THE ECONOMIC IMPORTANCE OF DISEASE IN DAIRY CATTLE.

by

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Two qualifications are necessary in order that the subject matter of this paper might be better understood. In the first place, only broad aspects of the more important disease losses can be discussed as there has not yet been any adequate survey of all disease losses in dairy cattle in New Zealand, and it is not possible to deal more than summarily with the minor diseases. In the second place, and for reasons which involve the somewhat subtle interacting effect of two or more diseases in the same animals and the effect of management policies in culling affected animals, I shall refrain from accepting the tempting bait of calculating a single figure in pounds, shillings and pence, in order to state exactly what is the economic loss due to disease in dairy cattle.

One further important qualification is also necessary. The data quoted in this paper has (except when otherwise indicated) been drawn from herds under Group Test or samples of such herds. It is freely admitted that these herds would probably be a better than average sample as compared with all herds in the industry. Where possible some allowance has been made for this selection, but the degree to which the estimates quoted are unduly conservative must remain a matter of opinion. Further factual data is required on the losses within herds for many diseases, but the economic importance of our advantage in emphasising the general healthy nature of New Zealand's dairy herds as compared with other countries should not, in the meantime be prejudiced by estimates of disease losses based on experience only of heavily infected herds, or on opinions not backed up by reasonably unselected data of average conditions.

There is a further qualification necessary when comparing the economic nature of disease losses in New Zealand with those in other countries. The average value of a cow in New Zealand is comparatively low - in fact, considerably below the value of a full season's production. For instance, the average value of a cow in New Zealand in 1942 was £10 to £12; in England it has been quoted as £42.10.0.(1) Calves not required for replacement are worth only about 15/- - in England they are valued at 50/-.

As the result of field surveys carried out by the Herd Recording Department of the Dairy Board, it is possible to indicate the general order of importance of some of the main dairy cattle diseases and to generalise on the probable economic loss consequent upon the more important of these diseases. As with most problems, there is a danger that the extent and nature of these disease losses will be over-simplified when converting the detailed herd position into an overall national picture. At the same time a summarised statement necessarily conceals extreme cases (such, for example, as herds in which the incidence of clinical mastitis accounts for over 80% of the herd or where over half the herd is "empty" at the end of the mating season, or the rare case where two-thirds of the herd are found to be reactors to the T.B. test, with the other extreme of herds showing in one season or more almost complete freedom from disease. The desire to emphasise spectacular extremes of this nature must be subordinated to the more sober picture of average conditions.

TOTAL HERD WASTAGE:

Table 1 shows the herd wastage returns for the five year period 1938 to 1943, compiled from returns from testing members, the data being collected in all cases by testing officers at their monthly visit to the herd. At the first visit in the season the member is asked for details of the total culling during the winter months since May 31st previously, and from then on all cows culled or lost from the herd are recorded on the test sheets, together with the reason for such culling or loss.

Table 1 referred to in the preceding paragraph is shown at the end of this paper.

The total wastage over this five year period is shown to be approximately 17%, but it is probable that these returns understate the actual annual loss by perhaps 1% or 2%. This additional loss would represent the small amount of information not collected from herds which do not continue testing and where cows have been culled or lost subsequent to the last visit of the testing officer, and prior to May 31st - that is the end of the testing season.

The general accuracy of these returns as a reflection of total wastage can be checked from several sources. The number of 2-year-old and first calving 3-year-old cows in the herds under test should reflect the true overall replacement rate, and a survey of several thousand herds during the period over which the wastage survey was made showed the percentage of 2-year-olds to be approximately 17%. Approximately 1% to 2% of the 3-year-old cattle would be first calvers and these would need to be added to the 2-year-old heifers in order to get the true replacement rate. The point might be raised, however, that this wastage rate of approximately 18% to 19% is low due to the probability that herds under Group Test constitute a somewhat better than average sample of the industry. Again total wastage from the dairy industry as a whole can be checked by the number of replacement heifers available. In January of each year the Government Statistician collects information on the number of heifers between 1 year and 2 years intended for dairying, and also the numbers below 1 year. For the five year period covered by these wastage returns (during which the cow population was fairly static), the number of such replacement heifers constituted 18% of the total dairy cow population; and as the final source of replacement can only be by means of such heifers this must measure the true total wastage rate for the industry as a whole. Even this rate is higher than the actual replacement rate because the heifers between 1 year and 2 years of age include heifers which will later prove to be infertile, and also a small proportion of heifers which will for various reasons never come into production. Cow killings are another source by which the wastage rate in the industry can be checked. These cow killings are collected monthly by the Livestock Division of the Department of Agriculture and include cows from beef herds as well as cows from dairy herds. These returns show that between 15% and 16% of all cows find their way to the slaughterhouse each year, and to this figure must be added deaths on farms estimated at about 1% of all cows, and cows sent to the Boiling Down Works. On this latter point I can offer no reliable estimate of the percentage of cows involved, but not more than about 2%.

It should be pointed out, however, that there is an additional loss within the industry which can only be measured by ascertaining the extent to which cows culled for disease and other causes are sold at the saleyards to those optimistic buyers who prefer this perilous method of replacing their own herds in the vain hope of increasing total production by carrying mainly mature stock. It is a most unfortunate commentary on the liquid milk industry that quite an appreciable percentage of these cull cows are purchased into herds engaged in the town milk trade, and it is obviously one of the reasons for the present high wastage rate among such herds.

CAUSES OF WASTAGE:

The table on general wastage indicates that culling for low production is still the main single cause of loss from dairy herds. There is a strong probability, however, that one of the contributing causes of low production would be the effects of sub-clinical disease in preventing cows coming into full production or the failure of certain cows to come back into full production after previous disease attacks. It is highly un-

likely, however, that these qualifications would influence the individual data at all appreciably or alter the order of importance of the causes of wastage. From this table it will be seen that mastitis, closely followed by sterility and abortion, is responsible for nearly 80% of annual culling due to disease.

MASTITIS:

Mastitis is clearly our worst disease problem, and the actual cullings at the end of the season for mastitis are possibly the least portion of the loss attributable to this disease. The wastage data shows that approximately 4 cows in every 100 are culled annually for mastitis, and data collected through Herd Recording sources indicates that for these cows there is an average loss of approximately 100 lbs. of butterfact per cow (i.e., just over 30% of normal production) during the season prior to culling. Data collected from herds under test, varying in number from 1099 in 1941-42 and 1223 in 1942-43, to 1919 in 1943-44, shows the incidence of clinical mastitis on a cow basis as 15%, 12%, and 12% in those respective years. The definition given to the testing member and to testing officers who collected the data was to regard as clinical cases "all quarters which are abnormal or which are giving abnormal milk. This includes any quarters showing discoloured milk, clots, sediment, or watery solution in the milk; also any quarters showing hardness, pain, swelling, or other similar abnormal condition." It must be admitted, however, that the returns in all probability understate the total incidence of clinical mastitis. There is also the further point that the herds from which this data was collected would probably represent a better than average sample. Consequently, the incidence of clinical mastitis in dairy herds is likely to be of the order of 12-16% of all cows in the herd.

The production loss in cows suffering clinical mastitis (apart from the 4% affected sufficiently severely to warrant culling at the end of the season) would range on the average from about 10 to 30%, the range varying according to the severity of the attack and the period of lactation. To what extent those cows which are not culled come in again as reasonable producers the following season, is still under investigation. Preliminary data indicates that approximately 50% of these cows which were not culled show no signs of clinical mastitis during the following season and that their production is approximately normal.

Recent work by one of the Board's consulting Officers, Mr. E.P. Nielsen, is of considerable significance in indicating the probable loss due to sub-clinical mastitis. Mr. Nielsen developed a technique for weighing the milk in each quarter of all cows in the herd, and carried out such weighings in six herds during three representative periods of the season. Leucocyte counts were made of all quarter samples, and it seems clear that in quarters showing a leucocyte count of 5 or 6 the fall in milk production compared with normal quarters of the same cows is of the order of 5% to 15%, again depending upon the period of lactation, the percentage being lower in the early part of the season and higher towards the end of lactation.

Data from the detailed investigations carried out by the Board's Consulting Officers indicate an average of 13% of all quarters showing high leucocyte counts of 5 or 6, and this percentage is confirmed from other samples of herds where leucocyte data has been available. Despite possible criticism of the use of high leucocyte counts as an indication of sub-clinical mastitis, there is sufficient field evidence available to justify the use of this criterion as an indication of the minimum incidence of sub-clinical mastitis.

A reasonable estimate, therefore, of the loss in production within the herd during an average season would be of the order of:-

	Average Loss Lbs. Butterfat per cow.
4% of cows severely affected	100
10% of cows affected with clinical mastitis and retained in herd	30
13% of quarters affected with sub-clinical mastitis	5 lbs. of butterfat per Quarter.

At current rates of butterfat, and allowing for the probable higher incidence of mastitis in the average herd as compared with herds under test, in very round figures this would approximate a loss of £1,250,000, at least.

In case any of those present might consider that the average loss should be calculated on the basis of heavier incidence in our higher producing herds, I would point out that extensive investigations by the Herd Recording Department of the Dairy Board into mastitis incidence in low, as against high, producing herds have failed to reveal any significant difference. In the 1943-44 season we examined 1919 herds, dividing these into "equal to", "better than", or "worse than" the district average for all herds under test; and it was found that the incidence of clinical mastitis did not differ significantly between any of these three groups.

STERILITY:

The wastage losses for sterility and abortion have been combined because of the difficulty of separating the influence of abortion from sterility losses. It is clear that secondary infections following abortion play an appreciable part in the incidence of "empty" cows, and the two diseases have, therefore, been combined in assessing causes of loss through sterility. These losses can, however, be divided into sections as follows:-

1. Late Calving Cows: From a sample of approximately 200,000 cows it was found that the percentage of cows calving after the end of September in the North Island is approximately 16.5%, and the difference in production to the end of the milking season, compared with earlier calving cows has been found to be approximately 15%. Up to the end of September there appears to be very little difference in seasonal production due to the particular time of calving; that is, cows calving in July-August and up to, say, about the 20th September, do not differ appreciably in average production during the period prior to the end of June.

2. Cows not in Calf at End of Mating Period: Examination of mating particulars for a sample of over 40,000 cows showed that approximately 7.4% failed to conceive. In order to obtain data on fertility in the following season of cows which failed to conceive during the previous season, a sample of 500 cows was examined. All these cows were "empty" at the end of the previous mating season. In the following season 58% of these cows held to the first service, 22% held to subsequent services, and approximately 20% remained "empty". The fact that 80% of the cows temporarily sterile in one season were successfully mated in the following season without undue difficulty, emphasises the importance of veterinary treatment of "empty" cows and the necessity for further detailed field information on the reasons for cows failing to conceive during any particular mating season. It is obvious that the cows culled because of sterility include quite a large proportion of cows which could be retained in the industry as satisfactory producers.

3. Sterility in 2-year-old Heifers: Data collected for a sample of 6,000 calves, whose history to the 2 and 3-year-old stage was available, showed that approximately 10% failed

to conceive when mated as yearlings. About 65% of these heifers were retained in the herd and calved at the 3-year-old stage. Due allowance has been made in this survey for animals not mated as yearlings but held over to calve at the 3-year-old stage.

4. Sterility in Bulls: Through the Board's Consulting Officers, data has been collected over a five year period on detailed services for 1643 bulls. This is a useful sample from which to measure the extent of poor fertility and sterility in bulls, although it would not include bulls sterile because of inability to mate and bulls obviously sterile and not included in any matings during the season. The data indicates that approximately 10% of all bulls have a fertility index of poorer than two services per conception (this index being based on services to fertile cows only), and approximately 2% of all bulls mated failed to secure conceptions.

ABORTIONS:

Although losses due to abortion have not been separated from losses due to sterility in the wastage data it is possible, from the herds under fertility survey, to obtain information on the approximate extent of abortion in dairy herds. A survey of calvings for 39,000 cows shows an average incidence of about 5% abortions. The fluctuations in the past four seasons have been:-

1940-41	...	4.5%
1941-42	...	5.3%
1942-43	...	4.6%
1943-44	...	5.8%

These rates are calculated from herds which, admittedly, would be slightly better than average in the care of stock, and the incidence rates quoted above would be lower than the average rate in the industry. The rate of abortion in 2-year-old heifers in the above herds was 10%. The rate in 3-year-old heifers was 7%, and in mature cows 3%. The degree to which abortion contributes to the percentage of "empty" cows in any one season is shown by the fact that 15%, on the average, of cows which abort fail to conceive during the following mating season.

Production losses are difficult to determine, but from a sample of herds we have been able to arrive at a very approximate estimate based on abortions prior to the end of June. This data shows that where abortion occurs seven months or earlier after conception, the loss in production is approximately 30%. The direct annual loss to the industry on this basis would be approximately £500,000.

It has been shown by Dr. Filmer that the incidence of abortion in 2-year-old heifers can be reduced to approximately 3% by the use of vaccination against brucella abortus. On this basis an estimate of the minimum monetary benefit to the industry if all calves were vaccinated against contagious abortion, would appear to be a direct saving of approximately £250,000 per annum.

TUBERCULOSIS:

The wastage data mentioned in the first table shows that approximately .33% of all cows, or 2% of the annual culling is due to T.B. Whilst not in any way wishing to minimise the importance of the T.B. problem, and indeed emphasising the fact that a low incidence of T.B. automatically encourages the opportunity at an appropriate time of eliminating T.B. from our dairy herds; it is necessary to indicate the average position in order to discount some of the statements frequently made about the high rate of T.B. in dairy cattle in New Zealand. The problem should be viewed in proper perspective, and whilst all possible steps should be taken to prevent the transmission of bovine T.B. to human

beings, all available data indicates that New Zealand is fortunate in possessing a relatively low rate of bovine T.B. I am indebted to the Livestock Division of the Department of Agriculture for the following information:-

On a Dominion basis, approximately 14.5% of all cows slaughtered show indications of T.B. infection, the rates being 15% for the North Island, and .9% for the South Island. It should be remembered, however, that this percentage is based on animal slaughterings, which comprise mainly cows of the poor boner type, aged cows and other cull cows from the industry. One would expect a very much higher incidence of T.B. in these cattle than in the normal working population of dairy cows in the industry. T.B. tests taken in various parts of the Dominion indicate an average reaction rate of 7-10% over all cows. The incidence is very low in some districts and higher than the average quoted in others. It should be borne in mind, however, that the reaction rate of cattle to the T.B. test would in turn grossly overstate the number of cows showing clinical signs of T.B. No information is yet available on the effect of T.B. on production.

MILK FEVER, GRASS STAGGERS AND PARALYSIS:

As a cause of death in the herd or as a cause of culling this group of disease is of small significance, representing approximately 0.25% of all cows in the herd, or 1.5% of all cows culled. This low culling incidence by no means measures the economic importance of this group of diseases, however, but unfortunately we do not yet possess adequate data on the number of cases occurring and the number of recoveries within a herd. Such information is essential before we can measure the real economic loss from this group of diseases.

SUNDRY DISEASES, CALVING TROUBLES, AND DEATHS DUE TO VARIOUS DISEASES:

This group accounts for approximately 1% of all cows in the herd, or just over 5% of all cullings. Again, no further information is available on the incidence of these diseases within the herd nor on the consequent loss in production.

CALF WASTAGE:

From the herds under survey by the consulting officers it has been possible to construct data showing the loss in calves prior to the age of 9 months. This data from a sample of 35,000 calves shows that approximately 4% of all calves die at birth or shortly afterwards and a further 3% are lost before the age of nine months. Intensive investigational work will be carried out by the Board's consulting officers during the next two years in order to examine this loss in calves in greater detail, to obtain information on the causes, and to investigate the general nutrition conditions associated with calf rearing in these herds.

DISCUSSION:

The difficulty of estimating the actual economic loss suffered through disease in dairy cattle in New Zealand arises chiefly because of the compensating factors which must be taken into account in each particular disease. For instance, I have indicated that it might be possible to calculate the loss caused by mastitis, and I have indicated that this is probably in the vicinity of £1,250,000 per annum in butterfat alone. Such a figure must at best remain an estimate - it may be too high or too low and there may be contributory factors not taken into account which would increase the loss or even decrease it. To attempt to assess such a loss in other diseases or to measure the interacting effect of cows affected with more than one disease in the same lactation is extremely difficult. There is, however, an entirely different approach to this whole problem of assessing the

economic importance of disease losses, particularly if the purpose of such estimates is intended to indicate the economic benefit that might be achieved by better breeding, feeding, management and treatment. The traditional method of calculating total disease losses frequently implies that the total cost of disease can be eliminated by appropriate measures and there is rarely any attempt to suggest how this Utopian ideal can be given a really practical objective. The alternative approach that I am suggesting is, therefore, based on the possible field results of a combined effort through better breeding, feeding, management and treatment to so prevent and control disease losses as to lengthen the working lifetime of the average cow in the industry.

What, then, are the practical conditions underlying this approach?

No farmer ever starts the season with only that number of cows on his property which he can milk right through the season, provided he suffers no disease losses. Normally he sees to it that he has on his property more cows at the beginning of the season than he can possibly carry throughout the season; and, indeed, he would be seriously overstocked in a normal season if he were fortunate enough not to experience any wastage. The data calculated from approximately 4,000 to 5,000 herds over a period of four years shows that the average farmer has 7% more cows at the commencement of the season on his property and intended for milking than the greatest number he will actually milk at any time during the season. The practical objective under these circumstances is to reduce the percentage of surplus cows which must be carried, and to length the working lifetime of the average cow so as to lower the replacement rate. The advantage of extending this working lifetime from its present figure of approximately 5 years to, say, approximately 7 years accrues in at least two important ways. Firstly, this longer lifetime lowers the replacement rate from 20% to about 14% and makes it possible to carry a higher percentage of mature cows in the herd, and, secondly, it permits a greater degree of selection of replacement stock.

As the first advantage is the more easily calculated (and time does not permit a proper discussion of the second) and as it is likely to be a minimum gain, it is the one which I have chosen for illustration. If the working lifetime were increased from the present average of just over 5 years to 7 years, the number of replacement heifers required each year would fall from 20% to approximately 14%. Thus, instead of the milking cow population consisting as at present of -

20% 2-year-old cows,	the composition would be 14% 2-yr.old cows.
17% 3-year-old cows,	12% 3-yr.old cows.
& 63% mature cows,	and 74% mature cows.

The production of the average 2-year-old cow in the industry is about 30 lbs. of fat lower than that of a 3-year-old cow, and the 3-year-old cows are on the average 30 lbs. of fat lower in production than mature cows. Consequently a reasonable estimate of this benefit of milking 74% mature cows as compared with 63% would be a gain of approximately 5 lbs. of butterfat per cow over the whole herd. At present butterfat prices this represents a gain of about £70,000 per annum. This, however, is only part of the gain to be secured by lowering the percentage of replacement stock necessary each year.

With only 14% replacement heifers needed, the number of heifer calves reared decreases from approximately 24% of the milking herd to approximately 16%. This means 8 fewer calves below the age of 1 year, and 7 fewer calves between the age of 1 year and 2 years to be carried on the property. This reduction in calves and yearlings paves the way for greater conservation of fodder crops, particularly hay and silage, or alternatively, an increased carrying capacity of milking cows. The latter is like-

ly to be the smaller gain and, again, in keeping with the conservative nature of these estimates, that is the method adopted to assess the increased value to be obtained.

From the best available information on feed requirements of calves and young stock as compared with mature milking cows, and after allowing for the consequent slight increase in size of the milking herd, it would appear that the carrying of 8 fewer calves and 7 fewer yearlings would approximate to 5 mature milking cows. The production of these cows would, under normal conditions, mean an additional £1,500,000 at present butterfat prices.

Therefore, it appears conservative to say that if the working lifetime of the average cow can be increased by two years through reducing the incidence of disease, particularly mastitis, sterility and abortion, the minimum gain would be approximately £2,250,000 annually. Or, in other words, just over £1,000,000 for each year that is added to the average cows working lifetime apart altogether from the additional direct saving due to less disease. In case it may be considered that a working lifetime of 7 years for the average cow is not possible of achievement, I would point out that an examination of herds under Group Test shows more than 10% of such herds have an average replacement rate of 14% or better. The Herd Recording Council is already fostering the breeding approach to this problem by advocating the selection of bulls from cows which have demonstrated their ability to produce at high butterfat levels over a period of at least 8 years, and the Lifetime Merit Register is evidence of the ability of cows to reach this standard. The record of one of the most outstanding breeding herds in this country - if not in the Southern Hemisphere - is also well worth quoting. Over the past 6 years this herd of 112 pedigree cows has averaged over 400 lbs. of butterfat per cow and the actual replacement rate during that period was a total of 90 cows or an average rate of 13.4% per annum. The owner has reared all replacements for the past 20 years and normally saves 15 heifer calves for such replacements.

It is a function of the field survey work of the New Zealand Dairy Board to seek to define the general conditions obtaining in the dairy industry. I have indicated very approximately and conservatively the general economic importance of our main disease losses. If, in the words of Professor Clunies Ross of the Veterinary School of the Sydney University, the outlook of the veterinarian of the future must be prevention of disease rather than cure, and must include problems of management, breeding and feeding, as well as treatment, then it seems worthwhile to summarise the present disease conditions of the industry and set as a goal for combined action in the future, the possibility of lifting the condition of the average herd to the condition of the top 10% of herds.

In conclusion I would again emphasise that the data quoted in this paper so far as can be ascertained is the most indicative of its kind available at present. It is based on sample estimates and the field survey work of the Board will be continued in order to check, and, if possible, improve these estimates. I hope it will not be considered unduly presumptuous on my part if I suggest that such field surveys are indispensable for defining the nature of the prevailing disease problem, and I further suggest that they must inevitably become the yardstick on which can be recorded the success of any combined attack on the diseases of dairy cattle.

References:

(1) "Report on Diseases of Farm Livestock" - National Veterinary Medical Association of Gt. Britain & Ireland, 1940.
(2) N.Z. Dairy Board, Twentieth Annual Report.
(3) Proceedings of First Annual Conference of N.Z. Society of Animal Production.
(4) Empire Journal of Experimental Agriculture, Oct.1939.

TABLE I.

ANNUAL WASTAGE & CULLING IN HERDS UNDER GROUP TEST.

(Stated as Percentage of all Cows in the Herd)

Cause of Wastage or Culling	1938 - 39	1939 - 40	1940 - 41	1941 - 42	1942 - 43	Average for 5 years
Low Production	5.53	5.95	4.95	5.28	6.38	5.63
Disease						
Mastitis	4.06	3.71	3.29	3.51	4.32	3.72
Sterility and Abortion	2.74	2.79	2.44	2.42	2.87	2.63
T.B.	.31	.33	.30	.31	.40	.33
Bloat	.20	.42	.25	.15	.13	.22
Staggers, Milk Fever and Paralysis	.12	.17	.27	.29	.33	.25
Calving Troubles ..	.26	.15	.18	.20	.22	.20
Deaths & Sundry ..	1.36	1.04	.82	.79	.92	.89
TOTAL DISEASE	9.05	8.61	7.56	7.68	9.19	8.24
Other Causes:						
Accident and Injury ..	.53	.73	.43	.52	.56	.54
Old Age and Sundry ..	1.58	1.83	1.16	1.81	2.31	2.41
Sold for Dairying ..			.65	1.54	1.62	
TOTAL WASTAGE	16.69	17.12	14.75	16.83	20.56	16.82
No. of Cows in Wastage:	18307	22375	34001	38500	29567	28550

TABLE 2:

DATA FROM INDEPENDENT SOURCES INDICATING ANNUAL WASTAGE OF STOCK FROM THE DAIRY INDUSTRY

Annual Wastage and Culling Returns from Herds under G.H.T.		Heifers between 1 and 2 years Intended for Dairying (Govt. Statistician)		Cow Killings (Livestock Division)	
1938-39	16.69%	1937-38	322,941	1938-39	355,158
1939-40	17.12%	1938-39	321,657	1939-40	390,904
1940-41	14.75%	1939-40	336,003	1940-41	335,781
1941-42	16.83%	1940-41	297,539	1941-42	385,311
1942-43	20.56%	1941-42	330,021	1942-43	442,349
Average	16.82%		321,632		381,900
		= 18.2% of all cows in milk.		= 15.5% of all dairy & beef cows over 2 yrs. of age.	

DISCUSSION ON MR. WARD'S PAPER:

DR. McMAHON: Has Mr. Ward any figures on the relationship between production in a single season and total lifetime production, which would include some allowance for length of useful life? In other words, does a high producer have a shorter or longer useful life? Does a high-producing cow burn herself out in one or two seasons or last as long or longer than the average cow?

MR. WARD: An investigation undertaken some time ago (and published in the Empire Journal of Experimental Agriculture, October, 1939) on high production in relation to disease shows that for cows under Group Test and under fairly normal herd conditions there is no shorter working lifetime for the high producer than the low producer.

DR. HAMILTON: Speaking of the loss due to mastitis in individual quarters, Mr. Ward mentioned that the loss was from 5 to 15 per cent relative to the normal quarters, and that the higher percentage figure was associated with attacks later in the lactation. What I am not clear about is whether to infer that Mr. Ward's reference is to the total production of the quarter for the season and the loss that is sustained, or whether it is to the reduction in yield occurring at the time of the attack. I find it hard to believe that the total lactation is reduced to a greater extent by an attack later in the season than by one earlier in the season.

MR. WARD: That is an important point, and is a qualification that should be introduced into all other disease loss figures quoted. A cow affected late in the lactation from any of the diseases I have mentioned would suffer a smaller total production loss than a cow affected early in any lactation, but the average figure for all cows has been telescoped together irrespective of the stage of lactation. The 5 to 15 per cent figure quoted is the average loss suffered in the affected quarter as compared with the noraml quarter and is based on comparison with production of the normal quarters of that cow at the particular time. The estimate of 5 lb. butterfat has had to be constructed from the percentage figures as an estimate of what the effect would have averaged over the whole season. The figure of 5 to 15 per cent would be a more accurate one, because it would be always related to the production of the normal quarters of that cow at the time the high leucocyte was shown in the affected quarter.

DR. CUNNINGHAM: I congratulate Mr. Ward on his excellent paper. It states in a very clear way a tempting goal for the veterinary profession and others interested in animal husbandry to reach. Unfortunately, the two diseases occupying top place in the available losses are the most difficult ones and will probably occasion quite a lot of head scratching before they can be cleared up. Looking down the list I notice bloat, and Mr. Ward pointed out that the culling rate gave no clear indication of the importance bloat might have in relation to production. Can Mr. Ward suggest a way in which to measure the temporary loss in herds due to sporadic outbreaks of bloat, which must upset cows. I would be interested to know if there is any method of collecting data whereby he can get some measure of the loss over a period of two or three days when a man has to be rushing out, sticking knives into cows, or poles down their throats, or anything else to control bloat.

MR. WARD: The future work of the Board's Consulting Officers will be a gradual intensification of the work carried out previously. At some future date we hope to get farmers who are now supplying detailed information to supply additional information on other disease losses. That will cover a sample of 500 or 600 herds. Bloat will be one of those tackled fairly

early, because it is associated to a considerable extent with the nutrition of the herd.

MRS. ROBERTS: It seems to me that Mr. Ward's remarks boil down to the problem of management. All these diseases have been discussed and you have suggested methods of treating and preventing them. The big difficulty of the whole problem seems to be in getting the information that we collect over to the farming population. Could Mr. Ward suggest a way of doing that?

MR. WARD: The answer lies to a great extent in the veterinarians themselves. (I think it is their expressed wish that it should be so). They propose taking a keener interest in the management of stock, so as to be able to say just what management factors play an important part in reducing the incidence of, or preventing, any particular disease. That has not been possible so far. That is why I emphasise what Professor Clunies Ross says - that the objective of the veterinarian of the future must be prevention of disease rather than cure. The only way for the veterinarian to prevent disease is by taking an active part, along with other field officers, in indicating the management conditions associated with a heavy or light incidence of any particular disease.

MR. DODSON: Mr. Ward has thrown out a challenge for the veterinary profession. I have been very impressed with the figures he gave. They are figures I had been trying to get hold of because I want to use them when I talk to the farmers in my district. I feel that the Veterinary Clubs have a golden opportunity of assisting in this work, and I shall be only too happy to try to help Mr. Ward to collect these figures, if we can get together and lay down a programme. We are so intimately in contact with these sort of things, but at present, as far as my Club is concerned, we are far too busy trying to put things right that are wrong that we have little time for statistical work, and, unfortunately, little enough time for preventive work. We are trying to direct interest towards better herd management. If I can assist in any way I shall be only too pleased.

DR. DRY: Mr. Ward has discussed the desirability of selecting for long life in cows. As that cannot be determined until late in life, how does he propose to carry out the selection; through the cows or the bulls?

MR. WARD: In the immediate future by emphasis on the selection of bulls from cows that have demonstrated their ability to produce consistently over a period of years and therefore in all probability combine an inherent resistance, if there be such, to any of the diseases I have mentioned; such cows have shown that they can achieve a working lifetime of at least the figure mentioned. The present publication by the Board of the Sire Survey and Merit Register includes the names of all cows that have qualified in the Lifetime Merit Register by producing at least 2,500 lbs. fat in not more than 8 consecutive years.

We are fostering entries from pedigree breeders in that Register in order to give us a nucleus of breeding cows which have demonstrated their ability to last at least 7 or 8 years. By selecting bulls from such cows we will confer the greatest benefit that is possible on the industry so far as this type of selection is concerned, because it is through the bull that the qualities are transmitted to a far greater number of replacement stock than could possibly be done by selecting through daughters of individual cows.

MR. McKEEKAN: I would like to congratulate Mr. Ward on his very excellent summary of the disease situation, and at the same time to provide a practical illustration of the sort of thing Mr. Ward has been talking about, and which has been rendered possible by his work. In artificial insemination work at