



<b>Project Title:</b>	RELACS: Replacement of Contentious Inputs in organic farming Systems
<b>Project number:</b>	773431
<b>Project Acronym:</b>	RELACS
<b>Proposal full title:</b>	Replacement of Contentious Inputs in organic farming Systems
<b>Type:</b>	Research and innovation actions
<b>Work program topics addressed:</b>	SFS-08-2017 Organic inputs – contentious inputs in organic farming

## Deliverable No D4.4 Publishable report on quantitative data from on farm evaluations of alternative parasite control strategies

<b>Due date of deliverable:</b>	30 April 2022
<b>Actual submission date:</b>	26 April 2022
<b>Version:</b>	v1
<b>Main Authors:</b>	Spiridoula Athanasiadou (SRUC), Ana Allamand (Soil Association), Veronika Maurer (FiBL)



This project has received funding from the *European Union's Horizon 2020 research and innovation programme* under grant agreement No 773431



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<b>Deliverable title</b>	Publishable report on quantitative data from on farm evaluations of alternative parasite control strategies
<b>Deliverable number</b>	4.4
<b>Deliverable version</b>	V1.0
<b>Contractual date of delivery</b>	30.04.2022 (M48)
<b>Actual date of delivery</b>	26.04.2022 (M48)
<b>Document status</b>	Submitted
<b>Document version</b>	V1.0
<b>Online access</b>	
<b>Diffusion</b>	PU (Public)
<b>Nature of deliverable</b>	Report
<b>Workpackage</b>	WP4
<b>Partner responsible</b>	SRUC
<b>Author(s)</b>	Spiridoula Athanasiadou (SRUC), Ana Allamand (Soil Association), Veronika Maurer (FiBL)
<b>Editor</b>	Joelle Herforth-Rahmé
<b>Approved by</b>	Lucius Tamm (FiBL)
<b>REA Project Officer</b>	Camilla La Peccerella

<b>Keywords</b>	Gastro-intestinal nematodes, parasites, biocontrol, condensed tannins, <i>Duddingtonia flagrans</i> , <i>Calluna vulgaris</i>
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## 1. Executive summary

The ongoing RELACS research into alternative gastro-intestinal nematodes (GIN) control strategies including the use of heather as a bioactive forage and the nematophagous fungus *Duddingtonia flagrans*, as a biocontrol agent was discussed in focus groups in four European countries. Farmers interested in trialling either alternative volunteered to participate in the trials to gather quantitative and qualitative data on their use. A total of seven farmers from 3 different countries participated on these trials. The experience was mixed, but through this project we have shown that there is a lot of appetite for this type of work, and farmer interest in participating in such projects.



## 2. On-farm trials in the UK

Eleven farmers participated in the focus group discussion in the UK and 5 farmers came forward for on-farm trials: two tested heather grazing and three tested the fungus.

On each farm, trial animals were divided into two groups: i) treatment group, receiving either the *D. flagrans* or the heather; ii) the control group, which was managed according to each farmer's standard practices. Trial duration was approximately 6 - 8 weeks and took place over spring/summer 2021. The animals in the heather group had access to and grazed heather daily. Control animals did not have access to heather. Animals in the *D. flagrans* treatment group received 1g spores / 100kg body weight in their feed daily. Control animals received no spores. Control and treatment groups of animals were separated from each other with fences.

Samples were taken at two timepoints -immediately before the trial and at the end of the trial period- and included: i) faecal samples; ii) body weight and/or body condition score (BCS); iii) health information, including anthelmintic treatments if required; iv) farmers' feedback on their experience using the alternative. Due to the nature of the trials it was not possible to do any statistical analysis, so the results are reported in a descriptive manner.

Table I presents the results from the five trials. In brief:

Heather treatment:

- Faecal Egg Count (FEC): No clear anthelmintic effect of heather was observed. On one farm the mean FEC remained the same for the heather group and reduced slightly in the control group with time. On the other, the FEC were very low throughout the trial making it difficult to detect any impact.
- Performance (BCS and/or weight gain): No clear impact. On one farm the heather group maintained BCS while the control group incurred a slight loss over time. On the other, the heather group had slight loss and the control group a slight gain over time.
- Health information: On one farm one individual was treated for scours in the heather group during the trial, using apple cider vinegar and garlic. The other farmer reported issues with ticks on 4/6 of the heather group, only 1 in control group.
- Farmer experience: One farmer did not think heather resulted in savings on financial costs. Instead, she highlighted potential risk on health/welfare from ticks in heather group, pain/irritation and transmissible diseases (although not to worrying levels). One farmer considered grazing on heather required additional management efforts: larger fields meant more walking time to check and feed all sheep (done twice a day). Although the undulating heather field provides more shelter for the sheep, there were also more danger areas, like one ewe that got stuck in a bog overnight.

Fungus treatment:

- Faecal Egg Count (FEC): No clear anthelmintic impact of the fungus administration. On one farm, the fungus reduced FEC by 1/3, whereas on the other it increased; on the third one several samples were missing, however data indicate a FEC reduction in the fungus group.
- Performance (BCS and/or weight gain): fungus treated group increased their BCS (+0.8) over time compared to control (+0.3) on one of the farms. Control groups very marginally gained more weight than fungus group on two farms.
- Health info: No health problems were reported.
- Farmer experience: One of the farmers observed dung beetles in both the fungus and control areas. Another farmer reported that the effort required to administer the fungus was extensive, even to 4 sheep, and he would not be motivated to do so in the future based on the results, especially on larger groups of animals. He would be looking for an alternative that achieved at least 70% control and mentioned he would only be prepared to spend 'slightly' more on alternative GIN controls than traditional controls.



Farmer	1	2	3	4	5
Alternative	Heather	Heather	Fungus	Fungus	Fungus
Target group	Ewes (lambs afoot)	Growing sheep	Ewes (lambs afoot)	Ewe hogs and gimmers	Ewes (lambs afoot)
n control	7	3	8	9	3
n treatment	7	4	8	9	4
FEC	No obvious effect	FEC too low throughout to detect differences	Treated reduced by 115 epg, control by 52 epg	Incomplete data to draw conclusions	Treated increased, control stayed same
BCS	Treated maintained, control lost BCS	Treated slight loss, control slight gain	NDA	Treated gained 0.8, control gained 0.3	NDA
Weight	NDA	NDA	NDA	Treated gained 9.3 kg, control gained 12.8 kg	Treated lost 1 kg, control gained 1 kg

\*NDA: no data available

Table 1. Summary of RELACS UK farm trial results on alternative GIN controls



### 3. On-farm trials in Switzerland

Ten farmers were involved in the focus group discussions in Switzerland and one farmer came forward for an on-farm trial with *Duddingtonia flagrans* (DF).

As soon as the weather permitted (End of May 2021), 26 male goats originating from different farms across Switzerland arrived at the alpine farm “Geissenparadies” at Göschenen, Switzerland (1'700m altitude). Faecal samples were analysed prior to their arrival and animals with FEC >1'000 were treated with an anthelmintic. For four weeks they grazed together on one plot to expose them to an even parasite pressure regardless of their origin.

The group was then divided and for the rest of the alpine season two groups of 13 animals each grazed separate areas.

According to the plan, group 1 received the DF feed supplement daily with some concentrate (DF group); group 2 received the same amount of concentrated feed daily without the DF feed supplement. Per kg live weight, 0.01g feed additive should have been fed, which corresponds to a dosage of  $10^5$  spores/kg live weight.

A faecal sample was taken rectally from the animals after their arrival and subsequently every 4 - 6 weeks and examined for GIN eggs (4 times in total). At the same time, animals were weighed. The last sampling/weighting took place at the end of the regular alpine season. The animals then returned to their home farms.

Due to the late start of spring, the trial could only start late, and as a consequence the feeding period of the fungus was only 8 weeks instead of 14 as planned. Several animals suffered from pneumonia and had to be treated or returned to their home farms earlier than planned. Therefore, the staff's priority was on caring for the animals and not on feeding the additive, which was given irregularly, two or three times per week.

The feed additive was eaten by the goats without any problems. However, at the end of the trial no positive effects on worm infestation nor on live weight of the animals could be observed. This lack of evidence can be caused by several reasons:

- very inhomogeneous animals in the groups (different breeds, ages, body condition scores at the start of the trial, history of anthelmintic treatments)
- smaller groups (2x13) than planned (2x20)
- high altitude causing slow development of GIN on pasture; therefore, duration of the trial was too short
- irregular and too infrequent feeding of DF.





## 4. On-farm trials in Germany

Four farmers were involved in the focus groups discussions in Germany. An on-farm trial with dairy sheep in Germany was planned for the grazing season 2021 by FiBL, SBT and Naturland in collaboration with the farm “Friesische Schafskäserei” at Tetenbüll in Germany. Due to the requirement for an elaborate approval procedure in Schleswig Holstein, permission could not be obtained in time to take place in 2021; the trial is now planned for 2022 (starting April 19th) and will last beyond the lifetime of RELACS.

The herd of 140 dairy ewes will be divided into two groups of 70 animals each, stratified by age and date of last lambing. The two groups will graze separate areas during the whole summer period or at least for 16 weeks. Otherwise, groups only differ in that the DF group will receive the DF feed supplement daily with their concentrate feed, while the control group will receive concentrate feed only. 1 g feed supplement is fed per 100 kg live weight, which corresponds to a dosage of  $10^5$  spores/kg live weight.

All animals will be weighed three times (at start, 10-12 weeks after start and at the end of the experiment). In addition, a rectal faecal sample will be taken in each case and examined using the McMaster method. If the values are too high ( $> 15,000$  EPG or according to the assessment of the farm managers and/or herd veterinarians), an anthelmintic will be administered. These treatments are included in the evaluation together with the main outcome parameters live weight development and faecal egg count.



## **5. On-farm trials in France**

Seven farmers participated in the focus groups discussions in France. Unfortunately, due to the timing of the trials it was not possible to have any on-farm trials in France.



## 6. Conclusions from the on-farm trials

Both alternatives tested here have shown a lot of potential as alternatives to anthelmintics but should not be seen as new drugs to completely replace traditional anthelmintics. Instead, they should be seen as tools which, together with others, will help address worm load on animals. We believe that the way forward is for farmers, advisors, certification bodies, etc. to change their way of thinking about worm control, adopting a more holistic approach rather than a “silver bullet” one. Important points to consider that support this holistic approach: i) we don’t need to target 100% efficacy; immune response and nutrition will help towards achieving control, ii) alternatives are best when used in a strategic manner to reduce pasture contamination, and iii) alternatives should be considered as tools in a toolkit to reduce anthelmintic use.

It is important to be aware of the limitations of our alternatives, for example logistical limitations (e.g. daily feeding of spores by farmers was difficult, or the fact that many farmers do not have access to heather) and gaps in knowledge around these alternatives (e.g. we are still unclear on the active compounds in heather, and the reasons of variation of the compounds in heather).

Farmers and advisors agree that alternatives may come at a slightly higher cost, but this is not prohibitive and therefore they have expressed they don’t think that would be a deterrent to uptake. What will be critical for uptake is to convince health experts (e.g. vets, advisors) of the importance and usefulness of the alternatives as a tool to reduce the use of conventional anthelmintics and improve health and welfare.

Through the project, the need for more on-farm trials became clear; we need to reduce the complexity of the legal procedures required to be able to run on-farm trials particularly at some European countries.

Finally, we have also become aware that innovation uptake would be promoted if we can improve the flow of information and facilitate communication and knowledge exchange between farmers from different countries. As they share experiences and know-how, these “champions” can show other farmers that these alternatives are an effective option from a real-life and practical perspective, which is a relevant driver for farmers when adopting new practices and/or products.



## 7. Dissemination activities related with the Deliverable

### 7.1 Presentation of the results at farmer participating activities

In 2022, farmer (and other stakeholders) participating activities, such as seminars were scheduled, and the results were disseminated in these groups.

- 9 February 2022 (organised by Pasture for Life)
- 8 April 2022 (organised by the Soil Association): this online event was recorded and can be accessed on the Soil Association's YouTube page (<https://youtu.be/kIKK42TLYHs>)

In addition, one practice abstract (PA) and a news-story (NS) are currently being drafted; the PA is on the available approaches for parasite control in organic livestock and the NS on the farmers trials during RELACS. Both will be disseminated to farmers that have participated in RELACS and beyond via the channels of communication of IFOAM-EU and the [RELACS website](#) under "Resources".