

## Extended Abstract

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<b>Paper/Poster Title</b>	<b>Farmers' Management of Nematode Infection Risk in Sheep</b>
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<b>Abstract</b>	<i>200 words max</i>
<p>Livestock productivity and profitability are threatened by gastrointestinal nematode parasites, but farmers can mitigate this problem using different management strategies. In this study, we examine farmers' preferences for detecting, preventing, and treating gastrointestinal parasites in sheep and the economic consequences of these choices, using Swedish survey data. The results show that treatment decisions are informed by fecal testing. Both testing and treating are influenced by the prevention methods chosen, risk factors, economic incentives, access to information, and whether farmers are organic or conventional producers. Based on the estimation results, we conclude that treatment without prior testing is more profitable than informed treatment.</p>	
<b>Keywords</b>	farm decision, management of nematode, sheep infection, profit
<b>JEL Code</b>	Q1, C2 see: <a href="http://www.aeaweb.org/jel/guide/jel.php?class=Q">www.aeaweb.org/jel/guide/jel.php?class=Q</a>
<b>Introduction</b>	<i>100 – 250 words</i>
<p>Livestock productivity depends on the efficiency of detection and treatment measures of microbial diseases, pests, and parasites and how these measures are used in combination with other factors of production and technology. Disease management can therefore have a substantial impact on the economic viability of livestock farms. Livestock production is an integral part of agriculture throughout Europe, where sheep represent one of the main production sectors. Profitability of sheep production is challenged by parasitic gastrointestinal nematodes (GINs), which affect host behavior and health in a variety of ways that directly or indirectly reduce productivity, resulting in potentially fatal diseases in ruminants if left untreated.</p> <p>Studies that examine how real-world livestock disease testing and treatment decisions are determined by farmers' characteristics, input choice, production practice, wild cervid interaction, and prevention mechanisms within a single framework are lacking. We aim to fill this literature gap using farmer-level survey data from Sweden for the analysis of farmers' revealed preferences for testing and treatment, and the associated impact on farm net revenues.</p> <p>The purpose of this study is to examine farmers' revealed preferences for GIN management strategies, including testing and treating gastrointestinal parasites in</p>	

sheep, and the impact of these strategies on farmers' profits. Using results that are cross validated under different model assumptions, we present evidence on the determinants of farmers' choice of fecal testing for GIN and deworming choices.

## **Methodology**

*100 – 250 words*

Livestock diseases can lower the productivity of animals. Disease management practiced by farmers involves economic considerations that require a trade-off to be made between the expenditures on control and revenues foregone due to lower productivity. We develop a simple model to illustrate this trade-off.

We examine factors that determine farmers' sheep disease control choices using outcome variables that reveal farmers' testing and treating (deworming) practices. The nature of the two outcome variables allows empirical analysis using both ordinal and categorical outcome models. We conduct the main analysis based on a model assumption that decision outcomes are generated by a two-stage choice mechanism, which is described using the zero-inflated ordered probit model. We cross-validate the robustness of the results to alternative model assumptions.

We examine the economic value of deworming using two outcome variables: the number of lambs per ewe and weights of the lambs (in kilograms) at slaughter. We estimate a linear relationship between the outcome variables and explanatory variables accounting for time invariant municipality level characteristics.

The data of the study comes from an online questioner that was sent out to all sheep farmers in Sweden. We received responses from 3949 farmers, which is equivalent to 46.6% of the 8476 sheep farmers registered in 2019 by the Swedish Board of Agriculture.

## **Results**

*100 – 250 words*

The results show that testing and treatment choices depend on preventive measures undertaken as well as on farmer and farm characteristics and potential wildlife-livestock interactions. In addition, the results show that deworming practices yield an average increase in the number of lambs per ewe of 5%. However, a similar effect is not observed for the slaughter weight of sheep. A back-of-the-envelope cost-benefit calculation shows that for the average farmer, deworming without fecal testing is economically more beneficial (a profit of EUR 4.54 per ewe) than deworming after first testing for and verifying the presence of parasites, which results in a lower profit (EUR 2.56 per ewe).

**Discussion and Conclusion****100 – 250 words**

Estimation results are not sensitive to model assumptions. Decision to deworm and the intensity of treatment are informed by conducting fecal tests. Farmers who conduct fecal testing are more likely to deworm implying informed decision making. Purchases of forage, buying live animals, and organic farming are perceived to increase infection risks. Farmers who practice alternative measures are also more likely to test, thus cautious.

We do not see the expected trade-off between control and inputs. Possible explanation is that farmers do not make such trade-offs because they have a strong preference for disease control.

Similar effects on output of informed and uninformed treatment suggests that economic value of testing might be low.

Farmers who are economically dependent on sheep test and treat more and they have higher productivity. Organic farmers are more likely to test but less likely to deworm implying environmentally motivated decision making. Qualified advice (from a veterinarian) increases farmers' willingness to pay for disease prevention and control; however, no observable economic gain. Future studies that track farmers' decisions over time will be able to capture the dynamic interaction between market factors, climate change and GIN control choices.