

While few would dispute the excellence of rye-grass and clover of the perennial types as judged by abundance of yield under perfect management, there are some who recognize the importance of out-of-season grass and have taken steps to secure it. Many of the grasses that have failed to stand up to the hard treatment that is necessitated by occasional spells of dry weather are nevertheless capable of persistence when treated according to their merits, and those that produce out-of-season grass have, for this reason, come into prominence sporadically in many localities. Prairie-grass that disappears from pasture under ordinary conditions persists when grazed appropriately and grows so abundantly in late winter and early spring that some who use it can do without turnips. Canary-grass seems to have the same attributes. Subterranean clover, because of its winter-growing capacity, and because it is not eliminated by being eaten out in periods of dry weather, has advantages over even wild white clover in some localities. The growth habits of red clover, cocksfoot, and paspalum have long been appreciated, and the project of having more or less pure or dominant strains of these pasture-plants in small areas is becoming increasingly important. The development, because of their off-season productivity and the use of what was once considered inferior plants, has doubtless been stimulated by researches into grass-strains, and is destined to become of major importance in the immediate future. If grasses that grow abundantly in the off-season and that possess the property of "store ability" in the paddock to a high degree-usually associated with a coarse-leaved succulence-could be exploited and developed, a very useful work would be accomplished.

USING DIFFERENT KINDS OF STOCK.

Whereas breeding-ewes and dairy cows have a well-defined feed-distribution for maximum production and react most sensitively to reduced supply, dry sheep and fattening cattle can tolerate fluctuations below the normal with less serious consequences. The day that the rams are put out with the ewes determines the week five months later when abundance of feed is required, and unless it is forthcoming and 'a late' spring is not unusual-then all the care that has been spent on ewes for the whole of the year may be easily undone.

With dry sheep or non-dairy cows a feed-shortage if protracted for an extra three weeks has less serious consequences than with in-lamb ewes, and the former class of animal appears to be an excellent safety valve to guard against the vagaries of lack of feed. in spring Provided two light hoggets can return 10s. each by way

of wool and price increment for a year's feed, they are just as profitable as a ewe that produces a fat lamb at 20s., since her wool usually goes to offset her depreciation. Where hoggets are kept to replenish ewe flocks they cannot 'as a rule be used in this way. During the last four years in Canterbury ewe or wether hoggets were as profitable as ewes, but at the present it is difficult to see how they can be with higher winter buying-prices of hoggets and higher prices of fat lambs.. There are fewer feed difficulties on a farm that carries 800 hoggets and 400 breeding-ewes than on a similar one carrying 800 breeding-ewes. Similarly, yearling cattle that show an improvement of £3 to £4 in value are as profitable as sheep, and almost as profitable as cows of 200 lb. of butterfat, and, if used as equalizers of feed-supply, they ease the feed position considerably.

SAVING SEED.

Where use has been made of pedigree grass, carefully sown and well established, intelligently managed and top-dressed in relatively small areas, where one grass is dominant, the saving of seed is a profitable adjunct to sheep-farming. It appears to have advantages over grain-growing as an association with sheep, because with this treatment grass is helped by the spells of seed-production. Grass is often looked upon as a second string in grain-growing, districts, with little attention given to its permanence, establishment, or management.

IRRIGATION.

Irrigation removes the weather hazard from grass-growing and leaves only the hazard of temperature, thus extending the growing-season from perhaps four to eight or nine months. Where irrigation is a possibility, the perennial types of rye-grass and white clover must ultimately attain the fullest expression of their worth.

GRASS-DRYING.

Grass-drying is of interest because of the certainty with which it establishes reserves of high-quality feed. It appears to have become established on a commercial basis in other countries, and to deserve careful attention in New Zealand. In association with irrigation, it should be exploitable to best advantage.

CONCLUSION.

The above considerations have been set out with the 'object of reviewing the processes 'commonly 'in use for adjusting the feed-supply to the needs of the animals. While these processes are often consciously used with skill to achieve the desired object, many use them automatically because it is the custom of the district, and without the skill that is associated with conscious effort. Some use them to their own embarrassment, being forced to make amends for the abuse of one by the wrong use of a second or other process. This is not to be wondered at. It was well illustrated in pigs some ten years ago, when the absence of an adequate winter-feed supplement to take the place of skim-milk forced pig-feeders into the malpractice of paying ridiculous prices in spring for weaners, which they fed to bacon-weights. Both high-priced

weaners and uneconomical feeding of a few were inimical' to profits! So now with sheep. Excessive growing of supplementary crops in many places forces farmers to 'use the markets wrongly,' to persevere with bad grass, and so to limit their summer carrying-capacity in a way that is inimical to profits. Finally, appreciation of this review might lead to better co-ordination of scientific effort. Grass is useful only as stock products, and better utilization of better grass by better stock must make more progress than will be made merely by spending all our efforts on better grass and ignoring the other factors. Consideration might even be given to what better grass really does mean, and to whether a selection of vigorous winter-growers with ability to persist by reseeding or other hunger-proof devices, and capacity to store themselves in the paddock in a succulent stage over long periods, may be a matter worthy of better consideration..

DISCUSSION.

Professor Feyer : Relative to the incidence of various troubles in sheep from time to time, there is very little trouble of the type Mr. Scott mentioned in well-managed stud flocks where the sheep are kept at a uniform level of feeding throughout the year. I should like Mr. Barry's opinion on this matter.

Mr. Barry : The largest incidence of disease occurs generally in the ordinary flock sheep. Stud sheep are undoubtedly less subject to these seasonal conditions or disorders which are dependent upon feed conditions. We have an example in the higher incidence of sleepy sickness in ewes which are subjected to a falling nutritional standard approaching lambing-time. Another instance in the Wairarapa seven years ago related to hogget-mortality which generally was severe in the early winter months. On one particular station there was no trouble. On this station it was the practice to supply to the hoggets some feed of a dry character preferably hay, and it was the custom invariably to feed the hoggets hay in the early winter. To ensure that hoggets would take the hay it was the practice to educate the lambs from weaning-time to eat hay. I have had many experiences of similar cases since then.