DAIRY BREEDING MANAGEMENT

A. TEAKLE*

INTRODUCTION

A reduction in the size of the dairy industry in Queensland has resulted in pressure on dairy farmers to increase herd size, improve herd management and efficiency of production to remain a viable part of the industry. Recent reallocation of quotas has increased the cash flow on many farms making it possible for them to consider investment in systems which can assist production efficiency.

Although difficult to accurately quantify, poor breeding performance of dairy cows has long been linked with reduced production efficiency and ultimately margins of return. Clark (1969) demonstrated that extended periods between calving in Queensland dairy herds resulted in reduced per cow production. This has recently been confirmed in Victoria by Morris (1971).

Dairy farmers are seeking awareness of the extent and pattern of breeding inefficiency on their herds, as well as causes and action to be taken to reduce its influence on their herd profitability.

BREEDING MANAGEMENT - ITS INFLUENCE ON GROSS FARM INCOME

IN QUEENSLAND DAIRY HERDS

G. LEGG**

The following paper presents a guide to gains in gross income expected from improving reproductive performance in Queensland dairy herds. Loss in lifetime production of milk and progeny receive the most attention as they are more readily evident to the dairy manager. Other influences are acknowledged but have been deleted to prevent complicating the basic principle of decrease in profitability through poor reproductive performance.

FACTORS AFFECTED BY POOR REPRODUCTIVE PERFORMANCE

1. Lifetime milk production. The number of lactations in a cow's productive lifetime has a strong influence on her worth in the herd. A cow with average production potential which calves regularly over her lifetime will eventually earn more than a high producer with poor reproductive history.

Averaged performances of cows recorded in the Department of Primary Industries Herd Recording scheme in 1978/79 are used as an illustration:

<p>| | |</p>
<table>
<thead>
<tr>
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</tr>
</thead>
<tbody>
<tr>
<td>Cows completing lactation in 1/7/78 - 30/6/79</td>
<td>42,628</td>
</tr>
<tr>
<td>Average lactation length</td>
<td>276 days</td>
</tr>
<tr>
<td>Average production/cow/lactation</td>
<td>2,869 litres</td>
</tr>
<tr>
<td>Average period between calving (PBC)</td>
<td>391 days</td>
</tr>
</tbody>
</table>

The 'average' cow, with this performance, will have 7.34 lactations in a theoretical lifetime of 10 years. A cow with a regular 365 day period between calving will produce an extra 0.66 lactations in this time. This amounts to an extra 1,894 litres of milk.

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The sale value of this milk under the Queensland percentage quota system is estimated at 20c/litre. (Current market: overquota = 40%; 60%. Approximate average values per litre for market and overquota milk are 32c and 12c respectively).

On this basis the value of the extra milk production is $378.00. This amounts to $2.08 per day loss of production for each day the period between calving is outside 365 days.

The effect on gross income becomes more apparent when we consider that for a herd of 100 cows, with a PBC of 391 days, loss of potential income is $5,408.00.

Clark (1969) made a study based on 146,070 calvings from 1953 to 1962 in Queensland dairy herds. He demonstrated that highest production was obtained from cows with 12 month period between calving, with an average lactation reduction of 62 lb of milk from cows with 13 month PBC.

(ii) Herd size A logical assumption from the preceding calculations is that a production target can be met by a smaller herd of more reproductively efficient cows.

Therefore a herd of 92 annually calving cows should produce as much as the 100 cows herd with 391 day PBC.

-Less competition for existing pastures is a significant added benefit, but difficult to quantify.

(iii) Calf sales With extended periods between calving, the average cow will produce fewer calves. Allowing for an average sale value of $50 per bull/heifer calf, the 'average' cow loses 16c/day for each day outside 365 day PBC.

The 100 cow herd with a 391 day PBC loses a potential value of $416.00 per year.

(iv) Extra mating costs A proportion of extended periods between calving are due to returns to service. Costs, particularly with A.I., are immediately apparent.

(v) Other losses The following factors deserve mention, but to attempt to quantify their effects on productive efficiency and gross farm income is beyond the scope of this paper.

(a) Cost of feeding. A freshly calved cow is generally a more efficient converter of feed to milk. A herd with an extended average PBC will contain a greater proportion of stale cows in late lactation, reducing efficiency of feed conversion and requiring greater herd numbers to maintain production requirements.

(b) Loss of genetic gain through reduced selection. As fewer heifer calves are born each year, replacement options in the herd are reduced. The purchase of replacements is often required.

CONCLUSION

Based on predicted losses of potential milk production and calf sales, a 100 cow Queensland herd with an average period between calving of 391 days and lactation production of 2,869 litres loses a potential annual income of:

- milk sales = $5,408.00
- calf sales = $416.00
- TOTAL: $5,824.

This amounts to $2.24 per cow for each day the period between calving is more than 365 days.
CALVING TO CONCEPTION - TRENDS IN REPRODUCTIVE PERFORMANCE

A. TEAKLE*

INTRODUCTION

Some economic consequences of suboptimal reproductive performance were outlined in the previous paper. Definition of the causes of reduced breeding efficiency is important if dairy herd managers are to take action to improve performance and increase profitability.

While breeding management has been examined extensively in the concentrated dairying areas of Victoria and New Zealand (Williamson 1976, McMillan 1981), the findings are not immediately applicable to Queensland. Dairying in this State is complicated by unpredictable rainfall and a year round calving pattern. Breeding management is flavoured with a combination of the unknown and the monotonous.

Reproductive performance was surveyed in thirteen South East Queensland herds during 1980 to assess local factors which influence breeding efficiency.

MATERIALS AND METHODS

During 1980, all calving, oestrus and mating dates were recorded for 874 cows on 13 dairy farms in the Darling Downs, Moreton, North Coast and South Burnett areas of south east Queensland. This information was supplemented with data from the Queensland Department of Primary Industries' Herd Recording system.

As the recording of all oestrus dates is not practised on most farms, participants were encouraged to use an oestrus expectancy chart.

The records of cows classified as problem breeders were analysed to identify the contributing factors of suboptimal breeding performance. Problem breeders were defined as those animals with a calving to conception interval of more than 110 days. Conception was assumed if a cow had not returned for service within 60 days of the last mating.

Causes were categorized as follows:-

(i) No visible oestrus
(ii) Returns to service (3 or more matings)
(iii) Not mated
(iv) Combinations of above

The effects of age (lactation number), production and season of calving were examined.

Four of the herds involved were participating in planned veterinary herd health programs.

RESULTS AND DISCUSSION

A regular annual calving pattern is based on achieving a mean calving to conception period of around 83 days. The mean calving to conception (CTC) of the 874 cows surveyed was 96.9 days. This amounts to a 14 day variation of the herd from the most desirable performance.

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The influence of individuals on the mean CTC was demonstrated by isolation of the "problem" fraction (CTC > 110 days). This fraction amounted to 29% of all cows surveyed.

**TABLE 1 Breeding indices - normal vs problem cows**

<table>
<thead>
<tr>
<th>Indices</th>
<th>Normal (621) cows</th>
<th>Problem (253) cows</th>
<th>Total (874)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average calving to conception (days)</td>
<td>71.0</td>
<td>160.4</td>
<td>96.9</td>
</tr>
<tr>
<td>Average calving to first heat (days)</td>
<td>44.7</td>
<td>82.7</td>
<td>55.7</td>
</tr>
<tr>
<td>Average calving to first service (days)</td>
<td>62.9</td>
<td>105.4</td>
<td>75.2</td>
</tr>
<tr>
<td>Average heats before conception</td>
<td>1.9</td>
<td>3.3</td>
<td>2.3</td>
</tr>
<tr>
<td>Average matings for conception</td>
<td>1.2</td>
<td>2.5</td>
<td>1.6</td>
</tr>
</tbody>
</table>

*Based on cut-off of 110 day CTC.

The impact of the problem 29% of the herd is particularly evident when compared with the quite acceptable average performance of the remainder. This clearly demonstrates the ability of the majority of cows to meet the required breeding indices.

Identification of the contributing factors of extended CTC in individual cows in the problem group revealed the following:

**TABLE 2 Problem cows - contributing factors**

<table>
<thead>
<tr>
<th>No visible oestrus</th>
<th>64% of problem cows</th>
</tr>
</thead>
<tbody>
<tr>
<td>Returning to service (3 or more matings)</td>
<td>45% of problem cows</td>
</tr>
<tr>
<td>Not mated</td>
<td>18% of problem cows</td>
</tr>
<tr>
<td>Combinations of above</td>
<td>27% of problem cows</td>
</tr>
</tbody>
</table>

Lack of observed oestrus contributed to two thirds of all extended CTC. Although specific causes were not identified, the importance of nutritional anoestrus often resulting from feed gaps in rain grown pastures, was acknowledged. Less than adequate attention to heat detection and weak or short heat signs in individual cows was also regarded as a likely major contributor. The importance placed on heat detection by the local industry is evident from the extensive adoption of the "oestrus expectancy chart", initially introduced to co-operators in this survey, as a breeding record aid to heat detection.

Twice as many matings were required for conception within the problem fraction compared with the remainder. Resulting from failure of the cow to conceive or early embryonic death, this problem was generally the most evident to farmers due to the cost and inconvenience of repeated matings.
A significant proportion of normal cycling cows fell into the problem category through management decisions not to mate. The practices of "holding over" cows to cover gaps in the calving pattern together with extended sexual rest for some heavy producers and first calf heifers are common and likely contributors.

Some increase in susceptibility of young animals to breeding problems was demonstrated. 85% of first lactation cows with extended CTC suffered from lack of observable oestrus signs.

**TABLE 3 Age/problem cows**

<table>
<thead>
<tr>
<th>Lactation group</th>
<th>Total No. of cows</th>
<th>Number of problem cows</th>
<th>% of problem cows in group</th>
</tr>
</thead>
<tbody>
<tr>
<td>Young</td>
<td>1</td>
<td>161</td>
<td>56</td>
</tr>
<tr>
<td>2</td>
<td>141</td>
<td>31</td>
<td>22.0</td>
</tr>
<tr>
<td>Mature</td>
<td>3, 4, 5</td>
<td>319</td>
<td>97</td>
</tr>
<tr>
<td>Aged</td>
<td>5, 6</td>
<td>253</td>
<td>79</td>
</tr>
</tbody>
</table>

In this study, high milk production had little bearing on reproductive performance.

**TABLE 4 Production/problem cows**

<table>
<thead>
<tr>
<th>Production group</th>
<th>Total No. of cows</th>
<th>Number of problem cows</th>
<th>% of problem cows in group</th>
</tr>
</thead>
<tbody>
<tr>
<td>Top 20%</td>
<td>173</td>
<td>52</td>
<td>30.1</td>
</tr>
<tr>
<td>Remainder</td>
<td>701</td>
<td>201</td>
<td>20.7</td>
</tr>
</tbody>
</table>

Although prevalence of problem cows was markedly seasonal in some herds surveyed, the overall pattern showed little seasonal tendency.

**TABLE 5 Calving season/problem cows**

<table>
<thead>
<tr>
<th>Calving season 1980</th>
<th>Total No. of cows</th>
<th>Number of problem cows</th>
<th>% of problem cows in group</th>
</tr>
</thead>
<tbody>
<tr>
<td>January - March</td>
<td>83</td>
<td>29</td>
<td>34.9</td>
</tr>
<tr>
<td>April - June</td>
<td>275</td>
<td>72</td>
<td>26.2</td>
</tr>
<tr>
<td>July - September</td>
<td>251</td>
<td>68</td>
<td>27.1</td>
</tr>
<tr>
<td>October - December</td>
<td>179</td>
<td>42</td>
<td>23.5</td>
</tr>
</tbody>
</table>

(Calvings in late 1979 and early 1981 were deleted because of the small number involved).

Although poor breeding performance is generally confined to a minority of cows, there appeared to be no pattern of susceptibility in this survey within groups based on age, production and season of calving. This perhaps demonstrates the complex nature of breeding management and dairy management in general and the necessity for systems to continually monitor the performance of individual cows as well as the herd as a whole.
CONCLUSION

Approximately 30% of cows in the herds surveyed did not achieve acceptable breeding indices.

The causes of extended periods from calving to conception were undetected oestrus signs, failure to conceive on several services and management decisions to defer matings.

OWNER/INSEMINATION - ITS ROLE IN BREEDING MANAGEMENT

D. BOOTHBY*

INTRODUCTION

The increased profitability of dairying and an awareness of the need to improve productivity are influencing a growing number of dairymen to adopt herd improvement practices. Despite the continuing decline in the number of herds and cows in Queensland, there has been a steady increase in the demand for A.I. and production recording. These techniques are recognized as an integral part of the management of larger and more capital intensive dairying enterprises.

In addition to the longer term benefits of genetic improvement, the introduction of artificial breeding as a tool of management creates awareness of the importance of adequate reproductive performance. This awareness is heightened when the dairymen accepts full responsibility for the reproductive efficiency of his herd by becoming an owner inseminator.

TRENDS IN A.I. SERVICES

A.I. was introduced to Queensland in the 1950's, primarily to assist in controlling reproductive diseases. Initially, liquid semen was used and this required a structured field service and highly skilled technicians.

In 1969/70, twenty two farmer co-operatives and Government services in three areas inseminated 60,000 of the State's breeding herd of 531,000 dairy cows. A limited number of inseminations were performed by veterinarians. Government policy at that time restricted the distribution of semen to licensed distribution centres (A.B. co-operatives) and veterinarians.

A trend towards a reduction in structured A.B. services became apparent in the early 1970's with the amalgamation of several co-operatives and the closure of others. The principal reasons for this were changes in the distribution of the dairying industry and constantly rising costs. The ready availability of frozen semen and liquid nitrogen also lessened the need for intensive local A.B. services.

The 'beef boom' of the early 1970's combined with the availability of exotic semen accelerated change. A.B. services were required in areas which could not support co-operatives and as a consequence, a demand for inseminator training courses for the public developed.

By 1979/80, only two of the original co-operatives continued to function under their original charter. The areas serviced by the remainder had been taken over by individuals or private operators working under various forms of lease agreement. Over 70% of the estimated 100,000 head bred artificially in 1979/80.

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were inseminated by owner operators. Over the ten years, the State's dairy herd had declined to 300,000 head.

REASONS FOR THE GROWTH OF OWNER INSEMINATION

Provided that more than 40-50 cows are bred artificially each year, owner insemination is more economical and convenient than traditional A.B. services. With the acceptance by dairymen of the value of A.I., the growth of owner insemination is not unexpected.

The principal argument against D.I.Y. has been that technical competence cannot be maintained if the inseminator has a limited amount of practice each year. Equally there was a firmly held view in the early 1970's that it took at least six weeks of intensive training to produce a reasonably competent inseminator. Results to date have demolished these views. Most trainee inseminators are now instructed over 4 days and the majority obtain breeding results equal to, or better than those obtained from commercial A.B. services.

Techniques which were once regarded at the province of professionals are now practised by many farmers. The interval between selection for breeding and insemination is a vital factor in the effectiveness of A.I. Owner inseminators can breed their cows at the optimal time rather than contend with the delays inherent in a once a day, six days per week insemination service.

TRAINING SERVICES

Most owner inseminators (95%) are trained on their own properties. Courses of five days' duration are conducted regionally with the assistance of local advisory staff. The maximum capacity on any one course is 12 people. The availability of non-pregnant cows and facilities for restraint are key factors in the effectiveness of training. Cows are provided by participants and the practical training takes place in the dairy sheds. In some instances, portable bails are used.

Trainees are supplied with a comprehensive instruction manual and are expected to have a reasonable knowledge of theoretical aspects before training commences. The emphasis, during the course, is almost exclusively on insemination technique, semen handling and hygiene. On each day of the course, as many cows as possible are used for insemination practice.

Day 1 Reproductive anatomy and the physiology of reproduction (initial practice on abattoir specimens)

Day 2 Reproductive anatomy (palpation per rectum - live cows) Hygiene and handling of equipment

Day 3 Placement of semen, timing of insemination

Day 4 Liquid nitrogen units, semen handling

Day 5 Revision and refinement of techniques

A recent Queensland survey showed that 81% of those receiving training continued to use A.I., 23% used A.I. as their sole means of getting cows in calf. A further 68% used A.I. on their milking herd (and a bull with the heifers). The remaining 9% used A.I. at varying levels.

Of the 19% who did not continue D.I.Y.A.I., the majority had left dairying.
EFFECTS ON BREEDING MANAGEMENT

As a general rule, only dairymen who are competent managers are interested in A.I. and attend D.I.Y. courses.

(i) Rise in use of A.I. When committed to D.I.Y. insemination, most dairymen mate a greater proportion of their herd to A.I. This has obvious advantages in genetic improvement.

There are more herds on 100% A.I. today than there were ten years ago when structured A.B. services were at their peak.

(ii) Record keeping With the total responsibility for his herd's breeding performance, the D.I.Y. operator has a greater interest in monitoring his success (or failure). This can only be achieved through adequate records. Systems for monitoring reproductive and productive performance are usually sought soon after training. Interest in veterinary herd health programmes is fostered.

(iii) Evaluation of specific reproductive performance This is a logical part of record keeping. During and after the A.I. course, the D.I.Y. dairyman encounters cows with specific reproductive disorders - particularly cows suffering from nutritional anoestrus and reproductive tract infections. Contact with these conditions during inseminations and record keeping makes him more aware of their significances in breeding management. Awareness of breeding problems and their effect on profitability leads to increased use of professional advice.

(iv) Extension D.I.Y. training courses are an excellent extension vehicle. Farmers as a group visit and work on each others properties during the course. They become receptive, as a group, to other extension activities not necessarily directly related to A.I. once training has been completed.

(v) Adoption of planned herd improvement programmes A more intense awareness of the variety of bulls available through A.I. and the systems involved in testing the bulls, results in a higher participation rate in progeny testing schemes.

PLANNED DAIRY HERD HEALTH PROGRAMS IN VETERINARY PRACTICE

D.R. KERR*

INTRODUCTION

The Werribee Computer Dairy Herd Health system has been well documented on numerous occasions since the original description by Blood et al. (1978).

A Herd Health program necessitates regular monthly farm visits to examine selected cows. Our original record system utilised a card system maintained by the farmer in the dairy shed. It worked well, as it was arranged in a clip file with self shuffling categories, according to lactation and pregnancy status. However, it suffered from lack of analysis of indices, with the resultant time lag in any corrective veterinary advice.

We now utilise the Werribee computer as our record system.

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RECORDS REQUIRED

The initial step in computerising a herd is to obtain breeding records. The cow number, name, last calving date, service dates, pregnancy status if available, and lactation status are all that are required by the computer. The farmer then commences using his self-carboning diary at the same time as these records are sent to the computer. The diary simply records all matings, heats, farmer treatments, veterinary treatments, drying off details, sales and deaths. The system also records sires utilised either in natural or artificial breeding.

The diary sheets are sent to the computer centre by the farmer 14 days prior to the projected monthly visit, so that the computer can update information and send cow listings back to both farmer and veterinarian in time for the visit. The farmer only has to send one group of sheets each month, as the second group of sheets is sent with the completed monthly cow listing by the veterinarian. The present cost of the computer record system to the farmer is $1.90 per cow per annum, with a once off $1.00 per cow initial coding fee.

MONTHLY EXAMINATIONS

The computer selects cows to be examined by the veterinarian. We generally advise that farmers paint the required cows at the previous evening milking, to facilitate easy segregation at the morning milking. The list of cows issued by the computer for examination has the following categories:

(i) **Pregnancy diagnosis** is carried out on all cows with no recorded heats for five weeks post mating.

(ii) **Post-natal examination** is carried out on any cows which have dystocia, retained membranes or prolapsed uterus. This examination is timed 17-48 days post calving.

(iii) **No visible oestrus (NVO)** cows are examined if no heats are recorded 49 days or more post calving.

(iv) **Failure to conceive cows (FTC)** are recalled in the month following their third service. Cows are also recalled which do not have a positive pregnancy test within six months of calving.

(v) **Endometritis** cases are recalled for inspection at the subsequent monthly visit.

(vi) **Rechecks for pregnancy** Cows can be re-examined if findings are uncertain at a previous visit. The computer also recalls cows which have not calved three weeks after their anticipated calving date. Often we find that they in fact have calved by the time the monthly visit is conducted. Cows which have aborted are also included in this section, but we often find that these cases are attended outside the monthly visit.

(vii) **No activity cows** The computer will recall any cow which does not have any recorded information for more than six months. Usually these are cull cows not recorded by the farmer in his diary.

In addition to these categories, our practice encourages drying off examinations on cows with consistent high cell counts or with mastitis clinical histories throughout their lactation. We also attend to cows with lameness or requiring corrective feet trimming.
Animal Production in Australia

COMMENTS ON EXAMINATIONS

(i) **NVO cows** The NVO cow is particularly common in our area, where farmers have high milk quotas, small land areas, and far from ideal climatic conditions. However, a real clinical problem relates to the high producing, well conditioned cow, with no structures on both ovaries.

We have found tail paint to be of benefit, especially in our large herds which are often milked in big herringbone units, as the base of a herringbone pit is far from the ideal heat detection vantage point.

(ii) **FTC cows** Statistically it is possible for a cow to pass through several heats and just not ovulate at the right time to link up with fertile semen. However, poor inseminator competence, infection, poor heat detection, ovarian malfunction, and nutrition all play a vital role in this category. Speculum examination is of particular value in these cases, as often there is some residual endometritis. Irregular cycling cows are common and are often found to have cystic ovaries.

(iii) Drying off examinations. We recommend that dry cow therapy be used on all cows in herds which have an average bulk cell count of over 250,000. Hence the drying off examination tends to be more important in herds with low counts, in order to utilise selective dry cow therapy. We recommend the five main mastitis control procedures on our programs.

1. Teat dipping
2. Dry cow therapy
3. Culling of incurable cases
4. Regular machine checks
5. Prompt and effective treatment of clinical cases.

(iv) **Lameness** is an important consideration to overall herd health. It is certainly a major cause of loss of milk production. We emphasise the necessity of good facilities for hoof trimming, as well as provision of foot baths in problem herds.

The computer sheet is then filled in, with the farmer, at the end of the visit. Emphasis can be given to particular points with resultant mutual discussion. Here is the time to learn more about the farmer's production system and the farmer himself. The value of the herd health concept lies in the intimate knowledge the records give us about a particular farm. I regard it as essential to regularly ascertain pasture information or feeding plans, in order to continually review herd nutrition. Failure to consider nutrition in a herd health program will place the whole program at risk.

The computer sheet is then sent to the computer centre along with the previous fortnight's farmer diary sheets. A monthly analysis of results then usually arrives back within seven to nine days.

**ANALYSIS OF RECORDS**

The monthly analysis is a vital part of the program, as it allows both farmer and veterinarian to assess progress and performance. The computer centre forwards two copies of the report to the veterinarian, which allows the veterinarian to make comments on the farmer's copy. The following items are listed in the monthly analysis:-
1. Milk production graph with milk per cow per day
2. Disposal records
3. Reproductive performance
4. Pregnancy test results
5. Calving to conception and calving to first service
6. Cows on heat by 60 days
7. First service pregnancy rate
8. 30 day non-return rate
9. Reproductive examination results
10. Mastitis report
11. Disease report
12. Calving pattern analysis
13. Cows to be dried off
14. Cows due to calve
15. Cows due to reach 50 days from calving in the on-going period.

These give a comprehensive background to the whole herd, and allow objective advice to be given to the farmer to correct problems revealed by the figures. It is our experience that farmers quickly rely on these monthly reports to plan their herd management, especially with respect to nutritional budgeting revealed by calving pattern analysis and drying off lists. The addition of calving to conception data in the drying off lists and prospective calving list allows early emphasis on any potential problem cow.

The computer centre also produces an annual report summarising herd performance. This includes all the monthly report indices as well as sire performance in the breeding program.

**FARMER MEETINGS**

A vital part of the herd health and production concept is the organisation of farmer meetings. These meetings can be of enormous benefit as they:

1. Serve to maximise information concerning the program
2. Give the farmer a sense of identity as being part of a progressive group
3. Allow the farmer to evaluate his progress as compared to others within the group.

The computer codes also allow confidential inter-farm comparisons to be made thus allowing farmers to compare their progress with the group. It is our experience that farmers enjoy herd health meetings, and that they gain much thought-provoking material from them. I find that farmers start to ask when the next meeting is due, and will suggest topics that they would like discussed. We take slides of cases and ideas throughout our practice and, when pooled, these make excellent teaching material.

**SUMMARY**

The herd health and production program allows farmers an opportunity to have a regular veterinary service, which monitors all facets of disease and production within their herds. It is our opinion that this type of veterinary service is by far the most efficient and cost effective on-farm service for the dairy farmer. The service is charged on a per cow per annum basis, which allows a farmer to budget on his veterinary costs.

The results of our programs have been most rewarding, with appreciable changes in all indices usually apparent in the first year of operation. The acceptance of the herd health and production program in our area is evidenced
by the farmer to farmer extension network, which has resulted in farmers initiating their entry on to the program.

REFERENCES


