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

(PRJ-0107-2016)

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Quarter 4 2016/2016 (October 2016 till December 2016)

Project goals

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

Achievements

As reported before, budgetary constraints led to termination of faecal collection and worm egg counting on Farm 1-3 in May, 2016, but not on Farm 4, where it was deemed necessary to continue, due to clinical fasciolosis having been encountered there in September 2015.

It is unfortunate that the faecal worm egg counting could not be continued with, for the reason that the snail survey is indicating lower levels of prevalence and incidence of the intermediate hosts of Fasciola, and it would have been very valuable to be able to correlate overlapping monthly results over the rainy season of 2015 and 2016.

The results of the routine counts are presented in "MelkSA Fasc-EPGs-3e Kwrtl VrgsVrslg-2016RCfin", 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. However, despite repeated emphasis, this was not done, and now the opportunity has passed, due to the budgetary constraints mentioned. On the other hand, it is strongly to be recommended that such testing should be done, as the paucity of effective anthelmintics and the serious deleterious effect that *Fasciola* sp. has on the production of dairy cattle makes it essential that farmers test, in order to receive an early warning if repeated drenching is perhaps leading to resistance of the parasite.

No Non-achievements / underperformance has been reported

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

Achievements

As stated in the second quarterly report of 2016, the laboratories which conducted ELISA testing for worm antigen in faeces ceased to do so, on account of the fact that, as reported to me, the tests did not give a dependable indication of the levels of *Fasciola* infection in infected animals. Furthermore, budgetary restraints preclude further investigations in this field for the foreseeable future, unless considerable additional funding can be obtained. It will also be necessary to obtain new sets of samples from infected animals.

No Non-achievements / underperformance has been reported

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

Achievements

Snail surveys: While some of the highlights of the snail survey are listed below, the details of the latest snail sampling results are reported in the following document: "*Fasciola* Proj. DOCUMENT 2 – Goal 4: SNAIL SURVEYS (3rd Quarter-Sept 2016)".

On each of the four farms ten samples of mud *were collected in similar fashion 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 mud samples were 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 numbers of the intermediate snail hosts of *Fasciola* sp. recovered from time to time give a rough estimate of not only the potential effect the parasite could have on the production of susceptible hosts, but also of the seasonal cycling of the snails. The latter is important not only as an indication of the risk to the animals exposed to infection at any given time, but also in relation to climatic conditions such as rainfall and temperature. Hence four trial farms were selected in the Tsitsikamma region, on the strength of farmer observations on the importance of *Fasciola* sp. infection, and visits to the farms were continued throughout 2016 for routine snail recovery and evaluation.

A further reason for persevering with the snail surveys over the course of the project is that the results may lead to suggestions for methods of biological control or at least large-scale reduction of the chances of contact between the final hosts (the cattle) with the infective stages of the trematode parasites, in this way to reduce the dependence on chemicals for the control of fasciolosis.

Differences between muddy spots in population by target snail species. While all the marshy spots selected appeared on visual assessment to be similarly suitable for propagation of the intermediate hosts, it is clear from the results that spots situated very close together 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, as well as for highlighting those spots which need to be specially considered when methods of biological control are developed and tested.

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, the numbers had to be reduced to very low levels, so as to have the minimal effect on the levels reached during the seasonal cycling.

Results over the present report period: No specific rainfall figures have been obtained for the duration of the project (this is to be done for further evaluation of the results of the project) but were lower than over the corresponding periods of 2016. Furthermore, irrigation has been common at times when the rainfall was inadequate. This latter was of great help regarding the

recovery of snails from the mud, for the reason that the muddy patches mostly contained spots of soft mud, in contrast to the less moist, firm mud, from which it is difficult to recover snails that happen to be present.

As can be seen from the series of graphs in the attached report, considerably smaller numbers of snails were recovered monthly during 2016 from the sampling spots on each of the four farms, than the mean monthly recovery for 2015. However, the numbers of snails recovered from Farms I, III and IV have risen considerably over the latter half of 2016. Furthermore, of special importance is that, on Farms I, II and IV where practically no snails were recovered from the sampling spots that were subjected to major earthworks for improved drainage thereof, the snails have subsequently been returning progressively over the course of 2016.

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

As discussed in detail in the second quarterly project report, the aim with this part of the project is to ascertain to what extent the Fasciola sp. worm eggs in the run-off of the milking parlours gain access to the pastures of the animals via irrigation from these dams, as this could constitute an important source for infection of the intermediate hosts of *Fasciola* parasites in muddy spots on pastures irrigated with this water.

As explained previously, this is one of the novel approaches planned for future investigation as part of the later stages of the project. However, while it was envisaged for investigation during 2017, the latter budget does not allow for pursuance of this potentially valuable approach within the near future.

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

There is no new information concerning Goal 6, and there have been no funds available for analysis of the stored samples, hence this needs must be postponed to an indeterminate later date.

No Non-achievements / underperformance has been reported

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

Achievements

GGT and GLDH enzyme analysis was recently launched on a batch of selected samples that is too small for meaningful interpretation of the results as yet. However, the preliminary results (included in **[DOCUMENT 1 - *Fasciola* Project - Goal 1: FAECAL WORM EGG COUNTS 2016].**

The few samples included in the initial analysis were selected to span May-October 2015 (the

only time when an episode of clinical fasciolosis was encountered on any of the farms during the course of the project) for both Farm IV (where the clinical cases of fasciolosis occurred) and "negative" Farm III. Being so small in number, the results should be regarded as of very preliminary nature, but are encouraging nonetheless, as regards apparently having been able to pinpoint the period of prime *Fasciola* sp. challenge on Farm IV. And, fortunately, funding allocated will allow the analyses to continue on a small scale during 2017.

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 above, the project budget did not allow ELISA testing to be launched. Furthermore, seen against the background of practically year-round presence of the *Fasciola* sp. intermediate snail hosts and thus the potential for transmission of the parasite over much of the year, the long half-life of the *Fasciola* sp. immune antibodies in the host and the fact that their levels do not accurately reflect parasite numbers, the considered opinion is that less advantage is to be expected in relation to input from ELISA antibody assay, than from that of the liver enzymes circulating in the bloodstream. The latter, in contrast, have the potential to reflect actively migrating, immature parasites, i.e. those which cannot be detected by the conventional tests, such as faecal worm egg counts. Furthermore, the institution, calibration and confirmatory testing of the assay at Onderstepoort will be costly in relation to the funds available, to continue with liver enzyme analysis of stored serum samples when practicable, since this is a routine test at Onderstepoort, and considerably less costly.

No Non-achievements / underperformance has been reported

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

Achievements

The funds available for 2016 did not, and those of 2017 do not allow any leeway for execution of the small-scale survey. Furthermore, the survey has more bearing on the next phase of the project, i.e. the expansion of the results of the project to farms with problems with fasciolosis, than in Phase 1. Hence the survey cannot be regarded as a priority at present.

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

As explained in the second quarterly report for 2016, the training of farm workers is an on-going process involving workers who are made available to the project team during the monthly snail surveys. In the process, the team is gaining experience concerning the way in which later training is to be structured, in order for the end-results to be useful to a wide range of farmers in the control of the parasite. However, at the available funds do not allow for any further development of this initiative.

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

In the light of the shortage of funds, as mentioned above, the soil and grass sampling for snail antigen detection could not be launched during the 2016 project year. However, soil analysis is to be initiated in the 2017 contract year, and proceed to the limit of the available funds.

No Non-achievements / underperformance has been reported

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

Achievements

In the light of the shortage of funds, as mentioned above, the soil and grass sampling for snail antigen detection could not be launched during the 2016 project year. However, soil analysis is to be initiated in the 2017 contract year, and proceed to the limit of the available funds.

No Non-achievements / underperformance has been reported

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

Achievements

In the light of the shortage of funds, as mentioned above, and in common with soil and grass analysis, it is not possible to launch the plant survey during the 2017 project year, but instead be conducted in 2018 or probably later, as and when the necessary funding may become available, and granted the availability of a project team at that time.

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

In the light of the shortage of funds, as mentioned above, it was not possible to launch the PCR analysis of soil and grass for the detection of snail antigen in 2016, since this will entail considerable develomental work in the laboratory, for which the necessary funds are not available for the project contract year, but preparatory work is to be done in 2017 for launching in 2018, granted the necessary funds.

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

In the light of the shortage of funds, as mentioned above, it was not possible to develop the methodology in the laboratory in 2016 for detection of snail antigen, but preparatory work is to be done in 2017 for launching in 2018, granted the necessary funds.

No Non-achievements / underperformance has been reported

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

Achievements

As explained above, present constraints in funding may necessitate postponement of completion of Goal 17 to 2018, particularly as it may be necessary for local supervision of the trial to be outsourced to the resident CapeCross Veterinary Services practice. However, preparations for the trial are to be done in 2017 for launching in 2018, granted the necessary funds.

No Non-achievements / underperformance has been reported

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

Achievements

Preliminary analysis of the snail recovery and egg counting data is being done 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 above, present constraints in funding may necessitate postponement of completion of Goal 18 to 2018.

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 as an adjunct to the results being obtained in the project. Hence a continuous search is being conducted for the necessary funding for this initiative, and a partner with the necessary experience for sophisticated evaluation of the data.

No Non-achievements / underperformance has been reported

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

Achievements

No further progress with the conduction of the envisaged small trial can be reported at present, principally also due to the lack of funding, which precludes the necessary developmental work and visits to the farm concerned in relation to the conduction of the trial.

No Non-achievements / underperformance has been reported

Income and expenditure statement

Income and expenditure statement	A0Y005-Milk SA Financial Report-31Dec2016.pdf
Unnecessary spending during period	No

Popular Report

Fasciola 2016 Proj Opsomm 4de Kwrtl-fin-b.docx

Additional documentation

MelkSA-Fasc-Slakke J'r-2016f RC2-JvW-fin2017a.docx
MelkSA Fasc-EPG+Ens'm-4e Kwrtl-2016 RC-JvW-fin.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