

USING THE FAMACHA© SYSTEM ON COMMERCIAL SHEEP FARMS IN SOUTH AFRICA

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ABSTRACT

Bath, G.F. & Van Wyk, J.A., 2001. Using the FAMACHA© system on commercial sheep farms in South Africa. Proceedings of the 5th International Sheep Veterinary Congress, 22-25 January 2001, Cape Town, South Africa.

Since 1997 we have tested the practical use of clinical classification of the ocular mucous membranes of sheep into discrete categories, according to the range of haematocrit values represented in a special card made for this purpose. This card has illustrations of sheep eyes and membranes and colour bars, each of a different hue, from bright red, through pink to almost white, representing haematocrit values of approximately 35 (28), 25 (23-27), 20 (18-22), 15 (17-13) and 10 (12)%. The 5 categories were assigned the numbers of 1, 2, 3, 4 and 5, representing haematocrits, which were optimum, acceptable, borderline, low and fatal respectively. The card was named FAMACHA© after its originator, and was accompanied by appropriate instruction manuals, training and support. Selected farmers were asked to use the system on their sheep flocks to help decide which sheep to treat for haemonchosis, and partly when to treat the whole flock.

A simple sheet was developed for data collection. In the early part of the summer, sheep were to be examined less frequently (every 3 weeks) but when the percentage of sheep becoming anaemic increased, the interval fell to every 2 weeks or even weekly. Altogether nearly 30 farmers have tested the system, mostly with little supervision by the research team. The data from 13 farms are presented. It is clearly shown that the overwhelming majority of sheep in a flock need no or very little treatment during the entire summer, the *Haemonchus* spp. season. On average, only 10% of the flock needed treatment at any given time, and usually far less. Only a tiny minority in each flock became seriously anaemic and required salvage treatment (usually < 1%). The system has worked well on both intensive and extensive farms in a number of summer rainfall areas. Farmers reported a significant drop in treatment costs, averaging 58.4%. We have not designed trials to investigate whether the FAMACHA© causes production losses.

However, one farmer who kept reliable records, was of the opinion that liveweights were not affected by no or little treatment, in fact the sheep treated the most gained the least weight. But to this was to be expected to some extent, as the farmer

treated only those individuals that were severely stressed by the *Haemonchus* spp. infection.

Farmers, farm workers and veterinarians were independently asked their assessment of the system on a 5 point scale. Their replies were consistently and overwhelmingly favourable. Average favourable assessments (good or excellent) ranged between 89% and 96% for understanding, practicality, animal production, financial aspects, awareness and usefulness. The average percentage of favourable assessments overall was 93%, with 68% of all responses rating the system as excellent.

A number of limitations to the implementation of the system exist. These include its applicability only to *Haemonchus contortus* infection; farmer misdiagnoses; complacency; irregular examination; anthelmintic resistance; poor nutrition; periparturient and lactating ewes and weaner lambs. If these are kept in mind, the system is a valuable practical tool in the management of haemonchosis in sheep.

INTRODUCTION

The use of clinical anaemia in managing haemonchosis had been demonstrated under conditions of close supervision by researchers (Malan & Van Wyk, 1992; Bath et al., 1996; Van Wyk et al., 1997), but needed to be tested under average farm conditions. We therefore investigated whether the FAMACHA© System would be implementable with minimal supervision by veterinarians and the research team on well-managed, commercial farms in different summer rainfall regions and using current management systems.

Investigations and trials were conducted between 1997 and 2000, on about 30 commercial farms in summer rainfall areas in the Provinces of Eastern Cape, KwaZulu-Natal, Mpumalanga, Gauteng, Free State and North-West Province. Most of the data presented here comprises that obtained from trials held between 1998-2000.

MATERIALS & METHODS

The trials varied in format according to the level of intensity at which the research team was able to visit the farm and be involved in sampling and evaluation, as well as to the levels of commitment and animal record keeping of the farmers.

The basic approach was periodic examination of all the trial animals by the farmer and workers, using the FAMACHA© technique, and paying closer attention to those sheep judged to be markedly anaemic. Mostly, the inspections were commenced at the start of the worm season, and were repeated at intervals of 3 weeks, until the worm challenge intensified, whereafter the intervals between inspections were reduced. Eventually, in mid worm season the sheep were to be examined weekly.

The farmers were advised at the beginning of the worm season to drench only sheep judged to be in FAMACHA© categories 4 and 5 (Van Wyk et al., 2001), but later (as larger proportions of the flocks became anaemic), to drench those in Category 3 as well, or even the whole flock if deemed essential.

The more intensive the trial, the more expansive the trial plans were, for instance, to drench the individual animals during the worm season (from October to May), only

after faecal and blood sampling had indicated that the individuals involved could be endangered if they were not treated. Nevertheless, as can be expected from relatively long distances and the fact that all but one of the trials were conducted under practical farming conditions on private property, in almost all of the cases we had to settle for less than the ideal described.

On the farms where we worked most intensively, both the haematocrit percentage and the FAMACHA© category estimate were recorded on occasions for every individual animal in each trial flock.

At the other extreme were a few farms to which the trial team paid few visits, with the result that the farmers had to make decisions as to individual and/or flock drenching. They based this on periodic discussions with the research team members, to their own clinical observations with the aid of the FAMACHA© chart and on other clinical signs of worm infection, such as the presence of submandibular oedema ("bottle-jaw") or diarrhoea.

Parameters For Identifying Suitable Farms To Test The FAMACHA© System:

While not all of the following parameters were always met on every farm, they served as a guideline of what was expected. The most important (non-negotiable) parameters are indicated with an asterix.

* Liver fluke not an overwhelming problem; * Good level of management; * Accurate record keeping; * Proven wireworm problem; * Determined to carry the investigation through to its conclusion; * Sheep numbers preferably >200; Good handling facilities and sufficient staff; Willingness to co-operate/follow instructions; Motivation to succeed; Proven track record; Knowledge of disease control; Reasonable distance from veterinarian; Good relationship with veterinarian; Willing to consult with veterinarian on problems; Willing to bring in dead sheep for examination; Willing to stress animals; Animals frequently handled; Use of faecal egg counts (FECs) and faecal egg count reduction (FECR) tests; Overall suitability.

Each farmer was assessed separately by 3 evaluators, and given a combined rating. Only the candidates who complied with most of the stipulations were selected - mainly from Gauteng, Mpumalanga and Free State Province.

Farm Sites Selected:

Two farms were selected from Gauteng, 5 from Mpumalanga, 5 from Free State and 1 from KwaZulu-Natal Province. Intensive grazing was practised on 4 farms, and more extensive systems on the rest.

Requirements From Participating Farmers

Participating farmers were expected to:

1. Supervise staff while using the FAMACHA©.
2. Practise the use of FAMACHA© in trial runs before clinical haemonchosis was expected.
3. Select a trial group of preferably at least 100 sheep of uniform type for the trial,

otherwise two or more distinct types (examples: unweaned lambs, weaned lambs, dry ewes, pregnant ewes, lactating ewes, wethers, rams). We preferred weaned replacement ewes.

4. Examine the trial group every 2-3 weeks until clinical anaemia was expected, rising to weekly examinations (particularly of lambs) during the peak *Haemonchus* season. However, if there were too many sheep in a group, or the farmer did not want to examine all sheep weekly, he could examine 20% of the flock. If more than 10% very anaemic sheep were identified (categories 4 or 5) then the whole flock was to be examined.

5. Score all animals in the trial group at each examination into categories 1 to 5 according to the FAMACHA© card for flocks in which sheep were not individually identified.

5.1 Use form FB3 (Annexure 1), to record the numbers of sheep classified into each of the 5 categories.

5.2 Sheep classified as 1 or 2 to be released without further action.

5.3 Dose all sheep scored 4 or 5 as well as all cases judged to be borderline in Category 3, being perhaps a doubtful Category 4, with an appropriate anthelmintic (levamisole preferred, but not one with residual action). Mark each of the animals that is treated, permanently as outlined in Form FB5 (Annexure 2).

5.4 Mark also those sheep classified as 3, which were dosed.

5.5 Record if dung was taken for faecal egg counts (FECs), as well as the results thereof.

5.6 Record the number treatments given.

5.7 Record if camps were changed

7. Remove no sheep from the trial group until the end of the trial. If they were removed, then numbers, dates and reasons were to be supplied.

8. Take all sheep of the trial group that die, to the supervising veterinarian for a post mortem examination. Where this was not possible the farmer would examine the dead sheep and record his/her findings as follows and send these to the veterinarian.

Recording Required When The Necropsy Is Done By The Farmer

8.1 whether the sheep was anaemic or not (pale mucous membranes, watery blood, pale carcass)

8.2 the presence or absence of bottle-jaw

8.3 the presence and severity of wireworm infection in the abomasum

8.4 whether a faecal sample was taken for FEC

8.5 if samples of worms were taken. Large canned-fruit bottles or similar containers and 10% formalin were left with the farmer, with the request that the entire content of the abomasum be preserved in it. The abomasum could also be tied at both ends and placed in a plastic bag containing 10% formalin

8.6 when the sheep was last dosed and with which anthelmintic

8.7 the date

8.8 other observations of suspected abnormalities

9 Dose the whole flock with an effective anthelmintic (preferably levamisole, but not a very long-acting remedy if more than 10% of the total flock was judged "anaemic" (4, 5 or doubtful cases of 3). Then the grazing camp could be changed after 2-3 weeks (or 2-3 weeks after the end of any residual efficacy in long-acting compounds) if necessary, in consultation with the veterinarian and researchers

10 Make trial groups of sheep available for taking of samples by prior arrangement

11 Vaccinate trial sheep at the start of the trial against enterotoxaemia at least

12 Nasal worm was to be treated conservatively (only if absolutely essential) with rafoxanide (trade name: "Nasalcur", Hoechst Roussel Vet - now Intervet) and then the whole flock to be treated

13 Liase closely with the supervising veterinarian

14 Make no changes to the agreed procedure without first consulting the supervising veterinarian

15 Submit trial records to the supervising veterinarian at the end of the trial

16 Compile assessment forms at the end of the trial

17 Sign undertaking and indemnity (below)

The Following Agreements Were Signed By the Farmer:

Undertaking by farmer

I,

hereby undertake to conduct a trial on the FAMACHA© anaemia guide and system according to the attached schedule and not to deviate from it before I have consulted with the supervising veterinarian. I undertake to inform him/her as soon as possible of any problems which may be emerging connected with the use of the system so that, if necessary, an investigation can be carried out and recommendations made.

Indemnity form

I,

hereby declare that I am taking part in the trial of the experimental FAMACHA© concept of my own free will and in the full knowledge that results cannot be predicted with any certainty. I further declare that I am competent to make this indemnity and have carefully studied and understood the information supplied on the implementation of the FAMACHA© anaemia guide and undertake to abide by its instructions and provisions. I therefore without qualification indemnify all persons and organisations involved in the trial, including all veterinarians, technicians, the Worm Workshop, the Livestock Health and Production Group of the South African Veterinary Association, Hoechst Roussel Vet Roussel Animal Health and any other advisors, functionaries and organisations whatsoever, from any responsibility for losses from any cause arising directly or indirectly from the use of the FAMACHA© card and techniques.

Signed Date, place, witnesses

Requirements of Local Veterinarians

Where possible, we identified and requested local veterinarians to monitor the situation on identified farms and investigate any crises reported. This meant that we had local experts to report to us and solve some problems.

Undertaking by supervising veterinarian

I.

hereby undertake to supervise the FAMACHA© trial/s as set out in the attached schedules (FV1 and FV2) free of charge (except where a written agreement determines otherwise) and to supply the required information to the research team. I further undertake to inform them in good time of any emerging problems which may arise in the course of the trials.

Recording of Results

All data in this section could be collected on a single, flock histogram form (Annexure 1) and the classification of the sheep into the 5 FAMACHA© categories was designed to be easy even for illiterate persons. The farmer was to fill in the remaining items.

Marking of Sheep

Sheep that were treated were to be marked by one of the methods illustrated (Annexure 2)

Support Visits

Support visits were planned for at least every 6 weeks for every farm during the *Haemonchus* season to monitor progress, but most farmers were visited every 3 weeks and a few less frequently. Some had unscheduled visits in addition. At these visits progress was discussed and problems (if any) identified and solved. Data was also collected and later collated for input into a database.

Occasional FECs were done on a bulk (flock) basis. Some of the farms also had the faecal egg count reduction test done on a representative sample of sheep.

Where possible, appropriate weather data was obtained from the farm or nearest available station.

Training of Participants

Staff and farmers were all trained as described separately.

Perception Questionnaire Interviews

Two sets of questionnaires (one for farmers and the other for stockmen and veterinarians) were compiled for gauging the experience, perceptions of and evaluation of the FAMACHA© system by participating farmers and staff, as well as by veterinarians involved in the trial. Each participating farmer and the principal stockman involved in the trials was interviewed independently at the conclusion of the trial. Care was taken to put them at their ease and not to direct their responses. The questions for farmers were designed to elicit their perceptions on their understanding of the system, its practicality, its effects on animal production, its financial impact, its effect on their awareness of helminth control, and its overall usefulness. The questions were asked in random order, in the form of both positive and negative statements concerning the FAMACHA© system, to obtain responses to each of the 6 aspects and the clusters of questions were pooled for recording.

RESULTS

Farms Selected and Data Used

The geographical locations of the trials sites are shown in figure 13.

Thirteen trial farms were selected, one in KwaZulu-Natal (Bester) three in Gauteng or on its border (Barnard, da Serra, Kleu), four in Mpumalanga (Bührmann, Mahlangu, Oberholzer, Steyn) and five in Free State (Cilliers, Köhler, Nicolau, Smit, van Zyl). Some farmers (Kleu) had data which was patchy and not easily interpreted or analysable and were thus also largely excluded. Bar graphs are presented of a representative selection of the flocks examined, where the data formed a meaningful series, or illustrated important findings (figures 1-12).

Data is also given of estimated or calculated financial effects. One farmer (Cilliers) could identify how many times each sheep had been treated during the season, in addition to the final weights of each sheep. This is presented in Table 1. Another farmer (Nicolau) had some financial data available (Table 2).

Treatment costs on one farm (Oberholzer) with detailed records are shown in Table 3, and a summary of calculated or estimated reductions in costs on 10 farms in Table 4.

In Table 5 the perception questionnaire results are summarised, combining the responses of 3 veterinarians, 13 farmers and 22 farm workers in 6 clusters of related questions so that comparisons are made easier.

TABLE 1: Numbers and Average Weights of Sheep Treated 0, 1, 2, Or 3 Times in a Summer

Number of treatments	Number of sheep	Percentage of flock	Average weight (kg)
0	81	32,4	33,75
1	139	55,6	32,60
2	28	11,2	32,70
3	2	0,8	29,75

Willem Cilliers, 1998 - 1999 (Ewe replacements)

TABLE 2: Partial Financial Analysis of one farm

Mike Nicolau, Brakvlei

Category	Financial Year			
	Before use of FAMACHA [®] system			After
	95/96	96/97	97/98	98/99
Ewes (number)	308	360	308	411
Culls	51	141	33	62
Income (R)	9240	33801	5646	15318
Deaths	2	7	1	4
Lambs	352	295	338	513
Retained	105	96	88	167
Sales	241	176	245	336
Income (R)	45549	42240	70315	98128
Deaths	6	23	9	12
Wool (R)	6732	8431	8921	12330
INCOME (R)	61527	84472	84882	125776
Licks (R)	5732	9231	6220	7560
Feed (R)	5130	7300	12183	17783
Veterinary Costs (R)	5421	7322	5322	3588
PARTIAL COSTS (R)	16283	23853	23725	28931

Year FAMACHA[®] system implemented: 1998

TABLE 3: Effect Of The FAMACHA™ System On Treatment Costs

Dosing costs of A.A. Oberholzer, De Emigratie

Period	Remedy	Costs (R)	Cost/sheep
Sept. 1996 to April 1997	Cydectin	11308.99	R 7.53
Sept. 1997 to April 1998	Cydectin	10030.70	R 6.88
Sept. 1998 to April 1999	Cydectin	5988.46	R 3.99

* Implementation of FAMACHA™ system

TABLE 4: Reductions in Costs Estimated or Calculated by Farmers on 10 Farms

Farmer	Period	Measurement	% Reduction
P. Kleu, Top Crop	1997-1998 * 1998-1999	3520 (doses)	200 96%
F. da Serra, Mooiplaas	1997-1998 * 1998-1999	5000 (rands) 1000	80%
J. Köhler, Rushoek	1997-1998 * 1998-1999	Estimate	66%
G.S. Smit, Wesselskop	1997-1998 * 1998-1999	Estimate	50%
A.A. Oberholzer, De Emigratie	1996-1998 (av) * 1998-1999	5988	10669 (rands) 44%
P. van Zyl, Tweede Geluk	1996-1998 * 1998-1999	Estimate	50%
M. Nicolau, Brakvlei (rands) 3588	1995-1998 (av) * 1998-1999	6021	40%
W. Cilliers, Zuringbank	1997-1998 * 1998-1999	Estimate	60%
A. Bester, Die Kroon	1997-1998 * 1998-1999	Estimate	60%
D. Steyn, Boomplaats	1997-1998 * 1998-1999	16 000 (rands) 10 000	38%
AVERAGE OF 10 FARMS:			58,4%

* Implementation of FAMACHA™ system

Figure 1.

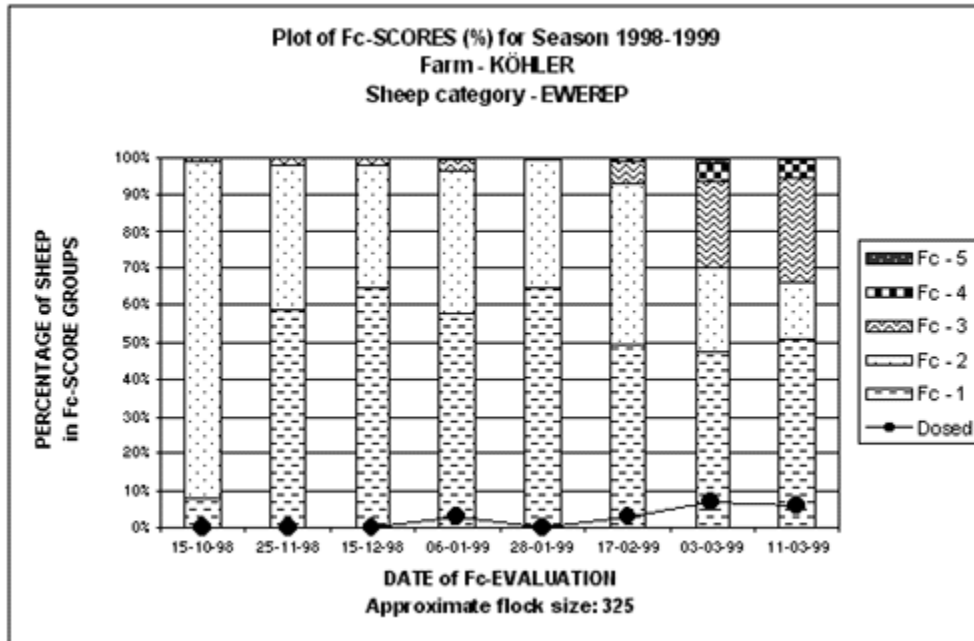


Figure 2:

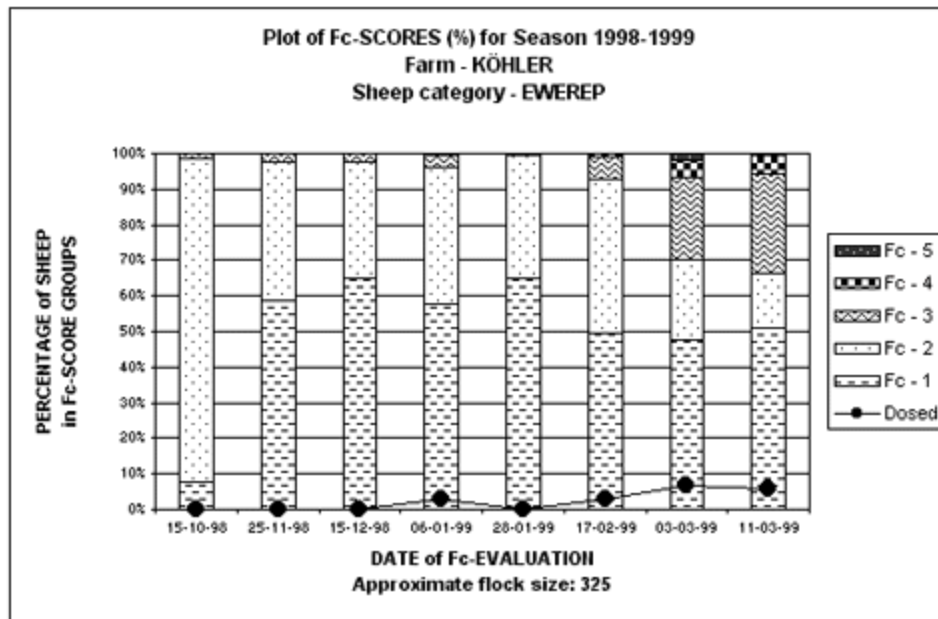
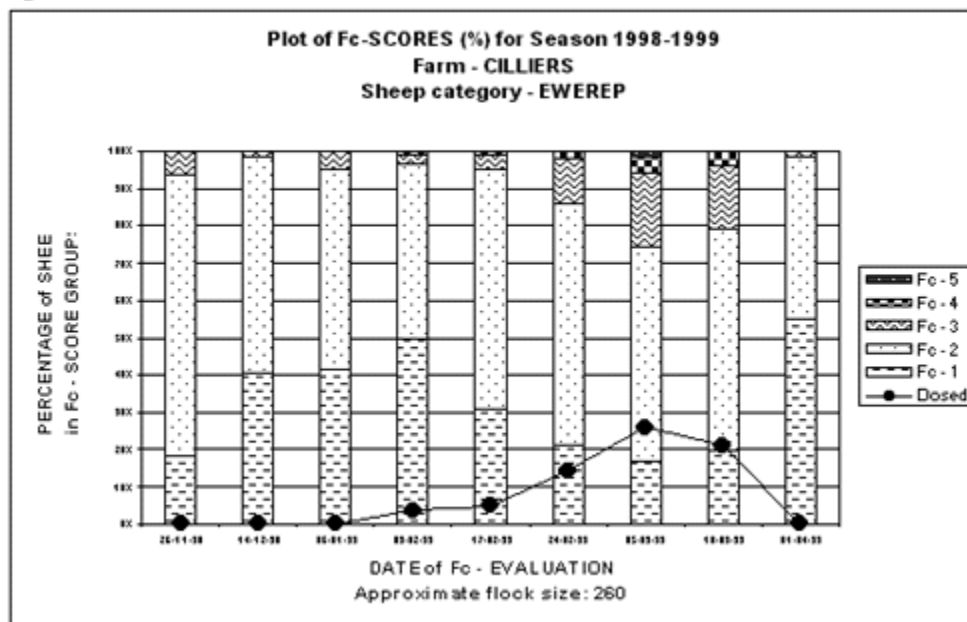


Figure 3:



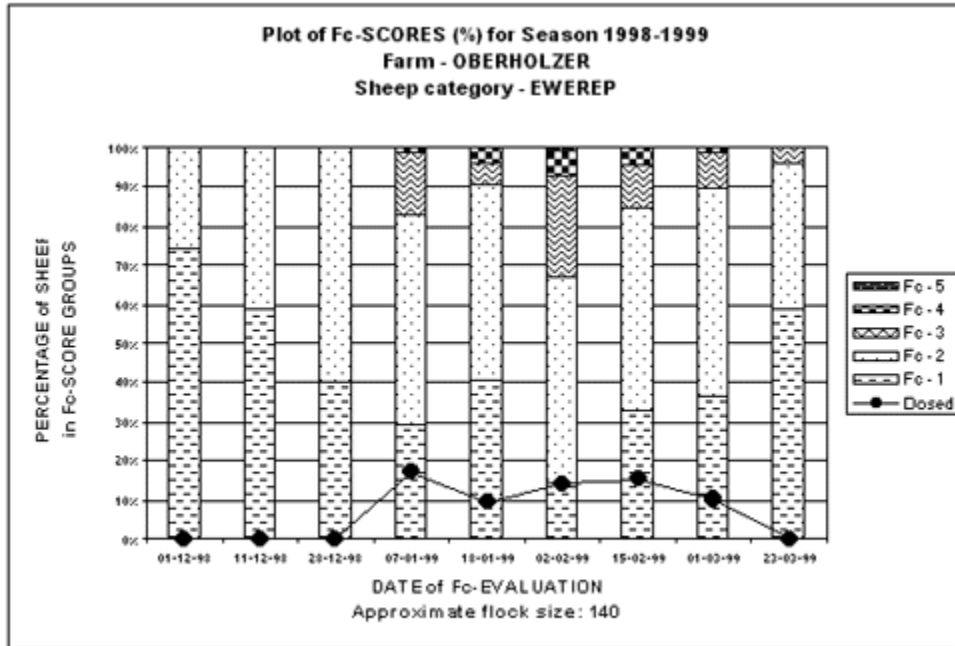


Figure 4:

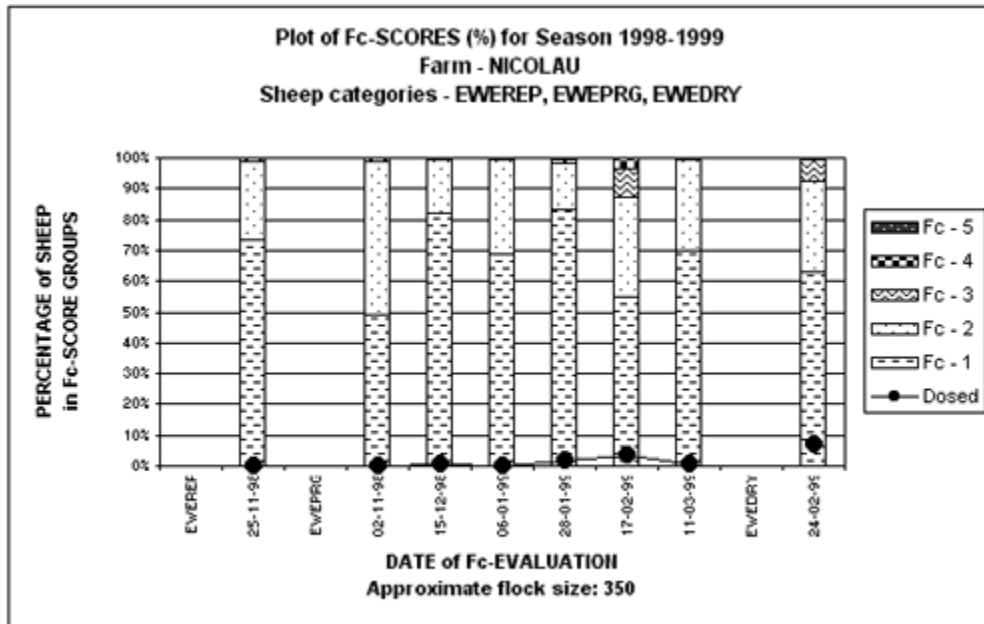


Figure 5:

figure 6

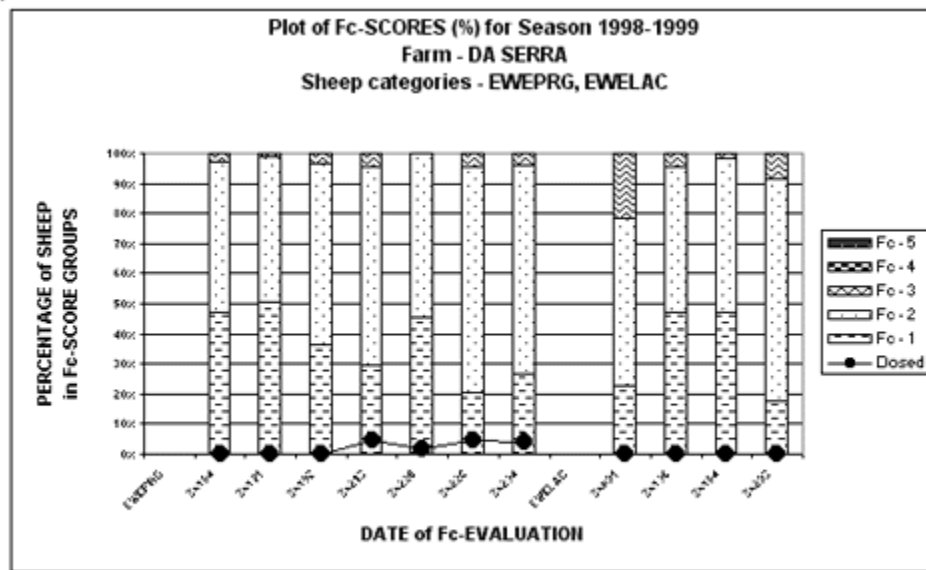
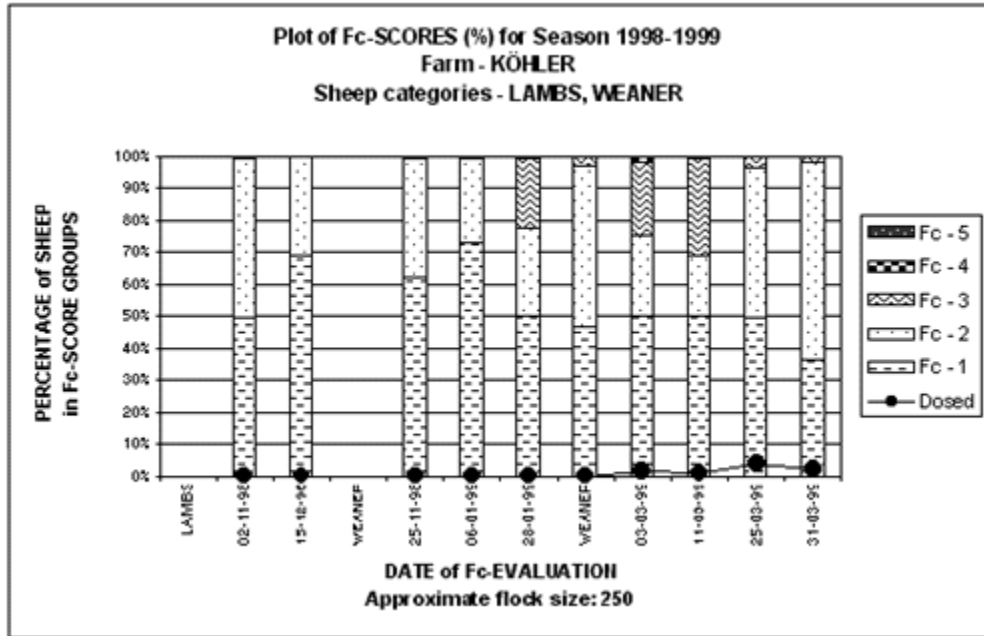


Figure 7:

figure 8

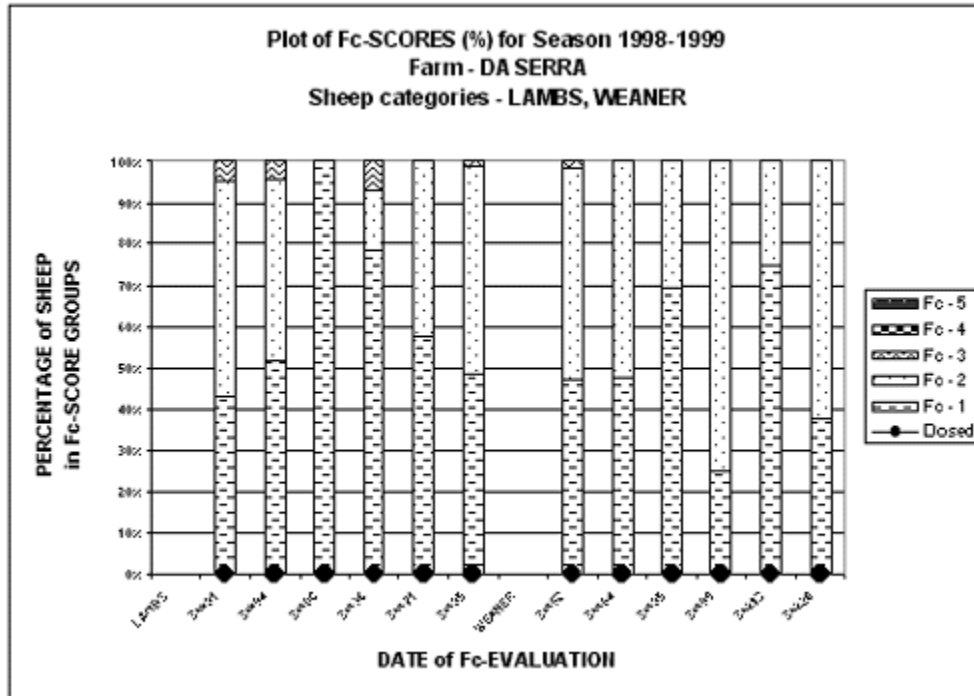


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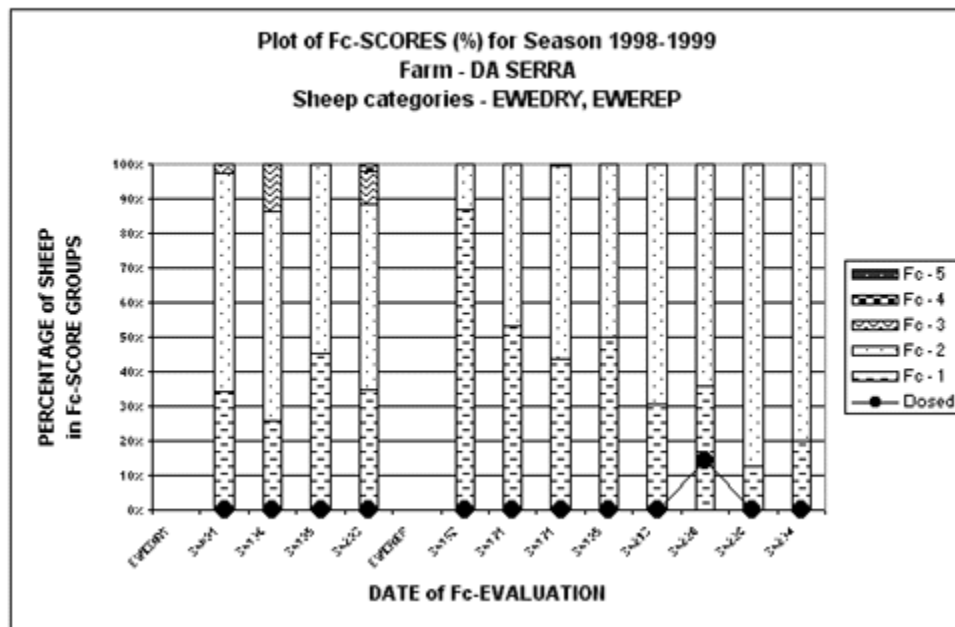
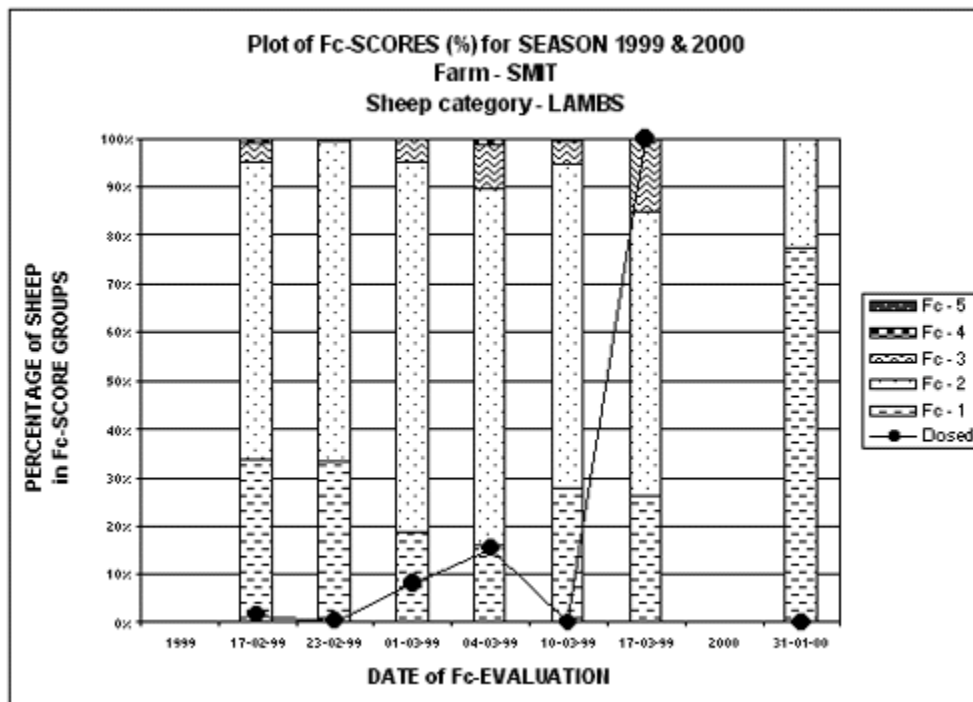
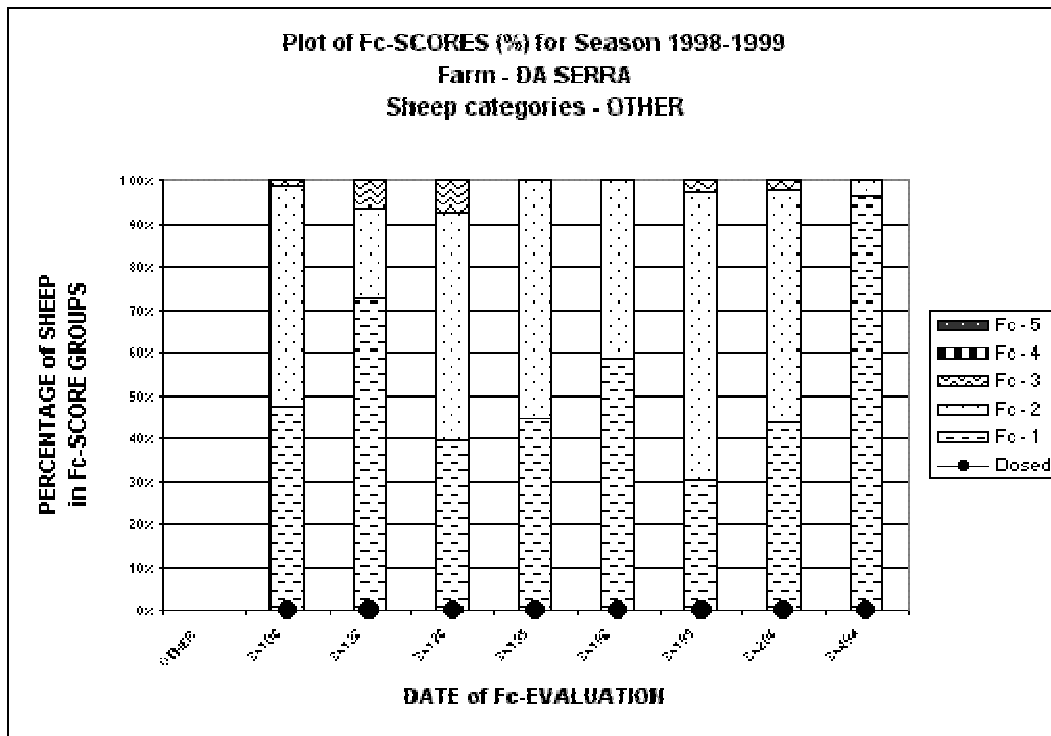


Figure 10:



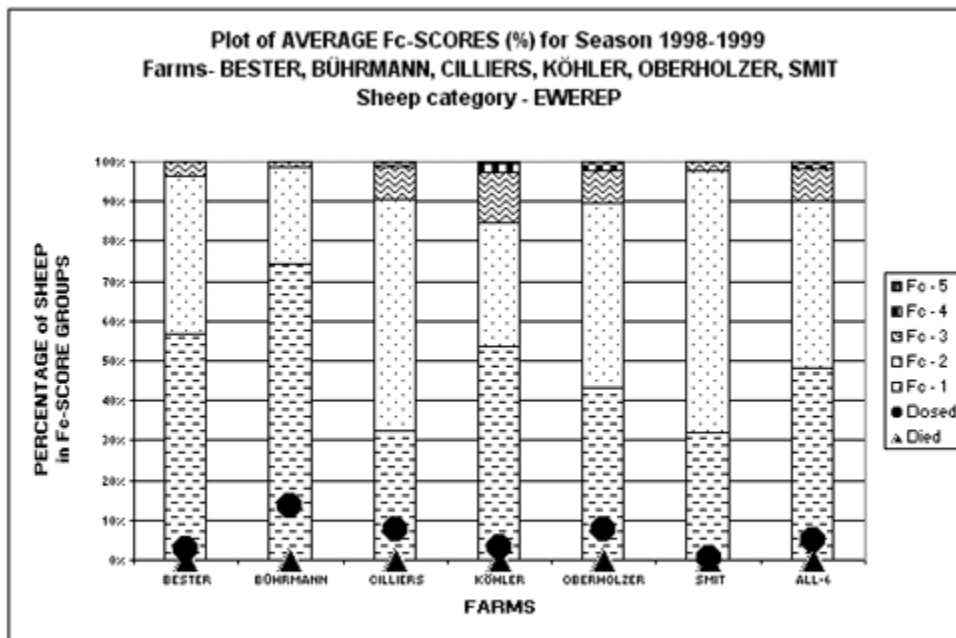


Figure 12:

DISCUSSION

The overwhelming majority of ewe replacements were consistently able to withstand challenge to *H. contortus* on the farms investigated. In most cases, until the last third of summer, either no animals or just a handful needed treatment at each examination.

It was clear that treatment became necessary on many farms in late summer, but even then only a minority (usually 10-20%) of the flock had to be dosed. However, neglecting to treat at this stage was dangerous because the percentage of sheep suffering from a significant degree of anaemia tended to rise sharply.

The considerable reduction in treatment costs on all farms (Table 4) increases the likelihood of farmers adopting the system.

Production figures (although not investigated in specific trials) were judged by the farmers to be either unaffected or not badly affected, and farmers could not ascribe unacceptable financial loss to the system.

The overwhelming majority of subjective responses to the FAMACHA© system by veterinarians as well as by farmers and workers was positive to very positive, and two thirds of responses rated it was excellent.

Wrong diagnosis by farmers was quite frequently encountered. Many farmers were inclined to attribute any loss or problem encountered during the trial to the system rather than anything else. Some examples encountered were:

Fasciolosis - as this causes anaemia and bottle-jaw, and is thus easily confused with haemonchosis. This was encountered on 2 farms. This should be investigated

further, as the FAMACHA© should be equally effective in identifying animals unable to cope with adult liver fluke infection. The important difference should be only to ensure that, on those farms where liver fluke is a problem, an anthelmintic is used that is effective against both the liver fluke and *Haemonchus* spp.

Trichostrongylosis - poor production and growth on one farm (Bührmann) was associated with this problem together with haemonchosis. It is clearly a problem which must be considered, and if present, controlled.

Blue tongue - what appeared to be sudden deaths on one farm were attributed by the farmer to acute haemonchosis, but examination showed that blue tongue was undoubtedly the cause of death.

Pasteurellosis - a similar situation was encountered on one farm but haemonchosis was excluded as the cause of death.

It is well known that young sheep are unable to mount as good a response to worms as are older sheep. This was borne out by our findings - both the graphs and farmer opinions support this observation. Lambs and weaners have to receive special attention.

In common with the results in the preliminary trial at Badplaas, ewes in late pregnancy or early lactation on several farms were clearly more susceptible than other classes to the effects of parasitism. They therefore need closer monitoring in the system.

Low condition scores were a danger sign of sheep unable to cope with parasitism where sheep were in poor condition. Whether due to inadequate nutrition or other causes, such sheep that were poor in condition were unable to respond adequately to challenge.

Obvious bottle-jaw (submandibular oedema) was seen in several cases before anaemia became severe. This emphasised that the sheep must be examined for bottle jaw as well as anaemia.

Wrong interpretation was encountered when some farmers became complacent and too confident of their ability to score sheep without reference to the FAMACHA© card for calibration. This resulted in problems and even losses

Irregular examination was a problem on some farms, and was especially important in the last third of summer. If management on a farm did not ensure that sheep were examined at the prescribed intervals, there could be a sudden worsening of the situation with many anaemic sheep to be treated

Anthelmintic susceptibility must be estimated with the FECR test before using the FAMACHA© system. On one farm where the status of worms' resistance to anthelmintics was unknown at the start, the wrong remedy was used, leading to apparent failure of the FAMACHA© system

CONCLUSIONS

1. It is essential that the principal worm species, as well as those others that could escalate in numbers and importance owing to reduced drenching without being detected by the FAMACHA© system, be known and monitored where the system is to be applied.
2. It is clear from the bar graphs (figures 1-12) that most sheep in the ewe replacement category did not need treatment under conditions of strong challenge by *H. contortus*. Lambs and weanlings; as well as pregnant or lactating sheep were also able to go without treatment of the whole group. However, they do need more careful monitoring and must be treated sooner.
3. A number of problems were identified, none of which were insurmountable. However, they do emphasise the necessity of implementing the system with caution and under proper supervision.
4. In the final analysis, the feasibility and acceptability of such a system has to be judged subjectively by farmers and workers who have to implement it. Their perceptions are presented together (See Table 5). As in all groups the overall positive rating approached 90%, often with two thirds or more rating the system excellent, we need have no hesitation in concluding that in good hands, and subject to the limitations listed in the instructions pamphlet, this system works well and when implemented will be a decided success.
5. Our overall conclusion is that the FAMACHA© system has now been properly tested in field trials and can be released for use by farmers. The training and distribution system needs some organisation and planning, but can proceed in the summer of 2000/2001. On the other hand, vigilance for possible problems must be emphasised.

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