PROTEIN PRODUCTION FROM SHEEP, GOATS AND DEER

I. E. COOP
Lincoln College, Canterbury

SUMMARY

The use of land for sheep, goat and deer farming is discussed. Considerable scope exists for increased animal production of all kinds from hill country, but reduced areas of arable land will be available for livestock farming.

Much of the increased output of meat will arise through better hill pastures and animal utilization. Increased efficiency in sheep farming is necessary through the development and use of animals selected for high reproduction rate and lamb growth and slaughtering of animals at heavier weights than currently practised. The need for the application of improved business methods to the industry is stressed.

Goat farming is unlikely to be further developed but deer farming will supply increasing quantities of venison for which satisfactory markets currently exist.

NEW ZEALAND is not supplying meat to a protein-hungry world but rather to the affluent societies of Europe and North America—populations in which obesity is equally as important as undernutrition. These exports are luxury foodstuffs, and for meat to hold its position as a form of exportable protein that is profitable to produce, it must retain its prestige value. It is certain that animal meat will come under increasing and severe pressure from substitutes which are cheaper as well as acceptable and it is the sheep industry's reaction to this that is the subject of this paper.

It is clear that sheep are inefficient converters of plant materials to human food. Thus a farm producing 8970 kg of dry matter per hectare (8,000 lb/ac) including 1680 to 2240 kg/ha of protein (1,500 to 2,000 lb/ac) and carrying 12 ewe equivalents (EE) per hectare (5 EE/ac) produces only about 20 kg/ha meat and 45 kg/ha wool protein. Fortunately for producers, biological efficiency is not the only criterion of viability of an industry—it merely contributes to that of economic efficiency.

To animal scientists the technical aspects of sheep production are of much interest yet it is deceptive to believe

that these are necessarily the most important to the development of the sheep industry. There is plenty of evidence that aspects of politics and marketing are of major significance and these can nullify the efforts of the producer and offset technical advances.

SHEEP PRODUCTION

Improvement in the biological efficiency of animal production is important if farming is to better withstand competition from other industries. It can be suggested that, in the future, cropping and protein extraction will drive the less efficient animals, sheep and beef cattle, off the flat, easy, arable country, where crops and grass can be harvested mechanically, up on to the hills, where only animals can harvest the pasture. Since New Zealand is poorly endowed with arable land the running of sheep and cattle on hill country must remain vital to the nation's economy. Some ruminants will still be required on the lowlands to utilize crop residues and to maintain soil structure and fertility. Also some will be required on those flat areas too distant to be serviced by protein extraction plants.

Soils and Pastures

The first step in increasing the efficiency of sheep production is to maintain research in soils and pastures, so that area yield of dry matter is increased and the overall production cost of dry matter is decreased. This approach has been successful in the past, and there is still much to do especially on the hill country. Coupled with this is further improvement in the utilization of pasture. The other ingredient of past success is investment in the sheep industry—confidence to put money into oversowing, topdressing, fencing and more stock. Soil fertility, pasture production and development will remain basic to the sheep industry, but continued profitability is dependent on increasing the efficiency of the sheep itself and of flock management.

Reproductive Rate

The outstanding deficiency of the New Zealand sheep is low reproductive rate and yet it is in this aspect that a great potential exists. From the 60 million sheep in the country, with a lambing percentage of 100, the industry should aim to reach 100 to 120 million in the year 2000—80 million on hill country with a lambing percentage of

125 to 135, 30 to 40 million on the flats with a lambing percentage of 200. This is technically possible and given the right economic conditions it could be achieved.

The hill country is averaging about 3.7 to 4.9 EE/ha (1½ to 2 EE/ac), yet has a potential on today's knowledge of 12 EE/ha (5 EE/ac). The sheep are predominantly Romney with a lambing percentage of round 85 to 90 but there are also some fine wool breeds, and increasing numbers of Perendale. The Perendale and Coopworth are capable of completely replacing the Romney by the year 2000. This in itself would lift the lambing average 15 to 20%. There are individual Romney flocks that are genetically as good as these newer breeds and these, too, if exploited, could give the same 15 to 20% improvement. To this should be added 28 years of selection for fertility from now until 2000, and if applied at only 50% efficiency this could add another 10 to 15% lift. Apart from this an infusion of ⅛ or ¼ Finnish Landrace blood into these breeds could raise the potential to 150%, or, say, 135% under large-flock management. The real point here is that the scientist can give the hill farmer pure breeds and crosses of sheep capable of giving lambing percentages of 150 to 200, limited only by the ability of the hill farmer to exploit this potential under large-scale, low-labour input flock management. These sheep have to be of the "easy care" type managed under a minimum attention policy.

On the arable lowlands sheepfarming must become even more intensive. Fortunately the circumstances of protein extraction and cropping will provide residues of fodder and grain that will make the flock less dependent on seasonal pasture growth. To get the maximum from the lowland sheep, a three-tier system must be adopted. Cast-for-age sheep from the hill country should give 150% of lambs without difficulty but if these are crossed first with a Finn × Poll Dorset ram the potential and opportunities expand. The first-cross progeny should give 160 to 200%. Further, ewes with Finn-Dorset blood can be made to lamb three times in two years and with light treatment twice a year to have potential in excess of 200% per annum. The techniques for this are either known now or are within reach. Additionally research in the control of ovulation by hormonal treatment has a reasonable chance of becoming practicable and economic, both for out-of-season breeding and for superovulation, before the end of this century.

Out-of-season breeding will obviously create serious problems of feed supply. Figure 1 shows the monthly feed demand (as percentage of the annual demand) and a

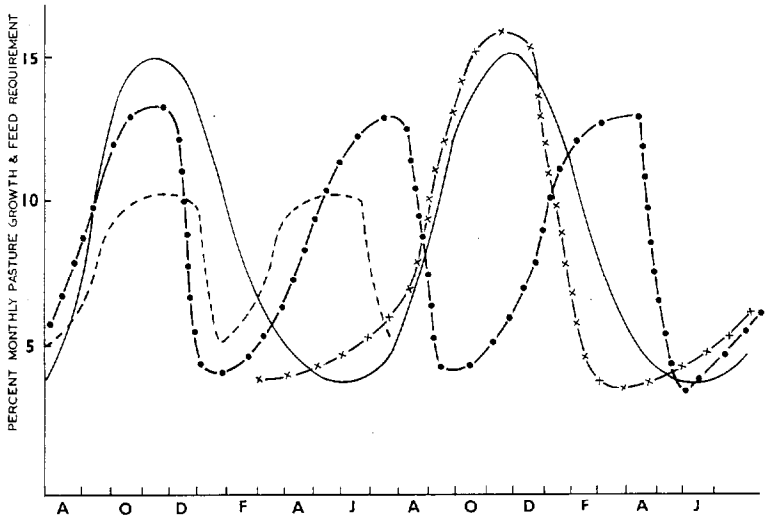

FIG. 1: *Typical monthly pasture growth profile* (—) *and feed demands for three flocks producing 200% lambs annually at rates of:*

200%, 1 lambing/yr (+ — + — +);
133%, 3 lambings/2 yr (● — ● — ●);
100%, 2 lambings/yr (- - -).

typical North Island monthly pasture growth profile for flocks producing 200% per annum—(a) 200% lambs once a year, (b) 133% lambs three times in two years, (c) 100% lambs twice a year. A very high fertility flock lambing once a year is ideally suited to pasture farming and it appears likely that this will remain the most practicable solution. Nevertheless other avenues of utilizing pasture by animals must be explored. An integrated sheep-beef cattle policy, with short-term fattening of purchased cattle over the summer surplus period is one possible answer. Associated with both very high fertility and out-of-season breeding are problems of rearing lambs. Early weaning and artificial rearing are already well advanced both in United Kingdom and in New Zealand.

GROWTH RATE AND SIZE

Cattle are more efficient producers of meat than are sheep. The basic reason for this is that cattle are slaughtered at round 80% of mature body weight and lamb at 50%. For too long the prime lamb industry has concentrated on production of a 14 kg (30 lb) carcass. Many justifications for this situation have been made yet equally it is time their validity was really tested. Raising the car-

cass weight to 18 kg (40 lb) would increase meat production efficiency and reduce unit processing charges. With the increase in lamb cuts, packaging and restaurant eating, a move to higher carcass weights seems highly advantageous. Breeds of Down sires are available to provide heavier lambs without excess fat, and growth rate within existing breeds is highly responsive to selection, so again, techniques are available. What is needed is encouragement through a price schedule which does not penalize the larger lamb unless it is overfat.

Alternatively, a system of contract production should be introduced additional to the normal lamb schedule.

These suggestions if adopted by the sheep industry could lead to contracts for sufficient Suffolk-cross lambs to be killed in one freezing works at about the same time so that a market for lean 18 kg lambs could be explored, or a similar contract for ram hoggets for a shipment to the Middle East. The present meat schedule is too inflexible to provide the ideal material to explore specialist markets. Other forms of contracting could also be advantageous, for example, in supplying replacement sheep at an agreed price per unit liveweight. In fact, a more businesslike approach is wanted in many aspects of sheep production; for more than 100 years the industry has survived without ever weighing anything except bales of wool and lamb carcasses. Even the beef cattle producers who started very late in life, relative to sheep producers, now think in terms of weight-for-age, daily liveweight gains, and buying weaners at *x* cents per pound liveweight. The dairy farmer, for generations, has known his productivity in terms of actual weights. An industry that knows the weight gains of its animals, the weights of animals bought and sold, is much more conscious of efficiency. There is need of some development in weighing animals on farm and at saleyards —in such a manner that it does not create more jobs and adds only marginally to costs.

Wool

All these changes and developments ignore wool. Wool is still a significant earner of overseas exchange and farm income. Against this a high proportion of farm costs are directly related to wool and as lambing percentages increase the contribution of wool to total income must decline. Every endeavour should be made to select for weight and quality and to extract the maximum value from the wool grown, but where this conflicts with other objectives wool should be kept in its proper perspective lest it act as

an impediment to progress in meat production as it has in the past.

To service the main objectives much research will be needed in allied fields such as disease control, control of the breeding season, artificial breeding, identification of twin pregnancies, lamb growth rates, rearing of lambs in large flocks at high lambing percentages, and hogget rearing. Research on the cost structure of sheep farm operations is needed to ensure that only that which is essential is done and that it is done in the most economical manner.

MEAT PRODUCTION FROM GOATS

The goat is biologically, and in terms of size, reproductive rate and growth rate, similar to the sheep. Goats are no more efficient than sheep, cattle or deer and are competitive with these, rather than complementary. The techniques of goat farming are not as well established and the exploitable breed potentials known to exist within sheep are less pronounced in goats.

By all means the market for goats' meat should be explored, but until large wealthy markets are revealed it is unlikely that goat farming will replace that of sheep and beef cattle.

MEAT PRODUCTION FROM DEER

The prospects for deer farming in New Zealand are probably quite good. There is a market for venison in Europe and North America and even in New Zealand, perhaps quantitatively not large, but certainly high priced. There is also in Asia a very high-priced market for the velvet and carcass by-products. The biological efficiency of deer is comparable with that of sheep and cattle. Fencing and management costs are higher and there are still many management techniques to be developed before full exploitation can be achieved. Nevertheless the value of venison and the by-products make the prospect quite exciting. There is need to assess the size of the market and the demand function for venison in order to determine the validity of allocating the resources necessary to develop deer farming as a major industry.

CONCLUSIONS

While there are certainly reasons for alarm in the sheep industry, there are also some reasons for confidence. These are as follows:

(1) The pressure from meat substitutes will take time to mount and there is some time to create adjustments.

(2) Synthetic meat substitutes are unlikely to affect sheepmeat with the suddenness that synthetic fibre production depressed wool realizations.

(3) Whereas wool has failed to achieve the luxury value sought, natural meat should retain most of this value.

(4) There is a large potential for increased production from hill country in all forms of livestock, a potential which is realizable provided there is confidence and investment in livestock.

(5) New Zealand is the only large exporter of lamb and is not in competition with other large sheep industries, as it is with other beef cattle industries.

(6) Sheep in New Zealand have a huge undeveloped potential for increased lambing percentage; cattle do not have a similar potential for increasing calving percentage.

(7) Economic pressure is increasingly affecting the sheep-farming industry and there should be little delay in acceptance of new ideas.