The Costs of Biosecurity at the Farm Level: the Case of Finnish Broiler

Siekkinen K.-M. [1], Heikkila J. [2], Tammiranta N. [1] and Rosengren H. [1]

[1] Risk Assessment Unit, Finnish Food Safety Authority Evira, Helsinki, Finland
[2] MTT Economic Research, Agrifood Research Finland, Helsinki, Finland

Abstract— **In the European Union, the animal health and food safety strategy includes managing biosecurity along the entire production chain. Farm-level biosecurity provides the foundation for this. However, the farm-level costs of preventive biosecurity have rarely been assessed. Yet many risk management practices are in place constantly regardless of whether there is a disease outbreak or not. We contribute towards filling this information gap by studying the costs incurred in preventive biosecurity by the Finnish poultry farms. In a preliminary analysis, we find that the cost of biosecurity is some 3.55 cents per bird for broiler producers and 75.7 cents per bird for hatching egg producers. The results indicate that work-time devoted to biosecurity represents some 8% of total work time on broiler farms and about 5% on breeder farms.**

Keywords— **Biosecurity, on-farm costs, poultry**

I. INTRODUCTION

Biosecurity can be defined as the exclusion, eradication, and effective management of risks posed by pests and diseases to the economy, environment and human health [1]. Risk management of biological hazards such as pests, pathogens and diseases can be broadly divided into i) actions that take place before the biological hazard has materialised (preventive measures); ii) actions that take place during an outbreak (eradication); and iii) actions aimed at reducing the consequences of the presence of the hazard.

A disease outbreak is likely to increase the costs of biosecurity, but many risk management practices are in place constantly, regardless of whether there is an outbreak or not. In several assessments of costs of epidemics it seems that it has not been taken into account that certain proportion of the biosecurity costs is encountered at all times, and cannot be attributed to the epidemic in question. A number of recent studies have identified the key on-farm biosecurity measures in production of beef [2], pork [3,4] and poultry [5,6]. There are also studies that have assessed the benefits of preventive actions in general [7], as well as studies on farm level economics related to animal diseases [8,9]. However, the farm-level costs of preventive biosecurity measures have generally not been assessed. The only study that the authors are aware of is [10], but there the primary interest is in assessing the total cost components in broiler production, and hence only vaccination and medication costs were included in the study.

It is important to study these farm level costs for several reasons. First, farm level biosecurity provides the foundation for biosecurity in the entire production chain. This is important in the European Union (EU), where the animal health and food safety strategy includes managing biosecurity along the entire production chain. In the case of poultry production, this approach is not the one adopted by all major producer countries. The second reason to consider farm level costs is that they in part determine the incentives that producers have in providing biosecurity, which is to a large extent a weakest (or weaker) link public good. Third, the EU is currently looking into several cost-sharing schemes related to animal diseases [11], where biosecurity is intended to be a factor in the cost-sharing strategies. The current level of expenses incurred by the different parties, including producers, is a factor to take into account in cost-sharing. The distribution of costs and benefits of animal disease outbreaks and policies has recently been highlighted as a topic that requires further study [12].

As mentioned, surprisingly few studies have been undertaken to determine the current level of costs of biosecurity at the farm level. We contribute towards filling this information gap by studying the costs incurred in preventive biosecurity by the Finnish poultry farms. Some preliminary results from the exercise are presented here.

II. METHODS AND DATA

Data on farm-level biosecurity costs were acquired through a phone survey of Finnish poultry farms. As the objective was to acquire reliable data and avoid double-counting the costs, personal interviews were used to get complete replies to complex issues from the appropriate respondents [13]. The interview was semi-structured: all producers answered the same set of questions but their answers were not restricted in any way. This type of data-acquisition is laborious. Therefore the sample population cannot be very large, in our case 17 broiler producers and 5 hatching egg producers. For both production types the sample size corresponds to about 10% of Finnish producers.

The questionnaire included different types of actions related to biosecurity. Only actions taken primarily for disease management purposes were included. The answers given by producers were in either euros (for direct costs or purchased services) or in hours of labour, which were converted into euros using an hourly wage rate of 12 euro/hour, the figure used in FADN accountancy. The average size of the studied farms is somewhat larger than the average size of all broiler farms in Finland. Production of poultry meat in Finland is vertically highly integrated, and the proportion of farms for each processor in the sample is consistent with the market share of the three poultry meat processors in Finland. A summary of the data is given in Table 1.

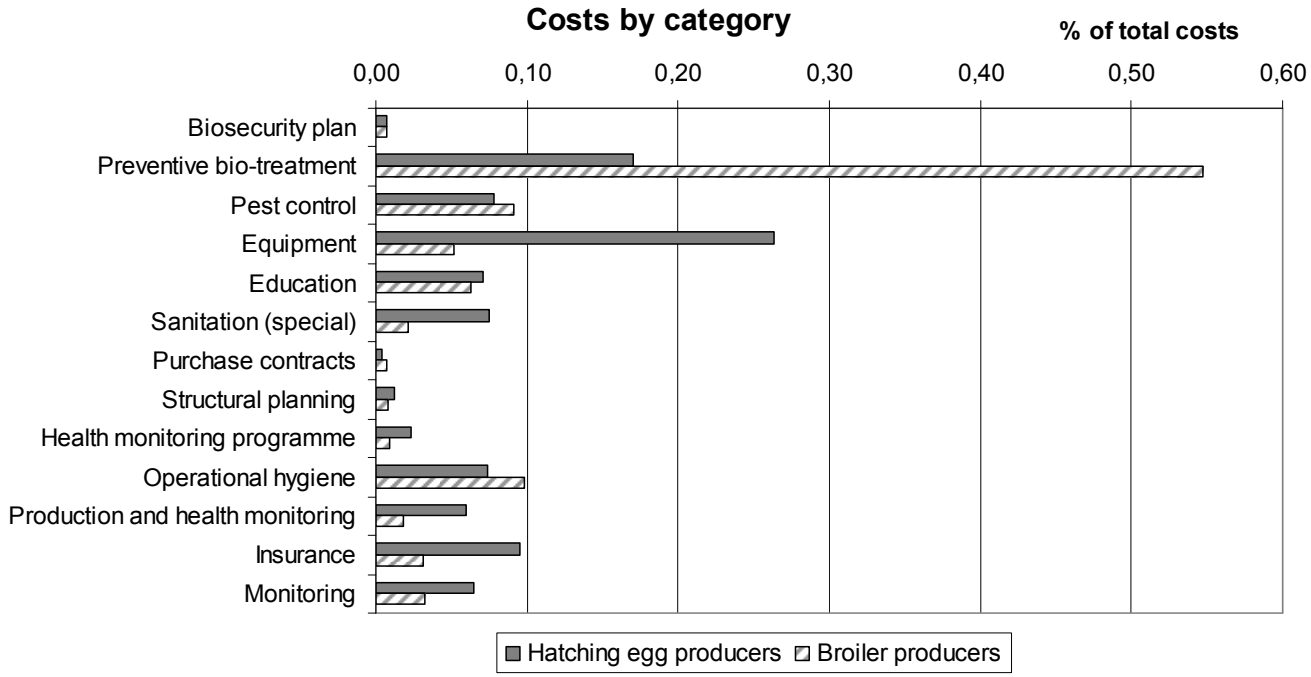
Table 1 Summary statistics of the data

	Broiler producers			Hatching egg producers	
	Birds / year	Density (m^2/bird)	Birds / batch	Birds / year	Density (m^2/bird)
Mean	330,053	0.05	52,447	12,900	0.18
Minimum	90,000	0.04	15,000	5,400	0.16
Maximum	774,000	0.05	129,000	18,000	0.19

III. RESULTS

The cost of preventive biosecurity for the broiler producers in our sample population was 3.55 cents per bird (90% confidence interval 2.56-4.40 cents per bird). For hatching egg producers the expenses were higher, the mean being 75.7 cents per bird (39.3-115.5 cents per bird). The small number of hatching egg producer holdings does not allow for reliable statistical testing, but despite this it can be concluded that the cost per bird is clearly larger than for the broiler.

Fig. 1 Farm-level biosecurity costs by category as a proportion of total costs



The majority of expenses are produced by only a few categories of costs (Figure 1). The main constituent of the costs in the case of broilers is preventive bio-treatment (55% of all biosecurity costs), which comprises of the use of coccidiostat in the bird feed and of competitive exclusion treatment. The two other larger categories are pest control and operational hygiene, including the time for shower before entering and exiting the production facilities. For hatching egg producers the equipment for biosecurity constitute the largest cost component.

We also undertook an analysis to study the relationship between costs and unit size, and which factors are primarily related to the variation in the costs between individual producers. The results of the analysis are still pending.

IV. CONCLUSIONS

This work reports results of one of the first attempts to determine the farm-level costs of biosecurity during the disease-free period. Our results indicate that the cost of biosecurity is some 3.55 cents per bird for broiler producers and 75.7 cents per bird for hatching egg producers. For a batch of 75,000 broilers the total cost would be 2,700 euro. This represents some two percent of total production costs and is similar in magnitude to cost of logistics (loading and transportation) (unpublished information). The results also indicate that work time devoted to biosecurity represents some 8% of total work time on broiler farms and about 5% on broiler breeder farms. The results are in the same range as the cost of vaccines and other veterinary services in England, where they were found to amount to 1.2% of total expenses and to 1.4 pence (about 1.9 cents) per bird [10].

The obvious questions that follow from the analysis are: do these incurred costs effectively prevent introduction of diseases? Is there a correlation between higher biosecurity costs and higher level of protection? In other words, is the cost variance between producers a sign of technical inefficiency or are some producers just investing more on biosecurity and hence on sheltering future production? The optimal management strategy would minimise the sum of costs before and during an epidemic. These questions cannot be answered by the results presented here, but they are obvious questions to consider when developing any risk management strategy. Nonetheless, it seems that in percentage terms (out of total costs) the costs of biosecurity are very modest considering the potential benefits of risk reduction.

The distribution of costs and benefits of biosecurity depends on both the risk associated with the disease as well as on the alternative strategies adopted by the producers. For many diseases, those who bear the consequences if the risk materialises and those who benefit from taking the risk are not the same person. Redesign of cost-sharing in animal diseases is currently ongoing in the European Union. Before we can assert how the risk should be shared, we need to understand the interdependencies in the system, as well as have an idea of how the costs are currently distributed. The ongoing study provides some elements towards understanding these issues.

ACKNOWLEDGMENT

The authors would like to thank the Finnish Ministry of Agriculture and Forestry for funding this project and all the participating producers for their time.

REFERENCES

1. Biosecurity Council (2003) Tiakina Aotearoa. Protect New Zealand: the biosecurity strategy for New Zealand. Biosecurity Council, New Zealand
2. Brandt AW, Sanderson MW, DeGroot BD, Thomson DU, Hollis LC (2008) Biocontainment, biosecurity, and security practices in beef feedyards. J Am Vet Med Assoc 232: 262–269
3. Casal J, De Manuel A, Mateu E, Martin M (2007) Biosecurity measures on swine farms in Spain: perceptions by farmers and their relationship to current on-farm measures. Prev Vet Med 82: 138–150
4. Ribbens S, Dewult J, Koenen F, Mintiens K, De Sadeleer L, de Kruif A, Maes D (2008) A survey on biosecurity and management practices in Belgian pig herds. Prev Vet Med 83: 228–241
5. East IJ (2007) Adoption of biosecurity practices in the Australian poultry industries. Aust Vet J 85: 107–112
6. Garber L, Hill G, Rodrigues J, Gregory G, Voelker L (2007) Non-commercial poultry industries: surveys of backyard and gamefowl breeder flocks in the United States. Prev Vet Med 80: 120–128

7. Finnoff D, Shogren JF, Leung B, Lodge D (2007) Take a risk: preferring prevention over control of biological invaders. Ecol Econ 62: 216–222
8. Chi JW, Weersink A, VanLeeuwen JA, Keefe GP (2002) The economics of controlling infectious diseases on dairy farms. Can J Agr Econ 50: 237–256
9. Hennessy DA (2007) Biosecurity and spread of an infectious animal disease. Amer J Agr Econ 89: 1226–1231
10. Sheppard A (2004) The structure and economics of broiler production in England. Special Studies in Agricultural Economics No. 59. University of Exeter, Centre for Rural Research
11. European Commission (2006) Evaluation of the Community Animal Health Policy (CAHP) 1995-2004 and alternatives for the future. Final report
12. OECD (2007) Impact of animal disease outbreaks and alternative control practices on agricultural markets and trade. Background paper and literature review. TAD/CA/APM/WP(2007)12/FINAL. Paris
13. Babbie E (1992) The practice of social research. Sixth edition. Wadsworth Publishing Company, Belmont, California