



# ***Fasciola hepatica: Impact on Dairy Production and Sustainable Management on Selected Farms in South Africa***

(PRJ-0107-2016)

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***Quarter 2 2016*** (April 2016 till June 2016)

## **Project goals**

### **Goal 1 - Faecal sampling and worm egg counting : Monthly [Months 1-9]**

#### ***Achievements***

**Cattle faecal sampling and worm egg counting (see Fig. 1-4 below):** As a result of budgetary constraints faecal collection and worm egg counting were discontinued in May 2016 on Farms 1-3, with only Farm 4 being an exception, with faecal egg counts being continued, subject to being able to fund it from the present budget. This continuation is deemed essential, on the grounds that severe fasciolosis was experienced in one age group of dairy cows in September of 2015, hence to allow a comparison up to at least mid summer, for a comparison between the two years of the project.

The results of the monthly worm egg counts are summarised in "DOCUMENT 1 – Goal 1: FAECAL WORM EGG COUNTS (2 nd Quarter – Apr-June 2016)", which is appended to the report.

## ***No Non-achievements / underperformance has been reported***

### **Goal 2 - Faecal sampling and worm egg counting : Ad hoc (Fasciolosis outbreaks & requests by farmers for evaluation of other animal groups) [Months 1-11]**

#### ***Achievements***

In order to evaluate the efficacy of the anthelmintics used, farmers involved in the project have been requested to collect samples of faeces from about 15 cattle, both before and 21-30 days after treatment for *Fasciola* infection, but, despite emphasis on a number of occasions, this has not yet been taken up by them. The need and indeed urgency for specific testing is, however, again being raised in discussion with the farmers involved, since it could be of considerable value to them as an indication of the sustainability of their present worm control measures and the danger of the development of anthelmintic resistance if the control measures do not make

specific provision for averting such resistance. On the other hand, this was not planned as an intrinsic component of the project, and farmer compliance is voluntary.

## **No Non-achievements / underperformance has been reported**

### **Goal 3 - Faecal sample ELISA analysis (if practicable) [Months 10-11+]**

#### **Achievements**

**Faecal sample ELISA evaluation for *Fasciola* antigen:** While this testing was listed initially as a possibly of value as a test for fasciolosis in the project, granted that it could contribute substantially to the accuracy of diagnosis, the laboratories which did the testing previously in the country have ceased to do so, on account of the fact that, as I was informed, the tests did not give a dependable indication of the levels of *Fasciola* infection in infected animals. Thus it was decided in 2015 already not to proceed with this approach to quantification of the levels of *Fasciola* sp. infection on the trial farms.

## **No Non-achievements / underperformance has been reported**

### **Goal 4 - Snail surveys (monthly) (Routine, as in 2015) [Months 1-9]**

#### **Achievements**

**Snail surveys: Below, a short summary of some of the highlights of the snail survey are listed, with details of the snail sampling results being reported in the attached report, "*Fasciola* Proj. DOCUMENT 2 – Goal 4: SNAIL SURVEYS (2nd Quarter-June 2016)".**

In order to manage fasciolosis on affected farms, it is essential to obtain an indication of the seasonal cycling of the intermediate snail hosts of the parasite, in the absence of which reproduction of the parasite is impossible. Furthermore, the larger the populations of snails on the pastures of a given farm, the greater the chances are of occurrence of fasciolosis, and the higher the level of, and losses from fasciolosis are to be expected on it. Hence four trial farms were selected in the Tsitsikamma region, on the strength of farmer observations on the importance of *Fasciola* sp. infection, and monthly visits are being paid to the farms for routine snail recovery as an estimate of the presence and seasonal cycling of the intermediate hosts.

Visits were paid during April, May and June, 2016 to the four farms and on each farm ten samples of mud were collected per occasion from each of the six marshy (muddy) spots, previously selected on the strength of visual evaluation for potential to serve as reservoirs for the snails. The sampled mud was sieved for recovery of the snail intermediate hosts of the two prevalent trematode species in the Tsitsikamma region, namely *Fasciola* and paramphistomid trematode species.

The prime purpose of these surveys is to establish the seasonal cycling of the transmission of the parasite, as a possible approach, at critical times of the year, to be able to base biological control of the parasite on large-scale reduction of the chances of contact between its final hosts (the cattle) and the infective stages of the trematode parasites, sufficient in extent largely to prevent losses in production from infection with the worms, without this being completely dependent on chemicals for control thereof.

**Differences between muddy spots in population by target snail species.** While all the marshy spots selected appeared on visual judgment to be ideally suitable for the intermediate hosts to be able to flourish, spots very close together were found to vary to a large extent in suitability for sustaining snail populations. This variation is of particular interest, as it may have potential for rapid and relatively low-cost evaluation of farms for suitability to population by the snail intermediate hosts of the trematode species involved. On the other hand, it is progressively becoming clear that, for successful investigation to this end, experts in the disciplines of ecology and soil chemistry will have to be consulted as the project progresses.

**Sampling of snails for laboratory investigation:** When relatively large numbers of snails are recovered from any given spot, a few of the individuals are removed for dissection in the laboratory for the presence of immature stages of the worms involved. However, as explained below, low levels of snail recovery during the present report period led to a decision not to remove a total of only about 30 snails from all sampling sites on all of the farms for laboratory evaluation.

**Results over the present report period:** After minimal rainfall over the first two quarters of 2016, spray irrigation was progressively increased especially on two of the four farms. As described above, however, a number of the various sampling spots became partially desiccated despite increased irrigation, to the extent that the soil in a number of the muddy patches was reduced to a firm, though moist state, which complicated processing for snail recovery in the respect that there is a possibility that breaking up the clumps of soil would tend to crush the very friable shells of the snails. In this way there is a possibility of false low estimates of snail numbers in relation to recovery from soft mud, and this led to an adaptation in the method of recovery in those cases through soaking of samples of firm soil in water before they are processed. But some clumps have remained solid even after having been placed in water overnight. On the other hand, the spots with firm soil have remained in the minority, with the result that recoveries from spots with soft mud do serve as a type of control for every one of the trial farms.

## **No Non-achievements / underperformance has been reported**

### **Goal 5 - Irrigation water sampling for worm eggs (When faecal egg counts of trial animals are relatively high) [Months 10-12]**

#### **Achievements**

[While, as explained under Goal 3 above, this is one of the novel approaches planned for future incorporation into the project, its introduction will probably have to be postponed to 2017, or whenever the necessary funding may become available for its execution]

**The origin of the plan:** It is planned to initiate investigation of irrigation water on a small scale, for instance to ascertain to what extent the worm eggs in the water run-off from milking parlours gain access to the pastures, and to find ways to prevent this if indeed found to be of importance.

**The mode of transmission of *Fasciola*** and the paramphistomids encompasses the entire life cycle of the parasite, comprising the chances for:

- (i) the worm eggs in the faeces of the cattle to reach the pastures where the cattle graze;
- (ii) the eggs to land in open water and to hatch; and then to
- (iii) infect the intermediate hosts of the parasites and to develop into the pre-infective stage for cattle in the snails;
- (iv) the immature parasites to emerge from the snails and encyst on herbage as the infective stage, the so-called metacercariae; and
- (v) the metacercariae to gain access to and develop to mature, egg-shedding adults in the bile ducts of their final hosts, the cattle, and commence egg laying to restart the development life cycle.

**Why concentrate on water run-off from milking parlours:** High proportions of the cattle per farm are concentrated on concrete in a small area for some hours each day and all the run-off from washing of the parlours is inevitably collected in a reservoir of sorts, from which pastures are irrigated. In other words, depending on the positioning of the irrigation water intake from such a dam, it seems reasonable to deduce that the chances of the eggs to land in open water in marshy pools on pasture could be considerably enhanced if the eggs entering the reservoir were to be disseminated on pasture. And this will be especially important if, as expounded below in Goal 19, a practical method of management of fasciolosis could be jeopardised by such worm eggs reaching "unprotected" spots on pasture.

## **No Non-achievements / underperformance has been reported**

### **Goal 6 - Worm recovery from livers of slaughtered animals (As and when trial animals slaughtered, or in outbreaks of fasciolosis) [Months 2-12]**

#### **Achievements**

A very valuable set of liver samples was obtained from a drug efficacy test conducted locally. The livers of 12 cattle were homogenised and aliquots of each liver sampled and frozen for future evaluation (when funds become available) as to the numbers of worms per liver (which were recorded at the time of the post mortal processing of the liver tissue). These samples could give a very good indication of the value of laboratory tests, particularly dedicated commercial ELISA kits for conducting *Fasciola* antigen tests, for quantifying levels of infection. And, if indeed accurate and practical, it could constitute a relatively inexpensive way of evaluating the potential of different farms for harbouring the parasite and its intermediate hosts. However, de to budget constraints, this testing will perforce have to be postponed to the 2017 project year.

One further liver from one of the trial farms was also processed by the research team when a cow apparently suffering from fasciolosis, was slaughtered while we were on a monthly visit to the farm. Samples were taken and frozen together with the serum samples being collected from the project cattle for evaluation when the available funding makes this feasible.

## **No Non-achievements / underperformance has been reported**

### **Goal 7 - Serum : Liver enzyme analysis (selected samples) (In relation to egg counts) [Months 10-12]**

#### **Achievements**

**Blood serum analysis for liver enzymes** : This is an assay of intracellular enzymes that are set free from the liver cells and enter the bloodstream during the hepatic migratory phase of the immature *Fasciola* parasite, which literally eats its way through the liver capsule and liver tissue over a period of some weeks, on its way to its final destination in the bile ducts of the host. Depending on the funds on hand towards the end of the project year, liver enzyme analysis, as an indication of immature *Fasciola* migratory activity, is to be done selectively, in relation to faecal worm egg counts after appropriate intervals for the migrating worms to have become adult and commenced egg production.

**Serum samples were recently selected in relation to the seasonal cycling of the parasite and brought to Onderstepoort for analysis during the third quarter of 2016.**

## **No Non-achievements / underperformance has been reported**

### **Goal 8 - Serum : Fasciola ELISA analysis (selected samples) (In relation to egg counts) [Months 10-12]**

#### **Achievements**

As in the case of Goal 7, arrangements are being made to have a selection of the samples evaluated.

## **No Non-achievements / underperformance has been reported**

## **Goal 9 - Questionnaire : On-farm execution (Outsourced) [Months 3-12]**

### ***Achievements***

[As explained before, the questionnaire may be launched only on a small scale during the present project year, and be continued into 2017 or later, depending on the availability of the necessary funding]

***No Non-achievements / underperformance has been reported***

## **Goal 10 - Technology transfer (Oral and written) [Months 3-12+]**

### ***Achievements***

1. An interview of JvW with Mr Hennie Maas was broadcast on the RSG radio station, and a video'd interview made at the same time for technology transfer;
2. An article of JvW was published in two parts, in separate numbers of the local dairy industry periodicle.
3. A presentation was given by JvW at the time of one of the management meetings of MILKSA in Pretoria, on fasciolosis, and the aims of the present project

***No Non-achievements / underperformance has been reported***

## **Goal 11 - Training of farm workers in snail surveying (When snails high in number) [Months 2-12+]**

### ***Achievements***

On two of the trial farms stockmen help with snail recovery from the various muddy spots on the farms involved. They also help with the sieving that is entailed in the work, and in the process, they are informally trained as regards the parasites involved, their recovery from marshy patches and their relationship to the various species of snail. A total of about 5 workers have been trained in this way, and the general level of interest is high. For example, questions are posed on the parasite-snail relationship, the effect of the parasites, and some enquire about the names of the different snail species. In the process of the training one of the helpers suggested a shorter method than what we were using at the time for detecting snails intertwined with organic material, such as grass leaves and roots in mud samples. This has greatly improved the speed of processing of such samples, something that is very welcome, given the fact that the amount of such organic material encountered in the samples has increased considerably over the past six months. Snail identification has not been part of the training and is probably unlikely to be included in the future, as a result of the fact that the identification is not straightforward, to the extent that we also need to consult experts from time to time, in the field of identification.

***No Non-achievements / underperformance has been reported***

## **Goal 12 - Soil & Grass : Sampling for detailed analysis: Snail antigen detection (Developing more convenient method for routine snail prevalence evaluation) [Months 8-10]**

## ***Achievements***

[For the reasons explained above, the soil and grass sampling may not be launched during the present project year, but instead be conducted in 2017 or later, subject to the availability of the necessary funding]

## ***No Non-achievements / underperformance has been reported***

### **Goal 13 - Soil : Sample analysis (Chemical & Physical) [Months 8-11]**

#### ***Achievements***

[For the reasons explained above, the soil sample analysis may not be launched during the present project year, but instead be conducted in 2017 or later, depending on the availability of the necessary funding]

## ***No Non-achievements / underperformance has been reported***

### **Goal 14 - Plant survey (marshy patches on pasture): Snail preference analysis [Months 8-11]**

#### ***Achievements***

[For the reasons explained above, the plant survey may not be launched during the present project year, but instead be conducted in 2017 or later, depending on the availability of the necessary funding]

## ***No Non-achievements / underperformance has been reported***

### **Goal 15 - PCR : Soil (mud) & Grass analysis: Snail antigen (Developing more convenient method for routine snail prevalence evaluation) [Months 9-11]**

#### ***Achievements***

[For the reasons explained above, the PCR analysis may not be launched during the present project year, but instead be conducted in 2017 or later, depending on the availability of the necessary funding]

## ***No Non-achievements / underperformance has been reported***

### **Goal 16 - Polymerase chain reaction (PCR) : Developing methodology in the lab: Snail antigen detection [Months 6-10]**

#### ***Achievements***

[For the reasons explained above, the PCR analysis development may not be launched

during the present project year, but instead be conducted in 2017 or later, depending on the availability of the necessary funding]

***No Non-achievements / underperformance has been reported***

### **Goal 17 - Small, preliminary Fasciola management trial [Months 2-12+]**

#### ***Achievements***

[As explained under Goal 3 above, present constraints in funding may necessitate postponement of completion of Goal 17 to 2017, particularly as it may be necessary for local supervision of the trial to be outsourced to the resident CapeCross Veterinary Services practice]

***No Non-achievements / underperformance has been reported***

### **Goal 18 - Data analysis [Months 9-12+]**

#### ***Achievements***

[Preliminary analysis of the snail recover and egg counting data is being evaluated in the form of graphs for depicting the results. While these are very valuable as indication of progress made, it has not included statistical analysis to date, as this is scheduled for the latter stages of the first part of the project. Furthermore, as explained under Goal 3 above, present constraints in funding may necessitate postponement of completion of Goal 18 to 2017; in addition to data from the project, there is a great deal of principally milk production data from at least one of the farms, that could potentially be of great value to the project. Hence a partner with the necessary experience for sophisticated evaluation of the data is presently being sought.]

***No Non-achievements / underperformance has been reported***

### **Goal 19 - Preliminary, tentative recommendations for sustainable Fasciola management [Months 10-12+]**

#### ***Achievements***

One approach that has been in the planning stage and suggested to various persons involved over the period, is to make use of a novel approach to strategic fencing of snail-infested marshy spots on pasture, to be able to attempt, at times of potential high levels of challenge of the cattle, to limit contamination of snail-infested marshy spots on pasture with faeces from infected cattle, in this way to break the life cycle string of the parasite. To this end, plans have been formulated for sustainable management, and a farmer approached for institution of small-scale evaluation of the novel approach. While it has not been taken up as yet, this is to be pursued during the present project year. One stumbling block, however, is that the farmers involved in the project, are so involved in the milking routine, that it is even difficult to have in-depth discussions with them during our monthly visits.

***No Non-achievements / underperformance has been reported***

## **Income and expenditure statement**

Income and expenditure statement	<a href="#">A0Y005 - Milk SA Financial Report - 30 June 2016.pdf</a>
Unnecessary spending during period	No

## Popular Report

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## Additional documentation

[MelkSA-2e Kwartl'IVerslag-Slak-15Jul-2016.docx](#)  
[MelkSA Fasciola-VrdrsgVrslg EPGs-2e Kwrtl-2016.docx](#)

## Statement

Levy funds were applied only for the purposes stated in the contract	Yes
Levy funds were applied in an appropriate and accountable manner	Yes
Sufficient management and internal control systems were in place to adequately control the project and accurately account for the project expenditure	Yes
The information provided in the report is correct	Yes