Assessment of implementation of biosecurity measures on livestock farms in three regions of Kosovo

B. Behluli, D. Axhami, R. M Gecaj, B. Mehmedi, C. R. Youngs and A. Cana*

Abstract

Biosecurity is a multicomponent procedure that encompasses risk analysis and management strategies relevant to human, animal and plant life, as well as environmental risk assessment. The aim of this study was to assess data related to biosecurity measures implemented by farmers on cattle, sheep and goat farms in Kosovo. A total of 36 farms from three regions of Kosovo, Pristina, Ferizaj and Peja were included. A questionnaire consisting of one open-ended question and 37 closed questions was administered directly to farmers, and the current on-farm situation was observed by the investigators. Based on the collected results, 86% of farms were cattle farms, 8% were sheep farms, and 6% were goat farms. Among all the farms visited, 67% of them operated with a combined system, 28% with a closed system and only 5% operated with an open system. The vast majority of participants (81%) declared that they did not have sufficient knowledge about the term biosecurity, whereas 11% of them were moderately familiar with the term biosecurity and only 8% of them were quite familiar with the term. 83% reported that their animals undergo a veterinary health check only when necessary. Other biosecurity measures applied less frequently included: showering before entering the farm, specific clothing and shoes for visitors, animal quarantine, disinfection and systematic plan for insect and rodent control. We propose that there is room for improving the level of on-farm biosecurity by enhancing practical training and information from local institutions. We conclude that routine integration of biosecurity measures was not demonstrated by most farmers in their management practices and that there is significant room for improvement concerning the level of biosecurity in Kosovo.

Key words: *on-farm biosecurity; food safety; public health; bioCheckGent; livestock farms*

Introduction

Systems and supply chain control have gradually replaced end-point testing as the primary focus of quality management systems, which are now focused on implementing high levels of biosecurity throughout the entire animal production

Behlul BEHLULI, Dhurata AXHAMI, Rreze M. GECAJ*, (Correspondng author, e-mail: rreze.gecaj@uni-pr.edu), Blerta MEHMEDI, Faculty of Agriculture and Veterinary, University of Pristina, Pristina, Kosovo; Curtis R. YOUNGS, Department of Animal Science, Iowa State University, Ames, Iowa, United States of America; Armend CANA, Kosovo Food and Veterinary Agency, Kosovo

process (Grumezescu and Holban, 2018). Biosecurity has been defined by the World Health Organization as "a strategic and integrated approach to analyzing and managing relevant risks to human, animal and plant life and health and associated risks for the environment" (WHO, 2010). Within the context of livestock production, biosecurity is defined as management activities that reduce the possibilities for infectious agents to get into, or spread within, a production unit (Kuster et al., 2015). Implementing biosecurity involves adopting a set of farmers' attitudes and behaviour to reduce risk in all activities involving animal production or animal care. The measures to be established should not be seen as constraints, but rather as part of a process aimed at improving the health of animals, people and the environment. The implementation of biosecurity measures reduces disease spread and is therefore part of the measures frequently proposed in the control of several infectious diseases (Sarrazini et al., 2014). A well-established biosecurity plan is required for additional preventive measures to have a greater impact, while keeping curative treatment to a minimum (Dewulf and Immerseel, 2018). Over the years, infectious diseases have caused great impacts on both animal and public health. Due to progress in science and epidemiology, many measures to prevent and control the spread of these diseases have been identified and promoted. Good biosecurity should be practiced at all times, not just during a disease outbreak (DEFRA, 2002). Biosecurity in animal production systems includes measures that can be implemented by the farmer at the farm level in order to manage the risks of infectious diseases on their holdings. It represents the basis of disease control measures against endemic and exotic diseases (Renault et al., 2021). Improving the use of biosecurity for prevention can only be achieved if farmers know if and how such preventive measures are being used (Brennan and Christley, 2012; Sarrayini et al., 2014).

Knowledge of a farm's biosecurity level is required to evaluate if and where improvement is needed, and it is useful for future animal disease risk assessments. Biosecurity plans must focus on recognising multiple factors that can lead to decreased quality, or unsafe food products through chemical or microbial contamination of water, manure and soil (Wells, 2000). It has been shown that improving farm-level biosecurity requires farmers to change their daily routine, and these practices are not easy to implement (Kristensen and Jakobsen, 2011). Usually, farmers tend to implement what is known and commonly practiced (Casal et al., 2007). It is also suggested that the community structure to which the producers/farmers belong may also influence the implementation of preventive measures and how they perceive farm management (Leibler et al., 2010; Brennan and Christley, 2013). This study aimed to examine the frequency of use of different biosecurity measures and the level of biosecurity in place on livestock farms in Kosovo.

Material and methods

The target population were cattle, sheep and goat farmers. A total of 36 farms from three regions of Kosovo (Pristina, Ferizaj and Peja) were included in this research. Visits were made to 31 cattle farms, three sheep farms and two goat farms. Randomly selected farmers from cattle, sheep and goat farms in the specific regions were interviewed in person. The farm owners/managers

were interviewed using a questionnaire-based structure adopted from the beef and dairy cattle surveys at Biocheck. UGent and modified for this study. Biocheck.UGent is a scientific risk-based and independent scoring system for the evaluation of quality of on-farm biosecurity (https://biocheckgent.com/en/surveys), and in this study, the questionnaire consisted of questions taken from Biocheck.UGent.

The questionnaire consisted of one open-ended question and 37 closed questions and was administered directly to farmers between May and August 2022, and the current on-farm situation was observed by the investigators. Farmers were asked whether or not they undertook any biosecurity practices. Farmers were also asked about their general views on biosecurity practices implemented on their farm. At the start of the interview, all participants were informed that all recorded data would be processed and analysed anonymously.

Data from the questionnaires were electronically transferred into a Microsoft Excel (MS Office version, 2007) database and then the results in percentage form were presented through chart templates in Excel.

Results and discussion

Quarantine is defined as the separation of newly purchased animals without the possibility of direct contact with animals on the holding (Brennan and Christley, 2013). Research has shown that both quarantine and buying animals from the same supplier are considered very important biosecurity measures (Damiaans et al., 2018). Yet, this study showed that very little attention is paid to these measures (Figure 1). Farmers came to the conclusion that it is not easy for them to carry out these measures continuously because a quarantine duration of three weeks is considered very long given the lack of any separate space available for quarantine on the holding (Damiaans et al., 2018).

Another important biosecurity principle is equipping visitors with farm specific clothes and boots. When visitors and personnel enter stables, they should always wear clean and herd- or flock-specific clothing and footwear and should wash their hands thoroughly. Hygiene locks should be available for this purpose that ensure a clear separation between the dirty and clean area (Dewulf and Immerseel, 2018). Yet, as shown by our research, these measures are applied to a very low scale (Figure 1).

Humans may act as a mechanical vector if they have been in contact with infected animals and then have contact with susceptible animals without taking precautionary measures. The first measure therefore is to keep the number of people with access to animal facilities to a minimum. Therefore, showering before entry to the barns (Dewulf and Immerseel, 2018) is mandatory in Kosovo by virtue of an administrative instruction (MAFRD, No. 15/2014). In this study, showering before entering the stables was given the lowest scoring of all biosecurity measures (Figure 1).

A number of pathogens may be transmitted directly or indirectly by insects, rodents, birds, dogs and cats, from outside the farm or between different compartments of the farm (Dewulf and Immerseel, 2018). Therefore, all farms should have an efficient vermin control programme. A systematic pest and pet control plan was ranked amongst the lowest of biosecurity measures. The majority of the farmers (97% pest) and (83% pet) concluded that they did not

execute these measures continuously (Figure 1), possibly because farmers do not consider a pest infestation or entry of pets as a major problem.

Cleaning and disinfection are key pillars of a strong biosecurity plan. These processes work in conjunction with zoning and other measures. Cleaning and disinfection reduce pathogen load on people, equipment, and vehicles, which mitigates the risk of pathogen movement between and within production areas (CFIA, 2011). Yet, multiple participants (86%) did not perform these measures consistently (Figure 1).

Feed and water are potential vehicles for pathogens. Several studies have demonstrated that drinking water can be a reservoir for *E. coli* O157:H7 and may help disseminate the pathogen (Eskin and Hoelzer, 2017; Czajkowsk et al., 2005). Access to clean, potable water is essential to prevent pathogen recycling among animals (Maunsell and Bolton, 2004). Ingestion of contaminated feed, water or contact with contaminated bedding can introduce and spread diseases. Feed stored in humid and tropical climates often becomes infested with fungi and their toxins. It is important to ensure that feed is not contaminated. Quality of feed should be checked periodically and before use. Regular testing of water and feed is very important while implementing the biosecurity plan at the farm level (Manuja et al., 2014). This study has shown that there is still room for improvement of these measures in practice (Figure 1).

Carcasses act as a reservoir of pathogens, attract pests and are a source

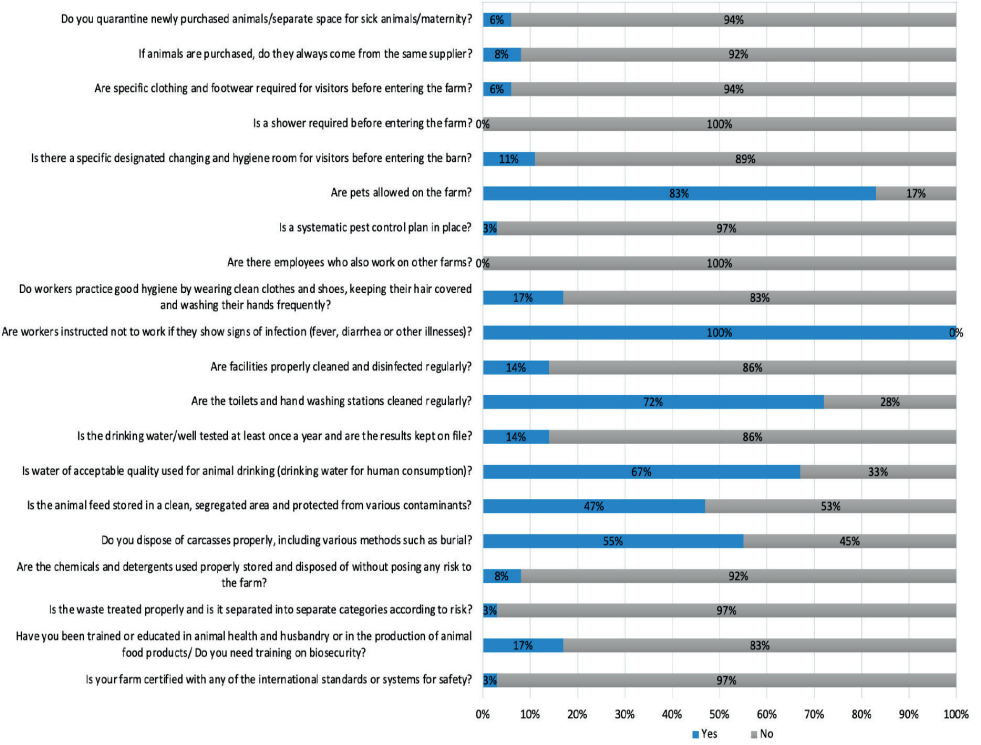

Figure 1. Farmers attitudes towards 20 biosecurity practices expressed as percentages

of transfer for pathogens. Various carcass disposal methods, including burial, landfill, incineration, rendering, composting and alkaline hydrolysis are known in practice (Manuja et al., 2014). According to the survey, 45% participants were not aware of the disease risks from not carrying out these practices and of the important role that these practices have on farm biosecurity (Figure 1).

Detergents, disinfectants and agro-chemicals used on the farm also have the potential to cause chemical residues in food unless simple precautions are taken. These include proper storage in a dry and well-ventilated area away from animals, and their use according to manufacturers' instructions, e.g., at the correct concentration (Maunsell and Bolton, 2004). This measure was ranked amongst the lowest of biosecurity measures (Figure 1).

The biosecurity measures undertaken on farms appears to depend not only on economics or feasibility, but more so on the producers' understanding of the biosecurity principles and their attitudes towards and motivations for undertaking or not undertaking such disease preventive measures (Gilmour et al., 2011). The veterinarian is the key actor in helping farmers understand the logical reasoning behind the proposed biosecurity measures (Laanen et al., 2014). It would be useful to understand the motivational and behavioural factors of the farmers in deciding on issues related to biosecurity (Kristensen and Enevoldsen, 2008). The better informed farmers are concerning farm biosecurity issues, the more willing they would be to improve biosecurity on their respective farms (Damiaans et al., 2018). Multiple participants (83%) stressed the urgent need for additional practical and persistent support and information (Figure 1). This information needs to be practical and should be repeated.

The vast majority of participants (81%) declared that they did not have sufficient knowledge about the term biosecurity, whereas 11% of them were moderately familiar with the term biosecurity and only 8% of them were quite familiar with the term (Figure 2). Due to the fact that this percentage is quite small, the research highlights the need for better education of farmers.

The health of food animals is inextricably linked to the production of safe food and the health of humans. Health examination of animals (on-site screening and laboratory support where applicable) and on-farm identification are the minimum precautions to be taken to prevent or control the transmission of zoonotic agents and animal diseases (Collins and Wall, 2004). Unfortunately, among the respondents, 83% reported that their animals undergo veterinary health checks only when necessary (Figure 3).

The majority of the farms in this survey operate with a mixed system (both open and closed system based on seasonality, with the open system preferred during the spring-summer season, and a closed system during the autumn-winter season) (Figure 4). This could partly explain their low biosecurity status. Open system farms tend to have a less secured boundary than that of closed system farms (Ali et al., 2014). All cattle farms in our study were small-scale, and this reflects the practice of cattle production in Kosovo (Bajrami et al., 2017). Compared to the world average, Kosovo lags behind in all measures that we assessed. Among the external biosecurity measures, the subcategory transport and carcass removal (I, Figure 5) scored the lowest with 19%, which is

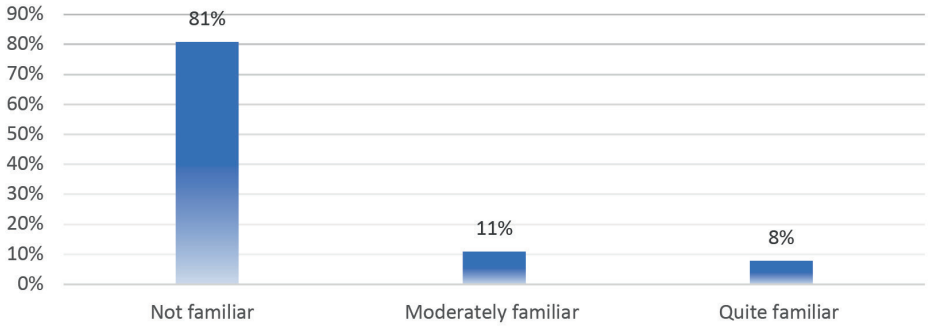

Figure 2. Farmers' knowledge about the term biosecurity

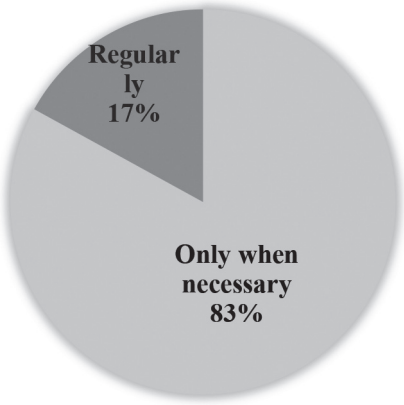

Figure 3. The interval of veterinary health checks

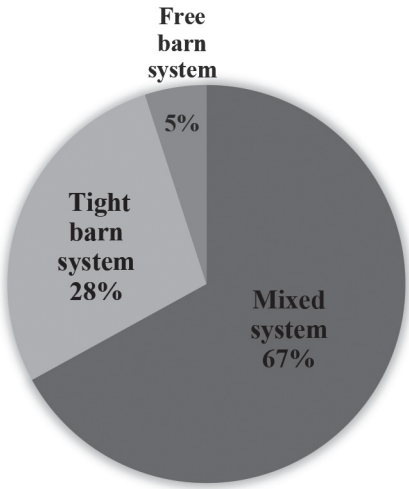

Figure 4. Different operating farm systems. The mixed system consists of animals kept free (summer) and enclosed (winter) system

relatively low compared to the global average of 50%. Internal biosecurity measures scored 34% (Figure 5).

The implementation of biosecurity plans is linked to a number of factors, including additional employees, costs, availability of funds, laws, and regulations (Fasina et al., 2012; Can and Altuğ, 2014). These factors have been shown to impact biosecurity implementation on farms in developed and in developing countries (Fasina et al., 2012) and these might also explain the low scores for the investigated farms in Kosovo. It should be noted, that this assessment is based on the data collected from the specific regions of Kosovo and for a better understanding, more regions and farms should be included in future research.

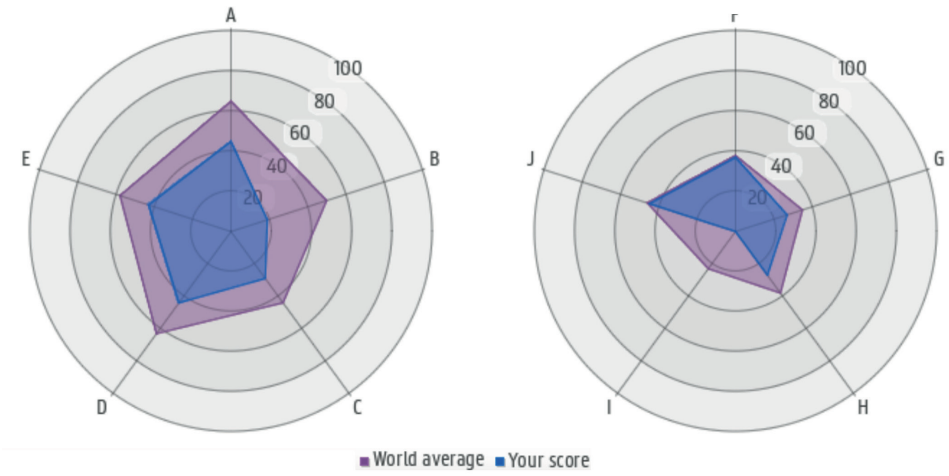

Figure 5. External and internal biosecurity in relation to the world average values (%). The purple plot represents the world average and the blue plot represents the average for Kosovo. In both spider graphs, the blue area is smaller than the purple, showing that Kosovo scores are below the world average in each section

A. Purchase and reproduction
B. Transport and carcass removal
C. Feed and water
D. Visitors and farmworkers
E. Vermin control and other animals
F. Health management
G. Calving management
H. Calf management
I. Adult cattle management animals
J. Working organisation and equipment.

Conclusion

From the results reported in this study, we conclude that routine integration of biosecurity measures is not demonstrated by most farmers in their management practices and that the level of biosecurity in Kosovo leaves much room for improvement. As a concluding remark, farmers stressed the need for additional information about simple biosecurity measures. Farmers admitted that there is room for improving the level of biosecurity on their farms, but indicated the need for practical information and financial support from local institutions. In another word, governments, veterinarians and other relevant advisors should have a key role in increasing motivation among farmers through providing training on implementing biosecurity measures and by providing appropriate support.

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Procjena implementacije biosigurnosnih mjera na stočarskim farmama u trima regijama Kosova

Behlul BEHLULI, dr. med. vet, izvanredni profesor, Dhurata AXHAMI, Msc, student; Rreze M. GECAJ, docent, Blerta MEHMEDI, dr. med. vet., docentica, Poljoprivredni i Veterinarski fakultet, Univerzitet u Prištini, Republika Kosovo, Odjel za reprodukciju životinja, Sveučilište u Prištini, Republika Kosovo; Curtis R. YOUNGS, redoviti professor, M. E. Ensminger katerdra za međunarodnu poljoprivredu životinja, Državno Sveučilište Iowa, SAD; Armend CANA, dr. med. vet., docent, Kosovska agencija za hranu i veterinarstvo, Republika Kosovo

Biosigurnost je višekomponentni postupak koji obuhvaća analizu rizika i strategije upravljanja bitne za život ljudi, životinja i biljaka, kao i procjenu rizika vezanih uz okoliš. Cilj je ovog istraživanja bio procijeniti podatke vezane uz biosigurnosne mjere koje provode farmeri na farmama goveda, ovaca i koza na Kosovu. U istraživanje je bilo uključeno ukupno 36 farmi iz tri regije Kosova: Prištine, Uroševca i Pećи. Upitnik koji se sastojao od jednog otvorenog i 37 zatvorenih pitanja primijenjen je izravno poljoprivrednicima, a istraživači su promatrali trenutnu situaciju na farmi. Na temelju prikupljenih rezultata, 86 % gospodarstava su: govedarske, 8 % ovčarske, a 6 % kozarske. Od svih posjećenih farmi, njih je: 67 % radilo je kombiniranim 28 % zatvorenim i samo 5 % otvorenim sustavom. Velika većina sudionika (81 %) izjavila je da nema dostatno znanja o pojmu biosigurnosti, dok je njih 11 % bilo osrednje upoznato, a samo 8 % njih bilo je dobro upoznato s pojmom. Njih 83 % izjavilo je da njihove životinje prolaze veterinarski zdravstveni pregled samo kada je to potrebno. Ostale biosigurnosne mjere koje su se rjeđe primjenjivale su: tuširanje prije ulaska na farmu, posebna odjeća i obuća za posjetitelje, karantena životinja, dezinfekcija i sustavni plan kontrole insekata i deratizacije. Zaključili smo da ima prostora poboljšanje razine biološke sigurnosti na farmama jačanjem praktične obuke i informacija od lokalnih institucija, ali i da većina poljoprivrednika ne pokazuje rutinsku integraciju biosigurnosnih mjera u svojim praksama upravljanja i da razina biološke sigurnosti na Kosovu ima velikih mogućnosti u poboljšanju.

Ključne riječi: *biosigurnost na farmi, sigurnost hrane i javno zdravlje, bioCheckGent, stočarske farme.*