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## SOME ECONOMIC EFFECTS OF DISEASE

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### SUMMARY

The component costs of animal disease are briefly outlined and problems involved in their estimation mentioned. Some of these costs as they affect productivity are then considered in relation to both the dairy and meat and wool industries of New Zealand.

ACTUAL deaths of domestic animals owing to the many diseased states are serious enough in themselves, but it is almost certain that morbidity losses greatly outweigh these (mastitis and footrot are excellent examples supporting this proposition). Indeed, it seems hardly necessary to point out that adequate animal mortality and morbidity statistics are fundamental to advances in the sphere of veterinary medicine and lack of such information is a limit to progress in livestock production itself.

Unfortunately, reliable information on neither disease incidence nor its effect exists in the majority of instances and there are no figures available which accurately show the overall losses attributable to disease in the animal industries in New Zealand. This lack of information is perhaps understandable in view of the limited veterinary manpower which has been and indeed which still is available, but it is a situation which cannot be too quickly remedied.

It is possible to estimate fairly accurately certain aspects of losses brought about by disease, *e.g.*, value of animals dying and the loss of meat condemned in abattoirs as unfit for human consumption. The level of this latter loss is shown in Table 1. To give estimates of the total loss due to animal disease is, however, an extremely difficult if not impossible task, and this is particularly so in those insidious conditions, which, although not always causing death, are responsible for lowered productivity. It is made even more difficult by the fact that ideas do not yet appear to be clear on physiological optima for animals; indeed, many concepts of the normal healthy animal and its output are based on studies in which the material was either parasitized to some extent or was affected with other subclinical disease such as that seen in virus pneumonia affecting many species, and low grade mastitis in dairy cattle.

TABLE 1: ESTIMATED LOSSES DUE TO TOTAL OR PARTIAL  
CONDEMNATION OF MEAT AFTER SLAUGHTER  
FOR SEASON 1963-4

Class of Meat	Gross Production (Tons)	Condemnation Estimated Value		
		%	Tons	(£N.Z.)
Lamb .....	304,200	0.1	300	51,000
Mutton .....	179,000	1.5	2,700	216,000
Beef .....	266,900	3.0	8,000	1,920,000
Veal .....	28,500	1.5	400	96,000
Pigmeat .....	47,400	3.0	1,400	238,000
<i>Total</i> .....	826,000	1.5	12,800	£2.5 million

Figures supplied by Director of the Meat Division, Department of Agriculture.

The monetary conversions are the writer's own estimates using average f.o.b. values for 1963-4 with pigmeat at same value as lamb. It should be noted that although disease plays a major role in condemnation of edible meat it is not responsible for all condemnations.

Acknowledging these difficulties, however, it is important to try to assess losses caused by animal disease. Cunningham (1965), for example, suggested that the annual toll from disease in New Zealand was at least 15% of the annual production. The same figure was published in the 1952 O.E.E.C. Report cited by Gracey (1960) when considering losses due to livestock disease in the European countries, while an FAO Report (1962) recorded the average known loss figure from 15 countries as being equal to 22% of the total livestock production. This latter report indicated that, in countries where intensive veterinary activity had been in progress for many years, losses still ranged between 15% and 20% of the total annual value of animal production. In countries where veterinary activities are less intensive, losses occur at a much greater rate.

Although it is rather idealistic to speculate on the productive output of the national herds and flocks in the complete absence of animal disease, it is pertinent to consider briefly the component costs of disease in their very widest sense. These may be summarized as follows:

(1) *Effect on animal productivity.*

Reduced yield due to deaths.

Lowered output per surviving animal.

Increased overheads due to high wastage.

Lowered selection potential for superior genetic material,

(2) *Expense involved in treatment and control.*

Veterinary service (general practitioner and government including quarantine and meat inspection services).

Medicines, vaccines, drenches, etc.

Research.

(3) *Effect on human health both directly as with the zoonoses and indirectly owing to "stress" during serious outbreaks of disease.*

(4) *Effect on potential markets.*

No attempt is made here to estimate the many imponderables involved in (3) and (4) above, and only scant attention is given to (2). This latter category covers the investment which the country makes annually in an endeavour to maintain herd and flock health; and even with this investment, losses remain high. Following a survey carried out by the New Zealand Dairy Production and Marketing Board during the 1963-4 season, it was estimated that, on the farm, animal health costs (veterinary services, medicines, vaccines, etc.) were approximately 11s. per dairy cow in milk (N.Z. Dairy Production and Marketing Board, unpublished). This would represent an investment by the farmer of about £1.1 million for the dairy industry. A similar estimate for the meat and wool industry, based on information published in the Meat and Wool Boards' Economic Service Financial Analysis of New Zealand Sheep Farms, is 1.25 pence per sheep carried (W. L. Keen, pers. comm.). This represents an investment of about £3.1 million. These total estimates of over £4 million take no account of other costs involved in research, quarantine service, meat inspection service, teaching, extension, and administration of other Acts and regulations. The expenses involved in treatment and control are clearly very substantial.

The remainder of this discussion is devoted to a consideration of some of the costs related to disease as it affects animal productivity. Although there are shortcomings in the data from which many of these observations are made, they provide in many cases all the information available. Reliance on diagnosis by lay personnel in particular is a fault common to many disease surveys, but this may well be justified depending upon the use to which such collected information is to be put.

## DAIRY INDUSTRY WASTAGE

Of every 100 heifer calves born to full term, 14.3 are dead, excluding those "bobbied", before they reach 2 years of age (figure calculated from the Vital Statistics of Dairy Cows, N.Z. Dairy Production and Marketing Board, *Production Report No. 41*, 1965). Calving difficulties and diseases of the newborn, especially enteric diseases, play an important role in these losses. The wastages in male calves in the first week of life is also considerable. Over 3% are either born dead or die at birth and of those that survive parturition and are selected for rearing about 12% are dead by the age of 9 months (N.Z. Dairy Board, 1944). In potential meat loss alone, this level of calf wastage costs the dairy industry something in excess of £0.75 million annually.

The present level of herd wastage is about 21% and of this just under half has been attributed to disease (N.Z. Dairy Production and Marketing Board, 1963). This estimate of loss due to disease is almost certainly conservative as there are no figures available on the part played by disease, especially subclinical disease, in the culling carried out for low production.

Reduction of this wastage figure would have many advantages in terms of allowing increased selection pressure for replacement stock to be exerted; the numbers of animals carried as non-productive dry stock could be reduced, the age composition of the milking herd would change in favour of the higher-producing, mature cows, and possibly a better salvage rate for animals culled would obtain. Ward (1945) outlined one approach to measuring this situation by calculating the advantage of increasing the average productive life of the dairy cow in New Zealand. He estimated that, for each increase in effective producing life of one year, the value to New Zealand in terms of additional butter-fat produced would be £1 million. On the basis of present values and taking into consideration the increased size of the national herd this figure would be trebled. Thus, extension of the average productive life of the dairy cow from the present 5 years to 7 years (requiring a reduction in current wastage of one-third) would yield a £6 million return. This is surely not an insuperable task.

## MEAT AND WOOL INDUSTRY WASTAGE

National wastage figures in this industry are conspicuous by their absence. A number of small-scale surveys, particularly those carried out in association with the New Zealand

Sheep and Beef Cattle Survey Unit of the Meat and Wool Board (I. M. Cairney, pers. comm.), suggest that the following estimates are not unreasonable:

Lamb deaths, birth to docking	.....	14%
Hogget losses, docking to 1 year	.....	5%
Annual ewe deaths	.....	5%

In terms of potential meat alone, this is worth about £17 million annually and if similar losses from the beef and pig industries were added it is not difficult to visualize a figure in excess of £20 million per year.

It is obvious that wastage losses such as these cannot all be attributed to disease, but it is known that, in one form or another, disease does play a major role and the cost is obviously high. Moreover, this type of information tells nothing about morbidity losses at all. It seems reasonable, therefore, to conclude this paper by mentioning some of these effects in a brief consideration of a few of the well-known major disease complexes.

#### STERILITY AND ABORTION

Sterility, including temporary infertility and subfertility, continues to be a major source of economic loss in all livestock industries. For example, 6.9% of dairy cattle are not pregnant at the end of each mating season (N.Z. Dairy Production and Marketing Board, 1965) and about 5% of ewes never get in lamb in any one year.

The average incidence of abortion in the national dairy herd is 2.8% and on the limited information available this figure is probably higher in the national beef herd. Production losses from these dairy cows alone have been assessed at over 22% (N.Z. Dairy Board, 1951) or about £0.5 million on present values.

Late calving is also a sizeable economic problem — about 15% of cows calve 6 weeks later than the median calving date for the district (N.Z. Dairy Board, 1951). The production of these animals is about 25% less than that of animals calving within 6 weeks of the median calving date. This loss can be computed as being something of the order of £2.5 million in terms of butterfat not produced.

Clarification of fertility performance in the national beef herd has yet to be done, but that many problems exist is abundantly clear from the fact that calving performance in the Poverty Bay area computed as number of calves marked per 100 cows mated is of the order of 75% (Young, 1965). A comparable figure in the Hawke's Bay area according to one survey is 88% (I. M. Cairney, pers. comm.).

Again, disease may not be the only component in these losses but it does play a major role and the rewards, if it could be controlled, would be considerable.

TABLE 2: ESTIMATE OF LOSSES DUE TO CLINICAL AND SUBCLINICAL MASTITIS

<i>Category</i>	<i>% Cows</i>	<i>Loss per Lactation (lb B'fat/Cow)</i>	<i>*Total B'fat Loss (lb)</i>
Culled for mastitis .....	1	100	2,000,000
Clinical cases retained .....	11	40	8,800,000
Subclinical cases	25	20	10,000,000
			20,800,000

\* Based on a national milking herd of 2 million cows.

#### MASTITIS

An estimate of losses in production owing to mastitis is shown in Table 2. These estimates are based on information reported in surveys conducted by the New Zealand Dairy Production and Marketing Board (N.Z. Dairy Board, 1958; N.Z. Dairy Production and Marketing Board, 1963) and from a study embodying production losses in dairy cattle as assessed by variation in monthly Californian Mastitis Test values carried out by Daniel (1965). These losses in production shown in Table 2 and valued at 3s. per lb butterfat equal an annual loss equivalent to £3.1 million.

#### BLOAT AND METABOLIC DISORDERS

These are unpredictable diseases and information available suggests that with bloat, at least, the incidence is increasing (N.Z. Dairy Production and Marketing Board, 1964). Marked differences among districts, herds and seasons occur and losses can be high. For example, the death rate owing to bloat during the spring of 1963 was 1.2%; losses in beef cattle in Hawke's Bay during the spring of 1961 were estimated at 3.8%, and two-thirds of this loss was attributed to grass staggers (I. M. Cairney, pers. comm.); in 1954 it was estimated that 83% of dairy herds in the South Auckland and Bay of Plenty districts experienced cases of milk fever and/or grass staggers, the actual incidence being 4.3% and 1.0%, respectively, while in the 1955 season only 68% of herds were so affected with incidences of 2.3% and

0.6%, respectively (N.Z. Dairy Board, 1957). Average death rates observed in this study were 8% for milk fever cases and 16% for "grass staggers" cases. Production losses for animals affected but not dying have not been established with these diseases, but, particularly where acetonaemia is involved, it would be surprising if these losses were not substantial.

The above are but a few of the many diseases of economic importance. What, for example, is the cost of footrot, pregnancy toxæmia, retained placenta, facial eczema, pneumonia and other conditions? There is no doubt that the cost is high and Cunningham's (1965) figure for economic loss of 15% of the value of annual production may well be right. Indeed, the cost may be a good deal higher.

If this is in fact the case, obviously more money and effort are required to be directed towards reducing these losses. Current eradication policies should be pursued with vigour and new ones instituted where they can be carried out economically; veterinary service should be increased; application of existing knowledge should be carried out with determination; and last, but by no means least, research programmes designed to increase knowledge of the control of disease should be expanded rapidly.

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