# SOLUTIONS TO SUBOPTIMAL PERFORMANCE IN LIVESTOCK IN THE FIELD

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## SUMMARY

Animal health and production management practices used on sheep and beef cattle properties in south-eastern Australia have been shown in recent surveys, and by consultancy work undertaken by the University of Melbourne Mackinnon Project, to be suboptimal in several areas. Implementation of many advances from research in animal nutrition, production and health in the field has been poor. For example, in some districts up to 80% of sheep flocks lamb during autumn and early winter. A change to a spring lambing would enable more sheep to be run on these properties without increasing winter stocking rates. Control of internal parasites on most properties could be improved through the correct timing and use of effective anthelmintics, awareness of the emerging problem of anthelmintic resistance, and planning low risk pastures for weaner sheep. Supplementary feeding could be used more cost-effectively by monitoring the live weight of young sheep over the dry summer and autumn months. Footrot, lice, fleece diseases, blowflies, stocking rate, flock structure, genotype, genetic improvement programs, and poor financial planning cause widespread problems. Each farm presents a unique combination of factors contributing to suboptimal performance, and each farmer has a different attitude to change and risk. Since regional extension methods have generally been unsuccessful in transferring research findings to the farm gate, it seems that the solution to improving suboptimal performance in the field is to have consultants and advisers working directly with the farmer who is charged for the services provided. The most important limitation at present is the availability of consultants trained to take a whole farm approach.

## INTRODUCTION

Solutions to suboptimal performance in livestock in the field require a whole farm and whole enterprise analysis approach in order to diagnose what components of livestock production are limiting farm profitability, and to provide a frame for recommendations. Many causes contribute to suboptimal performance in the field. It can arise from health problems such as poor control of internal and external parasites, poorly designed management calendars, flock structures and unbalanced production systems. Low stocking rates, inadequate nutrition of pregnant and lactating ewes and young sheep, unproductive genotypes, inadequate pasture production and soil infertility can all contribute.

The skills required to diagnose the causes of suboptimal performance in livestock in the field, and to provide economic solutions, are usually beyond those obtained in undergraduate courses in agriculture or veterinary science. Traditionally, agricultural and veterinary graduates have specialized in various disciplines and areas such as pastures, soils, farm management and finance, taxation planning, economics, clinical medicine and pathology, and in broader activities of either research and extension when employed in government departments. A few private advisers have been able to provide

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whole farm consultancy services (Bell 1988).

The low levels of contributions being made to the pastoral industries by veterinarians is a matter of great concern to us at the University of Melbourne Veterinary School. Veterinarians, who are mainly employed in private practice, appeared to be making little contribution towards any improvement in profitability of the pastoral industries, and the wool industry in particular. In an attempt to enhance this contribution, over the past 10 years we have developed a post-graduate teaching programme designed to train veterinarians in whole farm consultancy services. This training has been by coursework and assignments in farm economics, systems analysis, computing, statistics, nutrition of grazing animals, genetics, reproduction, and by practical exercises through provision of consultancy services to a number of farms (Morley 1985). Known as the Mackinnon Project it has been supported by the Scobie and Claire Mackinnon Trust, and from income derived from the consultancy work. The farm consultancy work keeps us in daily contact with farmers and provides immediate feedback on current problems in the field (Allworth et al. 1988, 1989)

Surveys have also been made of sheep and beef cattle properties in south-eastern Australia to obtain a broader perspective of the current health and production management practices. In this paper the major findings from these surveys, and our experiences from working with farmers through the Mackinnon Project consultancy practice, will be used to provide examples of the approaches being made to diagnose and solve suboptimal performance in livestock in the field.

## SURVEYS OF CURRENT ANIMAL HEALTH AND PRODUCTION MANAGEMENT PRACTICES ON FARMS IN SOUTH-EASTERN AUSTRALIA

The University of Melbourne through its Masters of Veterinary Studies Program has undertaken seven surveys of properties in south-eastern Australia since 1978. Two of these will be discussed here. In one survey in 1986, a mailed questionnaire was sent to farmers in the shires of Broadford, Euroa, Goulbourn, McIvor, Pyalong, Seymour, Violet Town and Yea in Central Victoria. In another in 1988, questionnaires were sent to farmers in the Hume, Gundagai, and Young Pastures Protection Board Districts of the southern slopes of New South Wales. The seven completed surveys have provided 48% usable responses from the questionnaires sent to 3,342 producers. These surveys showed that many of the recommendations from research were not being taken up by farmers. Therefore there are many opportunities to improve suboptimal performance of livestock. These include:

### Sheep health and production management practices

(i) Reproductive performance of flocks Most farmers (79 %) in Victoria mated their ewes in spring and summer for an autumn or winter lambing. Similarly, in Southern New South Wales this included 61% of Merino flocks and 75% of Crossbred flocks. A later lambing would enable better matching of available pasture to flock energy requirements, more wool producing sheep to be carried on farms, and hence increased profitability (Davies 1962; Mullaney 1966; McLaughlin 1968). A mid-winter lambing has been shown to be most profitable for prime lamb production in north-eastern Victoria (Reeve and Sharkey 1980), and at Wagga Wagga in New South Wales (Fitzgerald 1976). In southern New South Wales, only 16% of prime lamb producers joined ewes to lamb at this time.

Rams were left with ewes for more than 12 weeks in 50% of Merino flocks, and in 75% of crossbred flocks. Weaning was also delayed, with 79% of Merino flocks and 86% of other flocks weaning lambs more than 16 weeks after the start of lambing. This is despite all the evidence to show that a concentrated 5 to 6 week mating period will achieve an acceptable lambing percentage on most farms, and weaning at 12 to 14 weeks of age, especially in Merino flocks, will simplify weaner management (Lewis and Lisle 1970; Geytenbeek et al. 1962).

(ii) Control of internal parasites The 1986 survey in Central Victoria indicated that ewes on 28% of farms received 4 or more anthelmintic drenches in a year. Ewes on 22% of farms and wethers on 29% of farms received no drenches during the summer months. These two findings suggested there could be considerable savings for many farmers through implementation of drenching programmes aimed at preventing problems from internal parasites. The gains would be realised through savings in drench costs by using less drench, and better worm control in all classes of sheep by reducing larval intake from contaminated paddocks (Barger 1982). Very few respondents were aware of drench resistance testing, or had checked if the drenches used were still effective.

The 1988 survey in southern New South Wales identified four areas requiring immediate attention for better control of intestinal parasites on most farms. Although 66% of farmers said they had followed "Drenchplan", only 20% had adopted all the recommendations. Only 33% of farmers gave all sheep two drenches during the summer. Only 12% of farmers had conducted tests to determine the efficacy of the anthelmintics used. In most flocks lambs were weaned more than 15 weeks after the start of lambing. While most farmers drenched lambs at weaning, few planned "low worm risk" paddocks for the weaned lambs. Less than 15% of farmers took measures to prevent introducing anthelmintic resistant parasites onto their farms when purchasing sheep.

(iii) Control of external parasites Nearly all farmers (95% in Victoria and 82% in NSW) surveyed treated sheep every year for lice. Only 14% of respondents indicated their sheep were lousy at the previous shearing. If lice are not present, routine treatment is costly and of limited benefit. The protection period afforded by most treatments is in the order of 10 - 16 weeks.

(iv) Precautions and health checks made with introduced sheep These were generally insufficient to prevent footrot, lice, and anthelmintic resistant worms from being introduced onto most farms. Only 27% of farmers claimed to isolate introduced sheep for 3 months or more. It was estimated that 28% of the farms responding in the NSW survey had virulent footrot.

## Beef cattle management practices

Of the respondents to the 1988 survey in New South Wales, 71% of the properties had some cattle. Beef cattle production was the main farm activity on 26% of farms surveyed in North Central Victoria in 1986. The beef industry in the south-eastern Australia is dominated by the British Breeds (94%) with Continental breeds (6%) having little influence on the industry at present.

(i) Reproductive Performance in Beef Herds The calving rates ranged between 86% and 90%, indicating that reproductive performance could be considered satisfactory. The surveys indicated that 5 to 7% of calves were

born dead or died before weaning. Presumably most calf deaths were associated with dystocia.

Less than 50% of producers mated heifers to calve at two years. While 85% of beef producers practice controlled mating only 24% restricted joining to 8 – 12 weeks. A joining period of 9 weeks had been advocated by veterinarians and advisers in north-eastern Victoria for 5 years before the 1986 survey (Stafford and Sykes 1984). Pregnancy testing is not used as a routine management tool on the majority of herds. Only 20% of herds have all cows tested, 62% never test cows and, in the remainder, only heifers are tested.

The decision to purchase bulls is made mainly on physical appearance, temperament and performance testing. Routine reproductive examinations of bulls and serving capacity testing appear not to be well accepted.

(ii) Control of internal parasites in beef herds The importance of controlling intestinal parasites on the health and production of beef cattle in southern Australia has been well researched and documented (Cole 1986). Intestinal parasite control programmes in autumn calving herds in south eastern Australia are based on drenching calves at weaning and moving them onto clean pastures. Weaners and rising 2 year-old heifers are drenched in summer, so that autumn pastures do not become contaminated with worm larvae. Young cattle are drenched in July if they can be moved to low risk pastures over late winter and spring, then drenched again in the following summer. On farms with a routine strategic drenching program there should be no need to drench adult cattle.

When farmers answered questions in the surveys on which classes of cattle received drenches in any one month, it was evident from the responses that very few use strategic drenching programs to control internal parasites. It is likely that cattle are drenched whenever they are mustered. Over 50% of farmers drenched breeders at least twice a year. However heifers, the one group of cattle most prone to internal parasitic infestations, were only given one drench per year on 44% of farms. In 1986, 20% of the farms surveyed were already using avermectin, 65% used benzimidazoles, and 7% levamisole. There is little evidence that anthelmintic resistance in cattle parasites in southern Australia is as important as in sheep parasites.

(iii) Prevention of Clostridial diseases Calves were not vaccinated against clostridial diseases on 52% of farms, and only 20% of farms vaccinated calves correctly. Cows were not vaccinated on 75% of farms. Clostridial diseases are easy to prevent through proper vaccination. The reasons for the incomplete vaccination of young cattle are unknown, but could be associated with the inconvenience of mustering of cattle and appropriate storage of vaccines. The low adoption of vaccination against clostridial diseases by the beef industry may indicate that farmers perceive that these diseases cause minimal losses.

(iv) Other diseases causing suboptimal performance in beef herds In the 1988 survey, grass tetany was considered to be a problem in 46% of cattle herds in southern New South Wales. Other diseases considered to be important by respondents were:

(a) for-breeding cows and calves: abortion, dystocia and calf scours. Calf scours was listed as a problem by 59% of 128 farmers.

(b) for all classes of stock: worms, lice, fluke, bloat, cancer eye, pink eye and blackleg.

Trace element deficiencies were not considered important by the respondents to these surveys. Unless growth rates of cattle were being monitored it is unlikely that the effects of sub-clinical trace element deficiencies would be detected (Hosking et al. 1986).

## SOLUTIONS TO SUBOPTIMAL PERFORMANCE IN LIVESTOCK: EXPERIENCE GAINED FROM THE MACKINNON PROJECT CONSULTANCY PRACTICE

The Mackinnon Project veterinarians currently work with 115 clients on a regular basis. A total of 600,000 sheep and 28,000 beef cattle are run on these farms. The flocks on farms range from 500 to 36,500 sheep. Merino wool production is the major enterprise on almost all farms. On the 55 (48%) farms which also have cattle the herd sizes range from 11 to 17,000. The average farm size is 1,000 ha (range 100 - 5,800 ha) and is approximately twice the area of an average farm in the region.

The average annual rainfall on farms varies from 500 mm to 900 mm, with most recording 600-700 mm occurring predominantly in winter. Most farms have improved pastures. Subclover (Trifolium subterraneum), perennial ryegrass (Lolium perenne) and phalaris (Phalaris aquatica) are the main improved pasture species. Pasture growth occurs from April to November in most years, with October having the maximum growth rate. Pasture senescence occurs in December, and the period between January and March is typically dry.

Of the 76 clients who have joined the project over the last 3 years, 27 (36%) joined because of specific animal health problems (internal parasites, footrot, nutrition of young sheep, infertility, and lice in decreasing order of importance), and 49 (64%) of the farmers sought advice on their general animal health program and production management calendar.

We aim to provide the client with the best information available to make decisions such as when to drench sheep for internal parasites, an appropriate footrot eradication program, supplementary feed requirements, joining time 'and strategy, stock numbers and movements, genotype, and finance. Consequently any advice on health and production is provided with an accompanying budget, and usually contains several options with their expected time-scales of implementation.

### Consultancy services provided

Following initial contact, the farmer is usually sent a farm profile form to complete. Record keeping on farms is poor. The farm profile allows the farmer to gather all the relevant information before the initial visit. An initial visit to a farm generally takes three to seven hours, depending on the reason for the initial contact. If a specific problem concerns the farmer, and is the main reason for the visit, it is essential that a thorough investigation of this problem is undertaken. The initial visit generally involves discussion of all management and health policies. Areas for improvement and which warrant further attention are identified, ensuring continued involvement on the farm.. It is important to establish the farmer's objectives, as these can vary dramatically. A farmer with a young family, and owing money, will invariably wish to maximise profits. A farmer with 100% equity, and no educational commitments for children, may be more interested in the individual performance of his stock or appearance of the farm. Recommendations will vary depending on the farmer's objectives. A re-assessment of the objectives may be an important part of the advice where these have been based on unsound information.

An outline of the Mackinnon Project approach is as follows:

(i) Analysis of the farm management calendar This analysis is the most important step in identifying suboptimal performance and limitations to productivity on a farm. Failure to understand the management will often lead to failure of implementation of effective disease control programs. A whole farm approach ensures that advice given in a specific area is kept in the perspective of the profitability and success of the whole farm. Healthy animals alone do not necessarily mean that the farm will be profitable.

(ii) Farm inspection An appreciation of the state of the farm, including fencing, pastures and livestock, and also the skills, capacity and commitment of the farmer, is important. A farm inspection is essential because in many cases the farmer will understand concepts better whilst walking with the consultant across the farm, than he will in more formal discussions over the kitchen table.

(iii) Economic analysis The financial contributions and costs of enterprises on the farm are estimated to identify opportunities for improvement. The economic and biological evaluation of management modifications are examined, sometimes with the aid of computer models (Morley 1987; Vizard 1986). A serious recommendation to a farmer is accompanied by a detailed budget.

(iv) Proposal Following the initial visit, a written report is sent to the client. An overall plan is presented and discussed. In most cases, several areas will be identified where improvements can be made. However, it is usually difficult for all changes to be made at once and it is necessary to establish priorities for implementation. The opportunities for improvement and the time course for implementation of changes will be outlined with a budget and agreed to. Improving suboptimal performance of the farm may involve changes to marketing strategies, livestock health, the livestock production systems, pasture development and improvement, simplification of the management calendar, changing the emphasis between enterprises, and improved financing.

(v) Monitoring Clients are usually visited 4 to 5 times per year. This frequency may vary from two to ten times depending on the input required. Several visits may be required to ensure that a recommendation is properly adopted. There are generally more visits per farm in the first one to two years of involvement. It is during this period that the consultant is developing a rapport with the client and can monitor the effectiveness of the transfer of technology and recommendations. There is no fixed schedule for visits, although visits when lambs are weaned and another in late summer are usual on most farms. A report is sent to the client after each visit. A monthly newsletter is circulated to all clients, containing information relevant to likely practices occurring on the farm in the near future, and new information. The newsletter is important in maintaining client contact.

## Examples of animal health and management problems encountered on farms causing suboptimal performance of livestock.

(i) Internal parasites Concern about the control of internal parasites is the most common reason for farm visits. Recommendations for control in south eastern Australia are based on two strategic summer drenches to all sheep (Anderson 1972, 1973), a drench to weaner sheep three to five weeks after the autumn break, routine faecal egg count monitoring of young sheep,

anthelmintic resistance testing, and most importantly, planning of "low worm risk" pastures for weaned lambs. Resistance of internal parasites to anthelmintics is widespread (Martin 1988), and on 95% of the Mackinnon Project farms internal parasites in sheep have detectable resistance to at least one group of anthelmintics. In most cases this is not leading to clinical problems. Drench resistance tests, based on faecal egg reduction, on lambs at weaning are conducted annually or biennially on most farms. In many cases, larval cultures of faecal samples are made at Regional Veterinary Laboratories to identify the resistant helminths.

Internal parasite control programs need to be constantly monitored if they are to remain effective. Drenching technique must also be reviewed. Grazing management, an essential part of internal parasite control, is often poorly understood and infrequently utilised by farmers. Almost all clients have adopted routine faecal egg count monitoring of young sheep, and the planning of paddocks for weaner sheep.

(ii) Management of the health and growth of young sheep is another major reason for farm visits. Improved performance, characterised principally by-a lower death rate in weaner sheep and more efficient utilization of supplementary feed, has been achieved on most farms. Management of weaner sheep is complex, involving adequate ewe and lamb nutrition (primarily a function of time of lambing), effective internal parasite control and an appropriate weaning time. Monitoring of live weights to assess nutritional status and the need for supplementary feeding is a vital part of weaner sheep management over summer and autumn. Usually, 30 to 50 weaner sheep are individually tagged, and weighed at 3 to 4 weekly intervals over the dry summer months to assess the need for supplementary feed. Excessive supplementary feeding of all classes of sheep occurs on some properties. Of forty clients who have sheep weighing scales, 27 purchased scales in the last three years.

(iii) Choice of time of lambing A survey of 20 sheep and wool extension officers in the Victorian Department of Agriculture and Rural Affairs in 1988 showed that only two considered that time of lambing was an important determinant of profitability in a self-replacing wool flock (A. Carr unpublished). During the last three years, we have recommended to 52 of our clients that they consider a change of lambing from autumn to spring. Thirty-four of these clients (65%) subsequently altered their time of lambing, with another five (10%) considering the change this year.

Comparing autumn (April-May) and spring (August) lambing provides a good example of the need to have a whole farm approach when attempting to improve suboptimal livestock production on a farm. A number of experiments have been conducted that compare autumn lambing ewes with spring lambing ewes in the Mediterranean environment of southern Australia (Davies 1962). At the same stocking rates, clean fleece weight of the spring lambing ewes tend to be marginally heavier than autumn lambing ewes (Mullaney 1966; McLaughlin 1968). Weaning percentages are variable but similar between the two times of lambing. Growth rates of spring born lambs are greater than those of autumn born lambs but, at the usual time that the pastures dry off, the autumn born lambs are still significantly heavier (Davies 1962; McLaughlin 1968). Autumn lambing ewes require more supplementary feeding than spring lambing ewes. However, spring born lambs require more supplementary feeding than autumn born lambs (White et al. 1982).

changing the time of lambing from May to August on a farm with 5,000 adult merinos is estimated to result in an additional $35,000 net farm income, using October 1988 wool and livestock prices in our computer models (Morley 1987;

Vizard 1986). In summarizing experiments on time of lambing, some consultants have concluded that there is only a small economic advantage, if any at all, in spring lambing. Such a conclusion, however, is erroneous because it fails to recognise that a shift in management and productivity may remove constraints and alter the optimum level of variable inputs into the livestock production system. It also fails to recognise the farmer's motive for animal production. Farmers do not (or should not) act to produce an animal with a maximum clean fleece weight or a maximum weaning weight. Instead, they are trying to produce a product at a level that maximizes profits from their land.

Consequently, a comparison between spring and autumn lambing systems should allow for possible shifts in variable inputs and changes in constraint variables and compare the two systems at their respective optimal points. Few, if any, time of lambing experiments have been designed to do this. Instead, spring and autumn lambing systems have been compared at the same arbitrary stocking rate. With the lack of direct experimental data, computer modelling becomes an important method for comparing spring and autumn lambing systems. Computer programs such as "Merino" (Morley 1985) and "Prophet" (Vizard 1986) were used to evaluate changes in profitability associated with autumn and spring lambing. Outputs from these models show that the main advantage of spring lambing over autumn lambing is derived not from an increase in per head productivity of ewes or lambs but from an increase in profitability from being able to run additional livestock on the property. This advantage is far from obvious in experiments comparing autumn and spring lambing at the same stocking rate.

The optimum stocking rate in an autumn lambing flock is heavily constrained by the maximum grazing pressure coinciding with winter when pasture growth rates are very low. At the optimum stocking rate for an autumn lambing system there is relatively poor utilization of the spring growth of pasture. Any attempt to increase stock numbers beyond the optimum, to make better use of spring herbage, demands heavy supplementary feeding to the ewes during autumn and winter and this makes the system extremely vulnerable to a late autumn break. Moreover, many farmers are reluctant to stock near the economically optimal stocking rate for an autumn lambing system because they see the system as being vulnerable to feed costs and late autumn breaks. In practice, then, the winter stocking rate becomes even more limiting to the overall profitability of an autumn lambing system.

If the same number of ewes are lambed in spring the maximum grazing pressure no longer occurs during winter, and there is more efficient utilization of the pasture growth during spring. More stock can be added to the property until livestock production is constrained by the winter grazing pressure or some other factor (e.g. soil erosion) . At this higher optimal stocking rate, the spring lambing system is considerably more profitable than the autumn lambing system is at its optimal stocking rate. In practice, a second advantage accrues from spring lambing. Farmers are often willing to stock closer to the economically optimum stocking rate for a spring lambing system than they are for an autumn lambing system. The overall, effect of these two factors is that there can be a very substantial financial advantage in a spring lambing system over an autumn lambing system.

To successfully change the time of lambing on a property requires more than just a simple recommendation. There are obstacles, both perceived and real, that may erode the potential gains of a spring lambing. For example, weaner management is more difficult in a spring lambing flock than in an autumn lambing flock, rams may require special attention, and the time of shearing may need to be changed. It is the consultant's responsibility to ensure that adequate

attention is paid to these factors and that a suitable monitoring scheme is in place.

(iv) Use of genetic improvement to solve suboptimal performance in livestock No matter how good the performance of a flock or herd it can still be improved by selection of better stock. Selection may be based on individuals in the flock, between studs supplying sires, between breeds (eg Merino vs. Polwarth vs Corriedale), or between breeding systems (eg Crossbreeding vs. purebreeding). Our consultancy is invoked at all levels.

Most of our clients are interested in genetic improvement. Provided management is adequate we encourage them to consider, and perhaps to implement, programs for improvement. Some clients are now breeding their own sires, and we are advising on objectives, techniques, and procedures (Morley 1955, 1988a, 1988b), as well as formulating long-term plans. Others are comparing on their own proper ties, the offspring from sires from different sources. Still others may be using the results of wether trials as a guide to buying rams (Wilson et [illegible]. We help them make their decisions in many ways. We also are advising those who are managing group breeding schemes.

The results of genetic impovement are not obvious, except perhaps over decades. They can nevertheless return handsome dividends. For example an increase of 200 grammes clean wool can increase the gross margin per ha by 27 per cent. Similarly a decrease of average fibre diameter of two microns can increase it be 74 per cent. Both these can be achieved within ten years.

Genetic improvement programs can also have important spin-off. Selecting livestock and making best use of them adds immeasurably to interest in livestock production. Certainly any increase in production will be taxable, but this extra enjoyment of life is free.

## CONCLUSIONS

The surveys undertaken by the University of Melbourne veterinary School have revealed many aspects of animal health and production management on farms which can lead to suboptimal performance of livestock. The solutions to these problems are obviously beyond the current government rural advisory and extension services which are becoming more removed from the farm, and are only resourced to operate on a group or regional basis. The provision of private veterinary services to individual sheep farmers, based on a whole farm approach, has led to improved profitability of many farms involved in the Mackinnon Project. Much of the success has been due to the implementation of knowledge and technology developed from research findings obtained many years previously. With an individual farm approach the specific requirements of the client can be determined, and any advice and recommendations adjusted to suit the farmer's attitude towards risk. The skills required to provide such a service are numerous, and special training is almost essential for most veterinarians. An understanding of the implications of management policies on production and profitability in a sheep enterprise, together with a knowledge of livestock diseases, is essential.

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