A Manual Method for the Assessment of Health and Fertility Performance in Commercial Dairy Herds

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Abstract

During the last 5 years, an on-going research project has been monitoring the uptake of dairy herd health schemes by both farmers and veterinarians. This work concentrated on all the elements that will affect the success of the herd health scheme, rather than just looking at the recording part of the scheme. The element that appeared to be causing the veterinarians the most trouble was the problem of farmer motivation, particularly in the form of "they don't think they have sufficient problems to justify the joining of a herd health scheme."

With this problem in mind, a pilot method was developed for the veterinarian to quickly appraise a client farmer's herd by using easily accessible information from a sample of 20 randomly selected cows in the herd. Ten indices were used in the first part of the analysis, examining physical aspects of health and fertility performance of the herd. Six were then taken to give an assessment of the financial losses occurring on the farm and help identify in which areas there is most room for improvement.

The technique was tested on a sample of 52 veterinarians attending a conference who were asked to analyse several problem farms. The participants then completed a feedback questionnaire on the usefulness of such an approach to farm analysis, and most importantly, its usefulness in the adoption of the herd health scheme by the farmer. Ninety one percent of the respondents identified the method as a useful aid to the introduction of a computerised herd health scheme.

Introduction

In 1989 a survey was carried out investigating the type of veterinary practice likely to operate a herd health scheme, the number of schemes in operation and the principal problems associated with running a scheme (Wassell & Esslemont 1992). The respondents to this survey clearly identified lack of farmer motivation and a difficulty in demonstrating the financial benefits of a herd health scheme as the principal problems associated with uptake.

The poor motivation factor was followed up in a second survey in which 70% of the 113 veterinarians who responded agreed that farmer motivation was a main reason for the lack of uptake with dairy herd health schemes. An additional open question was attached, where the respondent could communicate theories and opinions as to the lack of motivation. Almost a third (32%) of the respondents who commented identified the fact that farmers could not see what the benefits of being on a herd health scheme were.

These results were further tested on a sample of dairy farmers whose veterinary practices operated a herd health scheme. This was carried out using a cluster sample survey of 536 dairy farmers from 6 veterinary practices. All the practices had been operating a herd health scheme for more than one year, thus ensuring that the farmers should at least have been aware of its existence. The results from this survey (Table 1) confirm the veterinarian's theories, with 72% of all the responses (81 / 112) mentioning one or more of the first three factors that relate directly to motivation as a reason why they had not joined a herd health scheme, even though one was operated by their veterinary practice. In addition, the costs of a scheme were identified as a major drawback by 70% of the respondents; this however can be seen as a normal response to a product with unknown benefits.

The findings from the surveys outlined above indicate that some form of quick on-farm analysis could be highly beneficial to the veterinarian. Firstly, this would address the question of "don't have the problems to justify it" by allowing the veterinarian to expose potential problem areas or areas for improvement within the herd. Secondly, the problem of additional costs of a herd health scheme can be put into perspective against the financial losses being incurred by not joining the scheme. Thirdly, it would act as a marketing tool for the veterinarian to use without a large expenditure in time or money.

Table 1. Reasons suggested by farmers as to why they had not joined a herd health scheme (n = 112 respondents).

Reason	Number	Percent 1 Respondents
Extra Cost	79	70
Don't have the problems to justify a herd health scheme	67	60
Don't see any need	44	39
Cannot see what the benefits are	25	22
Don't need more recording	30	27
Others	37	33

1: The total percentage exceeds 100% because respondents were asked to identify all the factors they thought appropriate, not just one.

Ideally, the method of analysis used would be rapid and would not require access to a large quantity of detailed records. It was anticipated that such a scheme would not work where few or no records are kept, but this type of farmer has been previously identified as being a low priority target for a herd health scheme (Eddy 1982). Slenning *et al* (1985) proposed a method of scoring herds for overall performance, but this method was considered unsuitable for this work since it required the veterinarian to attribute a score to over 140 different aspects of the farm. The result of the analysis should allow the identification of a number of easily understood performance indicators, both physical and financial, that can be used to highlight weak spots in the herd's performance. The system should only be considered as an indicator of possible problem or improvement areas, that could then be followed up and monitored more rigorously by the herd health scheme itself.

On-farm Analysis System

Sample Size

The objective of this work was to develop a system that gathered data from a small number of animals in a herd which will then represent the performance of the whole herd. The sampling fraction required needs to be sufficiently large to ensure the sample is similar to the population, but as small as possible to minimise the manual effort required. Forty cows was found to be adequate for herds of approximately 200 cows, and 20 cows would give similarly accurate answers for herds of around 100 cows (Chamberlain & Wassell 1994).

Selection of Performance Measures

To assess herd performance a number of indicators can be calculated. These can monitor performance at various levels:

a) the whole farm performance.
b) the whole herd performance.
c) the health and fertility performance.

Whole farm performance indicators, such as profit, gearing ratios and rental equivalents, are difficult to determine particularly if the farm is a multi-enterprise unit. In addition, many of the indicators at this level would be based on information that would be difficult for the veterinarian to acquire and would not necessarily be reflecting areas that he could have any influence on. Whole herd performance indicators such as margin per herd could be used to enable a holistic approach to the herd health scheme. However, their calculation requires access to a large body of information and was considered to be too advanced and complex to use in this type of simple appraisal.

Using just health and fertility indicators appears more feasible since this group of indicators can be related to the current usage of herd health schemes and, compared to the first two options, would not require the veterinarian to undergo much extra training to interpret the results. The data required for indicators in this group is also easily assimilated on most dairy farms.

Table 2. Indices selected for use in the analysis.

Calves Born Dead.**
Vulval Discharge.
Mastitis Rates.**
Lameness Rates.**
First Service Pregnancy Rate.
All Service Pregnancy Rate.**
Culling Rate.**
Days Open.
Heat Detection Rate.
Calving Index.**

** = Used in financial calculations

Ten indices were used to assess herd performance (Table 2). The indices were selected according to several criteria.

a) Data used to calculate the indices could be accurately recorded, with minimal variation in definition of the basal data between farmers.
b) Correction of any identified shortfalls was within the average farmer's capabilities.
c) Performance in the areas identified was not affected by management decisions or changes outside the farm.
d) The data needed to calculate the index was readily available on the farm.

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The indices were calculated according to definitions previously published (Esslemont *et al* 1985, MAFF 1984) and converted to percentage figures to facilitate comparison between herds.

On Farm Use of the Analysis System

The minimum information required to carry out a performance assessment would be:

a) Cow Numbers.
b) Calving Dates.
c) All Service Dates.
d) Confirmation that the Cow is in Calf.
e) All Cases of Lameness.
f) All Cases of Mastitis.
g) Cows Culled.
h) Calves Born Dead.
i) All Cases of Vulval Discharge.

Since in some cases parts of the above information would not be available, it is still possible to carry out the test with information missing, but this must be born in mind when reviewing the losses. The sample information for the 20 cows is collected and the indices calculated for the farm.

Assessment of Financial Losses.

From the ten indices identified in Table 2, six (as marked) were used to assess the potential financial losses occurring on the farm. The indices were selected to give an overview of the herd's performance whilst avoiding "double accounting", that is losses calculated in one index must not appear in any part in another calculation. All costs are scaled on a 'per 100 cow herd' basis to allow comparisons.

Financial Costs for Calving Index

Financial losses are generally said to be incurred by the herd where the calving index exceeds the 365 day optimum. This would cause a lowering of the annual milk yield and movement in the calving pattern to a less favourable time of year (Esslemont *et al* 1985). However, there is little benefit in reducing this figure below 365 days as it would result in an unduly short dry period or premature termination of the lactation. The losses for each day in excess of 365 days have been calculated at approximately £3 per day per cow (Esslemont 1992). The calculation per cow can then be extrapolated for the herd as follows:-

{Calving Index (days) - 365} x Herd Size x £3 =
Herd Loss (£ = $1.50 approx)

Financial Costs Related to the All Service Pregnancy Rate

Under normal circumstances 60% is considered to be an acceptable target for the all service pregnancy rate (Esslemont *et al* 1985); less than 50% is considered a significant herd problem (Castle and Watkins 1979). If the all service pregnancy rate exceeds 60% this can be classed as a financial benefit and costed accordingly.

In a study of 91 high-performing herds, Esslemont (1992) found that 91% of cows calved managed to get pregnant again. For a 100 cow herd with a 60% conception rate, 149 serves are required to achieve a 91% pregnancy rate. For a 40% conception rate this increases to 223 serves. Assuming a cost per insemination of £20.00 (Esslemont and Spincer, 1993) this gives a cost of £0.74 per cow per percentage point decrease in conception rate. Other costs, such as increased pregnancy diagnosis and fertility work will raise this to £1.29 (Esslemont *et al*, 1985 updated to 1992 values). Thus the calculation of cost of poor pregnancy rate in herd is:

{60 - All Service Pregnancy Rate (%)}
x Herd Size x £1.29 = Herd Loss/Gain

Financial Costs Related to Culling Rate

The optimum culling rate of 18-20% (Castle & Watkins 1979, Esslemont *et al* 1985) will mean that the average life of the cow in the herd will be approximately 4.5 lactations. Higher culling rates lead to increased losses due to the premature disposal of cows. There is little benefit in reducing the culling rate below 18%, as this will result in a rising average herd age, predisposing the herd to problems associated with older cows such as milk fever and mastitis. The approximate losses associated with excessive culling may be calculated as shown in Table 3.

Table 3. Cost of an Additional Cull (Esslemont 1990)

Cost of rearing a heifer	+£750.00
Value of the cull sold	-£370.00
Reduction in value of the heifer lactation	+£140.00
Lower value of heifer's calf	+£70.00
Total Cost	£590.00

This table shows the approximate costs of rearing a heifer to calve at 2 years of age, the market value of the barren cow and the lower yield of the heifer in its first lactation. The lower value of the heifer's calf assumes that it is sired by an easy-calving bull (such as Aberdeen Angus) and thus is a smaller and less valuable calf. The losses can then be calculated for the herd as follows:-

{Culling Rate (%) - 18} x Herd Size x £5.90 = Loss per herd

The Financial Costs of Mastitis

Since mastitis can vary greatly in its severity, depending on factors such as speed of detection, time of year, method of treatment and causal organism, it is

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difficult to place a precise cost on a single case. The range of possible cost per case associated with clinical mastitis was calculated by Blowey (1987): Mild £20.30, Severe £80.20, Fatal £780, who considered 70% of cases as being mild, 29% of cases severe and 1% fatal. The average case can then be costed at £45.26 per case, which leads to the calculation for the herd as follows:-

{Mastitis Rate (%) x Herd Size / 100}
x £45.26 = Cost of Mastitis to the Herd

The Financial Costs of Lameness

Using the incidence rates for lameness reported by Collick (1989), Esslemont (1990) has estimated the average cost of lameness to be £85.07 per cow.
This can then be calculated for the herd as follows:-

{Lameness Rate (%) x Herd Size / 100}
x £85.07 = Cost of Lameness to the Herd

Financial Costs of Calf Mortality

The financial losses due to calf mortality are calculated at a notional cost of £100 per calf, although the range will be from £60 - £190 depending on breed and sex.

{Calf Mortality (%) x Herd Size / 100}
x £100 = Cost of Calf Mortality

Overall Costs

The subtotals for the 3 fertility costs and the 3 health losses are brought together to form:-

a) Total financial losses due to health and fertility problems in the herd.
b) Financial losses per cow per year.

From an assessment of the magnitude of the various losses occurring, and comparison between similar farms, it is also possible to suggest areas that will respond quickly to the monitoring, control and action resulting from the implementation of the herd health scheme.

Method of Testing

To test the potential usefulness of this method, two workshops were arranged at the British Cattle Veterinary Association's 1991 Fertility Conference. The analysis system was appraised by testing the veterinarians' reaction to this method of getting a client onto a herd health scheme, and setting up a mock trial of the method using genuine herd data.

The workshops lasted approximately two hours each, with 26 delegates per workshop, split into 7 groups. They were given a brief introduction to the research and the potential use of this method of identifying losses on the farm. Each group was given a random sample of 20 cows from a one hundred cow herd, and asked to carry out an analysis for the herd using the equations supplied in a preprinted booklet. On completion they were given the actual losses for the total herd so they could compare these with their sample.

At the end of the session each delegate was asked to complete a feedback form containing four questions:-

1) How useful do you think this approach will be in getting a farmer onto a routine visit or a herd health scheme.
2) What additional indices or parameters do you think need analysing?
3) What do you consider to be the drawbacks of this approach?
4) What do you consider to be the strengths of this approach?

Forty-seven delegates (90%) returned a completed feedback form. The text was analysed by identifying key words or statements in each answer. The highlighted words were then moved onto a database where words or statements with a similar meaning could be grouped together, for example: good, quite useful and useful would all be grouped under the key word "useful." Statements or words occurring less than 4 times that could not be placed into a larger group were dropped from the analysis, although careful note was made of the relevance of the word or statement.

Results

The overall impression from the delegates was that of extreme interest and enthusiasm for the technique, with a considerable amount of discussion and comment between the authors and the delegates on its potential use and possible changes to the method. This impression can be further assessed from the feedback results as show in tables 4, 5, 6 and 7.

Table 4. Principal Responses on Usefulness n = 46.

Question	Number	Percent
Very Useful	22	48
Useful	20	43
Maybe Useful	4	8

Table 5. Principal Responses on Additional Indices n = 20.

Question	Number	Percent
Nothing	8	40
Inter Service Interval	7	35
Additional Heat Detection	5	25

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Table 6. Principal Responses on Drawbacks n = 52.

Question	Number	Percent
Sampling	25	48
Needs Good records	14	27
Time Consuming	13	

Table 7. Principal Responses on Strengths n = 64.

Question	Number	Percent
Simple to Use	26	40
Quick	13	20
Easy for Farmer to Understand	13	20
Shows Costs to Farmer	12	19

The feedback questionnaire identified the method to be extremely promising, with half (48%) mentioning the method as **very useful,** and most of the remainder (43%) rating the method as **useful**. The delegates understood the potential of the technique, giving comments such as:

"Very useful - may help with the hard sell", "puts the financial aspects in black and white" and "A useful introduction for initiating deeper involvement."

There was quite a range of variation amongst the respondents as to what extra indices could be recorded. Many possibly simply put down their own pet indices. But of the principal findings, 40% suggested that **no extra indices** should be added with comments such as:

"Probably enough included to make an informative discussion with the potential client", "Sufficient - don't overcomplicate at this stage" or "Keep it simple."

Over a third (35%) mentioned that **inter service intervals** would be useful, and a quarter (25%) mentioned the need to test **heat detection accuracy.** This last item along with many of the other lesser mentions would have to be dismissed due to the unlikelihood of the necessary information being recorded by the farmer.

A **lack of information** is noted by over a quarter of the (27%) delegates, typical comments revolved around the theme that "Identification of health problems rely almost entirely on farmer recording", but the biggest single drawback the veterinarians commented on was the **sampling** with almost half of them (48%) mentioning it. (Note that the validity of the sampling procedure was not presented to the delegates). The following cross section of these sampling related comments point to the lack of guidance they had at that stage on sampling such as:

"How do you get your sample in an unbiased manner", "How do you choose the random sample", "Is 20 cows too small a sample?"

Time consuming was also mentioned by a quarter of the respondents (25%) but conversely **quick** was mentioned by almost the same number (20%) as one of the strengths of this approach. Forty percent of the comments considered the simplicity of method as a major strength. In about half of these cases the word was further qualified using such comments as:

"Gives simple answers that should be easily explained to a client" and "Relatively simple and don't need a computer."

A fifth (20%) of the veterinarians clearly identified this as a farmer friendly approach, in some cases the veterinarian included himself with the farmer pointing out that is was easy for him to understand as well. Some of the comments from this section are shown below:

"Demonstrates to the farmer in his language", "Easy to present to farmer" and "Would appeal to the ordinary man."

Lastly the respondents identified the ability to **show costs** as an important factor. This was mentioned 12 times (19%) and covered such statements as:

"It illustrates (problems) in terms of failure to reach targets for parameters and their associated financial losses, what many farmers would be reluctant to believe" and "Costs easily identifiable to actual causes on farm as long as records are accurate."

It was interesting to note that 8 (12.5%) mentioned the fact that no computer was required as one of the strengths of this approach, but it was concerning that several participants thought it would be good enough to use this as their only monitoring scheme:

"We only deal with a few dairy herds and are unlikely to get a computer" or "No computer skills required."

Others saw the lack of a computer as an aid to getting the farmer onto the herd health scheme with statements like:

"Non-computerised - hence not inhibiting or intimidating."

Discussion

This paper introduces a manual method for the assessment of health and fertility performance in commercial dairy herds whilst it is put forward primarily as a "kick starting" device for veterinary practitioners running herd health schemes. The method is simple enough to use in those circumstance where a quick herd appraisal may be necessary. Since analysis is carried out on only a proportion of the cows the time taken to review a herd is greatly reduced. However, the calculation of the indices for the whole herd can be carried out

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where more comprehensive records are already kept. In addition, the financial part of the method can be used to estimate losses and these then compared with figures for other herds.

Since the method is simple and easy to use it can also be subject to misuse or misinterpretation. The necessity of obtaining a true random sample of cows from the herd is of particular importance. Its role is to get the farmer onto a full herd health scheme where a full and more detailed examination of the herd and its problems can then be carried out. It has already been stated that comparison of the individual components of the losses can be used as a pointer towards specific problem areas within the herd. However, care must be exercised if this is the only method of analysis available. For example, in the case of attributing costs to calving index, it is important to note that since this figure is an average it could be hiding a number of problem cows with extended calving intervals. Also this index must be looked at in conjunction with the culling rate for the herd, as it is possible to create a 365 day calving index by culling all the cows that have proved difficult to get back in calf.

The indices are best compared with other herds that have been reviewed using this same method rather than trying to justify the figures in isolation. The relative levels of typical costs generated by the different indices need to be taken into account when reviewing the economic losses estimated using this method. Certain factors such as the culling rate tend to have a disproportionate influence compared to, for example, the costs incurred by the lameness index. Lastly it is important to note that health factors tend to be less comparable across herds than the fertility factors due to the inherent variability in recording.

The conclusion is that the potential of this approach as a marketing and quick analysis tool looks promising, with the veterinary profession very keen to try and exploit this approach to herd health schemes.

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Behavior of lame and normal dairy cows in cubicles and in a straw yard

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The behavior of normal cows in cubicles was compared with that of normal cows in a straw yard and that of lame cows in cubicles. The normal cows in a straw yard lay down for longer in total (9.6 hours vs 6.8 hours) and during the night (8.55 hours vs 4.75 hours) and for significantly longer at a time (3.95 hours vs 2.45 hours) than normal cows in cubicles. The normal cows in a straw yard spent more time lying down and ruminating (5.1 hours) than normal cows in cubicles (3.3 hours). Lame cows in cubicles lay down for significantly longer during the day (3.3 hours) than normal cows in cubicles (2.1 hours). Although lameness did not affect the total time the cows spent in feeding and rumination, lame cows moved about less, and they adopted abnormal postures suggesting discomfort.