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Sebastián Jesús Moya Durán

PhD Thesis

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Certifican:

Que la tesi doctoral titulada "**Psychosocial factors in the implementation of biosecurity measures on dairy cattle farms in Spain**" presentada pel Sr. **Sebastián Jesús Moya Durán** per l'obtenció del Grau de Doctor en Veterinària, s'ha realitzat sota la seva direcció a la Universitat Autònoma de Barcelona.

I per tal que consti als efectes oportuns, signem la declaració a Bellaterra (Barcelona), a 26 de febrer de 2021.

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Director i Tutor

Dr. Francisco Tirado Serrano
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Doctorand

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“¿Y qué hay de comer?
Come-y-calla”

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List of abbreviations and acronyms

AC	Autonomous Community - Autonomous Communities
AHV	Animal Health Veterinarians
BT	Bovine Tuberculosis
BVD	Bovine Virus Diarrhoea
CEEAH	Comissió d'Ètica en l'Experimentació Animal i Humana
EC	European Commission
EU	European Union
FAO	Food and Agriculture Organization of the United Nations
FEGA	Fondo Español de Garantía Agraria
HDA	Health Defence Association
IBR	Infectious Bovine Rhinotracheitis
INLAC	Organización Interprofesional Láctea
MAPA	Ministerio de Agricultura, Pesca y Alimentación
MAPAMA	Ministerio de Agricultura y Pesca, Alimentación y Medio Ambiente
OIE	World Organisation for Animal Health
OVS	Official Veterinary Services
PV	Private Veterinarians
UAB	Universitat Autònoma de Barcelona
WHO	World Health Organization

Abstract

The general objective of this PhD thesis was to find out the psychosocial factors that influence the implementation of biosecurity measures in dairy cattle farms in Galicia and Catalonia in Spain.

In the first study, in-depth face-to-face interviews were conducted with 16 farmers and 16 veterinarians. A grounded theory analysis was carried out. The importance of veterinarians as a source of information was identified, including their communication skills, the individual experiences of farmers, farm traditions and the availability of time and space of the farmer. Finally, the need to deepen the knowledge of farm workers and mandatory biosecurity measures was suggested.

The second study explored the tension between old farming traditions and routines and veterinary recommendations. It was based on Lefebvre's triple spatial model that addresses spatial practices (old traditions and routines), representations of space (recommendations) and representational space (final implementation of biosecurity measures), all of which are part of security ecologies. An ethnographic approach was used on two farms in Galicia and two in Catalonia. It became clear that farms have different specific contexts, and that the reasons for the positions of farmers and veterinarians, effective communication and common sense must be taken into account.

In the third study, eight focus groups were used, four for farmers and four for veterinarians. Farmers and veterinarians were found to blame each other for not following biosecurity practices. Contradictions among veterinarians and certain individual veterinary practices that participated in the study were shown to exist, leading to doubts and confusion among farmers. Different perceptions were also identified on the role that public administration should play in relation to training and sanctions to improve biosecurity. In addition, participants expressed different opinions on whether biosecurity measures should be mandatory or voluntary.

The fourth study explored and deepened the public administration's views on biosecurity through 11 in-depth interviews with representatives of the public administration, using content analysis. According to the public administration, biosecurity measures should be flexible and take into account the reality of farms, and that training and awareness raising should be promoted. It was also suggested that the public administration should provide advice to farmers, but through veterinarians independent of the official veterinary services. It was also suggested that meetings between the different actors in the dairy sector should be encouraged to generate active participation in biosecurity issues.

Resumen

El objetivo general de esta tesis doctoral fue conocer los factores psicosociales que influyen en la implementación de las medidas de bioseguridad en las granjas de bovino de leche de Galicia y Cataluña en España.

En el primer estudio, se realizaron entrevistas en profundidad cara a cara con 16 ganaderos y 16 veterinarios. Se llevó a cabo un análisis de teoría fundamentada. Se identificó la importancia de los veterinarios como fuente de información, incluyendo sus habilidades de comunicación, las experiencias individuales de los ganaderos, las tradiciones de las granjas y la disponibilidad de tiempo y espacio del ganadero. Por último, se sugirió la necesidad de profundizar en los conocimientos de los trabajadores de las granjas y en las medidas de bioseguridad obligatorias.

El segundo estudio exploró la tensión entre las antiguas tradiciones y rutinas ganaderas y las recomendaciones veterinarias. Se basó en el triple modelo espacial de Lefebvre, que aborda las prácticas espaciales (antiguas tradiciones y rutinas), las representaciones del espacio (recomendaciones) y el espacio de representación (aplicación final de las medidas de bioseguridad), todo lo cual forma parte de las ecologías de seguridad. Se utilizó un enfoque etnográfico en dos granjas de Galicia y dos de Cataluña. Se puso de manifiesto que las granjas tienen contextos específicos diferentes, y que hay que tener en cuenta las razones de las posiciones de los ganaderos y veterinarios, la comunicación efectiva y el sentido común.

En el tercer estudio se utilizaron ocho grupos de discusión, cuatro para ganaderos y cuatro para veterinarios. Se comprobó que los ganaderos y los veterinarios se culpan mutuamente por no seguir las prácticas de bioseguridad. Se demostró que existían contradicciones entre los veterinarios y algunas prácticas veterinarias individuales que participaron en el estudio, lo que generó dudas y confusión entre los ganaderos. También se identificaron diferentes percepciones sobre el papel que debe desempeñar la administración pública en relación con la formación y las sanciones para mejorar la bioseguridad. Además, los participantes expresaron diferentes opiniones sobre si las medidas de bioseguridad deberían ser obligatorias o voluntarias.

El cuarto estudio exploró y profundizó en los puntos de vista de la administración pública sobre la bioseguridad a través de 11 entrevistas en profundidad con representantes de la administración pública, utilizando el análisis de contenido. Según la administración pública, las medidas de bioseguridad deberían ser flexibles y tener en cuenta la realidad de las granjas, y habría que promover la formación y la sensibilización. También se sugirió que la administración pública asesore a los ganaderos, pero a través de veterinarios independientes de los servicios veterinarios oficiales. También se sugirió que se fomenten las reuniones entre los diferentes actores del sector lácteo para generar una participación activa en temas de bioseguridad.

Publications

Study I: Dairy farmers' decision-making to implement biosecurity measures: A study of psychosocial factors

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Study II: From Biosecurity to Security Ecologies: An Analysis between Old Dairy Farming Traditions and Routines and Veterinary Recommendations in Spain

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Study III: Influence on the implementation of biosecurity measures in dairy cattle farms: Communication between veterinarians and dairy farmers

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Preventive Veterinary Medicine (Under Review)

Study IV: Influence of the public administration on dairy cattle farms: Perceptions and opinions on the implementation of biosecurity measures in Spain

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Research in Veterinary Science (Under Review)

Introduction

Chapter I

In general terms, qualitative research explores and delves into certain issues through people's perceptions, attitudes, and behaviours, and can generate certain hypotheses (Tenny et al., 2020). Its main characteristic is its ability to explain and understand processes and patterns with varying degrees and nuances that go beyond a descriptive view, through theoretical elements with abstract terms, which can be complex to address by quantitative research (Degeling and Rock, 2020; Tenny et al., 2020; Marjan, 2017). In this sense, qualitative studies give voice to their participants in their different contexts, deepen data ensuring veracity in their results, tend to use few preconceived theories and literatures and highlight the complexities of diverse phenomena, among others (Marjan, 2017). However, although qualitative and quantitative research are sometimes opposed and competing in their approaches, they are not incompatible, and can be integrated with each other to deepen and understand data (Tenny et al., 2020). In fact, qualitative and quantitative research can address similar issues, but answer different types of questions, as is the case in areas of natural science such as epidemiology, allowing for different approaches depending on the complexities of the research itself (Bannister-Tyrrell and Meiqari, 2020; Degeling and Rock, 2020).

Over the last decade, the concept of One Health has become more important, where qualitative research can be a cornerstone and social sciences, such as psychology and sociology, can play a key role. In this context, qualitative research can allow us to understand human behaviour and social phenomena through the meanings and visions of the people involved to improve interventions in relation to diseases. Understanding the world from the perspective of participants with a sceptical, critical, and reflexive stance is essential to the rigour of qualitative research. In this way, the participants' opinions are the important ones and not those of the researchers, being able to address questions such as "How do farmers make decisions about implementing biosecurity", being open and unbiased questions (Degeling and Rock, 2020).

Considering what Degeling and Rock (2020) point out, qualitative research must generate a plausible and coherent explanation and understanding of the phenomenon being researched. In this sense, a critical reflection is fundamental, being important the paradigms, approaches, methodologies, and analysis used, which must be rigorous, meticulous, and detailed, where the researchers must be properly trained. Research strategies are both flexible and rigorous, and may involve several iterative and intertwine research phases (Figure 1).

Figure 1: Elements of qualitative research.

1.1. Research paradigms

In qualitative and quantitative research there are mainly two branches, one ontological and the other epistemological. The ontology refers to the nature of reality as a whole or aspects of it, in addition to the nature of any existing object. While the epistemology refers to the nature of knowledge, where there is a relationship between the knower and what can be known (Tenny et al., 2020; Winit-Watjana, 2016; Kant, 2014). There are various ontological positions, such as realists (i.e., both natural and social phenomena have an existence that is independent of an observer) and idealists (i.e., the external world is only an appearance and does not have an independent existence apart from the observer's thoughts). There are too different epistemological positions, such as rationalists (i.e., reason as a source of knowledge, which distinguishes the true from the false) and empiricists (i.e., sensory experience as a basis of knowledge). However, it is crucial that an ontological position reflects the researcher's view of the nature of the world, and an epistemological position reflects their view of what can be known about the world (Kant, 2014). In this regard, these positions make it possible to characterise paradigms such as positivism, postpositivism, constructivism and pragmatism, as shown in Table 1 (Tenny et al., 2020; Winit-Watjana, 2016).

Paradigms	Ontology	Epistemology
Positivism	Realist	Rationalist
Postpositivism	Critical Realist	Modified Rationalist
Constructivism	Relativist	Subjectivist
Pragmatism	Realist/Relativist	Rationalist/Subjectivist

Table 1: Ontological and epistemological position of philosophical paradigms.

Positivism has an ontology that points to the existence of an objective, ordered and regular reality, with specific patterns independent of the perception of individuals, context, and time. Furthermore, this paradigm uses the scientific method through hypotheses, which grants elements such as generalization, usually with a deductive reasoning. Therefore, reality can be measured and observed with reliable and valid tools, and it can be explained or predicted by means of theories or laws, without an influence from researchers (Bannister-Tyrrell and Meiqari, 2020; Tenny et al., 2020; Winit-Watjana, 2016). On the other hand, according to Tenny et al. (2020) and Winit-Watjana (2016), post-positivism accepts an imperfect reality with its inherent biases in social interactions or processes, where social reality cannot be fully explained, but can be approximated. Likewise, this paradigm has the capacity to formulate a substantive theory with a mainly deductive reasoning. However, despite the influence of researchers and their own values, relevant biases that may affect the research are controlled. Contrary to the previous paradigms there is the constructivism, which holds that there are diverse subjective realities built through the interactions and backgrounds of the opinions and interpretations of individuals and their experiences and values, having a relativistic ontological view. This paradigm fundamentally uses inductive reasoning to generate a pattern and a theory, where generalisation is feasible through a theory rather than a hypothesis. And finally, pragmatism, which accepts multiple realities and provides pragmatic solutions, with an influence of the researchers, being both inductive and deductive with an association of facts and values (Winit-Watjana, 2016). Despite the above, the two dominant paradigms

in relation to ontological and epistemological traditions are positivism and constructivism, where the former is highly associated with quantitative research, while the latter with qualitative research (Ataro, 2020). Thus, these elements provide a basis for the research and the role of the researcher, with the implications of their work and their own positionality and biases in such research (Tenny et al., 2020).

1.2. Qualitative approaches

Considering the above paradigms, several approaches to qualitative research can be found such as grounded theory, ethnography, or phenomenology.

1.2.1. Grounded theory

Grounded theory is suitable for areas that have not been previously researched or there may be certain gaps, seeking an understanding of an event rather than a description (Harris, 2015). It has a constructivist paradigm in its conceptual thinking and construction of theories in social settings, although it has its origins in a positivist and pragmatist paradigm that has evolved, where the researcher is part of the research process with reflexivity, both of the researcher and the researched (Corbin, 2017; Khan, 2014; Charmaz and Bryant, 2010). Thus, it generates an inductive theoretical model through social interactions to explain certain behaviours and experiences of people (Tenny et al., 2020). Therefore, it can be defined as a strategy to generate a theory from data, based on them through their collection and analysis (Khan, 2014). However, the construction of the theory is parallel to data collection and analysis, with emerging theoretical concepts, being a flexible process (Moser and Korstjens, 2018). Therefore, considering its origins, grounded theory allows for the construction of emerging theories with new ideas, the generation of theories from qualitative research, rigorous and procedural processing, comparison in its process and the provision of specific tools for such theoretical construction (Charmaz and Bryant, 2010).

In the grounded theory there are constant comparisons between the elements present in the data to identify common points (Moser and Korstjens, 2018). In this way, this approach allows the exploration of the interpretation that individuals make of reality through their individual behaviours and experiences, through such constant comparison, which allows the abstraction of the researcher, who in turn employs a systematic perspective. In this sense, grounded theory uses as base elements the codification (i.e., data in units of meaning), the development of categories (i.e., code grouping), the constant comparison of data (i.e., similarities and differences between the data), the theoretical sampling, the theoretical saturation (i.e., concepts correctly defined and explained), the theoretical integration, and the use of memos and diagrams of the researchers (i.e., notes to describe relationships in the data collection and analysis process) (Cullen and Brennan, 2020). In general terms in relation to coding, coding starts with open coding (i.e., words or phrases of data under a code representing grouped data with common characteristics), which can be more descriptive with data sets based on their content (i.e., in vivo coding) or more abstract with data sets based on their interpretation (in vitro coding) (Harris, 2015). Then axial coding (i.e., identification of relationships between codes and categories) and finally selective coding (i.e., identification of a core category and its relationship to others in a methodical way, to be integrated and to identify a theory)

(Noble and Mitchell, 2016). Thus, the resulting theory is an accumulation and representation of all the cases addressed in the research process (Corbin, 2017).

In this approach, existing theoretical sampling should be avoided in the first instance, so that researchers can develop their own reasoning, to prevent them from being influenced by such material (Charmaz and Bryant, 2010). However, the theoretical sampling allows to generate the investigation of the problem, make comparisons, improve the subtle nuances in the data, provide questions, stimulate the data collection and analysis process, and confirm findings (Cullen and Brennan, 2020). It should also be noted that researchers may have background knowledge and experience, and from this they may generate ideas as starting points in data collection, but not as end points in data analysis (Charmaz and Bryant, 2010). In this sense, researchers must be open to the empirical world and must subject their own pre-existing ideas and notions to rigorous scrutiny, being aware of potential concepts and theories for the study but avoid using them to make sense of the data, known as theoretical sensitivity (Harris, 2015; Khan, 2014; Charmaz and Bryant, 2010). In this sense, the researcher is able to give meaning and understanding to the data, being able to discriminate between data (Noble and Mitchell, 2016).

Finally, there can be different kinds of theories generated from grounded theory, such as substantive theory, which relates to a specific situation, and formal theory, which relates to a variety of situations, being more abstract (Harris, 2015).

1.2.2. Ethnography

Ethnography has constructivists paradigms that attempt to represent the social reality of a community to access its point of view, where there can be tension in the understanding and interpretation of its world from an academic perspective (Jayathilaka, 2021). In this approach, the researcher is immersed in a community environment through interaction with its members (i.e., with their languages, symbols, actions, among others), building relationships, and participation in that community life, that may involve moral choices (Jayathilaka, 2021; Tenny et al., 2020). In this regard, the researcher can produce a complete account of the social phenomena that occur and find data that would otherwise be difficult to obtain (Tenny et al., 2020). In this environment there are several key informants who possess detailed understanding of a phenomenon and can act as representatives in revealing and interpreting that phenomenon. Therefore, an ethnographic approach looks for patterns in participants' behaviours and thoughts to understand a phenomenon (Moser and Korstjens, 2018).

According to Jayathilaka (2021), it is necessary to establish what role the ethnographer intends to take in the field work, such as their practical aspects, to explore what impression it can make and how it should act, which is part of the ethnographic process and can be negotiated and renegotiated. Thus, their involvement is important for the data generation, and can affect the acceptance of the participants which could mean different things; therefore, the researcher must continuously analyse themself, more so if the environments develop and change over time. Furthermore, they must also manage personal, emotional, physical, and intellectual situations.

In an ethnography, its design is difficult to generalise as there is no consensus among experts regarding a general guideline for ethnographic fieldwork. However, its basic

principle involves a social-scientific observer, what is observed, a report, and an audience to whom the report is presented (Dey Mullinck et al., 2013). Thus, the main idea is that the researcher translates their experiences into meaning for the reader through a coherent and convincing story with accessible language by interweaving observations and knowledge about a culture and its practices in a written or audio-visual report (Jayathilaka, 2021). In this way, situated stories are generated with narrative descriptions and representations of a phenomenon - human lives (Jayathilaka, 2021; Moser and Korstjens, 2018).

The fields of research of ethnographies can be anywhere, such as rural or urban communities, formal or informal organizations, social networks, among others. In addition, there can be various types of ethnography, such as autoethnographies (based on a personal and reflective perspective of the researcher), feminist ethnographies (based on feminist theory), critical ethnographies (based on critical theory), among others (Jayathilaka, 2021).

Thick description is related to ethnography (Clark and Chevrette, 2017; Luhrmann, 2015). It has been used to describe a context in detail (i.e., phenomena, environments, and quotes from participants) and to characterise the intentional, communicative, and interpretive meaning of a behaviour, allowing to understand a sequence of events in a coherent way, where there may be interesting tensions to address (Tenny et al., 2020; Clark and Chevrette, 2017; Luhrmann, 2015). In this sense, it generates plausibility, not being exempt from scrutiny (Clark and Chevrette, 2017).

1.2.3. Phenomenology

Phenomenology allows the exploration of phenomena uniting subjectivity of individuals and objectivity, being mainly a constructivist paradigm (Bahadur, 2018; Anton, 2016). While there is no univocal consensus on phenomenology, it investigates experiences from the perspective of individuals through their lived experiences in relation to a phenomenon and argues that there is an essence (i.e., invariant structures or aspects) of phenomena to the shared experiences, that generates consistency (Tenny et al., 2020; Bahadur, 2018; Marjan, 2017; Anton, 2016). In fact, experiences of reality are part of reality itself (Anton, 2016). It is also common to speak of conscious experiences, where being aware of an experienced relation between subjects and objects, without generating a division between subject and object, which is known as intentionality (Shudak, 2018; Anton, 2016). In this sense, acts of intentionality can be full or empty of meaning (Anton, 2016).

In this approach, data are collected and analysed by describing and interpreting these meanings of experiences in detail and characterising the phenomenon, without explaining or analysing, since it is explained or analysed by itself (Bahadur, 2018; Moser and Korstjens, 2018; Marjan, 2017). In this sense, interpretation makes the study more meaningful with its social and political structures and practices from the perspectives of individuals (Bahadur, 2018). Therefore, the description of the meaning for different individuals of their experiences in relation to a phenomenon is distinctive, where the researcher attempts to understand these experiences without their intervention on the data (Marjan, 2017). In fact, an attempt is made to decontextualise and eliminate the researcher's preconceived notions that may affect the data in order to prioritise what is

being investigated and such a phenomenon can occur, which is known as phenomenological reduction (Shudak, 2018).

People involved in a phenomenological approach vary in their individual characteristics and experiences, where common themes are sought within an individual and between individuals (Moser and Korstjens, 2018). In general, the process of phenomenology consists of silence, reflection, identification, selection, interpretation, construction, and verification in order to search for the meaning of different parts of a phenomenon and its totality. Its two main procedures are intentional analysis (i.e., how experiences are generated and what is experienced) and eidetic analysis (i.e., the intuition of essences adds meaning to those experiences) (Bahadur, 2018). Thus, it results in an unbiased, detailed, careful and systematic description of issues that captures the essential meanings of experiences and can use direct quotes from individuals with an interpretation of those descriptions (Bahadur, 2018; Moser and Korstjens, 2018: Anton, 2016).

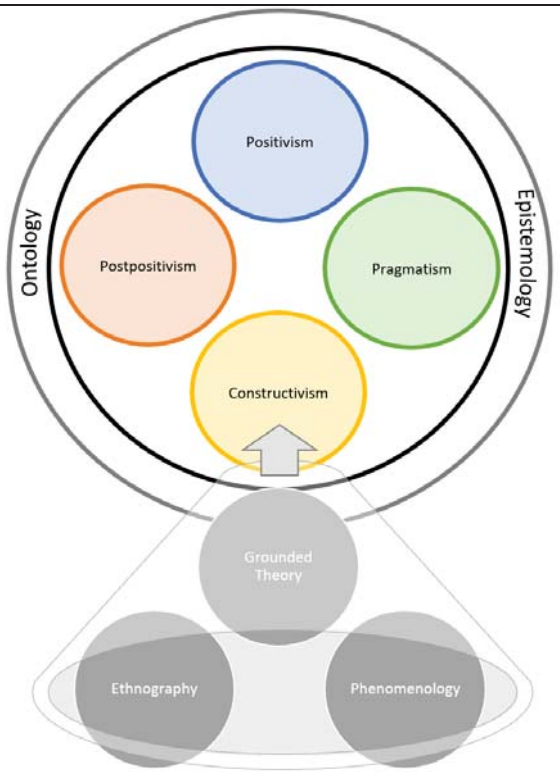

Figure 2: Approaches based mainly on the constructivist paradigm.

Phenomenology differs mainly from grounded theory, where the former focuses on experience to reveal a phenomenon where individuals are important, the latter focuses on the interpretation of reality to generate a theory where data are important. However, there may be porous boundaries between the two, especially if their initial steps are almost identical (Marjan, 2017).

Therefore, these three approaches are mainly based on the constructivist paradigm as can be seen in Figure 2.

1.3. Qualitative methodologies

For data collection, qualitative research uses methods such as interviews, focus groups and participant observation.

1.3.1. Interviews

Interviewing is the most common method of data collection in qualitative research (Jamshed, 2014). In the interview, researchers ask interviewees questions face-to-face, over the phone, online, via instant messaging or email, among others, to discover and understand their perspectives and meanings about a phenomenon of interest (Moser and

Korstjens, 2018; Faulkner and Trotter, 2017). Thus, researchers collect and analyse individual perceptions and attitudes (Faulkner and Trotter, 2017).

The interview preparation process involves studying secondary sources to provide a theoretical and empirical basis, which provide background and context, for formulating the core questions; understanding who should be interviewed, where and how, through critical reflection for detailed planning; formulating draft questions, with core questions that are simple to understand; establishing relevant contacts at different levels and settings, and planning meetings; and preparing practical aspects of the interviews. All these procedures are flexible and can be modified from time to time (Brounéus, 2011).

In interviews, the questions, their length, and style depend on the purpose of the research (Faulkner and Trotter, 2017). In general, they last from 30 minutes to over an hour (Jamshed, 2014). These interviews can be semi-structured, which are based on a thematic script, with pre-established open-ended questions on a specific topic, to explore that topic systematically and thoroughly (Faulkner and Trotter, 2017; Jamshed, 2014). These interviews are designed to start with light background questions, in the middle with intellectually or emotionally challenging and demanding questions, before ending with a tapering off, and finally ending with a summary and closing (Brounéus, 2011). And they can also be unstructured, without pre-established questions, which are generally carried out in long-term fieldwork, where interviewees express themselves in their own way and at their own pace, in order to gather detailed information. Unstructured interviews include focused interviews, where the interviewer refocuses the interview on the key topic when it deviates; and informal interviews, to clarify and fill in missing information, based on unplanned questions that are generated during the interview (Faulkner and Trotter, 2017; Jamshed, 2014).

In general, interviews should be conducted in a comfortable environment so that the interviewee feels safe, they should be conducted with a reflective and empathetic listening, but with a certain distance, confirming and clarifying with the interviewee's own words, and they should be conducted always keeping in mind their objectives for their thematic delimitation (Brounéus, 2011). In general, the number of interviews is given by saturation (i.e., new information is redundant), although a target of between 5 and 50 interviewees is usually recommended, as appropriate (Dworkin, 2012). And finally, responses are usually recorded by written means, being unreliable, or audio-visual, being a suitable option, which can be transcribed verbatim for analysis (Faulkner and Trotter, 2017; Jamshed, 2014).

1.3.2. Focus groups

Generally, in focus groups participants are interviewed in a discussion setting in the presence of a moderator (Moser and Korstjens, 2018; Jamshed, 2014). Focus groups generate group interaction and explore unique insights on a particular topic, which may involve complex issues involving values and beliefs behind certain behaviours (Tritter and Landstad, 2019; Hopkins, 2017, Carey, 2015). In these groups, participants can feel safe and can express and share their opinions and experiences openly on an issue, which are considered a democratised and empowering space compared to interviews (Tritter and Landstad, 2019; Hopkins, 2017; Jamshed, 2014). Indeed, these often discuss ideas that are not usually addressed in interviews (Hopkins, 2017). It is also important to note that,

as with other methods, focus groups can be used in parallel with other methods, such as interviews and participant observation (Tritter and Landstad, 2019; Hopkins, 2017, Carey, 2015).

In relation to their development, focus group discussions usually last between 60 and 90 minutes (Tritter and Landstad, 2019; Jamshed, 2014). Relevant to these are their number and composition of participants, along with their location, time, and context (Hopkins, 2017). Generally, there are usually from 4 to 12 participants, although it depends on the topic and the participants themselves (Tritter and Landstad, 2019; Hopkins, 2017, Carey, 2015). Participants should have common characteristics, such as demographics like gender, age or location, or experiences, and it is also important whether they know each other or not, which may affect the data depending on the research (Hopkins, 2017, Carey, 2015). Equally, it is desirable that the groups are homogenous, as participants are likely to share information in the presence of other similar participants. The number of focus groups is determined by data saturation (i.e., no new data is generated), as with interviews (Carey, 2015).

In these focus groups, mediators must have certain skills to perform, such as group management and handling, encouraging those who do not participate to do so (Hopkins, 2017, Carey, 2015). In fact, it is necessary to be aware of the possible comments that participants will make as well as their contexts (Carey, 2015). On the other hand, focus groups require a facilitator to help record; introduce and present the rules of the focus group, to ensure that one participant speaks at a time and views are respected; make a final summary of the session; and take notes, which allows monitoring of non-verbal issues (Tritter and Landstad, 2019; Carey, 2015). In relation to note-taking, it also allows for tracking who says what, so that during transcriptions of quotes are correctly assigned to participants (Hopkins, 2017).

Focus group sessions often use open-ended questions with a thematic script like interviews, considering certain background information in relation to the purposes of the study and incorporating pilot sessions (Carey, 2015). There are also five different types of questions in focus groups: opening questions, introductory questions, transition questions, key questions and concluding questions (Tritter and Landstad, 2019). And audio-visual materials can be used to guide the questions (Tritter and Landstad, 2019; Carey, 2015). Data can be recorded through audio-visual records, as verbatim transcripts do not capture absolutely everything, such as non-verbal communication, and can help in identifying who is saying what (Tritter and Landstad, 2019; Carey, 2015). Finally, in general, focus groups can be used in early stages of projects, to generate ideas or themes, or in later stages to discuss research findings (Hopkins, 2017).

1.3.3. Participant observation

In participant observation, the researcher explores practices and relationships in a population, usually over a long period of time, although it is also possible to collect information in a short period of time (Eramian, 2018; Moser and Korstjens, 2018; Jorgensen, 2015; Jorgensen, 2015). In this way, it is used to gain a broad and deep understanding of the everyday practices of such a population and its participants, exploring their social patterns and relationships, which may be contradictory between certain ideals and practices (Eramian, 2018). This method collects information in a less

invasive, intrusive, and reactive way than other methods, where the researcher has no control (Jorgensen, 2015).

Certain conditions must be in place to conduct participatory observation: an interest in human meanings, feelings, and interactions from the perspective of a population, a phenomenon that can be investigated in its environment, reasonable access to people and their practices, a phenomenon is limited in scope, size and location, appropriate research questions, and possibility of adequate collection in parallel with other methods (Jorgensen, 2015). Subsequently, while there are no defined strategies for conducting participant observation, important are access, to know how to enter a population and set boundaries for observation and participation, without violating shared expectations, which may change over time; socialisation, to know how to socialise with their environment, norms and traditions, is related to the researcher's prior knowledge, although a variety of questions are allowed; relationship building, to know how to recruit field informants, key informants being important, who can guide and give legitimacy to the researcher; and exit, to know how to manage the social relationships established when the researcher leaves a population (Fine, 2015).

In participant observation, the researcher has direct access not only to the physical environment of the participants, but also to their reality through their experiences, thoughts and feelings and activities (Jorgensen, 2015). In this sense, this method is characterised by carefully recording social actors, activities, and scenarios through field records, which can range from manual writings to audio-visual recordings, although field diaries are generally used as a support (Eramian, 2018; Fine, 2015; Jorgensen, 2015). In this sense, it not only collects what people say, but also what they do in such practices (Eramian, 2018).

In participant observation, researchers remain open to interactions to explore and examine their research questions. In this sense, interpersonal relationships are generated which, while allowing for a unique contextual view of participants and their everyday lives that may be inaccessible to other methods, can raise questions of possible researcher positioning (Eramian, 2018; Jorgensen, 2015). Despite this, the researcher can build empathy and trust with participants, who may cooperate in ways that provide information, such as their deep meanings and inner workings of their everyday lives. However, these relationships can lead to complex decisions about accessing certain environments and providing certain information, requiring negotiation with the population, with ethical elements being important (Jorgensen, 2015).

In general, there are varying degrees of participation and observation: no participation (i.e., a scan of written or audio-visual material), passive participation (i.e., a researcher is in the field, but acts as a spectator), moderate participation (i.e., occasional interaction), active participation (i.e., a researcher takes on virtually all activities with the population), and full participation (i.e., a researcher becomes just another person in the population) (Eramian, 2018). However, these degrees may vary over time depending on the activities in question, being more active or passive (Eramian, 2018; Jorgensen, 2015). In fact, usually the researcher may have various roles in activities and practices throughout their research (Jorgensen, 2015).

The main benefits and limitations of these methods can be seen in Table 2.

Methodology	Benefits	Limitations
Interviews	Participants express their own ideas and opinions. The interviewer adapts to individual differences and the circumstances of the situation.	There is little control over the order in which topics are discussed. The sample size is usually small and limited by cost, location, and time.
Focus groups	Allows for a flexibly organised and structured discussion. All participants can participate and express their ideas and opinions. Dominant and submissive participants can be directed and controlled. A discussion is generated among participants. Large amount of information collected in a short time.	Researcher has little control over the flow of the discussion. Skills are required to handle and manage focus groups. Individual and group views are complex to differentiate. Organising and ordering the data for analysis is complex.
Participant observation	Researcher can be immersed and involved with participants. Encourages relaxed conversation with participants.	Behaviours of observed groups and participants can be modified by the presence of a researcher. Building trust with participants takes time.

Table 2: Main benefits and limitations of qualitative methods based on Lopez and Whitehead (2013).

1.4. Sampling

Sampling in qualitative research is non-probability sampling, in this sense there are four main types of sampling: convenience sampling, purposive sampling, snowball sampling and theoretical sampling; which can be reviewed in Table 3 (Gill, 2020; Moser and Korstjens, 2018; Polit and Beck, 2017; López and Whitehead, 2013).

Type of sampling	Characteristics
1. Convenience sampling: Potential participants based on their availability in relation to their location, time, and willingness.	Quick, easy, efficient, and inexpensive. May provide information with reduced quality. And there may be under- or over-representation.
2. Snowball sampling: Current participants recommend others who might be willing to participate.	Finding and recruiting people who are not easily accessible. Less time to build trust. Quality of referrals may be problematic and/or limited. And there may be dependence on contacts.
3. Purposive sampling: Participants are selected according to criteria, who are familiar with a particular phenomenon.	Selection of participants beneficial to the study, cost-efficient, variety of strategies. Complexity in locating participants who may have quality information.

3.1. Quota sampling: The number and characteristics of participants are decided.	Specific with respect to sub-sample sizes and proportions.
3.2. Maximum variation sampling: Used to ensure that a phenomenon is fully represented in its entirety.	It can focus on individuals, time periods or contexts.
4. Theoretical sampling: Participants that allow theories to be generated. Mainly used in grounded theory.	Use of an initial homogeneous and a subsequent heterogeneous sampling. Essential for understanding an emerging theory. Sequential sampling in parallel with its analysis.
Table 3: Main qualitative sampling based on Polit and Beck (2017); Lopez and Whitehead (2013).	

There is no adequate number of participants, although in qualitative studies a common range is usually between 8 to 15 participants (Gill, 2020; López and Whitehead, 2013). In this sense, the concept of data saturation is used, which is generated when no new information is obtained or when it is evident that new data produces redundant information. In this sense, the number of participants is usually estimated in a first instance depending on various factors that may include: nature of the topic, scope of the study and its questions, variety of participants, method of data collection, sampling strategy and data quality, among others (Gill, 2020; Moser and Korstjens, 2018).

In general, the criteria for inclusion and exclusion of participants may vary during the data collection and analysis process. However, it is important that participants have knowledge about the phenomenon that researchers wish to address, along with a willingness to communicate that knowledge and interact with researchers, and that contexts are described in detail. Similarly, it is relevant to review sampling plans periodically and assess their possible adaptation (Moser and Korstjens, 2018).

In relation to the interaction between participants and researchers, the relationship between participants and researchers can also be important, as in qualitative studies the co-production of knowledge depends to a large extent on the participants and their willingness to share their knowledge. However, ethical dilemmas may arise from such a relationship and its dynamics, such as inferior and superior positions of one in relation to the other, and internal roles with inside observation and external roles with outside observation, even if researchers minimise their distance and separation from participants. Therefore, a continuous reflexive practice is essential to critically explore research and roles in knowledge production (Råheim et al., 2016).

1.5. Qualitative data analysis

There are various ways to analyse qualitative data, such as thematic analysis, discourse analysis, content analysis and narrative analysis, among others. In fact, approaches can also be considered a type of analysis. It is also necessary to point out that there are several qualitative data analysis software that are frequently used, among which the following stand out at a global level: NVivo, Atlas.ti, Dedoose, webQDA, MAXQDA or QDA Miner (Freitas et al., 2017).

1.5.1. Thematic analysis

Thematic analysis is one of the most common analyses in qualitative data analysis, although there is no clear agreement on the characteristics of their processes and details of the analysis (Jamieson, 2016; Braun, Clarke, and Gareth, 2014). This analysis involves finding meaningful themes in the data, along with interpreting their patterns, where the researcher relates to them through a narrative (Feza, 2015; Clarke and Braun, 2014; Kawulich and Holland, 2012). In this sense, although the themes reside in the data, the role of the researcher, who interprets them, is important (Braun, Clarke, and Gareth, 2014). Thus, it is flexible and usually summarises and provides a complete description of a dataset, identifying relevant themes and patterns of meaning. This analysis has six broad phases: familiarisation of data and identification of elements of interest, systematic coding, search for themes and patterns, review of themes, definition of themes, and drafting of the document. In fact, a theme must be independent and distinctive in relation to the codes, but at the same time work together to generate coherence across a story (Clarke and Braun, 2014).

It is important to note that this analysis shares common characteristics with other qualitative analyses, such as the codification and constant comparison of grounded theory and the description of phenomenology, which can also be considered a type of analysis alongside ethnography, where both look for patterns in the data, but are theoretically limited (Braun, Clarke, and Gareth, 2014; Clarke and Braun, 2014; Kawulich and Holland, 2012). In fact, in relation to grounded theory, if the purpose of a study is not to develop a theory, it is appropriate to use thematic analysis. Furthermore, there are also additional techniques for analysing data, such as word frequency and synonyms, where it may also be useful to identify the language for a particular context, which can allow the data to be interpreted for greater understanding (Kawulich and Holland, 2012). However, it should be borne in mind that this type of analysis, like any kind of qualitative analysis, also requires an appropriate degree of theoretical knowledge, since it is intertwined with everything and is a base element for its understanding (Braun et al., 2019).

In regard to the codes, conceptual codes (describing various concepts); relational codes (describing relationships between codes); perspective codes (describing participants' perspectives on a topic); characteristic codes (describing specific characteristics of participants); contextual setting codes (describing the context in which the data were collected in relation to the participants); among others, can be used to study the data, but it must be ensured that the codes are an accurate reflection of the unit of analysis (Kawulich and Holland, 2012).

1.5.2. Discourse analysis

Discourse analysis takes many forms across disciplines and can be confusing (Williamson et al., 2018; Weiyun He, 2017; Álvarez-Benito and Ínigo-Mora, 2016). However, its foundations are related to the use of language and its role in social life and the construction of the world (Williamson et al., 2018). Indeed, discourse analysis emphasises that language is a mode of doing, being and becoming, where the use of language is influenced by real communicative dynamics and is a medium where various actions and interactions take place (Weiyun He, 2017). So, discourse analysis recognises that the world is shaped by social interactions and a variety of sources where meanings underlie such phenomena, forming discourses in various contexts and generating a particular version of reality

(Williamson et al., 2018). In this sense, it is assumed that language shapes reality, and the analysis is carried out from a linguistic perspective, including elements such as syntax, semantics, and pragmatics, along with other non-linguistic elements, where the researcher describes the connections between them; including implicit and explicit issues (Álvarez-Benito and Ínigo-Mora, 2016; Kawulich and Holland, 2012). Therefore, this analysis does not focus on what is said, but on how or when it is said. Thus, discourse analysis it is related to language use in context and not to language in isolation, and it prioritises external factors, which can play an important role in communication, as they constitute the context (Álvarez-Benito and Ínigo-Mora, 2016). In this regard, both written or audio-visual resources and contexts are addressed, as both contribute to the understanding of the communicative content for specific purposes in specific environments, dealing mainly with social, political, and cultural aspects (Weiyun He, 2017; Álvarez-Benito and Ínigo-Mora, 2016).

There are two main interpretations of discourse, a communicative one, which focuses on the exchange of messages, and a representational one, which examines the combination of elements that construct a version of reality. Communicative discourse produces and reinforces (or undermines and changes) representational discourse, while representational discourse influences and shapes communicative discourse. Furthermore, discourse analysis can be divided into other groups, such as critical discourse analysis (Williamson et al., 2018). Critical discourse analysis addresses the relationship between power and discourse, along with how different social groups gain access to a public discourse, where they exert their influence and dominance over a society. Therefore, power relations are discursive, with a society being shaped by a language (Álvarez-Benito and Ínigo-Mora, 2016).

1.5.3. Narrative analysis

Narrative analysis is used as a means to gain a greater understanding of the social world and the production of data (Earthy and Cronin, 2008). This analysis is based on a narrative, where certain characters with their actions are placed in a certain context with a particular time and place, and the events that occur there, with the complexity of the interactions of its element, are given coherence (Kim, 2016; Bamberg, 2012). In this sense, narrative analysis emphasises the understanding of narrative data by means stories, maintaining their qualities through a plot that incorporates various nuances of the meanings of these events (Kim, 2016; Kawulich and Holland, 2012). However, it is necessary to distinguish between narrative analysis and analysis of narrative, where the latter attempts to identify common themes across a range of narratives (Kawulich and Holland, 2012). Thus, narrative analysis explains why and how events happen and why and how participants act, allowing them to explore their experiences (Kim, 2016; Bamberg, 2012). Thus, there are two general components, one related to the experiences of the individuals and their meanings and the other to the narratives that give coherence, where narrative analysis attempts to systematically relate the two, giving more importance to the narratives in order to understand particular experiences through interpretations (Bamberg, 2012).

In this regard, researchers can focus on narrative style and storytelling as social construction and can use stories to investigate experiences and identities (De Fina, 2016;

Earthy and Cronin, 2008). Indeed, it can be noted that they focus on how participants present their stories, considering both the ways in which these stories are constructed and the ways in which participants see themselves in them, generating narrative stories (Kawulich and Holland, 2012; Earthy and Cronin, 2008). Therefore, this analysis allows a problem to be approached through detailed stories, with the stories of one or more individuals being central. In this sense, its unit of analysis is people and not codes and categories (i.e., data) as in grounded theory or thematic analysis. Therefore, the interpretation of the concepts and the plot of the narrative are relevant, where there is a collaboration between the participants and the researcher in relation to the story (Kawulich and Holland, 2012).

1.5.4. Content analysis

Content analysis can use both quantitative and qualitative techniques, although the two should be considered complementary (Lazar, Feng and Hochheiser, 2017; Neuendorf and Kumar, 2016). From a quantitative point of view, this analysis maps data into a matrix for statistical analysis and can consider such statistics to support the description of the content of the qualitative analysis, such as the frequency of function words (Mukherjee, Sinha and Chattopadhyay, 2018; Williamson et al., 2018; Roberts, 2015). And from a qualitative point of view, content analysis explores the meanings of certain themes contained in a message, where communication is relevant (Mukherjee, Sinha and Chattopadhyay, 2018; Williamson et al., 2018). In this sense, meanings are constructed within social contexts, structures, and processes where people are encountered (Williamson et al., 2018; Jamieson, 2016; Neuendorf and Kumar, 2016).

The researcher interprets content to reveal issues about the characteristics of the message (Mukherjee, Sinha and Chattopadhyay, 2018). In this sense, interpretation is useful when the communication is explicit or implicit, along with its complexity and intentionality, to understand the content, bearing in mind that meanings can be surface or deep (Jamieson, 2016). In addition, an analysis based on interpretations can generate new knowledge (Lazar, Feng and Hochheiser, 2017). However, in these interpretations, the researcher may have a preconceived idea about what is sought in the data and looks for evidence that it is present (Jamieson, 2016).

In general, texts are the most common objects of content analysis. Thus, the focus is on the meanings of words and their relationships, along with the sources of texts, to identify individual and social characteristics, characterising texts in the way the sources intended them to be understood (Roberts, 2015). In this sense, this analysis develops a representative description in a systematic, reflexive, and flexible way, identifying specific features of messages through coding, such as discourse analysis, and constant comparison (Mukherjee, Sinha and Chattopadhyay, 2018; Williamson et al., 2018; Lazar, Feng and Hochheiser, 2017; Neuendorf and Kumar, 2016). Indeed, this analysis is also like thematic analysis, in the sense that it analyses the content of the data (Williamson et al., 2018). Because of these characteristics, this analysis allows large volumes of data to be examined relatively easily in a systematic way (Mukherjee, Sinha and Chattopadhyay, 2018).

In general, different ways of combining methodologies, sampling, software, and analyses in one study can be found, as is the case in studies related to biosecurity in dairy cattle farms (Table 4).

Reference	Methodology	Sampling	Software
Brennan et al. (2016)	(24) Interviews. Dairy farmers.	Maximum variation sampling	NVivo
Shortall et al. (2016)	(28) Interviews. Practicing veterinarians	Purposive sampling	Nvivo
Hidano, Gates and Enticott (2019)	(15) Interviews. Dairy farmers.	Convenience sampling	NVivo
Roche et al. (2019)	(6) Focus groups. Dairy farmers.	Purposive sampling	ATLAS.ti

Table 4: Examples of biosecurity studies on dairy cattle farms combining methodologies, sampling, and software, using thematic analysis.

1.6. Quality in qualitative research

It should be noted that the quality of qualitative work is assessed based on four standards: credibility, transferability, dependability, and confirmability.

Credibility refers to what makes the findings derived from the data credible, demonstrating an image in keeping with a phenomenon. This can be done through triangulation, in which multiple research, data sources, data collection methods and/or data analysis are used to obtain reliable and accurate findings (Tenny et al., 2020; Chowdhury, 2015; Kawulich and Holland, 2012); peer review, where coding decisions are justified by peers, who ensure that the data are consistent with the findings (Tenny et al., 2020; Jamierson, 2016; Chowdhury, 2015; Kawulich and Holland, 2012); or member-checking, who verify the authenticity of transcripts and themes derived from the data (Jamierson, 2016).

Transferability is the basis for making similarity judgements, providing sufficient contextual detail to know whether the findings of one research can be applied in another setting (Tenny et al., 2020; Chowdhury, 2015; Kawulich and Holland, 2012). In general, it is carried out by maintaining all original data through thick description (Tenny et al., 2020; Kawulich and Holland, 2012); triangulation (Chowdhury, 2015); and audit trail, which is a set of original documentation and records on the selection of participants, the data collection process and the decisions made (Tenny et al., 2020; Jamierson, 2016). In this sense, research conducted in small contexts may be transferable to other contexts (Jamierson, 2016).

Dependability is complicated to measure in qualitative research, as if the research were repeated, in the same context, with the same methods and with the same participants, the findings should be similar (Chowdhury, 2015). It can be achieved through triangulation and audit trail, which provides accuracy of information enabling reconstruction of events and processes. And confirmability, which ensures findings based on data and not just the influence of the researcher, through triangulation and audit trail (Tenny et al., 2020;

Chowdhury, 2015; Kawulich and Holland, 2012). Although there are also other standards with other criteria (Chowdhury, 2015).

It is equally important to be aware of possible biases in qualitative research such as the Hawthorne effect (i.e., change in participants' behaviour when they know they are being observed), the effect of observer expectation (i.e., change in behaviour or responses to meet the researcher's desired effect) or the effect of the artificial scenario (i.e., information may not be accurate due to the artificial nature of the scenario) (Tenny et al., 2020).

1.7. Qualitative research in the natural sciences

At present, there are few articles that adequately consider all elements of qualitative research in areas of the natural sciences, such as epidemiology. And, therefore, there are few discussions about their different ontologies and epistemologies, together with theories, that can help to better understand the processes behind certain phenomena. Despite this, qualitative research can help to improve elements of its field by making sense of certain findings; exploring and investigating roles, structures and processes in diverse historical, social and economic contexts, and psychosocial factors (Bannister-Tyrrell and Meiqari, 2020).

In general, epidemiology is strongly influenced by positivism, that seeks to understand the mechanisms that mediate cause and effect. Therefore, although epidemiology does not usually consider elements of qualitative research, they can contribute to understand cause-and-effect relationships within their contexts (Bannister-Tyrrell and Meiqari, 2020). In this sense, according to Dahlberg and Dahlberg (2019), qualitative research in traditionally positivist fields, such as animal health and infectious diseases, can reveal misunderstandings, generating little use of its potential given the various confusions that can exist, such as the confusion between content and meaning, and the attempt to separate description and interpretation, where qualitative research has its foundations. Meaning is the cornerstone of qualitative research, which is not self-evident as it relates to person and context. Thus, meaning is associated with sense (i.e., intuition) and one's senses (i.e., perception), which allow to understand the world through bodily interaction. Meaning is therefore related to what is already understood and what is to be understood during a given process, where subject and object interact and evolve.

In this regard, in a qualitative research it is fundamental to self-reflect to be aware of the researchers' assumptions and presuppositions and to be opened to understand new possibilities. However, it must be remembered that content as an isolated element does not exist, since meaning is always present, and one must be reflective about how it is generated and articulated to develop possible theories to recognize and articulate social structures or relationships around them, considering their context (Dahlberg and Dahlberg, 2019).

1.8. Positioning the concept of biosecurity

Biosecurity refers to the protection of human, animal, plant, and environmental life, and to efforts to control and prevent risks associated with pathogens, pests and invasive species as unwanted organisms and threats. In this sense, biosecurity practices are continuous and variable at different scales, from individuals to policies, including research, to exclude, eradicate, or manage such risks. Thus, biosecurity can develop

regulations related to human health, food security, sustainability of agriculture, and environmental protection (Hulme, 2020; MacLeod and Spence, 2020).

Despite the above, within this concept the common elements between processes related to human, animal, plant, and environmental health are not usually considered, even more so with the current global redistribution of pathogens, pests, and invasive species (Hulme, 2020). In fact, although biosecurity practices are the most effective way to prevent and control these threats, they ultimately protect humans (Ritter et al., 2017). Therefore, an integrated approach to biosecurity such as One Health is crucial (Hulme, 2020).

One Health recognises that human, animal, plant, and environmental health are interdependent, with a unified and holistic approach to health enabling research and policy to be designed and implemented. These conceptual health spaces, and their intersections, are conceived as identities defined as boundaries, where practices are generated primarily to protect human life. However, a crossover between these spaces is inevitable. Therefore, One Heath could contextualise the interaction and interweaving between all its spaces and components, and reveal their interconnections and interdependencies, where life can be understood as continuous, dynamic, and composed of different types of relationships and assemblages. Similarly, One Health tends to focus on the management of illness and scarcely on health, excluding other possible interpretations of health. In this way, tensions and contradictions can arise from the classic One Health model, and it is important to integrate this vision into all its spaces and levels. In fact, some social science currents point out that it scarcely explores cultural, social, political, economic, and even spiritual processes and concepts, as it usually has an approach from the natural sciences such as epidemiology, with a focus on health-related behaviour (Davis and Sharp, 2020). Therefore, One Health as an integrative, transdisciplinary, and interdisciplinary approach, where psychosocial elements can have influence, can provide a space with multiple edges, but only if health in all its forms is considered, and not only disease (Davis and Sharp, 2020; Harrison et al., 2019). Furthermore, while this approach can provide insight into the different contexts of disease, its main criticism is its tendency to universalize health values, its lack of knowledge about cultural, social, political, and economic contexts, and its anthropocentrism (Davis and Sharp, 2020).

In this regard, the concept of One Biosecurity appears, which seeks synergies between human, animal, plant, and environmental health, and integrated biosecurity practices, through an interdisciplinary approach, since each of these areas can work optimally when problems exclusive to their sector are addressed, but not when they are related to each other, and are scarcely explored (Figure 3). In this way, One Biosecurity can address challenges such as: urbanization, movement of people, training/preparedness deficit, agricultural/livestock intensification, management constraints and climate change, which integrate various issues that require robust strategies and responses with a holistic and interdisciplinary approach with natural and social sciences, such as epidemiology, psychology, or sociology, at global, national, and local levels (Hulme, 2020).

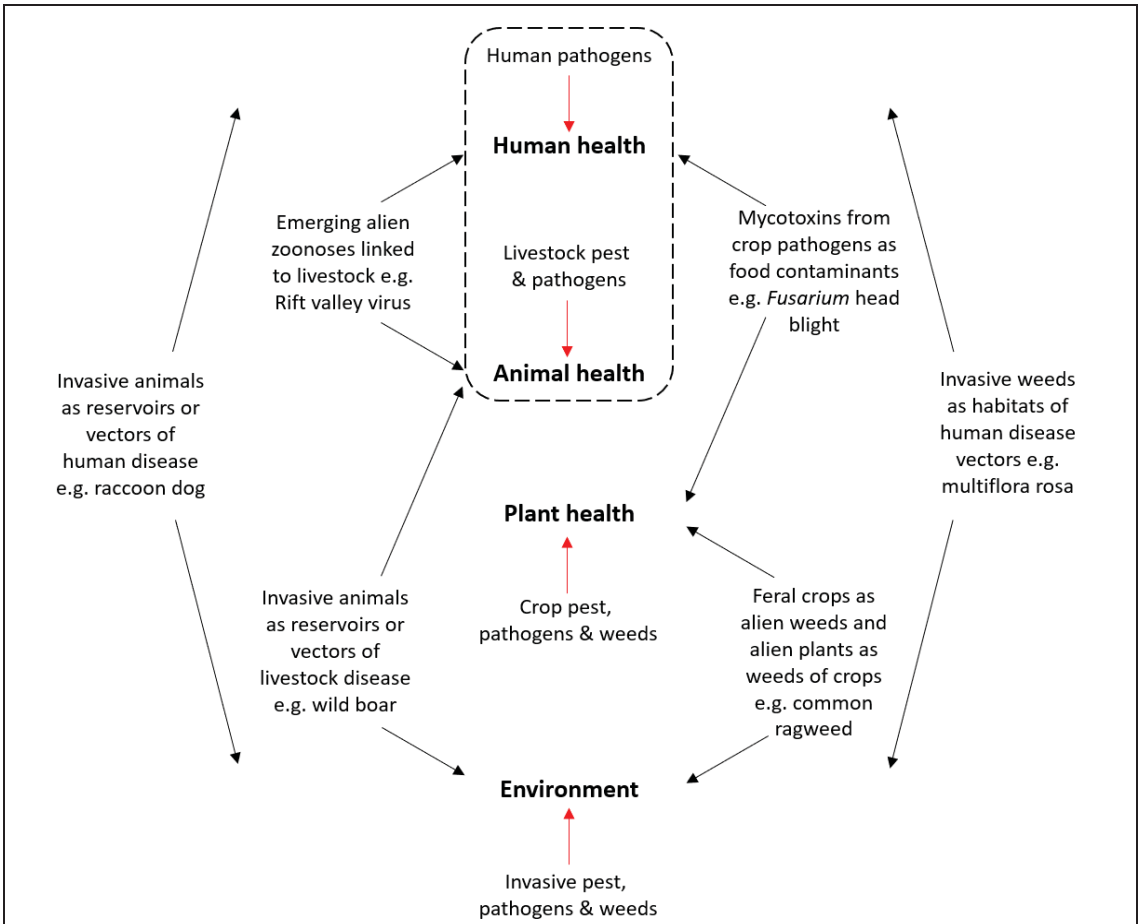

Figure 3: Adaptation based on Hulme's One Biosecurity concept (2020).

Specifically, in relation to animal production systems, biosecurity addresses the prevention and control of infectious diseases on livestock and aquaculture farms, and feed storage facilities (Hulme, 2020). In this regard, in recent years the threats, and risks, to these diseases have increased due to increased urbanization, movement of people and commercial intensification (Mankad, 2016). In fact, these diseases can affect both the health and the welfare of animals, generating a significant economic impact on these systems (Ritter et al., 2017). Thus, biosecurity practices have tried to incorporate the notion of shared responsibility and strategic integration of the common effort, although participation in programmes to implement these practices has not been optimal (Ritter et al., 2017; Mankad, 2016). This may be since most of the initiatives carried out tend to give little consideration to human components in biosecurity practices (Mankad, 2016). So, qualitative research to address such human elements may be relevant.

1.9. Qualitative research on biosecurity on animal farms

In general terms, decision-making regarding biosecurity by the various actors on animal farms, such as farmers, may be affected primarily by their perceptions and attitudes, which in turn may be influenced by their individual traits (e.g., experiences, knowledge, skills, values, beliefs, intentions, personalities, and demographics elements) and their cultural, social, political, or economic contexts (Ritter et al., 2017). In this sense, a change in their perceptions and attitudes through various activities and communication channels

can be favourable for the implementation of biosecurity practices, more so when their conviction and commitment are involved (Ritter et al., 2017; Mankad, 2016). Thus, the elements mentioned above are psychosocial factors that allow explaining and understanding the decisions behind biosecurity practices, being important to consider in the designs of prevention and control programmes, along with their heterogeneities, since there may be different ways of approaching them (Ritter et al., 2017).

1.9.1. Perceptions

Perceptions are an active process of selection, organization, and interpretation of information, which can contribute to the acceptance and adoption of risk reduction strategies. Thus, there are psychosocial factors that influence the perception of risk and the implementation of biosecurity. In this sense, people can perceive a threat in various ways, where individual cognitions and motivations around an appropriate response to the risk of that threat are important. So, risk perceptions and related behaviours can be influenced by the biosecurity context of animal production systems. In turn, this context can affect all aspects of a person's life because of their personal, social, emotional, and financial investment, which can also lead to conflict between people (Mankad, 2016). On the other hand, the perception of responsibility for prevention practices may also be related to the implementation of such practices, although this is not always evident. In fact, in animal production systems, farmers may also point to other agents or production systems as partially responsible for biosecurity practices (Ritter et al., 2017).

1.9.2. Attitudes

Attitudes are an organization of feelings, beliefs and behaviours towards certain events or people, allowing to determine what individuals do and why they do it. There may be affective, cognitive, and behavioural components to attitudes, and their meaning may depend on their importance, personal relevance and knowledge about the event or person. In this sense, the risk attitude has to do with making decisions considering expected benefits, risk contents and risk contexts, and can vary between events and people depending on their global and specific attitudes. Likewise, attitudes can also influence perceptions (Mankad, 2016). On the other hand, a person's attitude may also be influenced by their belief in effective implementation of biosecurity practices, along with their self-efficacy (i.e., belief in their ability to carry out a certain behaviour) and experience in problem-solving strategies, which may in turn depend on their knowledge (Ritter et al., 2017; Mankad, 2016). Generally, knowledge is acquired through experience rather than formal training, and the risks associated with certain diseases, such as their prevention and control, may be known or unknown. This may be due to their availability of time and information sources, which may have varying degrees of confidence (Ritter et al., 2017).

1.9.3. Sources and media

Information sources can influence farmers to implement biosecurity measures, where these sources can generate social pressure. The number of available information sources and information is diverse and continuously increasing, and their credibility and dissemination are important, respectively. For example, there may be sources of information that are not considered credible, useful, or important, and which may be ignored and negatively associated, such as public administration, except when it is about

certain diseases. On the other hand, there may be sources that have a relationship of trust with farmers, such as veterinarians, where their knowledge, communication skills, time and interests may be relevant. However, an effective way of delivering information is from a personalised perspective. Similarly, the effect of direct sources of communication may be limited, and indirect sources may be important in unconsciously eliciting a desired behaviour. On-farm communication between all agents is important, as all agents must be sufficiently informed to believe that prevention practices are effective and to be able to eventually implement them (Ritter et al., 2017). However, it should be borne in mind that there may be inherent cognitive biases influenced by existing patterns that can affect how communications and their messages are delivered, received, and interpreted. Likewise, there may be cognitive dissonances, which occur when two or more convictions of a person are in conflict and may generate a search for internal coherence between them (Mankad, 2016).

Knowing and understanding the media at the disposal of farmers, such as their individual preferences and contexts, can help to ensure proper communication between their sources of information and them. For example, farmers prefer printed and literary media, such as research articles and journals and websites of animal health organisations and associations, which are considered current and relevant. On the other hand, events, such as seminars and conferences, are less preferred, even if they obtain information from experts and generate instances of interaction between farmers, mainly because of elements such as time, location, and cost. In relation to instances of interaction between farmers, collective learning approaches allow farmers to share experiences and improve their knowledge, with discussion groups being preferred, such as those that can be conducted in participatory action research (Ritter et al., 2017).

Participatory action research includes participatory epidemiology, which is useful in resource-constrained settings where conventional epidemiology does not allow for adequate understanding of a given phenomenon to design an intervention. Participatory epidemiology makes use of participatory approaches and methods for the collection and analysis of qualitative elements from a community and its context to understand the diseases and their prevention and control, facilitating the empowerment of people. In this participation all people are on an equal footing, including researchers, generating a common learning space for effective understanding of the phenomenon. In this sense, it considers the participants, with their problems and solutions, as active and primordial elements. However, these participatory approaches are still scarce (Alders et al., 2020).

1.9.4. Behavioural change

In general, people can change their behaviour if they are aware of the consequences of their current situation in relation to risks. However, their behaviours may also depend on how their environments address these risks. Similarly, farmers often assess their threats and issues by also considering other topics that require their attention, and may address those with a greater degree of urgency or severity. In addition, it should be considered that not only should there be consensus between estimation of possible impacts and standardization of biosecurity recommendations to avoid confusion and questioning, but also there should be motivation to effectively change behaviours (Ritter et al., 2017).

Motivation is an internal process that initiates, guides and maintains a behaviour for a certain period towards an objective, explaining why people act in a certain way (Mankad, 2016). Thus, motivation may be influenced by the consequences of actions, such as compliance (e.g., financial support) or non-compliance (e.g., financial penalty) to adhere to socially shared biosecurity standards. There may also be non-economic motivators, such as animal health and welfare itself, but also reputation, status and recognition of the farm, quality and image of dairy products, among others (Ritter et al., 2017; Mankad, 2016). According to Mankad (2016), one of these motivators is social incentives. In this sense, private and public preventive biosecurity actions can influence the implementation of biosecurity measures, which can be applied by all and all be beneficiaries, or be applied by only some and only some assume certain costs. Behaviour can therefore be influenced by the actions of others, where socially desirable behaviour can be a social incentive. Thus, there may be a motivation based on an emotional state in a situation, such as fear, to prevent the risk of a threat, allowing decisions to be made regarding a risk and facilitating a change in behaviour. In fact, certain emotions can be related to different levels of stress and attachment and can significantly influence a certain response.

Equally relevant are social norms, where the issues that are commonly approved or rejected and the actions that are commonly taken in each situation are found. These norms are developed through socialisation processes within a context with specific elements within a social group. Thus, these norms can influence farmers' behaviour through social channels within a social system, which can allow biosecurity practices to be accepted and adopted, and motivation can also be important (Mankad, 2016).

Finally, the feasibility, practicality and cost-effectiveness of biosecurity measures are also related to their implementation, as well as the time, labour force, and structural design of animal farms (Ritter et al., 2017).

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Hypothesis and Objectives

Chapter II

2.1. Hypothesis

Understanding the psychosocial determinants related to decision making for the implementation of biosecurity measures will enable effective recommendations for the improvement of biosecurity on dairy cattle farms.

2.2. Objectives

The general aim of this PhD research is to understand the psychosocial factors that influence the implementation of biosecurity measures in dairy cattle farms in Spain.

The specific objectives guiding this PhD research are:

- To explore what are the perceptions and attitudes of dairy cattle farmers that influence the implementation of biosecurity measures;
- To find out what are the perceptions and attitudes of veterinarians that influence their advice on biosecurity measures;
- To evaluate how dairy cattle farmers and veterinarians behave in the implementation of biosecurity measures;
- To examine what are the perceptions and attitudes of the public administration on the implementation of biosecurity measures by dairy cattle farmers and veterinarians.

Study I

Chapter III

Dairy farmers' decision-making to implement biosecurity measures: A study of psychosocial factors

Transboundary and Emerging Diseases **(2020)**

doi: 10.1111/tbed.13387

3.1. Abstract

Biosecurity measures are a set of management procedures that prevent the risk of introducing and spreading infectious diseases to a farm, although these measures are rarely implemented in dairy farms. There are some studies that have identified that the decision to implement biosecurity measures can be influenced by several psychosocial factors (attitudes and behaviours). Thus, the objective of this study was to examine the psychosocial factors (and their interactions) influencing the implementation of biosecurity measures in dairy farms in Spain, through the views of dairy farmers and veterinarians from Catalonia (northeast Spain) and Galicia (northwest Spain). Face-to-face in-depth interviews were performed with 16 dairy farmers (nine from Catalonia and seven from Galicia) and 16 veterinarians (eight from Catalonia and eight from Galicia). Grounded theory analysis was performed on the transcripts, following the subtopics of: information sources, individual factors of the farmer, social dynamics, official veterinary services and other factors. The study identified the importance of veterinarians as a source of information, including their communication skills, the individual experiences of farmers, traditions of the farms and availability of time and space in the dairy farmer's decisions making. Further, it suggests the need to deepen the knowledge of the farm workers and the obligatory biosecurity measures. This research represents a starting point to develop future strategies to improve the implementation of biosecurity measures in dairy farms.

3.2. Introduction

Biosecurity can be defined as the methods that are used to stop a disease or infection from spreading from one person, animal, or place, to others (Cambridge Dictionary, 2019). On farms, this concept is defined as a set of management procedures that prevent the risk of introducing disease agents into a farm (external biosecurity) and that minimize the spread of disease agents within the herd (internal biosecurity) (FAO, 2010).

The implementation of biosecurity measures can improve animal health (Oliveira, Sørensen, & Thomsen, 2017) and animal welfare (Barkema et al., 2015) and therefore increase productivity in dairy farms (Postma et al., 2016a). In addition, an association has been observed between higher biosecurity and a reduction in antibiotic use (Laanen et al., 2013; Postma et al., 2016b). Despite this, biosecurity measures in dairy farms are rarely implemented (Renault, Damiaans, et al., 2018a; Sahlström, Virtanen, Kyyrö, & Lyytikäinen, 2014; Sarrazin, Cay, Laureyns, & Dewulf, 2014).

The implementation of biosecurity measures at the farm level requires the adoption of a set of attitudes and behaviours by individuals. These attitudes and behaviours are within the so-called psychosocial factors. Psychosocial factors refer to the combination of psychological (level of individual processes and meanings) and social (level of human society, social structure and social processes) factors. In this way, the psychological factors can mediate with the social factors, and the social factors can affect the individual factors (Stansfeld & Rasul, 2007).

Different studies have identified several psychosocial factors in dairy farmers and veterinarians that might influence their decision on whether or not to implement biosecurity measures. Among these factors, it has been described that the attitude of

farmers and veterinarians towards the implementation of biosecurity measures might be affected by the technical knowledge they have (Frössling & Nöremark, 2016; García & Coelho, 2014; Toma, Low, Vosough, Matthews, & Stott, 2015), the individual experiences they have lived (Broughan et al., 2016), the importance they can attribute to risks (Renault, Humblet, et al., 2018b), and the benefits they can obtain from measures implemented (Ciaravino et al., 2017). Moreover, their behaviour towards the implementation of biosecurity measures has also been related to their perceived social pressure to apply these measures (i.e. the subjective norm (Ajzen, 1991)). This might be influenced by personal relationships (Cardwell et al., 2016; Ellis-Iversen et al., 2010; Shortall et al., 2016), action and communication dynamics (Heffernan, Nielsen, Thomson, & Gunn, 2008; Sayers, Good, & Sayers, 2014), or by the relationship between farmers and veterinarians working in the public administration (i.e. official veterinary services (OVS)), where organizational and institutional support (Kristensen & Jakobsen, 2011) and bureaucracy (Hovi, Mcleod, & Gunn, 2005) can be relevant. And finally, their behaviour can be affected by individual factors such as age and gender (Frössling & Nöremark, 2016) or location and size of the farm (Hoe & Ruegg, 2006; Sayers et al., 2013), which may influence their willingness to invest in biosecurity measures (Gunn, Heffernan, Hall, McLeod, & Hovi, 2008). Time and economic constraints may also be relevant (Brennan & Christley, 2012; Pritchard, Wapenaar, & Brennan, 2015), as well as incentives (Frössling & Nöremark, 2016), access to information sources (Laanen et al., 2014; Toma, Stott, Heffernan, Ringrose, & Gunn, 2013), education, and awareness (Brennan & Christley, 2012; Kuster, Cousin, Jemmi, Schüpbach-Regula, & Magouras, 2015).

In Spain, there are several profiles of dairy farmers and veterinarians. On one hand, there are conventional and organic farms, which differ mainly in that the latter have a holistic and integral approach (self-sufficiency) (Stonehouse, Clark, & Ogini, 2001) and must adhere to strict standards with regard to the use of agricultural chemicals (such as synthetic fertilizers and pesticides) and animal medicines (such as antibiotics, anti-parasitics and hormones; EC, 2019). On the other hand, there are private veterinarians (PV), animal health veterinarians (AHV) and OVS (Figure 1). PV are the technical advisors who are hired and paid by the dairy farmer for different areas (e.g. clinical, reproduction, milk quality or nutrition, among others). AHV fall in two main groups: (a) health defence association (HDA) veterinarians. HDA are constituted by farmers associations that aim to improve the health status of their herds, but the responsibilities of the contracted HDA can vary among regions. For example, in northwest Spain (i.e. Galicia) they are only involved in voluntary control programmes of non-regulated diseases (such as Infectious Bovine Rhinotracheitis (IBR), Bovine Virus Diarrhoea (BVD), paratuberculosis or neosporosis). Contrary, in northeast Spain (i.e. Catalonia) these veterinarians are just involved in control programmes of regulated diseases (such as tuberculosis or brucellosis). Nevertheless, in both cases, regardless their involvement with regulated or non-regulated diseases, the HDA are recognized by the public administration and regulated according with national legislation (Royal Decree 842/2011). These are hired by the farmer association itself through the payment of a quota. And, although these associations can receive public funds for the development of these programs, these are not linked to public administration. And (b) veterinarians who carried out mandatory eradication programmes (i.e. regulated diseases) contracted by the

OVS (i.e. public administration). They carry out the fieldwork of these programmes and provide all the data to the public administration. As a matter of fact, in Galicia, the control of tuberculosis and brucellosis is exclusively carried out by these veterinarians. In the case of Catalonia, on the contrary, just one HDA is responsible for the mandatory eradication programmes. Thus, in this area there are no specific entities charge of the control of non-regulated diseases. Finally, OVS monitor farms in various fields, such as animal health. The objective of this monitoring is for farmers to carry out certain management that are under direct or indirect official legal frameworks.

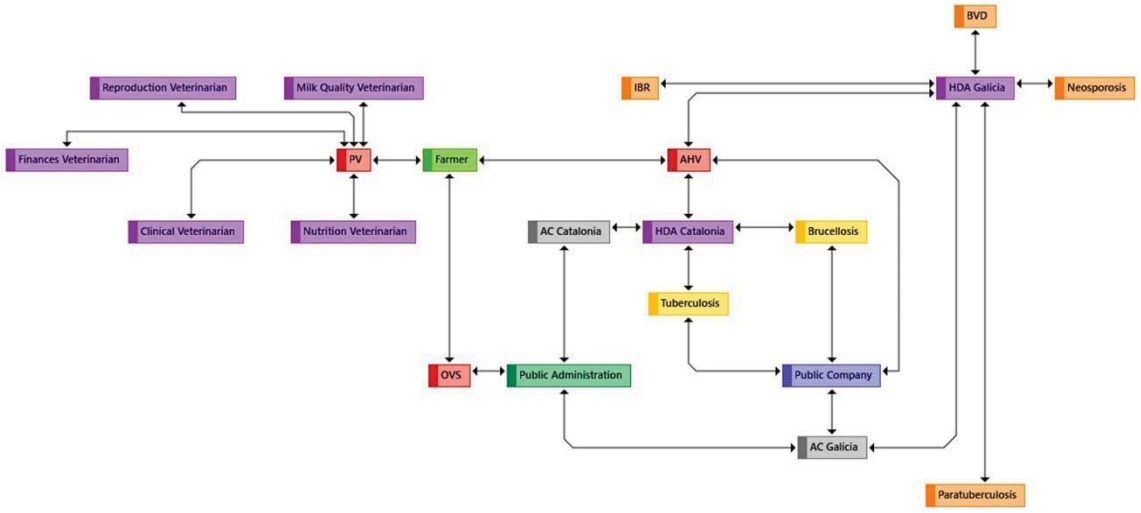

Figure 1: Interaction among veterinary profiles. Scheme obtained from ATLAS.ti 8.2.34 through the codes. AC: Autonomous Community; AHV: animal health veterinarians; HDA: health defence association; OVS: official veterinary services; PV: private veterinarians.

To improve biosecurity, it is necessary to identify the psychosocial factors (and their interactions) that can influence the decision for the implementation of biosecurity measures. Thus, an understanding of each of them and their interactions might allow establishing the individual and collective processes that would be necessary to improve the implementation of biosecurity measures on dairy farms. Therefore, the aim of this study was to explore the psychosocial factors of dairy farmers and veterinarians that determine the implementation of biosecurity measures in dairy farms in Spain. The study results could lead to providing recommendations to improve biosecurity in dairy farms.

3.3. Materials and methods

3.3.1. Area of study

The present study was carried out in two Autonomous Communities of Spain, Catalonia (northeast) and Galicia (northwest), which contain 11% and 38% of dairy cattle population, respectively (MAPAMA, 2019a), with a high level of dairy productivity, 66,270 and 231,331 tons per year, respectively (FEGA, 2019). However, the type of farms in both areas are very different, while in Catalonia the dairy farms have a medium–large size (240–890 lactating cows per farm), in Galicia they are smaller (33–73 lactating cows

per farm) (MAPAMA, 2019b) and they have been developed around homes, being small family farms in most cases (De Llano, 1989).

3.3.2. Study design

A qualitative research design was used in this study using individual in-depth interviews. These interviews were conducted with dairy farmers and veterinarians from both Autonomous Communities. Participants were selected by intentional sampling to identify different discourses through maximum variation (Flick, 2014).

3.3.3. In-depth interviews

For the in-depth interviews, a thematic guide was produced based mainly on scientific articles related to psychosocial factors in dairy farms. Subsequently, modifications were made based on the different views of the research group, and final corrections were made based on a pilot interview with a dairy farmer. In this way, a thematic guide was obtained composed of five topics: (a) knowledge; (b) direct actions; (c) sources of information; (d) experiences; and (e) expectations (Annex). The questions asked to the veterinarians were in relation to the dairy farmers' attitudes and behaviours.

The semi-structured in-depth interviews were conducted face-to-face and tape-recorded. The interviews were conducted between 16 February and 19 July 2018 in Catalonia, and between 3 July and 12 July 2018 in Galicia.

A total of 32 participants were interviewed. Different profiles of dairy farmers and veterinarians were considered in order to have different views (Table 1). Only the profiles of PV and AHV were considered, but not OVS. However, for results and analysis, these profiles were unified only in farmers and veterinarians.

Table 1: Profiles of dairy farmers and veterinarians that participated in the present study.

Dairy farmers profile	Catalonia	Galicia	Veterinarians profile	Catalonia	Galicia
Conventional	7	6	Clinical (PV)	2	1
			Reproduction (PV)	2	1
			Milk Quality (PV)	0	2
Organic	2	1	Nutrition (PV)	0	1
			Finances (PV)	2	1
			AHV	2	2
Total (*)	9 (3*)	7 (1*)	Total	8 (2*)	8 (3*)

Abbreviations: AHV, animal health veterinarians, PV, private veterinarians. *In brackets, number of women participating.

Each interview lasted between 45–90 min. In the first minutes of the interview, general questions were asked to generate a relaxed atmosphere between the interviewee and the interviewer. These questions were related to personal and professional topics, showing interest in knowing their answers. In the following minutes, in-depth questions were asked. These questions were directly related to the topics of the thematic guide. In the following minutes, corroborative questions were asked to answer the generated doubts. These questions were related to their answers to the previous questions.

The audios of the in-depth interviews were reviewed and subsequently transcribed to analyse their data. In the transcripts, the participants were labelled with an initial letter 'F' for dairy farmers or 'V' for veterinarians, followed by a 'C' for the people in Catalonia or a 'G' for Galicia, with a final numbering from 1 to 9 for their differentiation (e.g. FC1 refers to a farmer in Catalonia).

3.3.4. Analysis of data

The data collected (answers of the participants) were analysed using ATLAS.ti 8.2.34, a software based on grounded theory. Grounded theory is a method of interpretative analysis that allows developing a theory that includes social processes and specific concepts (Tesch, 1990; Trinidad, Carrero, & Soriano, 2006). This method is based on constant comparative processes, theoretical criteria and conceptual saturations to provide explanations and important applications (Glaser & Strauss, 1967; Trinidad et al., 2006).

Throughout the discourses of participants, the software allowed us to recognize a set of segments of information that were of interest for the research objectives (i.e. codes, also called concepts or categories). Moreover, it allowed to generate a set of stand-alone ideas based on these discourses for the researchers themselves (i.e. memos) (ATLAS.ti, 2019). In this way, the software introduced the discourses of participants as citations, which were associated to codes (codes groups), and memos.

The previous results were then sent via e-mail to the participants so that they could provide some feedback. Thus, this feedback was taken into account when interpreting the results of the present study.

3.4. Results

A total of 178 citations, 39 codes (nine codes groups) and 25 memos were selected and used for the final analysis process. These citations are in their original language (Spanish) in the Annex to the present study. Comparatively, these citations were the most heterogeneous of all. The citations were organized following the subtopics of: (a) information sources; (b) individual factors of farmer (i.e. internal world of the farmer); (c) social dynamics (internal and external)); (d) official veterinary services (OVS, bad policemen or necessary enemies?); and (e) other factors (variables of time and space). Thus, attitudes and behaviours and their diverse interactions are intertwined with the five topics of the thematic guide. In this way, several psychosocial factors influencing the application of biosecurity measures in dairy farms were mentioned during the interviews, which can interact with each other in different ways, as is shown in Figure 2.

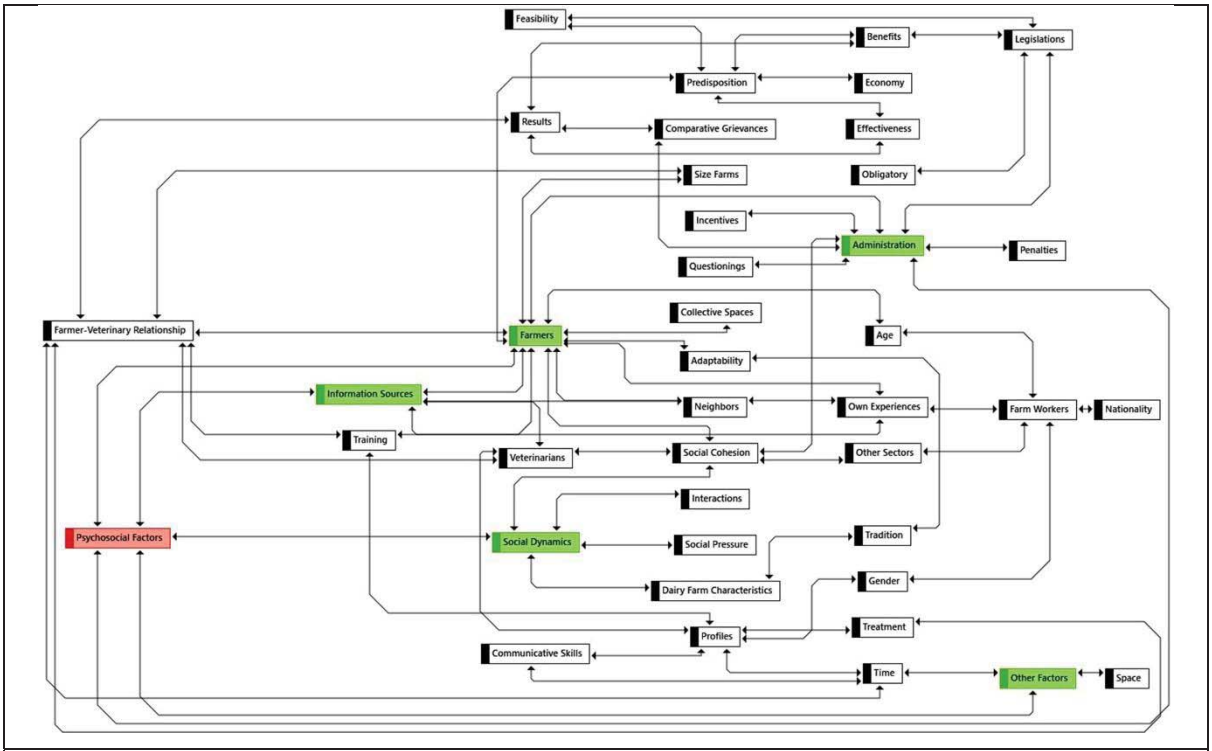

Figure 2: Interaction among the various psychosocial factors. Scheme obtained from ATLAS.ti 8.2.34 through the codes.

3.4.1. Information sources

The interviewees indicated that farmers can use different sources of information to learn about biosecurity, but they pointed out veterinarians and other farmers as the most relevant sources.

The farmers emphasized that veterinarians know the farms in more detail and, therefore, have a greater capacity to influence the decision to apply biosecurity measures by insisting and persisting on the possible risks to which the farms are exposed. Veterinarians suggest options to the farmers that may be viable depending on the priorities that the farms have. These suggestions, in the opinion of veterinarians, are given spontaneously or as a result of a direct consultation, since they do not want their farmers to believe that they have a conflict of interest.

The interviewed also commented that the veterinarian profile can influence advice on biosecurity, for example, the HDA veterinarians. This veterinarian profile advises on biosecurity and raises awareness directly or indirectly about these measures in their daily practice. In addition, the voluntary membership to an HDA by dairy farms was linked to an improvement in the sanitary status of the farm due to a greater biosecurity awareness:

> *FG2: "(...) Many workshops in the HDA also helps. In diarrhoea of small calves (...) it has helped us a lot (...), deaths are reduced (...). The HDA insist a lot that we are going to do this and such, little by little, but it insists on many things. He/she is a good technician (...), very involved (...)" [Original: "(...) Ayuda también muchos talleres en la ADS. En temas de diarreas de terneros pequeños (...) nos ha ayudado mucho (...), se reducen las muertes (...). La ADS insiste*

mucho que vamos a hacer esto y tal, poco a poco, pero insiste en muchas cosas. Es un buen técnico (...), muy implicado (...)"]

VG2: "(...) I had two important outbreaks of IBR (...), one of almost 500 heads, and another of about 100 (...). Since we have been working in HDA, the numbers have been decreasing (...). We, those of HDA, are those who do the 90% of biosecurity work (...)" [Original: "(...) Tuve dos brotes importantes de IBR (...), uno de casi 500 cabezas, y otro de unas 100 (...). Desde que llevamos trabajando en ADS, los números fueron disminuyendo (...). Somos los de ADS los que hacemos el trabajo de bioseguridad en el 90% (...)"]

In relation to the veterinarian's ability to influence the farmer's decision to apply biosecurity measures, an important factor that emerged in the interviews was the existing trust relationship between the farmer and the veterinarian. This relationship, in the opinion of the interviewees, is influenced by the time and treatment given–received, which in turn is influenced by the profile of the veterinarians and their level of training and communication skills. In the interviews, different types of relationships were described. One of them was described as 'close' and was characterized by the long periods of time farmer–veterinarian have worked together. In this type of relationship both farmers and veterinarians feel heard and, therefore, can agree on their decisions. However, other relationships were also described that were 'more distant' due to the limited periods of time they share, such as with the AHV from public animal health companies of only a few hours per year, different from those of clinical, reproduction, or nutrition. In the same way, in the interviews, 'close' relationships were also described to be characterized by a friendly treatment (i.e. due to the dynamics of nearby social circles). In these dynamics, there may be interactions that involve personal areas with reciprocal understandings and decisions mutually agreed directly or indirectly. These relationships were linked to the size of the farms (more on small ones), and the results that farmers can observe regarding the advice given by the veterinarian. It was also mentioned that a friendly treatment could lead to the farmers ignoring a mistake by the veterinarians, unlike an unfriendly treatment. However, there were opposing opinions among veterinarians. Some of them were in favour of a 'close' relationship with the farmer, involving personal and professional aspects, while others preferred a purely professional relationship in order to avoid conflicts of interest.

The ability of the veterinarian to influence the farmer's decision to apply biosecurity measures was also linked to their level of training in biosecurity and their communication skills. Some veterinarians expressed that they did not have enough arguments to defend the application of biosecurity measures and that they required extra training to transfer biosecurity to dairy farms. Similarly, it was mentioned that there was a lack of persuasive skills for farmers to implement such measures due to the lack of observable benefits attributable to the implementation of biosecurity measures in the short term. In addition, veterinarians mentioned that farmers require time to come to terms with the proposals, with communication skill being a key factor to avoid fatigue by the farmers due to the insistence of the veterinarians:

VC4: "(...) I do not know if we can convince them enough, because I am amused that maybe you told or recommended them that they use or do something, and

another person can come here and be able to sell them a tractor (...). We have no power of conviction (...), there comes a time that he/she says: 'it is normal that you come and tell me this, and others come and tell me that' (...)" [Original: "(...) Yo no sé si podemos convencerlos suficientemente, porque me hace gracia que a lo mejor tú les dices o recomiendas que utilicen o hagan cualquier cosa, y es capaz de venir un señor a venderles un tractor (...). No tenemos poder de convicción (...), llega un momento que dice: 'ya es normal que vengas tú y me digas esto, y viene este y me diga lo otro' (...)"]

VG4: "(...) It is something that is so implanted that it is not easy to say: 'we must do this and this' (...), I think there is a lack of more ways to propose it (...). I do not think that people are closed, I think maybe we do few apostolates (...)" [Original: "(...) Es algo que está tan implantado que no resulta fácil decir: 'hay que hacer esto y esto' (...), creo que faltan más formas de proponerlo (...). Yo no creo que la gente esté cerrada, creo que quizás hacemos pocos apostolados (...)"]

As far as gender is concerned, female veterinarians indicated that farmers that have previously worked with them usually respect their professionalism, just as they respect that of a man. However, those farms that have not worked with women previously tend to value their work over time. In the same way, although there may be situations in which sexist dynamics persist, such as those involving physical effort, female veterinarians pointed out that farmers have more confidence in women to share issues of deeper personal aspects. Despite this, it did not stand out clearly in these interviews that the fact of being a woman or man made any difference in influencing the decision of the farmers in relation to the application of biosecurity measures.

As regards the ability of the farmer to influence the decision to apply biosecurity measures by other farmers, bars, pubs, or restaurants were stressed as a space where there is greater interaction among farmers, due to them being locations prone to engage in relaxed conversations and acquire knowledge (which may be reliable or not). Indeed, from the point of view of the farmers themselves, it was emphasized that they could provide information that may be incomplete if it is related to their own farms. In these places there are farmers who are capable of being vocal or leaders and influence others, although those who are considered as reference models are those farmers who are innovators or pioneers in certain areas, and who own large farms.

The relationship between farmers was not only limited to a collective space such as bars, pubs, or restaurants; in fact, the visits to other farms were emphasized by the veterinarians. These visits tend to have positive effects on the farmers through observations and a later reflection, which may lead to the application of biosecurity measures. In these visits the farmers can find out realities different from theirs, being totally disposed to its realization.

The events that occur in the neighbouring farms (proximity experiences) were highlighted as another relevant factor in the decision to apply biosecurity measures, for example, outbreaks of infectious diseases in other farms. In these cases, neighbouring farmers that have not been affected begin to deploy a series of actions to prevent the possible entry and spread of that infectious disease in their farm. This kind of learning was featured as one of the most important, since the unaffected farmers are placed in a scenario where

that could happen, imagining their possible consequences. In the same way, this type of event might be used as an example by certain veterinarians to encourage their farmers to implement biosecurity measures and thus avoid experiencing similar situations. However, it should not be forgotten that each farmer has its own economic, social, cultural and political contexts. This means that they have their own factors that can affect their decision-making process to implement biosecurity measures.

3.4.2. Internal world of the farmer

Individual factors of farmers can determine their perceptions regarding the feasibility of implementing biosecurity measures. Factors reported in the interviews as most relevant could be grouped in adaptation, pre-disposition and individual experiences.

The ability of farmers to adapt to changes was associated with a greater capacity to progress. Despite this, the interviewees stressed that these changes are not always easy to carry out since farmers are usually people with habits, and therefore, they are not always prepared to face and tolerate these changes, a situation that generates their bewilderment and fear, especially when these changes are drastic.

The pre-disposition of farmers to implement biosecurity measures was mentioned to be linked to their effectiveness and benefits. Resistance, carelessness or lack of interest could be generated if they do not see a return to their actions and feel difficulties in their performance. Some farmers believed that biosecurity measures could avoid disease risk and health problems, improving therefore their productivity due to an enhance in the health status of the herd. In this way, some farmers indicated that biosecurity was essential and that without it their farms would not work. The interviewees also perceived that biosecurity was important to not fear infectious diseases enabling themselves to focus in the improvement of other areas. On the other hand, there were participants who had not convinced that biosecurity measures could generate benefits. For example, some commented that there are other productive systems (e.g. swine) that have also faced health problems, although implementing several biosecurity measures. In the same way, they revealed that biosecurity was not their priority and preferred to invest in other areas and that those measures could be complicated to carry out without observable effects in the short term.

The pre-disposition to implement biosecurity measures was not clearly linked to their financial situation. For example, there were farmers who were highly willing to invest in prevention but whose limitation was their economy, and other farmers who were not willing to invest in prevention since they prefer to invest to grow. Even though the advice of the veterinarian, some interviewees mentioned that farmers would invest on biosecurity depending on the profitability or the urgency of biosecurity measures.

Individual experiences of the farmers were reported as the factor with the greatest impact on farmers to implement biosecurity measures. For example, farmers who experienced outbreaks of infectious diseases on their farms attributable to not having good biosecurity had subsequently begun their implementation. In fact, it was expressed that if they had not experienced a similar negative situation, they would not have valued those measures. In addition, these experiences motivated farmers to seek more information, such as about infectious diseases, for better understanding.

Other factors, such as the training that farmers have, were also pointed out. Some farmers commented that they do not know the risk of certain external agents entering their farms, a situation that can perpetuate their risk dynamics. Another thing that stood out was that farmers usually demand information from their veterinarians; therefore, they have the willingness to learn. However, although farmers can receive training from veterinarians, they should learn issues pertinent to livestock as business (e.g. personal management) and on other professional areas:

> *VG3: "(...) That the farmer has training and sees through training how important it is in his/her business to take biosecurity measures (...). Let's say we give them training on a day-to-day basis, whenever you go to visit them, you are advising them with training (...)" [Original: "(...) Que el ganadero tenga formación y vea a través de la formación lo importante que es en su negocio llevar medidas de bioseguridad (...). Digamos que la formación se la damos en el día a día, siempre que vas a visitarlo le estas asesorando con formación (...)"]*

> *VG8: "(...) There is still a lot (...) in the training part (...). The farmer must receive training as a farmer, the farmer cannot receive training as a veterinarian, nor as an agronomist, because for that he/she would have to go to a university (...)" [Original: "(...) Todavía queda mucho (...) en la parte de formación (...). El ganadero tiene que recibir formación de ganadero, el ganadero no puede recibir formación de veterinario, ni de ingeniero agrónomo, porque para eso tendría que acudir a una universidad (...)"]*

3.4.3. Social dynamics (internal and external)

Dairy farms (farmers and veterinarians) are inserted in different social media that can generate different social dynamics, which can be internal or external.

The internal dynamics refer to intrinsic issues of the dairy farms. In this way, the participants mentioned that dairy farms have different characteristics from other productive systems such as swine, which can be a limitation to implement biosecurity measures. These characteristics, in the opinion of the people interviewed, might be linked to the tradition of certain farms, such as, the visits of people without a previous appointment. However, this tradition is currently undergoing major changes, for example, certain farms are evolving, in words of a veterinarian, 'from being an extension of the kitchen to being a business'. On the other hand, the effect of pressure or social influence was also highlighted, which may be greater in rural contexts than in urban contexts, especially when there are events that generate alarm in the population, such as public health issues, which increases interest in biosecurity.

The external dynamics refer to issues specific to the social factors (inside and outside the dairy farms) and to the various degrees of social cohesion. In this sense, it was pointed out that inside the dairy farms there is a coordination between the farmers and their different veterinarians with a joint task. However, there was no perceived coordination outside, between private and official veterinarians, as well as with other sectors (universities, dairy industry, or laboratories). As regards the OVS, it was mentioned that farms and veterinarians that belong to the OVS are in parallel worlds, since the last ones only watch over the compliance of the protocols and they are not involved in the farms

like private veterinarians. Furthermore, private veterinarians featured their role as intermediaries between the farmer and the OVS. It was also mentioned that pressure from private and official veterinarians drives farmers to implement biosecurity measures. The need for better coordination was stressed, with the involvement of all people who interact internally (farm workers, farmers or veterinarians) or externally (OVS, universities, dairy industry or laboratories) on the farms should direct their efforts in the same direction.

It is important to mention that although it is the farmer that does the training or resorts to certain sources of information, it is the farm workers who finally perform the actions. These workers have different types of profiles which can vary mainly by gender (men and women), age (20–55), nationality (national or foreign) and previous experience in farms (present or absent). This diversity of profiles was linked to the scarce availability of labour:

> *VG1: "(...) Here there are young people, from 20 years olds to people over 55, women, national people, foreign people. They do not meet a profile, as you work more with protocols, you look for a worker who meets them and that's it (...), they are farm workers (...)" [Original: "(...) Aquí hay desde gente joven de 20 años a gente mayor de 55, mujeres, gente nacional, gente extranjera. No cumple un perfil, como se trabaja más a protocolos, buscas un trabajador que los cumpla y listo (...), son operarios de granjas (...)"]*

> *FG5: "(...) If I do not install facilities, no, to have them wrong. I'm tired of having things wrong, and it also gives a lot of work. And workforce is very limited, there is no workforce (...). Workforce is needed (...)" [Original: "(...) Si no hago instalaciones, no, para tenerlas mal. Estoy cansado de tener las cosas mal, y además da mucho trabajo. Y la mano de obra es muy escueta, no hay mano de obra (...). La mano de obra hace falta (...)"]*

3.4.4. Official veterinary services: bad policemen or necessary enemies?

Farmers and OVS may interact because of existing legislation. Public administrations force farmers to implement specific biosecurity measures that they probably would not do voluntarily unless they experienced certain complications. In fact, some participants pointed out that mandatory actions are important, unlike those of a voluntary nature, as they allow farmers to move forward to implement these measures. However, it was indicated that some regulations could be improved to make biosecurity measures feasible to implement.

Regardless of the obligatory nature and the feasibility of the biosecurity measures, some situations that can generate mistrust towards the public administration, and consequently compromise the credibility of their recommendations, were mentioned. The situations mentioned by the interviewees could be grouped into questionings about measures and comparative grievances.

In relation to the questionings about certain measures, which may vary depending on the infectious disease, the participants attributed negative consequences to the farms by applying compulsory vaccination programmes (collective experiences). For example, some participants reported several productive losses after vaccination against bluetongue, causing its use to be feared by farmers and not recommended by veterinarians. They also

challenged the real importance of certain measures, such as the perimeter fences, which went from mandatory to voluntary. In fact, some participants pointed out that the OVS show contradictions as to whether to implement biosecurity measures. Likewise, the participants questioned certain situations in which the official veterinarians recommended fencing, but leaving the gates open in case a common road crossed the farm or dividing the farm with two fences in case a stream crossed the farm.

In relation to the comparative grievances, there were farmers who made comparisons with other farmers and other productive systems. Some farmers pointed out that all dairy farms should be under the same rules to be on equal terms, an issue that could be favourable for dairy production itself. Likewise, they commented that other productive systems (e.g. goats and sheep) should also be subject to the same rules. Farmers did not want them (OVS) to be more flexible or permissive with their farms, since they agree with them, but they demand minimums from all ruminants without exception.

All these factors, added to other experiences, have led to the farmers having a certain perception of the OVS. There are collective opinions that believe that public administrations do not understand the realities of farms and that they should know and have a closer contact with them to subsequently generate legislation that considers their realities since, in the opinion of the interviewees, they frequently create regulations complicated to perform (e.g. the perimeter fences). In addition, from their point of view, sometimes the official veterinarians can be very severe and apathetic, creating problems in the farms that previously did not exist. This situation leads to them being defined by some farmers as 'bad policemen', who only penalise, although there may be exceptions in that they believe that some are understanding and facilitators.

Some farmers were aware that the public administration just do their work and that this can favour their farms. In fact, some veterinarians used the term 'necessary enemies' to define the official veterinarians (OVS). In this way, farmers highlighted that public administrations are essential, although they might be slow in their management (bureaucracy), a situation that can be evidenced by their late responses, but that can play an essential role in the application of biosecurity measures in the farms. Some veterinarians commented that the penalties (e.g. fines) can lead to farmers implementing these measures, but also the incentives (e.g. subsidies) if they meet specific conditions. However, some farmers mentioned that the farms should not operate by incentives, but on their own account as a business without depending on them:

> *VC2: "(...) The farmers' perception is that the administration always tries to penalise, rather than advising or helping to solve the problem. They are people who, when they come to control routinely, or by surprise, an exploitation, always try to look only for the bad, that is their perception, it's like when the police stop you and you do not know why (...)" [Original: "(...) Su percepción es que la administración siempre intenta penalizar, más que asesorar o ayudar a solventar el problema. Son gente que cuando vienen a controlar de manera rutinaria, o por sorpresa, una explotación, siempre intentan buscar solo lo malo, esa es su percepción, es como cuando te para la policía y no sabes por qué (...)"]*
>
> *VC3: "(...) The administration, in most of the farms, is conceived as the bad policeman (...), as a necessary enemy (...). Inspectors who have zero empathy (...),*

there is also someone who (...) is considered as an ally in the farm (...)" [Original: "(...) La administración, en la mayor parte de las granjas, es concebida como el policía malo (...), es un enemigo necesario (...). Inspectores que tienen cero empatía (...), también hay alguno que (...) se le considera como aliado en la granja (...)"]

FG1: "(...) People who are there do not understand much about what farming is, they should know more about this (...). They should generate other stuff that were related to each zone (...)" [Original: "(...) La gente que está allí no entiende mucho de lo que es una explotación, deberían saber más de lo que es una explotación (...). Deberían sacar otras cosas que fueran relacionadas a cada zona (...)"]

FG2: "(...) The relationship with the head of the health area is good, I think they have to do their job and they do it (...), what mistakes everyone has, but they are very understanding, and I think that they defend themselves in their area (...)" [Original: "(...) La relación con el responsable del área de sanidad es buena, yo pienso que tienen que cumplir su trabajo y lo hacen (...), que errores los tiene todo el mundo, pero sí que son muy comprensivos y pienso que se defienden en su área (...)"]

3.4.5. Variables of time and space

Time and space available were two other factors that were highlighted as barriers for the application of biosecurity measures. On one hand, time was reported as a limitation for farmers and veterinarians to implement these measures and to conduct training or to resort to sources of information, such as visits to farmers. This was because the farmers usually perceive to have too many hours of work and the veterinarians usually work with defined times in each farm, depending on their profiles and demands, being able to cover (or not) these measures. And, on the other hand, the available space in the farms could also influence the implementation of biosecurity measures, since there are regulations that can restrict infrastructure constructions. For example, because of this, farmers might buy external animals since they cannot make their own replacements due to space limitations.

3.5. Discussion

According to the 'Animal Health Law' (European Parliament & EU Council, 2016), the implementation of biosecurity measures at farm level is the responsibility of the farmers. Therefore, in the context where there are no policies that force farmers to implement biosecurity measures, and in a sector where the implementation of biosecurity measures is scarce (Sahlström et al., 2014; Sarrazin et al., 2014), developing strategies to motivate farmers is of paramount importance to achieve an improvement in biosecurity. Nevertheless, the development of such strategies should be based on an understanding of the different psychosocial factors influencing farmers' decision-making. The present study, to the best of our knowledge, is the first one that has attempted to do so in dairy farms in Spain.

One important factor that arose from the interviews was the influence of the private veterinarian. As previously described in other studies (e.g. Cardwell et al., 2016), veterinarians are considered to be the main source of information for farmers to learn

about biosecurity and therefore their training and communication skills are highly relevant (Hamood, Chur-Hansen, & McArthur, 2014; Ruston et al., 2016). In this sense, some researchers have pointed to the fact that veterinarians usually give more importance to their own knowledge than to the opinion of their clients (e.g. farmers), and therefore, they are paternalistic (Bard et al., 2017), which highlights the importance of establishing a dialogue with consensus between farmers and veterinarians (Kuster et al., 2015). In our study, the interviewed veterinarians emphasized that they see farmers as an equal and that they usually have a horizontal relationship, a situation that can facilitate an effective communication. However, some of them mentioned feeling uncomfortable to recommend biosecurity measures due to the possible reactions that the farmers may have (e.g. their fear that farmers believe that there may be a conflict of interest). Interestingly, this was not mentioned by any farmer. Therefore, the relationship between farmers and veterinarians could incorporate personal and professional aspects with transparent dialogues to be close and reliable without misunderstandings, helping to ensure that biosecurity measures can be internalised in a better way.

As for the veterinarian's profiles, the HDA veterinarians were identified as those that are mainly responsible for biosecurity, being consistent with their role played; however, there are still farms that scarcely implement biosecurity measures. This could be due to the existence of obstacles in their relationship, as was described in Sweden (Svensson, Alvåsena, Eldh, Frössling, & Lomander, 2018). According to these researchers, although the health management veterinarians are important and have a similar professional profile to those of the Spanish HDA veterinarians, farmers do not always carry out their suggestions because of difficulties in their relationships. Furthermore, in this study, these obstacles are not directly linked to the time that veterinarians spend on the farms, since they visit the farms with the same frequency of other veterinarians' profiles (e.g. clinical and reproduction). Thus, it would be particularly interesting to look deeper into this profile, as their role is directly related to biosecurity measures, unlike other profiles that indirectly approach this issue.

Other factors were mentioned in relation to the pre-disposition of providing advice to farmers about biosecurity, such as their lack of sufficient training in the topic, or the risk of developing fatigue in farmers due to their insistence. Further studies to look deeper into all the aspects related to the communication process between farmer and private veterinarians are, in our opinion, of paramount importance, as seems to play a central role in the implementation of biosecurity measures by farmers. Issues such as transparency of relations between farmer and veterinarians or the position that the veterinarian should have in front of the farmers, together with the necessary steps to achieve this, might be required before developing adequate motivation strategies.

Individual experiences were also highlighted to heavily influence the decision-making process of the farmer to implement biosecurity measures. Interviewees mentioned increasing biosecurity in the event of a public health problem or an outbreak of a disease in a neighbouring farm (proximity experiences), as previously described in different studies (e.g. Hernández-Jover, Taylor, Holyoake, & Dhand, 2012) but, interestingly, none of them (farmers nor veterinarians) linked biosecurity as a way to reduce the risk of disease transmission in the scenario of the introduction of an exotic disease in the country

(e.g. foot and mouth disease). This could reflect that farmers and veterinarians have a lack of awareness about these diseases that may deserve further attention.

Moreover, collective experience may also play a role in the decision-making process, giving rise to doubt about the effectiveness of some biosecurity measures carried by OVS or resistance to their implementation. As, for example, there are still farmers today that remember what happened with the vaccination against bluetongue (2006–2009) (Sok, Hogeveen, Elbers, & Oude, 2016), and it might not let the farmers fully trust in the public administration. This kind of experience is difficult to approach, since it has a repeated retrieval and feedback among the farmers (Roediger, Zaromb, & Butler, 2009), and it should be kept in mind when trying to reach the farmers. Therefore, the strategies to face these experiences must combine unified official discourses with transparency and awareness, which together could gradually have an impact on the farmers' decision-making.

On the other hand, the pre-disposition of farmers to implement biosecurity measures was linked to the effectiveness and benefits of the measures, as reported in previous studies (e.g. Alarcon, Wieland, Mateus, & Dewberry, 2014), which is an issue difficult to demonstrate. However, the perception of benefits does not always maintain a univocal relationship with the perception of risks, since sometimes, if benefits are perceived, risks are avoided, while in others they do not (Valeeva, Van Asseldonk, & Backus, 2011). This was demonstrated in our study, as farmers had different opinions in relation to the benefits of implementing biosecurity (from people that considered it essential to more sceptic people). The development of tools and the spreading of the results showing the potential benefits of biosecurity are also recommended in order to improve their perception of the cost-effectiveness of biosecurity.

This study was focused on farmers and veterinarians, but the farm workers also appeared in their answers, as they are the ones that implement the biosecurity measures in the field. Interviewees mentioned that farm workers are scarce nowadays, and often with a low level of training, which has forced some farms to replace them with milking robots. The reasons can be varied, for example, it may be due to the existence of high levels of stress due to working conditions (health and safety) or workloads (Chen & Holden, 2016; Lunner et al., 2013). Considering the importance of farm workers in the implementation of the biosecurity measures in the field, performing studies focused on this group are also highly recommended.

Although, as previously mentioned, the European 'Animal Health Law' attributes the farmer with the responsibility of implementing biosecurity measures. In Spain, there have been some attempts by regional and national governments to develop specific legislation to force farmers to implement some recommendations, which has generated many discussions. Biosecurity measures imposed by legislation usually generate a lot of debate, as described elsewhere (e.g. Oliveira, Anneberg, Voss, Sørensen, & Thomsen, 2018). The role that OVS should play in the implementation of biosecurity measures is subject to debate and might also deserve further studies. According to the responses of some interviewees, legislation is needed to safeguard dairy farms, although they should be accompanied by an understanding of all the people involved, as proposed by Brennan and Christley (2013). However, the legislation and their obligatory nature is a complex issue

to approach, a situation that becomes even more complex when they intersect issues, such as awareness. Thus, it would be interesting to look into the effect of the obligatory in future theorized discussions from a sociological perspective.

As for the methodology used in this study, we decided to use a qualitative methodology (i.e. semi-structured in-depth interviews) which can be appropriate to investigate and look deeply into the different realities of people (Mason, 2006). Qualitative methods are based on interpretivism and constructivism paradigms (multiple realities), while quantitative research is mainly based on a positivist paradigm (only an objective reality) (Sale, Lohfeld, & Brazil, 2002). Therefore, the repeatability of qualitative studies can be lower than for quantitative studies, since it considers that all interviewees have unique and unrepeatable realities (Leppink, 2017). However, this technique is adequate to determine the different interpretations of reality from the opinion of each of the participants (Della, 2014), which can be influenced by various factors that may be difficult to perceive by us.

As regards the intrinsic flexibility of the semi-structured in-depth interviews, it has to be borne in mind that the questions were carried out differently with each of the participants, that is, their order and content were varied in relation to their development with each of the participants. For example, gender questions were asked only to the women interviewed at different times. The objective of the above was to be executed a fluent and spontaneous interview, where the participants could feel comfortable and free (Ryan, Coughlan, & Cronin, 2009). Nevertheless, there is a possibility that this may have affected their response to some degree, although this procedure is characteristic of this technique. In relation to the number of participants involved in the present study, although a saturation of the discourse (heterogeneous group) was reached, there is the possibility that other small variables could have arisen if we had carried out more interviews. This is mainly due to the magnitude of the various psychosocial factors that affect each of the contexts, which are not generalizable.

Results from our study highlight the need of promoting awareness as the key to the implementation of biosecurity measures, since they must be understood for true implementation. However, motivation strategies might also include other aspects, such as direct participation of farmers and monitoring of efforts by the cohesion of all the people involved over time. Nevertheless, the development of such strategies would benefit from a deeper understanding of some of the topics identified through this study by using other techniques, such as an ethnography (Naidoo, 2012) or focus groups. Therefore, it has highlighted the impact that qualitative studies such as these can have, which can guarantee a greater representativeness of the data if carried out together with quantitative studies. This study was not intended to look deeply into each of the various factors separately, but to describe a global panorama of those that may exist among different dairy farms, identifying the main psychosocial factors that influence farmers' decision-making.

3.6. Conclusion

The decision to comply with the existing regulations and suggestions on the implementation of biosecurity measures in dairy farms are influenced by various psychosocial factors. In this study, we have identified the main psychosocial factors (and their interactions) that influence dairy farmers' decision-making in Spain. These factors are related to the relationship between farmers and veterinarians, the feasibility of

implementing these measures, and the influence of social dynamics and OVS, together with the available time and space. All these psychosocial factors were identified as factors that influence the attitude and behaviour of farmers to implement biosecurity measures. In this way, the farmers function as complex systems that have certain psychosocial factors, which in turn can interact in different ways according to their economic, social, cultural and political contexts (i.e. they are heterogeneous).

In addition, these farmers can interact with other systems (e.g. veterinarians). The veterinarians appeared to play an important role in the dairy farmers' decision-making to implement biosecurity. Therefore, all the aspects that can influence the communication between dairy farmers and veterinarians such as trust, level of training or fears to provide recommendations, might play an important role and may deserve a deeper study in order to provide future recommendations to improve biosecurity. However, all these system interactions (farmers and veterinarians) can be further complicated if we consider other systems (e.g. farm workers and OVS). Thus, other aspects such as the internal social dynamics of farm workers and the role that OVS and the compulsory should play in the improvement of biosecurity were also identified as issues which need further analysis. In this way, this research represents a starting point to develop future recommendations to improve the implementation of biosecurity measures.

3.7. Ethics statement

The present study was approved by the Ethics Committee of the UAB (CEEAH 4055), who also helped design the informed consent for the participants.

The informed consent was used to mainly to explain the objectives of the study and the conditions and guarantees of the participants. It was pointed out that the data would be confidential and analysed anonymously, that there would be no economic benefits to participate, and that the interview would be recorded by audio or text. The decision to participate in the study was totally voluntary, and if they wished they could stop and leave the interview at any time. In this way, the informed consent was signed by the interviewee and interviewer, with a copy for each one of them.

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Study II

Chapter IV

From Biosecurity to Security Ecologies: An Analysis between Old Dairy Farming Traditions and Routines and Veterinary Recommendations in Spain

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4.1. Abstract

Biosecurity has gained significant interest in farm animal health in recent years. However, in dairy cattle farms, there is slight, or no implementation of biosecurity practices recommended by official authorities and techno-scientific experts. This situation might be explained by the tension between old farming traditions and routines and veterinary recommendations. We draw upon Lefebvre's threefold model of space, which addresses spatial practices (old traditions and routines), representations of space (recommendations) and representational space (final implementation of biosecurity measures), constituting security ecologies to understand what might be happening by using an ethnographic approach on two farms in Galicia and two in Catalonia in Spain. The three biosecurity practices considered are management of dead animals, control of vectors and pests, and animal management. The results show that farms have different specific contexts, and that the reasons behind the positions of farmers and veterinarians, effective communication and common sense need to be considered. Security ecologies based on Lefebvre's model could therefore be a positive mechanism for ensuring the implementation of biosecurity, beyond the visions of authorities or specialists.

4.2. Introduction

The concept of biosecurity can have specific meanings in different disciplines. This term has been used from threats of infectious origin to threats of human origin (Koblentz 2010; Hinchliffe 2017). Thus, it is possible to identify four areas of biosecurity: emerging infectious diseases, bioterrorism, innovation and transformation of life sciences, and food security (Collier and Lakoff 2008). In this way, we see biosecurity as a strategic, integrated approach to the analysis and management of major hazards to human, animal and plant health and life, as well as to the environment (WHO 2010); where one of its main areas of attention is farm animal health in relatively recent years, being internationally led by the World Animal Health Organisation (OIE; FAO 2007).

Therefore, it is possible to define biosecurity within farm animal health as 'a set of management and physical measures designed to reduce the risk of introduction, establishment and spread of animal diseases, infections or infestations to, from and within an animal population' (OIE 2018). This notion includes a set of technical and political measures to prevent, control, manage and/or contain infectious diseases on livestock farms on an individual and collective level (Braun 2007; Bingham and Hinchliffe 2008).

International organisations and national governments, through standards and guidelines, seek to harmonise the various biosecurity measures that exist around the world (Dibden et al. 2011). In this sense, in the last two decades, several authorities have joined efforts to promote biosecurity protocols (EC 2003). For instance, the OIE has generated biosecurity recommendations that can serve as the basis for legislation in each country (OIE 2019) and the Food and Agriculture Organization of the United Nations (FAO) has highlighted the importance of promoting such recommendations, emphasising the limitations that strict legislation on biosecurity could cause to developing countries and the need to create global, integrated biosecurity strategies (FAO 2007). In this vein, Europe currently has its Animal Health Law (Regulation (EU) 2016/429), which states that biosecurity is a requirement to manage farm animal health in an efficient manner, and that it must be flexible, adaptable to different types of production and animal species

and consider local circumstances. Following these recommendations, Spain has established regulations such as the Management of Livestock Farms (Decree 40/2014). However, it is important to highlight that there are no widespread or specific official regulations on biosecurity on dairy cattle farms, although this situation might change in the near future (MAPA 2019).

Biosecurity measures are intended to prevent pathogens entering from outside (i.e. external biosecurity) or to control spread within the herd (i.e. internal biosecurity). As it is very well known, external biosecurity is the more efficient form of control, but if it fails and there is an outbreak, internal biosecurity becomes the more important line of defence (FAO 2010). External biosecurity can include measures related to the entry and exit of animals, removal of dead animals, visits and personnel, vehicles and equipment, vectors and pests, and fodder and water. In turn, internal biosecurity includes animal management, cleaning and disinfection, and labour routines (Dewulf and Van Immerseel 2018; Sarrazin et al. 2018). For example, biosecurity can address the main infectious diseases present on dairy cattle farms such as bovine viral diarrhoea (BVD), infectious bovine rhinotracheitis (IBR) and bovine tuberculosis (BT), as is the case in Spain (Renault et al. 2018a; MAPA 2020a). Biosecurity can therefore reduce mortality (Renault et al. 2020), improve animal health (Oliveira et al. 2017) and welfare (Hristov et al. 2011), and consequently, increase animal productivity (Postma et al. 2016a). A relationship has also been described between greater biosecurity and less use of antibiotics (Laanen et al. 2013; Postma et al. 2016b; Isomura et al. 2018).

Different livestock farmers, such as cattle, swine and poultry farmers, have shared their perceptions about infectious diseases and biosecurity, and generally claim that there are little or no limitations on the implementation of biosecurity measures (Laanen et al. 2014). However, swine farms have a higher level of biosecurity than cattle farms (Nöremark et al. 2010; Sahlström et al. 2014). Dairy cattle farmers implement biosecurity practices in a heterogeneous manner that may not observe biosecurity standards, sometimes including little or no implementation (Brennan and Christley 2012; Sahlström et al. 2014; Renault et al. 2018b). There are considered to be various (favourable and unfavourable) internal and external factors that determine whether farmers implement biosecurity practices, such as: experience, knowledge, understanding, attitude, motivation, sources of information, economy, perception of the importance and effect of biosecurity, animal welfare, internal and external cohesion, obligatory and voluntary biosecurity, availability of time and space, farm size and facilities, climate and behaviour of other agents, among others (Nöremark et al. 2010; Brennan and Christley 2013; Toma et al. 2013; García and Coelho 2014; Laanen et al. 2014; Sarrazin et al. 2014; Toma et al. 2015; Broughan et al. 2016; Frössling and Nöremark 2016; Naylor et al. 2016; Ciaravino et al. 2017; Renault et al. 2018c; Moya et al. 2020).

Due to all the above, dairy cattle farms can be considered one of the agroeconomic sectors that face the greatest problems with implementing biosecurity practices. The present research focuses on this problem and examines how biosecurity practices are carried out on dairy farms. Our main objective is to analyse and understand the problems associated with the implementation of biosecurity practices, and why this process sometimes fails, or even worse, is non-existent. We explore the relationship between the recommendations by veterinarians and the old traditions and routines that have traditionally guided

biosecurity practices on dairy farms. To do so, we introduce the three-fold model of space proposed by the philosopher Lefebvre (1991) and the 'security-ecology' concept to understand how daily practices are developed and established by their users. After this introduction, we detail our empirical data from our ethnographic study, which focuses on the implementation of biosecurity practices on four Spanish dairy farms. Finally, we conclude that the problem described in the scientific literature of there being little or no implementation of biosecurity practices on such farms is a reductionist view of the real situation. Thus, biosecurity practices are used on farms, and biosecurity recommendations are considered. However, these official measures are combined and mixed with old traditions and routines. We have regarded as security ecologies those daily practices that combine veterinary recommendations with farmers' traditions and routines, in a new way of securing life.

4.3. From Lefebvre's model to security ecology

In 2018, Fuchs observed that Lefebvre (1991) had been interested in understanding how human beings (e.g., veterinarians and dairy farmers) produce their own lives, consciousness and worlds, and how they mobilise various elements to achieve a purpose (e.g., biosecurity), and articulate their daily practices to order and give meaning to their existence. Such processes not only involve the production of social relations, but also spaces, where bodies are produced, and in turn, generate new spaces. Thus, spaces are considered a product and a means of production where various sets of relationships and forms coexist. It is also possible for causes and effects to be found in the same space, where past actions, such as old traditions and routines, can have an impact on future actions, such as recommendations, and vice versa. It is important to note that spaces are not only demarcated physically, but also by means of speech and signs that generate symbols, such as biosecurity measures and biosecurity legislation. In this sense, the real and the symbolic revolve around the imaginary (i.e. around the possible scenarios in which infectious diseases are transmitted on farms). It should be pointed out, however, the different modes of production that Lefebvre described are characterised by a lack of attention to historically concrete forms of difference (Kinkaid 2020). Nevertheless, in this study such historical processes are considered, which are closely linked to old traditions and routines. In fact, considering the logic set forth by Hinchliffe and Ward (2014), old dairy farming traditions and routines that affect biosecurity contribute to the diversity of epidemiological units (i.e. groups of animals with a defined epidemiological relationship that approximately share the same probability of exposure to a pathogen, because they share common practices or environments; OIE 2018). Such diversity, along with the existing spatial and microbiological diversity, could contribute to animal health.

Lefebvre (1991) defined three distinct sets of practices: (1) spatial practices, where old traditions and routines are generated based on the historical knowledge of those who perform them (in our case dairy farmers), (2) representations of space, where techno-scientific knowledge is relevant (in our case recommendations by veterinarians), and (3) representational space, the final product or combination of the previous set of practices (in our case, the space where biosecurity measures are ultimately implemented). Although Beyes and Steyaert (2011) also reframe the representational space as the rhythms, cycles, movements and flows, encounters, intensities, capacities and forces, events; instincts, affects, atmospheres and auras; relations, knots and assemblages. In fact, we must consider that knowledge of farmers and veterinarians comprises both objective

(independent of the social context) and subjective (context-dependent and not easily transferable to other contexts) attributes, possessing three fundamental fields: rational (explicit knowledge), typically characteristic of veterinarian' knowledge, and emotional (bodily, emotional and sentimental response to external stimuli) and spiritual (ethical values and principles), typically characteristic of farmer' knowledge (Bolisani and Bratianu 2017). In this sense, a field of knowledge can be transformed into any other field, since they are in continuous interaction and transformation (Bratianu 2016). Thus, decision-making in relation to biosecurity is the product of a conversion and combination of two or more fields of knowledge, and therefore, the rational field alone is not adequate (Bratianu and Vătămănescu 2018). Therefore, the three previous sets of spatial practices should not be understood as independent or hierarchical (Beyes 2018). These dimensions must be tackled in an integrated way, which are interacting in a single moment of social space, within which power relations and hierarchies operate; although it may be useful to distinguish them to analyse potentially dominated and free spaces, and to pay attention to significantly different dynamics (Taylor and Spicer 2007; Dale and Burrell 2008).

According to Lefebvre (1991), it is also possible for there to be a dominant space that strives to mould other spaces on its periphery. This could be the case with the techno-scientific recommendations of veterinarians who have the support of various legislations of international and national bodies with regard to old farming traditions and routines. Thus, a dominant group is able to organise and instrumentalise a social space in its own interest. However, the dominant group does not necessarily benefit, since all those who live in this space can also do so, such as dairy farmers, even more so if there is a participatory design that includes the dominated group.

In general, Lefebvre's triple space model is not usually applied in biosecurity studies, although there are other investigations within the rural field that have used it, such as that carried out by Halfacree (2006). In this research, it can be evidenced how Lefebvre's model addresses rural localities (spatial practices), formal representations of the rural (representations of space) and everyday lives of the rural (representational space). In this sense, there could be a complementarity with the present study in the way in which this model has been used, such as dissolving the duality between spatial practices and representations of space, generating a tension among all the parts to varying degrees. Therefore, Lefebvre's model could have several applications that could be perfectly used by the rural sector, to help not only go beyond dualisms, but also even understand new processes that embrace disparate elements that may be in tension dynamics. Thus, in this study, Lefebvre's model is of value in understanding what happens behind the final implementation of biosecurity measures, specifically in relation to the representational space, where there is tension between farmer knowledge, through its old traditions and routines, and veterinarian knowledge, through its recommendations.

In relation to biosecurity practices, dairy farmers could be committed to them, but not necessarily take into account the official biosecurity measures recommended by techno-scientific experts and are instead more flexible and adaptive (Higgins *et al*. 2016a). It is also interesting to consider the complexity and specificity of farmers' contexts (Naylor *et al*. 2016), as biosecurity practices have limited value if they are not localised. Hence, it is necessary that biosecurity practices, that are heterogeneous, are adequate to farmers, who should decide for themselves which measures to implement (Enticott 2008a; Enticott *et al*. 2012). In addition, the way farmers perceive and respond to the risk of infectious diseases might influence such implementation (Enticott and Wilkinson 2013). Thus,

biosecurity can generate processes of adaptation to local social and ecological conditions that could coexist alongside the uncertainty of infectious diseases (Enticott *et al*. 2012; Higgins *et al*. 2016a). This generates mixed practices that we have called security ecologies, which describe how tensions between recommendations and old traditions and routines ultimately lead to the implementation of biosecurity.

To understand security ecologies, it is useful to briefly explore the 'disease-ecology' concept. This term originally only considered a disease agent and a host, whose contact at the same time and place generated the occurrence of disease (May 1950). However, this concept has been incorporating and combining social, cultural, political, economic and environmental factors (Mayer 1996; Oppong and Harold 2009). In this sense, the effects of anthropogenic elements can have various effects on the disease process within disease prevention and control strategies, integrated by the relationship between disease, humans and animals, and their environment (Wilcox and Gubler 2005; Keesing and Ostfeld 2011; Oppong and Huddleston 2014). It is possible to appreciate the extension of disease ecology in other related areas such as epidemiology, combining different subjectivities, spatialities and materialities that can address diseases in different ways (Enticott and Ward 2019). In this regard, new configurations of epidemiology are created, which are transformed into a border practices that are remodelled to adapt to a context. Thus, these configurations, with their social and biological dimensions, must be recognised to facilitate disease management (Hinchliffe *et al*. 2013; Enticott and Ward 2019).

Collecting some of the previous elements, the security-ecology concept is derived from a social ecological perspective whose subject of analysis is situated within a specific context, which can determine the behaviour of its environment through the influence of intrapersonal, interpersonal, community, sociopolitical and institutional factors (Green *et al*. 1996). In this sense, security ecology refers to the creation of spaces that shape specific situations where agents deal with unpredictable dimensions, such as infectious diseases, by incorporating local elements to predict and adjust to their environment (Lorway *et al*. 2018). In fact, security ecology is very close to the practices described above, where borders are mixed and crossed to maintain a pathological life (i.e. the interactions of the elements that are behind the disease in relation to the powers and threats active to life; Hinchliffe *et al*. 2013). Although, in this case, it is to maintain a biosecurity adapted to the various contexts through a hybridisation of old farming traditions and routines and veterinary recommendations. Thus, security ecology describes how dairy farmers, veterinarians and the tensions between them can intervene in and modify their environment through the final implementation of biosecurity, which ultimately achieves the biosecurity objectives, whether or not recognised by the authorities or experts. This helps to appreciate how dairy farmers can create their own security environments, where both forms of knowledge (i.e. old farming traditions and routines and recommendations) are intertwined and create a heterogeneous space. Lefebvre's model is therefore ideal since it is mainly based on practices that can permeate biosecurity practices, and in turn, organise these perfectly, thus generating security ecologies.

4.4. A conflictive relationship between recommendations and old traditions and routines

Generally speaking, at present, dairy cattle farmers and veterinarians are mainly responsible for carrying out biosecurity practices (Gunn *et al*. 2008; Donaldson 2013;

Higgins *et al*. 2016b). However, farmers tend not to agree with that situation, believing the contribution from organisations and governments, which they do not fully trust, to be insufficient (Heffernan *et al*. 2008; Gunn *et al*. 2008; Palmer *et al*. 2009). In Spain, as established by the Ministry of Agriculture, Fisheries and Food, those responsible for implementing biosecurity are all the people who, directly or indirectly, work with animals, such as farmers, veterinarians, transporters, farm maintenance personnel, slaughterhouse personnel, among others (MAPA 2020b).

In Spain, there are private veterinarians (e.g., clinical, reproduction, milk-quality or nutrition specialists, among others), animal health veterinarians (AHV) and official veterinary services (related to the public administration). Of these, AHV have training and experience in biosecurity practices above other veterinarians and participate in control programmes of regulated and/or non-regulated diseases. For example, in Galicia (northwest of Spain), AHV are contracted by an animal health defence association (HDA) to carry out control programmes of non-regulated diseases such as BVD, but not for regulated diseases such as BT, which are controlled by AHV contracted by public companies through programmes of mandatory eradication. While in Catalonia (north-east of Spain), AHV of an HDA only carry out control programmes of regulated diseases, and there are no control programmes of non-regulated diseases. Veterinarians are key agents in the livestock industry, being an important source of information that could influence farmers with regard to infectious diseases and biosecurity management (Ciaravino *et al*. 2017; Moya *et al*. 2020). In some European countries, such as Belgium, France and Spain, most cattle veterinarians consider biosecurity a priority for their profession, and their perceptions of biosecurity can influence its proper implementation (Renault *et al*. 2018c). It is therefore important, in general terms, for veterinarians to have sound knowledge of epidemiology when developing and implementing control programs for biosecurity and infectious diseases on farms, at the regional and national levels (Robertson 2020).

Despite the above, typically veterinarians seem to lack effective strategies to turn their knowledge of infectious diseases and biosecurity into actual practice among farmers (Ruston *et al*. 2016), even though they regularly come from the farming industry and their gradual entry into this sector is increasing (Shortall *et al*. 2018). There are often communicative inconsistencies or contradictions between veterinarians and cattle farmers with regard to their opinions and the implementation of biosecurity, which, at the same time, might be influenced by regional, age and farm size differences (Sayers *et al*. 2013, 2014). Additionally, as Silvasti (2003) highlighted, an understanding of these inconsistencies or contradictions requires knowledge of the farming way of life, in which old traditions and routines are important.

To understand the problem in Spain, it is important to know about the history of dairy farming in the country, and its traditions and routines. In the 19th and 20th centuries, there was an increase in the number of heads of cattle on Spanish dairy farms, mainly due to the need to supply cities, especially in Autonomous Communities (AC) such as Galicia (Langreo 1995). In the 1920s and 1930s, there was an intense process of industrialisation of the dairy sector in such regions as Catalonia (Hernández 2017). Following the Spanish Civil War, certain principal productive areas such as Galicia were maintained, while others were isolated and punished, such as Catalonia, which had to seek new trade channels. In the post-war era, dairy farming was one of the slowest agricultural sectors to recover. Although the agricultural sector underwent modernisation in the 1950s, there

was little industrialisation of farms, despite their rapid increase in production. The greatest increases occurred between 1965 and 1970, while progress was slower from 1975 to 1985, despite improved yields. Moreover, 84 per cent of farms had fewer than 10 cows per farm, making them difficult to modernise, and 45 per cent of farmers were over 55 years old, while only 8–9 per cent were under 40 years. The dairy sector was finally expanded and modernised in the late 1980s (Langreo 1995). It can therefore be observed that Spanish dairy production has been characterised by high regional specialisation and high heterogeneity. Nowadays, Galician dairy farms tend to be medium to large, and modernised; while in Catalonia they tend to be large and are often owned by large production companies (De Llano 1989; MAPAMA 2016). Galicia has 55 per cent of the country's dairy farms with an average of 43 cows per farm, while Catalonia has 4 per cent of the farms but an average of 144 cows per farm (MAPAMA 2018).

Generally, that historical process can be associated with consolidation of the use on dairy cattle farms of old traditions and routines related with the security, animal production and conservation of land, and farmers and their families (Singleton 2010). This point is important because issues related to old traditions and routines in terms of identity and symbolic meaning can clearly determine the direction of dairy sector and are relevant for understanding how farmers perceive and respond to the world (Burton 2004). The authors such as Waage and Mumford (2008) consider these elements of animal production to be key factors for understanding processes of resistance and resilience on farms.

Some initiatives have included old dairy farming traditions and routines among their main elements, such as the Amsterdam Treaty on animal welfare, which is closely related to biosecurity (EU 1997; Kümmerlen *et al*. 2019). These old traditions and routines can have various effects on dairy farming contexts. For example, in some parts of Europe as Spain, the matter generates major difficulties for young people looking to join the livestock sector and help to restructure its identity (Fischer and Burton 2014; Kontogeorgos *et al*. 2014; Góngora *et al*. 2019), which is leading to greater ageing and less generational turnover, as opposed to other European countries (Lobley 2010). However, this might be positive for the continuity of rural practices (Joosse and Grubbström 2017). Gender issues are another example, wherein men tend to work with machinery, while women focus more on animal health and welfare (Kallioniemi and Kymäläinen 2012).

Despite these initiatives, the conflictive relationship between official measures, especially those focused on biosecurity, and old traditions and routines that have survived on dairy cattle farms for decades, is still present. For some researchers, this is the direct reason for there being little or no implementation of the former on many dairy farms, and for the failure of solutions proposed by institutional sectors, which include pressurising and even strongly penalising dairy farmers. However, there is a blind spot in the literature, namely that institutional actors do not usually consider traditional and routine farming practices to hold any value in themselves or be able to guarantee any kind of security. To better understand this value and why it has survived so strongly and for so long, as well as the relationship established between the official measures and the old traditions and routines, we can refer back to Lefebvre's model and security ecology dimension previously explored.

4.5. Data collection

The present research was conducted on four dairy farms in Spain, in Galicia (two) and Catalonia (two), which are described in Table 1. Furthermore, veterinarian data were obtained from private clinical and reproductive veterinarians. The research was based on a mainly ethnographic approach, whereby the ethnographer spent time collecting data on people's daily lives, to thus give shape and content to social processes (Hammersley and Atkinson 1994). Several studies have used ethnographic approach, such as those by Høg *et al*. (2018) on the perception of biosecurity among key agents in production; Rimi *et al*. (2016) on the kind of messages that raise awareness of bird flu among rural people; and Keck (2015) on the practices of people from farms and laboratories with regard to biosecurity and bird flu, among many others. The ethnographic approach involved full-time participant observation for about two weeks on each farm, together with personal notes collected in a field diary for later analysis.

Table 1: Characterization of dairy cattle farms explored.

Dairy farm	Start year	Total number of animals	Number of animals in lactation	Number of animals in rearing	Own rearing (Int/Ext)	Staff amount	Territorial expansion (Hectares)
Galicia I	1951	220*	100	85	Int	4	60
Galicia II	1985	490	290	200	Int/Ext	5	100
Catalonia I	1963	100*	45	25	Int	2	30
Catalonia II	1933	580*	205	200	Int	3	90

*Includes males.

The dairy farms were selected in two stages. Several dairy farmers were contacted who had previously been linked directly or indirectly to one of researchers. They were told of the general and specific objectives and the activities that could be conducted during data collection, and then agreed or refused to participate. Together with the farmers who agreed to participate, the roles and rules that ethnographer would perform and respect on each farm were established, and the participants filled out an informed consent form.

It is important to note that the ethnographer was a veterinarian with theoretical experience in infectious diseases and epidemiology and practical experience on dairy farms, and who had received training in sociological methodologies and techniques. The ethnographer therefore played a mixed role, mainly using his profession not only as a veterinarian but also as a farm worker (depending on situations that arose) to gain access to the field and collect data. For example, as a veterinarian, they made recommendations on animal health and biosecurity, while, as farm worker, they performed everyday chores such as milking and feeding cattle and cleaning beds. In general, the ethnographer was permanently in the company of dairy farmers and farm workers and, ultimately, of veterinarians who visited these farms.

From those ethnographic experiences, we selected three vignettes to illustrate how security ecologies emerge from the combination of official biosecurity measures and old traditions and routines. These were selected on the basis of three criteria: (1) transversal (i.e. biosecurity measures present on two or more farms), (2) variability (i.e. heterogeneous implementation of biosecurity practices), and (3) availability of data (i.e. quantity and quality of empirical material that involves biosecurity practices). We present

the results in the following manner: management of dead animals (external), control of vectors and pests (external) and animal management (internal).

4.6. The tug and pull between veterinarians and dairy farmers

4.6.1. Management of dead animals

Dead animals were removed from farms by specialised companies. The veterinarians instructed that dead animals should be disposed for collection in an isolated, enclosed place:

> *(...) The veterinarian told the farmer: 'I'm tired of saying this again, but if I have to, I'll keep saying it until you do it'. These words alluded to biosecurity practices regarding dead animals. The veterinarian pointed out that the farmer needed to keep dead animals far apart from healthy animals, ideally in an isolated, enclosed area adjacent to a driveway. However, the veterinarian also reminded the farmer that the best option would be to invest in building a special place just for those animals (...). (Field diary, Galicia II)*

The purpose of that recommendation was to prevent trucks entering the farm to collect dead animals, because neither the veterinarians nor the dairy farmers knew exactly where those trucks had been before. The reason for the recommendation was therefore to prevent the trucks from bringing new pathogens onto the farm and animals from being a source of infection for the healthy animals.

The above extract shows that there was apparent insistence on the part of veterinarian that the dairy farmer should implement that biosecurity practice, even recommending investment in a new space. It can be deduced from this that old traditions were deeply rooted among farmers, who emphasised the use of old facilities over the creation of new ones, although in part it was also due to an economic factor.

In contrast, it was possible to observe the inexistence of an effective communication space between the dairy farmer and the veterinarian since both parties seemed to ignore the arguments of the other without reaching a definite and concrete agreement. In fact, the dairy farmer had another short-term plan in mind, as they were thinking of investing in renewable energy using the farm's own waste, and the veterinarian knew this. Moreover, the farmer had told the veterinarian that they were willing to implement that biosecurity practice in the future, but only after carrying out the energy plan. So, it is worth asking why both agents were trapped in a kind of vicious circle in which the veterinarian apparently insisted on one recommendation, despite knowing that the farmer had other plans, and the farmer apparently ignored it, because they had other priorities; and neither agent seemed able to appreciate the reasons why and why not. Hence, communication was somehow failing. Three main elements can therefore be observed: (1) different prioritisations of the farmer and veterinarian, (2) apparent insistence by the veterinarian and ignoring by the farmer, and (3) practically non-existent dialogue and consensus between the veterinarian and farmer. Such disharmony between the veterinarian and the dairy farmer's priorities and decision-making can be known as counter-intuitive rhythm (Lefebvre 2013), where both the veterinarian and the farmer have different action times, which may or may not coincide. In this sense, their rhythms are discordant, being disorderly and mobile, being able to generate that arrhythmia. Thus, these rhythms could

be an important factor to consider in terms of effective communication when implementing biosecurity practices, since both agents must agree minimum points within such dynamic.

In other cases, veterinarians reported that they were exhausted by the stubbornness of dairy farmers. This could come from the old traditions of dairy farms themselves and led to the veterinarian leaving biosecurity completely in the farmer's hands. This particular veterinarian even warned the farmer of the consequences of culling:

> *(...) The veterinarian told me: 'There's nowhere suitable for dead animals. Look, they just leave them in the middle of the dairy farm. Then the truck has to come inside'. The veterinarian also told me that the farmer could quite easily make a space to leave such animals at the entrance to the farm, but they won't do it. The veterinarian finished by adding: 'If something gets in and they end up needing to cull all the animals, it won't be because we didn't tell them, but because it's always the same story' (...). (Field diary, Catalonia II)*

The veterinarian pointed out that the farmer could easily make a space to dispose of dead animals, as mentioned above, and not in the middle of the farm, and also argued that there was plenty of space and money. But again, there was no communication to explain the reasons behind the apparent lack of implementation of that biosecurity practice. So, the farmer ended up trying to follow the veterinarian's recommendation as far as possible, without necessarily observing all the details:

> *(...) The dead-animal zone was about six metres away from the area for calves. So, I advised the farmer to move it somewhere else, and they agreed to temporarily move it to another corner of the farm, about twelve metres away. Although the new place was not enclosed, it was closer to the driveway and more isolated than the previous one. It was also much easier for the farmer to move these animals than calves, even though they also planned to move the calves in the future. A different situation arose in the rearing area, where there was only one place for dead animals, at the back of the farm, close to a driveway, although it was about two metres away from the healthy animals. However, this situation did not depend directly on the farmer, since there were no more spaces and infrastructures available for the purpose (...). (Field diary, Galicia II)*

There was a mix of facilities, some old and some modern, a result of the historical evolution of dairy farms. So, the main elements that dairy farmers considered in the management of dead animals included farm spaces and infrastructures, where old traditions and routines were perpetuated based on each farmer's definitions and uses (Broadbent et al. 1980). Space and infrastructure thus generate a kind of reluctance for farmers to follow veterinary recommendations. In turn, these facilities acquire different meanings depending on the specific contexts of farms with regard to biosecurity, as Lefebvre proposed. In addition, as Enticott (2008a) points out, the interaction between modern (ordered) buildings and old (disordered) buildings can influence the entry and spread of infectious diseases, whereby spaces and infrastructures can become reproducers of social reality (Gregory and Urry 1985). However, historical and social contexts are directly linked to social reality, which is dynamic and in permanent transformation. The sets of practices based on social reality are in continuous transformation as well, because

they are always subject to a process of convergence between the old and the new. Such a situation could be observed on another farm:

> *(...) The farmer told me that their habits are always changing. They now dispose of dead animals in the middle of the farm because that is the easiest area to manage, given the facilities. It is easy to reach from anywhere on the farm in a similar amount of time (Figure 1). However, although trucks do have to come onto the farm to get to the area, it was isolated to some extent. The farmer also told me that if they did what the veterinarian had recommended, they could end up having other problems because families with children often came near to farm, and they might be curious and try to explore the area (...). (Field diary, Catalonia II)*

Figure 1: Dairy farm Catalonia II. Red circle indicates place where the dead animals were arranged.

As can be deduced from the above, the management of dead animals on a dairy farm involves a series of spatial practices that are combined with representations of space in two different ways. First, the farmer noted that their habits were changing, in other words, old traditions were gradually being affected, but were still present. Second, the farmer considered access to the dead animal area from anywhere on the farm, but also the consequences of biosecurity practices for the surrounding communities. Finally, a representational space emerged that mixed both sets of practices, which is where the biosecurity measures were eventually implemented. These practices are not the official biosecurity protocols established by institutions but are instead influenced by the availability and distribution of spaces and infrastructures, and the simple use by farmers

of common sense (Hinchliffe 2015). Ultimately, a space is created that is not lacking in security, but that neither meets official protocols nor is limited to the old traditions and routines that have prevailed on the farm for decades. This is what we have called a security ecology, where two issues are respected: (1) the need for security, even though there is no implementation of official biosecurity measures; and (2) the clash between the official, the new and the old.

4.6.2. Control of vectors and pests

The farms not only had dairy cattle, but also other animal species. However, the veterinarians advised against other domestic or wild animals, mainly because they could be reservoirs for certain infectious diseases that could affect cattle. The farmers were also told that they needed to prevent these animals from getting into other areas of farms, particularly the place where feed was stored:

> *(...) The farm had different domestic animals, such as dogs, cats, chickens and ducks. So, I pointed out to the farmer that it was not a good idea to keep such animals because they could easily come into direct or indirect contact with the cattle. I told them that there was evidence that certain infectious diseases can be transmitted by domestic animals, such as Neospora canis by dogs, Streptococcus canis by cats or Salmonella by chickens and ducks, which could cause abortions, mastitis or diarrhoea, respectively. Besides, carnivorous species, such as dogs and cats, might theoretically transport infected tissues from outside or around farm (...). (Field diary, Catalonia I)*

The veterinarians also said that carnivorous species used for pest control, such as rodents and birds, should be replaced with other control methods or techniques and be kept off farms.

In relation to wild animals, the veterinarians recommended the use of physical measures:

> *(...) The farmer told me that the veterinarian had advised them that building a perimeter fence, both around the farm buildings and land, could be effective for preventing wild animals from contacting the herd or destroying crops (...). (Field diary, Galicia I)*

The farmers again implemented biosecurity measures in consideration of that recommendation, since both their residences (i.e. personal spaces) and their businesses (i.e. professional spaces) shared common spaces. They lived on their farms because they had been handed down over generations, in accordance with old farming traditions and routines. They were aware that certain areas should not be crossed, but without neglecting typical domestic activities like commerce and recreation:

> *(...) Chickens and ducks were kept in pens near to the rearing shed and used mainly for sale of meat and eggs. Some of these birds were free-range, but they did not pose a risk to cattle, as they did not share the same spaces. Dogs, kept in a kennel on the other side of the rearing area, were sold as hunting dogs, while there were cats scattered all over the farm, both inside and outside of the farmhouse. They were kept as pets but were also used as an effective form of*

> *rodent control. In fact, I often saw rodents scuttling around the farm (...). (Field diary, Catalonia I)*

The farmer tried to keep the cattle separate from the other domestic animals, but they did not always have absolute control over their movements, although this was not a concern either. This situation was also observed on another dairy farm, although this farmer claimed to have absolute control and said that the dogs did not come into direct or indirect contact with cattle:

> *(...) The dogs were mainly used as protection against wild animals, such as boars and wolves, which often come close to the farm buildings and land. Crops were planted about eight metres from the farm, and when we were clearing the fields, I could see that boars had been wreaking havoc the night before just a few metres from the farm itself. It is also important to note that the dogs never went close to the herds. They often followed the farmer to the gates of sheds where cattle were kept, but never went inside (...). (Field diary, Galicia I)*

The dairy farmers implemented a biosecurity measure in consideration of old traditions and routines as well as modern recommendations. This consisted of their own domestic animals acting as controllers of wild animals that could cross all the physical barriers around their farms. They also indicated that there were no official plans to address the problem of wild animals, and that it was the duty of public administration and not of farmers to take care of the problem. So, rather than having no species other than dairy cattle, farmers kept other animals, but made sure they made no direct contact with the herd, thus seeking to strike some kind of balance between both spaces when species other than dairy cattle were present.

One possible explanation for that situation is the different understandings held by veterinarians and dairy farmers about infectious diseases, which are continually being restructured and rethought (Enticott 2008b; Enticott and Franklin 2009). Thus, the perception of infectious diseases also requires consideration within the heterogeneity of elements linked to biosecurity. So, the farmers employed common sense to develop their own biosecurity spaces to keep their farms free of infectious diseases as much as possible, generally related to trying to prevent contact between cattle and other species. They were aware that total control of infectious diseases on farms was practically impossible and concentrated efforts on reducing those with the highest potential consequences on production. They therefore take risks rather than aiming for the total absence of infectious diseases (Hinchliffe 2017). Veterinary recommendations may make the error of focusing all attention on avoiding the transmission of pathogens, while ignoring some of the specific factors involved such a situation (Hinchliffe et al. 2013).

As mentioned in the previous section, we observe a security ecology here, which maintains a security situation without completely renouncing old traditions and routines (i.e., existing historical, situated practices). In this way, it is possible to reach a hybridisation of these traditions and routines and veterinary recommendations, which may even have a much greater scope considering the complexity of the various existing contexts.

4.6.3. Animal management

Finally, a similar situation arose with the location of dairy cattle. The veterinarians recommended that new-born animals should be kept apart and housed in individual pens, located outdoors and with easy to clean surfaces, and that when these calves left these pens, they should be grouped in batches of the same age. However, one of the most important recommendations was for calves to be kept in different places to adult animals, avoiding all direct and indirect physical contact:

> *(...) The farm was divided into three sheds: adults (lactation), weaners (rearing) and calves. However, the calves were all kept together in the same place, instead of being separated into individual pens, and the ventilation was poor. Meanwhile, there were other adult animals roaming freely around the farm. So, I told the farmer that ideally, the calves should be kept separate outdoors, and adults should be in yards. The cattle were not even separated by age in the sheds. So, I told the farmer how important this biosecurity practice was, mainly to detect sick animals by observing weight and growth problems (...). (Field diary, Catalonia I)*

A similar situation occurred on another dairy farm, where the veterinarian commented the following:

> *(...) Calves were kept in individual pens in the same shed as adult animals, about two metres away. Also, the rearing animals, due to high animal density, were not arranged based on age. The veterinarian stressed to the farmer: 'You've got a problem with BVD, if you want to fix the problem, you'll have to separate your animals and take samples from them all. Sorting counts for nothing if these animals all end up together in the same place' (...). (Field diary, Galicia II)*

Considering Holloway (2019), there may be many knowledge practices that relate biosecurity with animal welfare that do not entirely consider veterinary recommendations, especially since dairy farmers try to ensure the life of their livestock in difficult times. This situation can be observed mainly on small farms such as those in the present study:

> *(...) Calves were kept in a shed together because the farmer did not have enough space for individual pens, and it was winter. However, in the summer the farmer would take the animals away from there and put them in a small yard next to the house, mainly due to their concern about high temperatures. In the rearing shed there were two spaces for males and two spaces for females, where they were kept separate for mainly physiological, behavioural and spatial reasons. Meanwhile, the free roaming dairy cattle had some type of limb injury and were set free to reduce the likelihood of slipping and getting even more badly injured, so they would not have to go to slaughterhouse early (Figure 2) (...). (Field diary, Catalonia I)*

Figure 2: Dairy farm Catalonia I. Dairy cattle free roaming.

In that situation, despite possible limitations, the farmer generates a space that prioritises animal welfare as much as resources allow. This is a further case of common sense prevailing, but this time focused on animal welfare. Some elements of common sense apply to all farms, such as those regarding biosecurity, infectious diseases and animal welfare, and can sometimes be even more complex:

> *(...) The dairy farm was being expanded, but calves were temporarily being kept near the yards where the adults were. This was the healthiest place for them to be, as the farmer was trying to solve a problem with BVD. However, although they were trying to separate calves and weaners, due to high animal density and limited facilities, they were in a difficult situation (...). (Field diary, Galicia II)*

The common sense of dairy farmers is strongly influenced by spaces and infrastructures, which in turn are determined by old farming traditions and routines. Hence, various elements are generated with different understandings, such as those mentioned above.

Following Lefebvre, three biosecurity practices can be observed: (1) the facilities that contain an important element of old traditions and routines, (2) the three recommendations themselves, and (3) the biosecurity implementation, which does not exactly follow the recommendations, but does fulfil the ultimate goals as much as possible while also considering old traditions and routines. In this way, the three elements are in constant interaction, generating different combinations depending on the various

contextual elements of each of the farms, as the elements of this empirical material, making security ecologies present.

4.7. Discussion and conclusions: From biosecurity to security ecologies

The risks of infectious diseases that Spanish dairy farms face involve permanent tension between farmers and veterinarians, since both agents try to establish how these risks could be avoided. Both agents seek to generate a space free of infectious diseases by different means based mainly on avoiding direct or indirect contact between animals and such diseases, which is a core factor of biosecurity (Dewulf and Van Immerseel 2018). Biosecurity therefore is in favour of life (Bingham et al. 2008), although there are major complexities involved in the biosecurity measures that are ultimately implemented due to the tension between old farming traditions and routines and veterinary recommendations. Implemented measures might be influenced by both elements to different degrees, depending on the specific contexts of each farm, without either of these completely prevailing over the other. For example, such a situation could be related with people showing how competent they are (Enticott 2008a), whereby farmers employ their knowledge of the risks of infectious diseases and act in coherence with this in order to keep their farms safe. Meanwhile, the veterinarians used the techno-scientific knowledge available in their territories to generate recommendations influenced by their experience and training. This means farmers are continually pressured by these recommendations, but both agents continually question and remodel biosecurity practices, as a kind of continuous tug and pull against old farming traditions and routines. However, it is important to highlight that it is always the farmers who make the final decision as to which biosecurity practice to implement and how, which is influenced by various factors relating both to old traditions and routines and modern recommendations. Similarly, the biosecurity measures finally implemented might strike a good balance between the biosecurity concepts of veterinarians and farmers, or at least, fulfil the same ultimate objective.

Complete consensus between all parties is extremely rare and practically impossible (Hinchliffe and Bingham 2008), and we should instead assume the existence of integration with historic farming knowledge, which also leads to different approaches to biosecurity (Enticott and Franklin 2009) for which techno-scientific veterinary knowledge might be an important starting point (Bingham and Hinchliffe 2008). So, biosecurity based on techno-scientific knowledge should be flexible enough to consider historic knowledge, and vice versa, thus increasing the likelihood of it being effective (Henke 2000; Enticott and Wilkinson 2013). In addition, famers' knowledge of infectious diseases can generate a complex space where social, economic and environmental relations interact (Enticott 2016). It is not about farmers and veterinarians doing things their own way, but of biosecurity devices being conformed in every sense around security ecologies, which are generated from Lefebvre's model.

On the other hand, the heterogeneity of so many Spanish dairy farms and their specific contexts could pose a problem for following veterinary recommendations. As Holloway and Morris (2012) pointed out, continuous effort is required to persuade farmers to implement biosecurity practices. However, although veterinary recommendations are generally disseminated as the sole, unquestionable truth, biosecurity measures ultimately

contain both these recommendations and old farming traditions and routines. Similarly, it is important to consider that these recommendations could have a direct or indirect institutional component (i.e. from urban areas) that may involve a limited understanding what happens on farms (i.e. in rural areas) (Higgins et al. 2016b), and farmers are also aware that veterinarians may have different ways of promoting biosecurity practices, for example, through imposition and maintenance supported by an official regulatory framework, as has happened with some infectious diseases (Sok et al. 2016). Therefore, the finally implemented biosecurity measures could mainly be influenced by farmers, who respond in different ways to the promotion of biosecurity practices by veterinarians.

In general, farmers have shown resistance to almost everything that is linked to a regulatory framework (Gronewold et al. 2012), such as this one issued by international organisations and national governments that can influence veterinarians and cause greater tension among farmers with regard to their recommendations, and which can ultimately put biosecurity practices be at risk. It is therefore worth considering how official legislation can increase tension between farmers and veterinarians, and that alternative pathways should be sought. New approaches could be generated that might be relevant to the socio-political context of biosecurity, and even more so considering the complexities of each farm. New biosecurity traditions and routines might need to take security ecologies into account (Convery et al. 2008; Enticott 2008b), which could also incorporate the different working timeframes of dairy farmers and veterinarians.

Finally, there is a need for further ethnographic studies conducted over longer periods in order to observe security ecologies in their entirety (i.e. beginning, development and final implementation), together with all the different biosecurity practices.

In conclusion, the security ecologies based on the Lefebvre's model effectively give us a better understanding of biosecurity practices and the possible elements behind their final implementation. These security ecologies are associated with the representational space, which can be flexible and adaptable to different farm contexts and are part of the dynamics of tension between dairy farmers with their traditions and routines (spatial practices) and veterinarians with their recommendations (representations of space). They must also consider the specific current social context that is a product of historical processes (i.e. the different spaces), the reasons that farmers and veterinarians act or do not act in certain ways, and the need for effective communication and common sense in relation to infectious diseases and animal welfare (Diagram 1). Therefore, security ecologies should be seriously considered in local animal health plans, for they could be a positive mechanism that could enrich and enhance the biosecurity practices among different actors on the farms, such as dairy farmers and veterinarians, but there could also be other actors involved. Thus, these findings are aligned with studies such as that by Shortall et al. (2016), which demonstrates the limited success of biosecurity practices due to dairy farmers and veterinarians having very different ideas about everyday biosecurity to those of the authorities or experts. However, this limited success could be the result of the implementation of biosecurity measures generating tension between old farming traditions and routines and the recommendations by veterinarians but does not mean that biosecurity practices are not carried out.

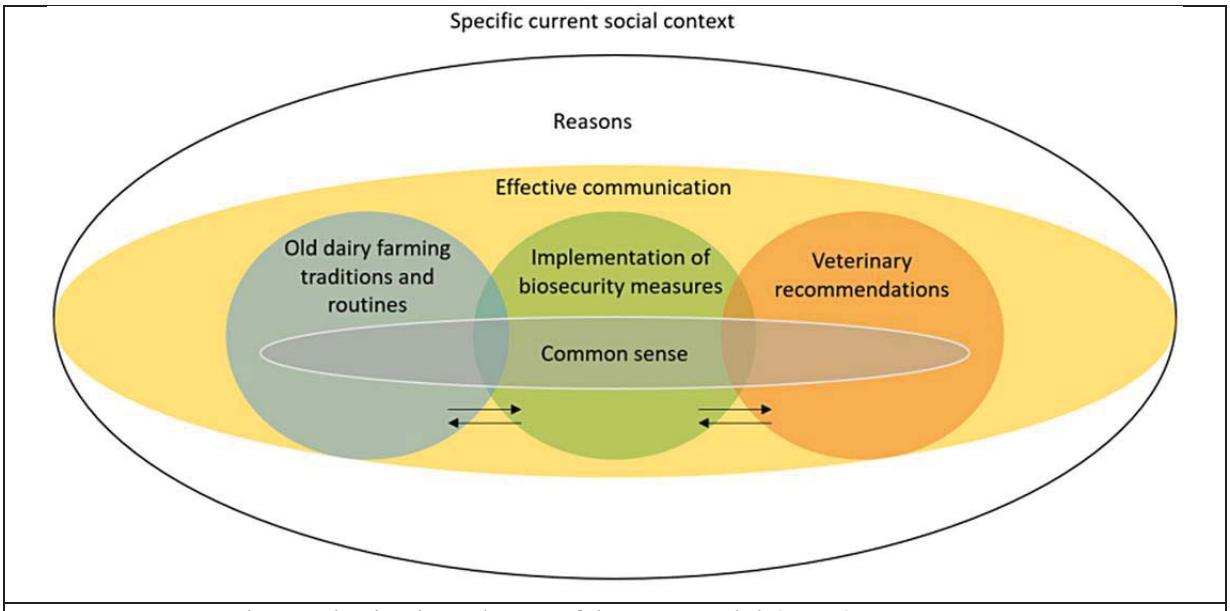

Diagram 1: Security ecologies based on Lefebvre's model (1991).

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Study III

Chapter V

Influence on the implementation of biosecurity measures in dairy cattle farms: Communication between veterinarians and dairy farmers

Preventive Veterinary Medicine **(Under Review)**

5.1. Abstract

This study was carried out in two regions in Spain (Catalonia and Galicia) through eight focus groups; four for dairy farmers and four for veterinarians. The results showed that dairy farmers and veterinarians attributed responsibility to one another for not following biosecurity practices. The study brings to light contradictions among veterinarians and certain individual veterinary practices that participated in the study, which lead to doubt and confusion on the part of dairy farmers. Distinct perceptions were also identified of the role that government authorities should play in relation both to training and sanctions as a means of improving biosecurity on dairy farms. Additionally, the participants expressed varying opinions as to whether biosecurity measures ought to be made mandatory or remain voluntary. Results from this study highlight the need to promote initiatives through which distinct stakeholders such as veterinarians, government authorities, and dairy farmers can develop consensus-based messages on the implementation of biosecurity practices.

5.2. Introduction

Biosecurity is defined as "A set of management and physical measures designed to reduce the risk of introduction, establishment, and spread of animal diseases, infections, or infestations to, from, and within an animal population" (OIE, 2018). Consequently, it is important in understanding how farmers maintain an optimal state of animal health (Satyanarayana et al., 2008). In reality, farmers' biosecurity practices are inconsistent among distinct groups of farmers, within distinct geographical contexts and, more generally, within the agricultural commodity chain (Maye and Chan, 2020). In particular, the implementation of biosecurity measures in dairy cattle farms is influenced by a diversity of people and contexts present within these, and by a context in which dairy farmers take various risks in their final decisions (Oliveira et al., 2018; Ritter et al., 2017; Cardwell et al., 2016; Lestari et al., 2014; Brennan and Christley, 2013; Brennan and Christley, 2012).

Veterinarians are the main source of information on animal health and health management for dairy farmers (Moya et al., 2020; Damiaans et al., 2018; Shortall et al., 2017). Consequently, veterinarians have a central role in delivering practical information on how to feasibly carry out biosecurity measures to farmers (Denis-Robichaud et al., 2019; Damiaans et al., 2018; Kuster et al., 2015). In this sense, knowledge and awareness are not usually a limitation for veterinarians in advising farmers (Pritchard et al., 2015), and farmers use and trust the information provided by veterinarians (Derk et al., 2013). Despite this, the promotion by veterinarians of preventive measures for farmers is limited and could be improved through better communication skills and through collaborative work among veterinarians (Ruston et al., 2016; Shortall et al., 2016). Communication between veterinarians and farmers is therefore of paramount importance, to the extent that poor communication skills on the part of veterinarians can be detrimental to veterinarian-farmer trust and to their working relationships (Svensson et al., 2018).

In the farm production system, all stakeholders involved in the production chain must be committed to biosecurity in order to implement efficient biosecurity practices (Siekkinen et al., 2012), although they may have different understandings of biosecurity (Gunn et al., 2008). Hence, dairy farmers and veterinarians should carry out intra- and inter-group

work to achieve this goal. While there are some exploratory studies that evaluate collaborative working among dairy farmers in other fields, such as production and finance (Kristensen and Enevoldsen, 2008), there are no such studies on collaborative working among veterinarians.

In light of this, the main objective of the present study was to explore and scrutinise the communication dynamics between veterinarians and dairy farmers in relation to biosecurity practices in Spain. This was given rise to as we suspect that biosecurity measures are poorly implemented since, on the one hand, dairy farmers do not fully trust their veterinarians and, on the other hand, veterinarians do not properly raise awareness among their dairy farmers. In this scenario, the establishment of face-to-face meetings could be a possible solution.

5.3. Ethics Statement

This study was approved by the Ethics Committee of the Universitat Autònoma de Barcelona (CEEAH 4055), which helped in the design of the Informed Consent for participants. The Informed Consent document was used to explain the objectives of the study and the conditions and guarantees pertaining to all participants. The document indicated that all data was confidential and would be processed anonymously; that no financial benefits were offered for participating; and that all focus-group activity would be recorded by audio or text. Participation in the study was entirely voluntary, and participants could leave the focus group at any time. The Informed Consent document was signed by participants and researchers, and a copy was provided to each of them.

5.4. Materials and methods

5.4.1. Dairy farms

This research was conducted in Spain in two of its so-called Autonomous Communities (semi-independent regions). One area is Galicia—located in the north-west—and the other is Catalonia—located in the north-east. In general, Galician dairy farms are small and family-based compared to the sizeable Catalonian farms owned by large production companies (MAPAMA, 2016; De Llano, 1989). Galicia has 55% of all Spanish dairy farms, with an average of 43 cows per farm; Catalonia, in contrast, has 4% of all Spanish farms but with an average of 144 cows per farm (MAPAMA, 2018). Galicia produces 39% of all milk produced in Spain; Catalonia accounts for 10% of national production (MAPA, 2020a).

5.4.2. Types of veterinarians

Throughout Spain (as elsewhere) there are control programs for regulated diseases that are generally compulsory (e.g., Bovine Tuberculosis) and for non-regulated diseases that are generally voluntary (e.g., Bovine Viral Diarrhoea). In these control programs, farms are brought under the auspices of Health Defence Associations (hereafter HDA; the initialism in Spanish is ADS). HDA are managed directly by farmers and receive financial subsides from the government to support the activities included in control programs. In this regard, HDA can directly contract veterinarians in implementing such programs. In this article, veterinarians termed animal health veterinarians (hereafter AHV) can also be contracted—in the case of regulated diseases—by public companies who, at the same

time, are subcontracted by the government. In Galicia, control programs of non-regulated diseases are conducted by AHV contracted directly by HDA, while the control of regulated diseases is conducted by AHV contracted by public companies to participate in these compulsory eradication programs. In contrast, in Catalonia, AHV participating in the control of regulated diseases are contracted directly by the HDA, and there are no control programs for non-regulated diseases.

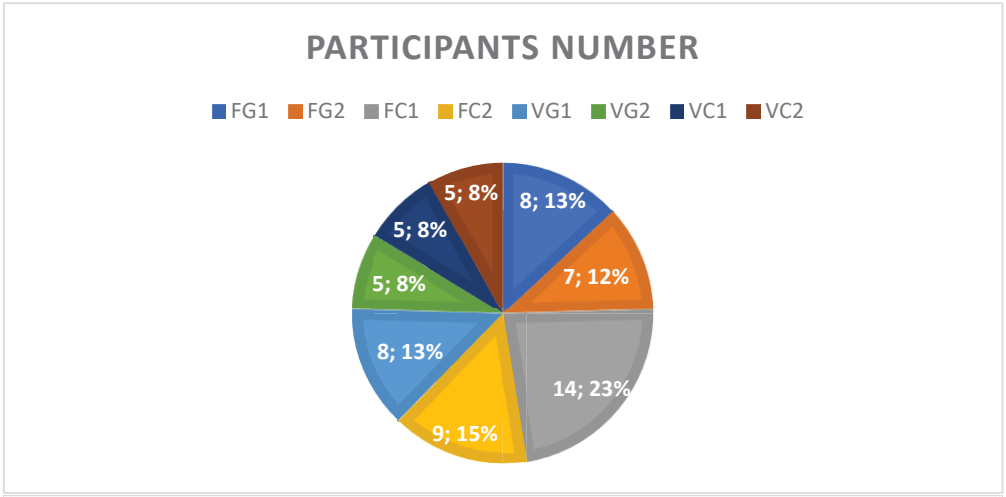
Veterinarians termed private veterinarians (PV) advise on distinct technical areas relating to herd health management (e.g., clinical, reproduction, milk quality or nutrition). Finally, veterinarians belonging to the official veterinary services are responsible for monitoring farmers and veterinarians, ensuring that they carry out certain compulsory practices; they also control HDA activities. This last group is not included in this study.

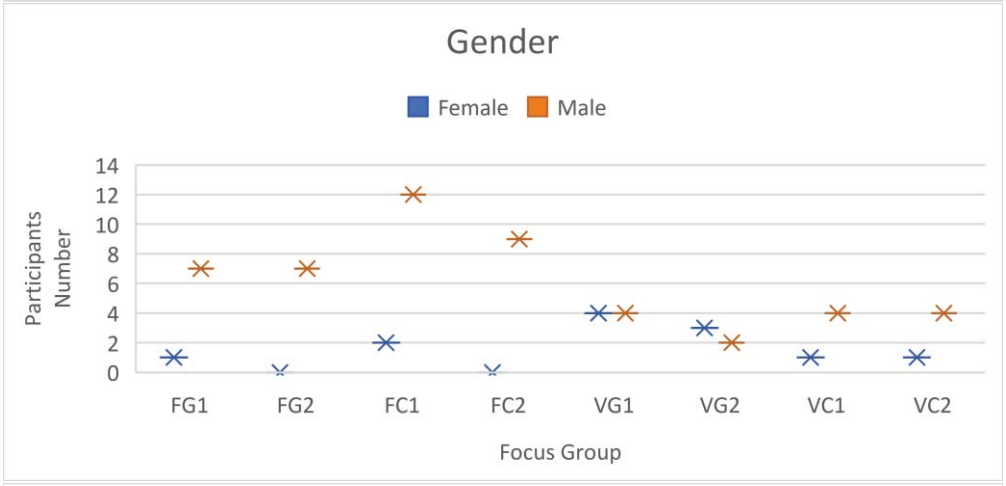
5.4.3. Study design

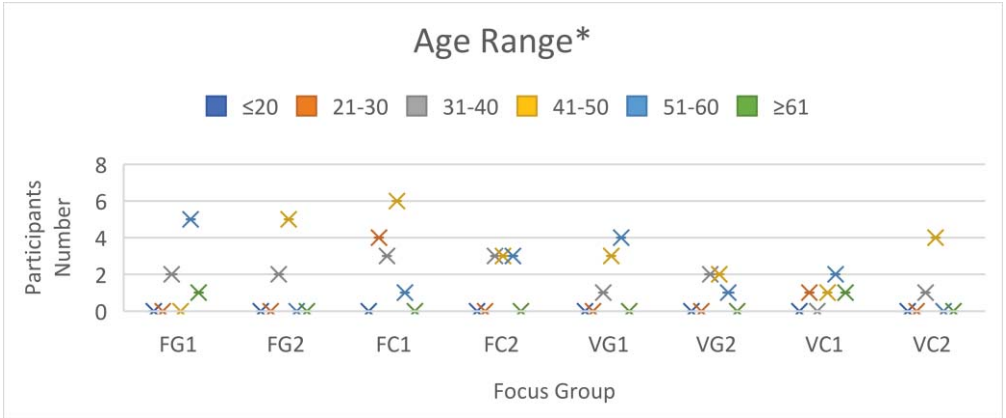
Qualitative research was conducted using focus groups. This qualitative technique brings together people who have certain characteristics in common, allowing them to share their views and to interact with each other on a specific topic (Rezaeian, 2019; Kitzinger, 1994). We used this technique as: i) we had insufficient information on dairy farmer-veterinarian communication dynamics that involve biosecurity; ii) we wanted to directly ascertain justifications for the opinions held by dairy farmers and veterinarians; iii) it facilitated addressing complex and sensitive issues on a range of communication skills and biosecurity measures among the parties concerned; and iv) we wanted to generate an environment in which both groups (farmers and veterinarians) could set out their problems and needs in relation to biosecurity (Dilshad and Latif, 2013).

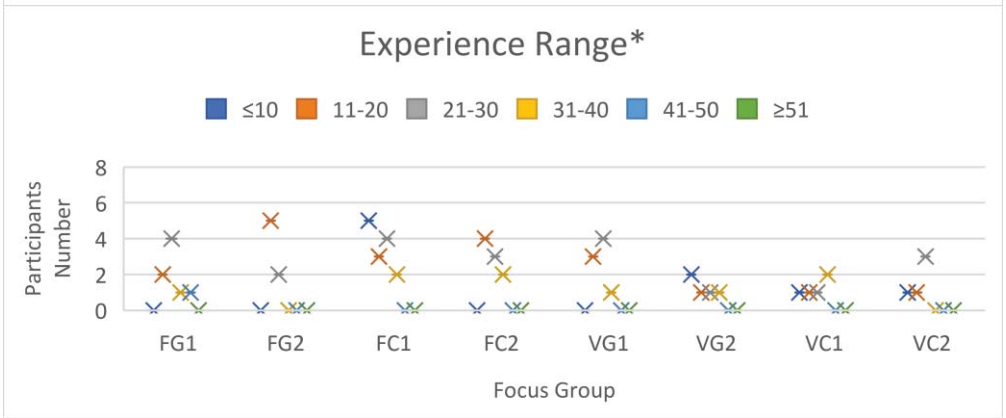
Eight focus groups were used in this study. Following Guest et al. (2016), who pointed out that 90% of discussion topics could be covered by three to six focus groups, four focus groups per stratum were used to reach data saturation. The stratum considered were 'type of stakeholder' (i.e., dairy farmers and veterinarians), and 'geographical area' (i.e., Galicia and Catalonia). Despite this, it is difficult to attain total saturation since there is always the possibility of uncovering new concerns from the data (Hennink et al., 2019). Convenience sampling was used, based on the availability of those wishing to participate in this study (Etikan et al., 2015). Dairy farmers and veterinarians were contacted through the professional network of this study's researchers. As a result, groups of 14 farmers and 8 veterinarians were created. A higher number of farmers was initially planned, as it was assumed that the probability of not attending focus group meetings was higher among this sector. Figure 1 and Table 1 describe the characteristics of the dairy farmers and veterinarians attending each of the focus groups.

Figure 1: Characteristics of the dairy farmers and veterinarians. Gender, age range and experience range.


PARTICIPANTS NUMBER
FG1
FG2
FC1
FC2
VG1
VG2
VC1
VC2
8; 13%
7; 12%
14; 23%
9; 15%
8; 13%
5; 8%
5; 8%
5; 8%


Gender
Female
Male
Participants Number
14
12
10
8
6
4
2
0
FG1
FG2
FC1
FC2
VG1
VG2
VC1
VC2
Focus Group


Age Range*
≤20
21-30
31-40
41-50
51-60
≥61
Participants Number
8
6
4
2
0
FG1
FG2
FC1
FC2
VG1
VG2
VC1
VC2
Focus Group


Experience Range*
≤10
11-20
21-30
31-40
41-50
≥51
Participants Number
8
6
4
2
0
FG1
FG2
FC1
FC2
VG1
VG2
VC1
VC2
Focus Group

F: farmers; V: veterinarians; G: Galicia; C: Catalonia; 1: group one; 2: group two; *: in years.

Table 1: Types of veterinarian that participated in the present study*

	VG1	VG2	VC1	VC2
Clinical (PV)	1	1	0	2
Reproduction (PV)	0	1	1	1
Milk Quality (PV)	3	1	1	0
Nutrition (PV)	1	0	0	0
Consulting (PV)	1	1	2	1
AHV	2	1	1	1
Total	8	5	5	5

AHV: animal health veterinarians; PV: private veterinarians
V: veterinarians; G: Galicia; C: Catalonia; 1: group one; 2: group two
*Number of types of veterinarian
Note: Technical areas are not exclusive. There may be veterinarians who have two or three technical areas at the same time. However, for the purposes of this study it was decided to choose the most representative technical area of each veterinarian.

Focus groups were conducted from 14 March 2019 to 9 September 2019 in both regions. Sessions were conducted face-to-face, recorded on audio tape, and lasted between 60-90 minutes. The focus-group recordings were then reviewed and transcribed by the first author of this article for data analysis. In the transcripts, statements were labelled with as "F" for dairy farmers or "V" for veterinarians, followed by "G" for Galicia or "C" for Catalonia; a number (i.e., 1 or 2) was also used for differentiation (e.g., FG1 refers to a focus group of dairy farmers from Galicia). Statements in the original language are given in the appendix.

Data were analysed using critical discourse analysis through ATLAS.ti.8.4.18 (ATLAS.ti, 2019). This analysis was used as it facilitates far greater understanding of meaning and helps to comprehend complex phenomena, as described by Fairclough (1992). In this way, the ideas expressed by farmers and veterinarians were more comprehensively scrutinised, thereby providing a greater elucidation of biosecurity practices (Ponton and Larina, 2017; Ponton and Larina, 2016; Hodges et al., 2008; Van Dijk, 1998).

In addition, critical discourse analysis takes a social and political approach (Van Dijk, 2001). This analysis therefore includes a relationship between discourse and social processes and structures, in which discourse influences social processes and structures, and vice versa (Hidalgo, 2011; Fairclough, 1992); in this case, this relationship was that shown by the intra- and inter-group discourse and social processes and structures of dairy farmers and veterinarians. The analysis was based on the various statements made directly by participants. However, these statements were associated with the four main strata (i.e., FG, FC, VG and VC) and not with an individual speaker (Duggleby, 2005).

5.5. Results

The results of this study were organised into two main groups: veterinarians ('contradictions' and 'face-to-face meetings') and government authorities ('roles', 'mandatory biosecurity measures', and 'basic biosecurity measures').

5.5.1. Perceived veterinarian contradictions: Who is right?

Farmers emphasised that advice in relation to biosecurity could be divergent among veterinarians. This divergence, in the opinions both of farmers and veterinarians, may be influenced by the veterinarians' training and competence in biosecurity, the availability of time spent on farms, knowledge of the farm, and each veterinarian's intrinsic characteristics (i.e., personality). Consequently, veterinarians may have distinct perceptions of biosecurity, and distinct approaches to it, resulting in various contradictions.

Some contradictions were characterised by a discourse that, on the one hand, promotes the implementation of biosecurity measures among farmers by veterinarians, yet, on the other, were not borne out by certain veterinarians' actual practices, which were not in accordance with such discourse. In this respect, some farmers challenged practices that increased the risk of introducing infectious diseases onto their farms; specifically, veterinarians entering their clients' farms with dirty boots:

> *(1)FG1: "(...) The best measure is for vets to bring clean boots, properly clean. Nothing's worse than them arriving with manure on their boots, putting on disposable plastic overshoes and then dragging their feet along; when they go from here to there the plastic gets broken and so the contact is obviously the same as not having any protection at all. I think that the vets should see that for themselves; farmers shouldn't have to ask for this.*
>
> *And on top of that, they don't like it when you tell them (...)"*

Similarly, on this same topic, certain farmers mentioned the excuses that some veterinarians gave them, such as not wanting to wear disposable plastic overshoes because they could slip:

> *(2)FG1: "(...) For one thing, for some vets, it's an effort just to put on disposable plastic overshoes.*
>
> *We have to insist on this, if necessary, even with people who come here to teach us. With vets, we have to be very insistent about them putting on disposable plastic overshoes; they say that they slip if they wear them. They should be coming here to help us have a clean farm, but instead they end up making it dirty.*
>
> *I think that AHV contracted by public companies excuse themselves by always pouring liquid over their boots before starting.*
>
> *On the other hand, clinical vets do come with boots, they come in and when they leave, they wash them, but without disinfecting (...)"*

Similarly, farmers did not understand why veterinary professionals with the same training and competences (i.e., the same type of veterinarian) could provide different or even contradictory advice on standards of on-farm biosecurity practices. In particular, there were distinctive differences among AHV involved in an HDA in providing on-farm

biosecurity advice for farmers. In this situation, certain farmers were confused by the fact that some AHV involved in an HDA farm visit did not follow the same biosecurity practices. Such divergence leads farmers to distrust and question veterinarians' awareness of the preparations required for reducing the risk of disease. Some farmers expressed surprised that recently graduated veterinarians could make these mistakes, as biosecurity is an important subject that should be covered in training:

> *(3)FG1: "(...) I once had an AHV contracted by the HDA who got here with worn-out boots, it was impossible for him to clean them. And he said: 'If you want, I can put bags over my boots'; but he didn't have any disposable plastic overshoes in the car either. He was here for a very short time. He was a young vet who'd only recently finished his degree, which is even more serious (...)"*

In a similar mode, certain farmers did not understand why some AHV gave them advice on biosecurity, while others did not:

> *(4)FG1: "(...) In my case, the vet doesn't advise me about biosecurity.*
>
> *In some cases, the AHV contracted by the HDA explains how you should do things. Or they ask you 'if you have a problem, how are you going to resolve it?' But they don't explain much to you anyway (...)"*

During the focus groups, the participating veterinarians had divided views on a number of biosecurity measures, such as whether farmers should install disinfection arches to clean vehicles entering the farms. In this respect, some clinical or reproduction veterinarians pointed out that farms should have disinfection arches for vehicles; in contrast to this, the HDA veterinarians pointed out that it was unrealistic, and more only be more effective if only essential vehicles entered the farms via specific roads.

In light of the contradictory views expressed by veterinarians on the instalment of disinfection arches, farmers began questioning the ability and trustworthiness of their own veterinarians, since differing types of veterinarians gave conflicting advice, as the following comments show:

> *(5)FG1: "(...) The thing is that the criteria the vets have sometimes don't match, and then you get confused. The reproduction vets come along, and they tell you one thing; later, the clinical vets come by, and they tell you another thing. And sometimes their criteria just doesn't match up. So you get more confused about what you should do.*
>
> *That's especially the case when you get conflicting advice from AHV contracted by the HDA.*
>
> *And there are things that you really need to think about, about what you are going to do, because you're not very sure and they haven't guided you to anything specific. It makes you wonder (...)"*

These contradictions were also perceived by veterinarians:

> *(6)VC1: "(...) Depending on the experience of an individual, one thing will be recommended for one farm and something different will be recommended for*

another. And if the individual lacks the ability to demonstrate which [criteria] is actually better, it can lead to this clash (...)"

However, farmers also understood that this could happen due to the differing characteristics and competences of distinct types of veterinarians. This did not necessarily mean that advice from one veterinarian was considered more valid and better than that given by another, simply that the approach suggested was different. In fact, veterinarians pointed out that divergent approaches might be owing to different specialisations in veterinary science and to the relative degree of importance ascribed to biosecurity practices:

(7)VG1: "(...) I think that we all have the same essential training, in spite of individual specialisation. We leave the faculty knowing all about biosecurity; but what happens is that, afterwards, each person applies this knowledge in their area (or doesn't apply it, as the case may be); or else it's easier to apply it for one person but far more difficult for another, it is very different (...)"

5.5.2. Face-to-face veterinarian meetings: Do the meetings actually take place?

Veterinarians acknowledged the diversity and the specialisation of veterinarians visiting farms, and the need to organise face-to-face meetings among themselves:

(8)VG1: "(...) There are different technicians working on the same farm. Milk quality, clinical, reproduction, nutrition, or AHV contracted by the HDA. If they do come [to the farm], what does each one say?

What we need to do here, regardless of whether we're from the same working team or not, when there is a problem on a farm and it affects everybody, what we need to do is meet up and talk (...)"

(9)VG2: "(...) So they tell me: 'I've got problems with Bovine Viral Diarrhoea'. So, you talk to the AHV contracted by the HDA, that's their area, and you get involved in the HDA program to control it. And it's like what I said: 'I don't have the time to come here every time a calf's born, I don't have time and it's not my area of specialisation'. I think that specialisation is leading us towards this, to look for collaboration.

We need to meet up more (...)"

Veterinarians commented that reasons for face-to-face meetings among the different veterinarians visiting a farm were few, but included moments when they work together (i.e., on the same team) or in exceptional situations such as an outbreak of an exotic disease. Some veterinarians believed that such meetings were necessary in order to resolve problems for the benefit of farmers. However, veterinarians were also aware that their discrepancies should be resolved among themselves only, keeping farmers out of such discussion to avoid generating the distrust commented on above. These veterinarians therefore suggested that a problem should be approached collectively, among veterinarians only, in order to give unanimous advice to farmers.

According to certain veterinarians, farmers supported the idea of meetings exclusively among veterinarians. At all events, although veterinarians showed their willingness to participate, they also pointed out that it should be farmers who encouraged these meetings, even though this was actually rather complex to achieve:

> *(10)VG2: "(...) In short, there is no collaboration. The only person linking everyone together is the farmer, and in theory they should be deciding these things because they're the ones paying everybody. But the problem is that farmers are not usually qualified, they're not seen as leaders to coordinate a team of veterinarians.*
>
> *The issue is that, if farms function as companies, who can direct them? I think that there are farmers who are perfectly well trained to do this. But there are others who simply aren't. I don't know what kind of "figure" we need to run things in such cases. Or maybe those who aren't specifically trained are just doomed to disappear.*
>
> *As regards that "figure", I really don't know who it should be. I think it should be a farmer, but a farmer probably needs technical counselling in order to identify problems. The concept of "having problems" is very subjective; every farmer understands them differently (...)"*

Veterinarians therefore believed that some farmers did not have the requisite skills (i.e., leadership and knowledge) to manage face-to-face meetings among veterinarians. Additionally, the perception of problems that farmers may face could vary, and may need technical counselling in order to be appreciated.

The veterinarians also stressed that farms need to function as competent companies or else eventually disappear. This is particularly the case with the very small farms in Galicia, which are characterised by a low level of professionalism, a factor that might also limit the implementation of biosecurity measures.

Some veterinarians drew attention to the current absence of face-to-face meetings among colleagues as problematic, since these are a framework within which to gain familiarity with distinct veterinary disciplines, or as a means of carrying out direct consultation with such colleagues to resolve certain technical problems common, which might also include biosecurity measures. However, not all veterinarians favoured such a framework. In this regard, they highlighted the fact that the distinct questions raised by farmers should be transferred to the relevant veterinarians only, and discarded the option of approaching disciplines distinct from their own. In this sense, veterinarians did not seek to invalidate any analyses made by others or pass on responsibilities to others. Nevertheless, on some occasions they appeared to disregard certain problems:

> *(11)VG2: "(...) There's very rarely any direct conflict. I don't find myself in situations where I need to say to a farmer: 'You decide: either listen to me, and give the animal a branded vaccine [the veterinarian understands this as a biosecurity measure], or listen to them, and do something else'. That doesn't really happen very often; but what does happen is that we keep knocking the ball backwards and forwards into each other's court (...)"*

In agreement with these remarks, certain veterinarians stressed that clashes among veterinarians were not common, nor were attempts to force farmers into making the final decision on these matters.

5.5.3. The roles of government authorities: Reality and expectation

Farmers mentioned that government authorities (hereafter simply 'the authorities') have primarily a sanctioning role, although they commented that this role varied within national territory. The possibility of being sanctioned is the reason that farmers have a defensive attitude towards (or plainly distrust) official veterinarians. However, farmers also observed that, in those regions in which the primary sector is more important, farmers received greater support:

> *(12)FC2: "(...) When the authorities come to the farm, 99% of the time it's to fine us, they don't come to find out what we're doing. In other parts of Spain, things are different, the authorities are at the same level as the farm because the primary sector is really important there. But here, when an outsider [official veterinarian] comes to your farm, you have to keep an eye out for things (...)"*

In spite of the previous statement, one farmer mentioned that, on one occasion, farmers and official veterinarians had convivially enjoyed a meal together, and commented that this situation of "friendship" between both sectors should be normalised.

Farmers disagree with biosecurity measures that, in their opinion, do not make sense (such as visitor registers, for example). Additionally, farmers added that their attitudes towards certain measures are influenced by their views of official veterinarians (i.e., of the authorities as represented by that veterinarian) who, they feel, do not have enough knowledge about their farms. They observed that official veterinarians should try to determine the reality of their farms, and understand more fully how distinct farm activities are carried out. Despite this, both farmers and veterinarians recognised the important role of the authorities, which need to guarantee correct operational functionality, as farms deliver products for human consumption. Farmers and veterinarians also agreed that the authorities should play a more active advisory/training role and not merely that of sanction-giver:

> *(13)FC2: "(...) They [official veterinarians] should help us; what they should do is collaborate, provide a little guidance for us. They come with the excuse that, as they're regulated by the EU, they have to comply with these regulations. It's not that they want to, they say, it's because they're obliged to. That's one part of the story. The other part is what we say: 'A little bit of collaboration, help or advice would be fine, if it wasn't that they always come to fine us' (...)"*
>
> *(14)VG1: "(...) The authorities, in my view, minimally ensure that everything works, 'more or less'. Food for human consumption is being produced, and some supervision helps ensure that the whole sector works correctly. And this calls for the presence of an important arbitrator.*
>
> *But I do believe that the authorities should be more involved in training. I think it should do more in this ambit, and not always focus on sanctioning. Farmers and even veterinarians should be trained.*

I think the authorities should have a double role. They need to must energise resources, important resources for training and for implementation, to establish animal health programs – this seems fundamental to me. And then there's the need for control, I think that control is necessary: thinking of the authorities as a friend just doesn't work (...)"

The authorities should therefore have a regulatory (supervisory) role that both advises and sanctions concurrently. Specifically, as regards training, the authorities could expand the incorporation of biosecurity measures based not only on official health programs (i.e., with regulated diseases) but also based on other infectious diseases, as is the case for example in Galicia with HDA programs (i.e., with non-regulated diseases). Consequently, animal health programs could be generated to favour both the productive sector and the end consumer. In the same way, according to farmers, the authorities should ensure that all farms follow certain basic biosecurity measures, thereby avoiding heterogeneous risk perceptions. They could therefore anticipate problems, instead of relying on measures implemented by the farmers themselves.

Finally, some farmers pointed out that the authorities should not merely be concerned with what happens within their own farms, but should also monitor what happens outside their farm premises. In this sense, it has been mentioned that there should be measures to control wild animals, which cause numerous problems. These farmers observed that the authorities should be responsible for these problems and their consequences, as farmers can take responsibility only for what happens on their own farms, and at all events also have a range of other problems to solve. Dairy farmers, additionally, perceived that other animal production systems (e.g., swine and poultry) are less affected by wild animals in comparison to the dairy sector, since other sectors have very little direct contact with wild animals:

(15)FC1: "(...) Measures to control the population of wildlife in the country.

We are affected by wild animals. It is out of the authorities' control, and the wild-animal population is getting more and more serious, we're really suffering from this problem. It's 100% the authorities' responsibility.

We can be responsible for the premises inside the farm, but not for the environment outside; the authorities should be responsible for the environment surrounding the farm.

It is different for dairy cattle than for poultry or swine.

Apart from wildlife, we have other problems. There are areas close to farm animals with lots of different problems, not just with wild animals (...)"

5.5.4. Mandatory biosecurity measures

There was some discrepancy among veterinarians regarding the mandatory nature of biosecurity measures (e.g., control of cattle movements in an HDA), based on the tactic of 'apprehension' (i.e., a tactic that depends on the reluctance to receive sanctions), and on strategies to increase farmers' biosecurity awareness. Some veterinarians pointed out that mandatory measures from the authorities increase workload, since farmers have to implement them in order to avoid being penalised. However, penalties can also foster the

implementation of measures on farms, as was the case with the control of antibiotics in milk, which led to a favourable change. According to some veterinarians, establishing mandatory biosecurity measures will lead farmers to implement them more effectively as they will be reluctant to receive penalties and will want to avoid breaking the law. Conversely, there were veterinarians and farmers who highlighted the redundancy of making biosecurity measures compulsory. These people proposed, instead, constructive action such as subsidising certain basic measures or providing positive incentives, such as with controls on milk quality, which could be requirements for the market access of final products:

> *(16)VG2: "(...) For a dairy company to be able to export to third-world countries, it has to carry out some measures for certain diseases. Milk quality in the end was attained by penalisation within the industry (...)"*

> *(17)FG2: "(...) To obtain points granting access to a subsidy, you have to do that. It may not actually be obligatory, but if you want access to a subsidy, the authorities give you points for having that (...)"*

Farmers added that obligations or incentives for biosecurity measures should be given for those measures that are in fact useful to them. On the other hand, some veterinarians said that biosecurity measures should not be mandatory; instead, farmers should be aware of the importance of these measures for farms and for final products. As regards this latter point, certain veterinarians also added that the authorities should establish a series of measures that could be accompanied by an explanation and objective so that biosecurity measures would make better sense. Additionally, the effectiveness of these measures should be demonstrated so that farmers can understand why they need to implement them. Crucially, farmers noted that mandatory measures should consider the context of each particular farm (e.g., infrastructure and environment).

Finally, several farmers pointed out that preventative measures to reduce risks of introducing certain pathogens into farms should be voluntary, since this relates to their farms only, and does not represent a risk for third parties. In addition, these farmers considered themselves to have already implemented several measures voluntarily. Nonetheless, other farmers mentioned that measures capable of reducing the risk of releasing and spreading certain pathogens from their farms should be mandatory, but that they require financial support from the authorities:

> *(18)FC1: "(...) I think it shouldn't be obligatory, because if there is a disease it's you who allows it to enter into your own farm.*

> *I think there should be both obligatory and voluntary things. I don't personally agree with fencing off all farms or having a disinfection arch. If that's obligatory one day, then the authorities should help subsidise it.*

> *A lot of measures are already being implemented voluntarily.*

> *Obligatory, in the first place, only whatever might be harmful from your farm to another, but if it's only harmful to you, it's your responsibility; that should be voluntary (...)"*

5.5.5. Basic biosecurity measures

Some farmers also highlighted the importance of not only considering external routes of introduction, but also possible spread within farms due to farm workers or to feeding management. In this regard, certain veterinarians also indicated that solutions need to be different according to the situation (i.e., prevention and emergency). As regards preventative measures, these veterinarians emphasised the importance of initiating approaches with a general on-farm diagnosis, and with a personalised risk analysis, to establish basic biosecurity measures in the short, medium, and long-term.

In contrast to this, according to veterinarians who did not hold these views, basic measures should mainly be directed towards those infectious diseases that could affect animal health, as well as having a financial and commercial impact on farms. In this vein, some veterinarians also pointed out that non-zoonotic diseases should be taken into account by the authorities through official animal health programs, noting that they might eventually consider that a risk could become zoonotic.

Veterinarians also mentioned that other production systems (e.g., poultry or swine) are stricter than dairy farms. Such systems have, for example, mandatory basic measures relating exclusively to clothing and the condition of machinery, as well as isolated collection sites for dead animals.

Some farmers were aware that there is broad scope for improvement in implementing biosecurity measures, but they did not completely agree on establishing mandatory basic measures as, in their view, this was a question of common sense. However, other farmers disagreed, since 'common sense' tends to vary by individual. In light of this, these farmers pointed out that the authorities should indeed intervene through official control programs, with which they may or may not agree:

> *(19)FC2: "(...) I think that there has to be some common sense, doing things right. It's a problem that needs a solution, a little common sense and doing things as they should be done. Then there'd be no problems, not even for things like fences.*
>
> *Common sense is very variable; for one person, one measure might be normal and for another it could be complete nonsense.*
>
> *It's all very complicated; I think that the authorities should have basic standards to apply, which we might like or might not (...)"*

In addition to this, some farmers cautioned that basic measures—if they became mandatory—should be implemented gradually. Nevertheless, veterinarians argued that if biosecurity measures are implemented, controlling them would be complicated, and that this would hamper the implementation of these measures by the sector as a whole. To this observation, farmers added the importance of understanding the effectiveness of biosecurity measures if they became mandatory. For example, certain farmers observed that a disinfection point could be placed at the entrance to a farm, but if it was located in a separate place and nobody used it, it would not be effective. A similar situation could occur with other measures, such as perimeter fences and farm registers of entries and exits, the effectiveness of which was questioned:

> *(20)FC2: "(...) The measures have to be really effective. If the authorities say that you have to wear a disinfection backpack, I can't see that working because the*

backpack'll never be touched and that'll be the end of it. But, if they force you to have a place for trucks with disinfectant, that'd be more effective, I think.

It is the same as closing your perimeter with fences: you can't close in all your hectares, it's just not feasible (...)"

Certain veterinarians once again highlighted the role of the veterinarian, who is a fundamental and decisive figure of reference in the implementation of biosecurity measures, with some veterinarians pointing out the necessity of their support for ensuring implementation of basic measures. Similarly, other veterinarians commented on the importance of cohesion among all sectors, beginning with shared objectives, and on the need for collaboration among distinct veterinarians. However, following on from these basic measures, other veterinarians pointed out that when certain fundamental levels are attained and favourable results are achieved by farms, new objectives could then be created.

5.6. Discussion

With respect to the dynamics of communication between dairy farmers and veterinarians, contradictions among veterinarians were particularly evident. The contradictions pointed out in this study among veterinarians seem to derive from a lack of specific regulations throughout Spain. Animal Health Law (Regulation (EU) 2016/429) establishes biosecurity as a requirement for managing animal health in an efficient way. Currently in Spain there are no compulsory biosecurity measures for implementation on dairy cattle farms; however, there are several good-practice guidelines that include biosecurity recommendations (INLAC, 2007). Contradictions on this matter may be due to interest, time availability, knowledge of farms, and the personal characteristics of a veterinarian (i.e., there are elements, such as interpersonal, management, decision-making, or problem-solving skills affecting biosecurity advice, and which are mainly related to individual experience). Naturally, this is also the case with any other veterinarian, such as those AHV involved in an HDA, for example, who should theoretically have common and substantiated criteria for giving advice on biosecurity measures.

Veterinarians may be responsible for biosecurity measures that have not been correctly conveyed to dairy farmers, since not only do they need adequate knowledge about biosecurity but also be able to transmit and promote this by raising general awareness and by means of distinct training. Through training sessions, the implementation of biosecurity measures should also be directly related to the viability of such measures, which in turn might indirectly depend on the veterinarian. In this regard, veterinarians should primarily consider the needs, priorities, motivations, and objectives of dairy farmers, in conjunction with their perception of the effectiveness of the measures being promoted (Svensson et al., 2019). In fact, Visschers et al. (2016) and Kuster et al. (2015) point out that veterinarians usually recommend preventive measures that they believe are feasible and effective to carry out. In this sense, communication is crucially relevant in the professional relationship between veterinarians and dairy farmers.

There may be a wide range of factors that can affect communication between dairy farmers and veterinarians. In this study, we observed that there are veterinarians who are not greatly predisposed to recommending biosecurity measures to dairy farmers, which

in turn can influence dairy farmers' interest. This lack of predisposition, together with seemingly contradictory advice given by veterinarians, may then result in dairy farmers not implementing biosecurity measures. In this respect, our study is in agreement with those conducted by Ruston et al. (2016), or Hall and Wapenaar (2012), who pointed out that veterinarians have become 'partial prevention' advisors, since there seems to be, in general, little effort given to promotion, although this differs by geographical area and is affected by complex bureaucratic dynamics. In addition to having effective communication skills (e.g., the ability to effectively transmit knowledge), veterinarians must therefore also be proactive advisors and provide consensus messages that are both consistent and linked to continuous monitoring and evaluation (Oliveira et al., 2018; Jansen and Lam, 2012). In other words, veterinarians should draw on their own experience and re-appropriate this to consolidate the information that they provide, thereby improving their communication of 'preventative measures' (Ruston et al., 2016). Consequently, not only are communication skills important; so too are the time and method of communication (Hall and Wapenaar, 2012).

In relation to collaboration networks between dairy farmers and veterinarians, although it has been established that such networks may be of interest to dairy farmers, even when they are difficult to find (Hovi, 2005), the same cannot be said for collaboration networks among veterinarian which have been completely neglected. We observed that veterinarian collaboration networks tend mainly to be limited to certain types of veterinarians who, nevertheless, may have discrepant views, partly on account of the infrequency of their face-to-face meetings and discussions. As a result, they have greater difficulty in providing a consensus message. In this way, orchestrating such meetings among veterinarians can strengthen veterinarian collaboration networks in favour of dairy farmers. In keeping with this, researchers such as Ruston et al. (2016) have identified the need for veterinarians to work collaboratively rather than competitively among themselves. Notwithstanding this, it is still necessary to address the reasons for this general lack of collaboration, which may not necessarily depend as much on veterinarians as on the context in which they work. Veterinarian competition is reinforced by the diversity and individualism of veterinarians, which may be positive and necessary, but which may also result in inconsistencies (Shortall et al., 2016), meaning that competition amongst a wide range of different types of veterinarians is not useful for dairy farmers.

Returning to the issue of face-to-face meetings among veterinarians, it is a significant finding that, although veterinarians indicated that it was the farmers who should demand more collaboration from their veterinarians, this latter group also indicted that farmers are not or would not be able to do this because of inadequate managerial skills. In this sense, a farm can be conceived of as a business in which the businessperson (i.e., farmers) has absolute power over their own decisions. However, there are also subcontracted businesses that condition business through their activities and, therefore, the businessperson often has little power over their decisions. Hence, if a comparison is to be made, it should be noted that veterinarians act as a subcontracted business, over which the farmers have little decision-making power. At all events, and regardless of the farmer's skills, there may be structural elements contributing to this situation, such as veterinarians' organisational schedules (e.g., working times and work rhythms) and the schedules of other stakeholders in the productive sector. Last and by no means least, veterinarians may inadvertently or even consciously transfer the tasks involved in

creating durable collaborative networks onto farmers, rather than assuming part of this themselves, as with the example of organising meetings.

Therefore, an intra-group collaboration is essential for other members of the group–in this case, veterinarians. Once these issues have been resolved, far more progress could be made in making inter-group decisions, such as those between dairy farmers and veterinarians, to establish mutual objectives (Atkinson, 2010). In this regard, Sayers et al. (2014) also commented that dairy farmers and veterinarians are not regularly in contact, which in turn perpetuates the absence and inconsistency of standardised information given by veterinarians. Instead of such a situation, communication gaps could be overcome by a more effective integration of both groups, regardless of whether dairy farmers and veterinarians have different biosecurity frameworks and distinct perceptions of the problems involved (Shortall et al., 2016). The network of groups should be flexible enough to incorporate other groups subsequently approached, such as milk buyers, who are important agents of the dairy sector in the implementation of biosecurity measures (Richens et al., 2018). Thus, the literature underlines shared decision-making as a crucial element in the development of collaborative work (Wright et al., 2018). In this regard, our study is in accordance with others regarding the communication and exchange of knowledge throughout the entire dairy-sector chain, such as that between dairy farmers and the authorities or consumers (or, as in this current study, between dairy farmers and veterinarians) for the sake of generating collaborative networks (Young et al., 2010). Consequently, although this research contemplated an approximating of the hierarchical relationships between farmers and veterinarians within the dairy sector, it is necessary for future research to analyse other agents within the hierarchical structures of this sector, since the relationships between farmers and veterinarians may also possibly be conditioned by such agents (e.g., milk buyers).

Mandatory biosecurity measures are a complex issue as regards dairy farmers and the authorities. The mandatory status of biosecurity measures currently receives increasingly significant attention; this is the case, for example, with the recent approval of the Infectious Bovine Rhinotracheitis program in Spain (Royal Decree 554/2019), an issue of interest because of the pressures exerted on dairy farmers involved in HDA programs. In this sense, it is interesting that farmers insist on maintaining their autonomy over the management of their farms (i.e., less intervention by the authorities), through the justification that, even if they assume animal-health risks, these will not harm third parties—a fact that might be incongruous. Nevertheless, it is interesting that farmers indicate that the authorities should be co-responsible if biosecurity measures become mandatory, eventually assuming part of their cost. Farmers therefore distinguish between two levels of reality, one that is of a productive-economic character; the other of a preventive-health character. What is evident from the farmers' statements recorded in this study is their perception of being trapped between these two levels of reality. In light of this, an analysis of the coincidence between the farmers' way of viewing these matters, on the one hand, and the productive-economic and preventive-health levels, on the other, should be the subject of future studies.

Diverse opinions by dairy farmers were recorded here as regards the authorities, some of them indicating that these mainly played a sanctioning role. This partly coincides with the scenario described by Oliveira et al. (2018), who found that penalties and incentives

were essential for ensuring adequate biosecurity practices. Similarly, there was agreement regarding incentives provided by the authorities in other European countries, although in distinct ambits. For example, the New Zealand authorities have generated initiatives to implement a green infrastructure for dairy farmers who meet the regulatory framework. However, the dairy sector and its farmers lacked sufficient motivation to carry out this implementation without the incentive provided by complementary payments from the authorities (McWilliam and Balzarova, 2017).

In general terms, then, it may be stated that dairy farmers can be positively influenced by veterinarians, and negatively by the authorities, as Brennan et al. (2016) pointed out. Similarly, according to Broughan et al. (2016) dairy farmers did not believe that veterinarians working for the authorities could help them, possibly because of the distrust felt by farmers regarding these authorities (Christley et al., 2011; Enticott, 2008). Again, future studies could carry out an in-depth analysis of the levels of trust existing among the distinct agents involved within the dairy sector, as well as those factors that can increase or reduce such trust, since in a matter of risk management, trust-engendering processes are key. Additionally, communication processes are also essential to levels of trust. Such processes, besides supporting collective action, need to reframe various messages and deliver them from a neutral source (Heffernan et al., 2008). Additionally, there need to be both mandatory and voluntary biosecurity measures, an issue that could improve dairy farmers' perception of the authorities, provided that the authorities take these farmer's participation into account in their policies. It should not be forgotten that changes on dairy farms could be achieved through more active participation of all agents involved (Lahuerta-Marin et al., 2018).

5.7. Conclusion

Dairy farmers' understandings of biosecurity practices are shaped by veterinarians. While dairy farmers and veterinarians attribute responsibility to one other for not applying biosecurity measures, the responsibility for carrying out such practices lies with both groups (MAPA, 2020a; Higgins et al. 2016; Donaldson 2013; Gunn et al., 2008). The development and establishment of face-to-face meetings in a participatory manner that involves dairy farmers and veterinarians, both intra- and inter-group, would be beneficial to biosecurity improvement. Perceptions of the authorities by dairy farmers and veterinarians, as well as of the biosecurity measures that may pertain to those authorities, are findings that merit further attention and in-depth study to gain fuller insight into those perceptions and also into the authorities' predisposition towards those under its administration. This article therefore hopes to be a starting point in generating common parameters and unified efforts aimed at developing initiatives for the dairy sector.

5.8. References

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Study IV

Chapter VI

Influence of the public administration on dairy cattle farms: Perceptions and opinions on the implementation of biosecurity measures in Spain

Research in Veterinary Science **(Under Review)**

6.1. Abstract

The present study explored and looked deeper into the perceptions and opinions of the public administration regarding biosecurity through 11 in-depth interviews with representatives of the administration, using conventional content analysis. Results showed that for the official veterinary services, biosecurity is a strategic line used to prevent the spread of infectious diseases. In general, they considered that biosecurity measures should be flexible and take into account the reality of farms, and that training and awareness should be promoted. However, they also highlighted that resources for biosecurity, in terms of budget and staff, are insufficient. Similarly, it was suggested that veterinarians should take responsibility for advising farmers on biosecurity, possibly through veterinarians independent of the official veterinary services. Furthermore, it was also commented that meetings between the different stakeholders of the dairy sector should be encouraged, in order to generate an active participation in biosecurity issues. Thus, it is important to establish the figure of the biosecurity advisor veterinarian, and to define the meetings among the different agents. It is therefore important to consider the point of view of the public administration as regards biosecurity, not only to understand all the actors, but also to understand the feasibility of carrying out certain initiatives that require their collaboration.

6.2. Introduction

Biosecurity focuses on monitoring, preventing, controlling, and containing the transmission of infectious diseases (Kaoud, 2015), and can lead to improve health and productive performance (EC, 2016). However, the implementation of biosecurity measures can be influenced by various factors, such as those related to the people, such as age and gender (Frössling and Nöremark, 2016), individual experiences (Broughan et al., 2016), risk-benefit perception (Renault et al., 2018a; Ciaravino et al., 2017), education, awareness, and technical knowledge (Frössling and Nöremark, 2016; Kuster et al., 2015; Toma et al., 2015; García and Coelho, 2014; Brennan and Christley, 2012), information sources (Laanen et al., 2014; Toma et al., 2013), action and communication dynamics (Sayers, Good and Sayers, 2014; Heffernan et al., 2008), and personal relationships (Cardwell et al. , 2016; Shortall et al., 2016; Ellis-Iversen et al., 2010), as well as to the farm, such as location, size, and structural issues (Moya et al., 2019, 2020; Sayers et al., 2013; Hoe and Ruegg, 2006); as well as to the economics (Moya et al., 2019; Frössling and Nöremark, 2016; Pritchard, Wapenaar and Brennan, 2015; Brennan and Christley, 2012; Gunn et al., 2008); as well as to the public administration and the legislation (Kristensen and Jakobsen, 2011; Hovi, Mcleod and Gunn, 2005).

The current Animal Health Law (Regulation 2016/429 on transmissible animal diseases) emphasises the importance of biosecurity and encourages the development of biosecurity plans, which should be flexible and adaptable to different types of animal production and take local circumstances into account. Therefore, this legislation empowers Member States to promote higher biosecurity standards. In Spain, there is currently no official regulation on biosecurity in dairy cattle farms. However, new regulations concerning minimum biosecurity requirements on dairy farms are expected in the near future (MAPA, 2019). In this sense, it is expected that this regulation will give more powers to

the official veterinary services, as there are currently few legislative tools that regulate the implementation of biosecurity measures.

Previous studies, in general, have shown that veterinarians are the main source of information on biosecurity for farmers, and their decision-making is mainly influenced by the former, although official veterinarians can also influence them negatively (Moya et al., 2019; Denis-Robichaud et al., 2019a; Damiaans et al., 2018; Shortall et al., 2017; Brennan et al., 2016; Kuster et al., 2015). Veterinarians from the official veterinary services have been perceived as "bad policemen" (Moya et al., 2019, 2021), adding to the distrust towards the administration (Christley et al., 2011; Enticott, 2008), and leading farmers to believe that the latter do not help them (Broughan et al., 2016). In this regard, it has been pointed out that these veterinarians do not know the realities and problems of the farms, as well as that they have a sanctioning role as well as an advisory role, which could explain such negative influence (Moya et al., 2021).

Therefore, considering the enactment of new legislation with greater powers to official veterinary services in matters of biosecurity, together with the negative perception and opinion that mainly dairy farmers have about these services, we intend to explore and look deeper into the perceptions that the various levels of public administration have about the implementation of biosecurity measures in dairy cattle farms in Spain.

6.3. Materials and methods

The present study used key informants, whose main advantages are related to the quality of data and its collection in a limited period (Marshall, 1996). Thus, opinions and perceptions were collected from key informants of the public administration. Key informants are considered "key" because of their personal and professional experience (Kogan, 1994; cited in Kennedy et al., 2008). Therefore, the informants were identified through an initial exploration of all the structural levels of public administration, based on the territorial organisation of Spain (IGN, n.d., Figure 1). In this context, key informants were those people, who were at different structural levels within the administration, and acting as representatives of that level for this study. A total of 11 representatives from the public administration participated, with two from national central levels (MN1 and MN2), two from autonomous central levels (GA and CA), three from provincial levels (GP1, CP1 and CP2), and four from regional levels (GC1, GC2, CC1 and CC2) from Galicia and Catalonia. The main actions carried out by the representatives of these levels are described in Table 1. Informants were contacted directly through the research network if they had participated in previous studies, or indirectly through another informant, and who agreed to participate in this study.

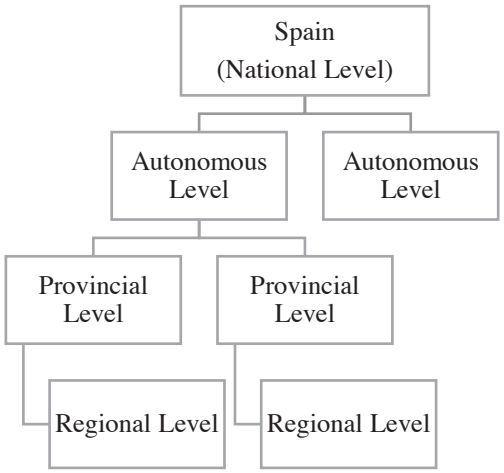

Figure 1: Structural levels of public administration based on the territorial organisation of Spain.

Table 1: Main actions carried out by the representatives of the public administration according to them.

Autonomous Communities	Levels of public administration	Main actions
Madrid	National (MN)	To carry out surveillance programmes and biosecurity plans in veterinary activities. To propose and carry out basic animal health legislation based on European Union legislation. Coordinating and informing Autonomous Communities. Establish communication between Autonomous Communities and international organisations such as the World Organisation for Animal Health (OIE), Food and Agriculture Organization of the United Nations (FAO), and the European Commission. Coordinating national disease eradication and control programmes. Controlling and monitoring zoonotic diseases and antibiotic resistance.
Galicia	Autonomous (GA)	Coordinate programmes for diseases. Manage records, recognition, authorisation and updating of Health Defence Associations (HDA) in all species. Conduct disease analyses of HDA programmes. Verify compliance of HDA programmes. Carry out annual HDA grant order. Verify destination of animal movements.
	Provincial (GP)	Coordinate, territorially, animal health and zootechnics, including food industry. To carry out and coordinate sanitation campaigns. Inspect primary production hygiene, conditionalities, and animal welfare and identification. Monitoring health programmes carried out by HDA.
	Regional (GC)	Inspect and control animal welfare and identification, as well as medicines in all species. Document and authorise animal movements. Authorise registrations and cancellations of animals. Control teams of veterinarians who carry out field inspections. Authorise new farms and report and issue guidelines and attend to the public.
Catalonia	Autonomous (CA)	Manage health programmes for all species. Take decisions on the continuity, modification, or adaptation of health programmes for different species. Coordinate animal identification and traceability.

		Resolve certificate consultations, requirements, or problems. Manage fines.
	Provincial (CP)	Export to third countries. Coordinate farms and animal health, and feed. Control and supervise animal welfare in transport and slaughterhouses. Register animal feed establishments. Coordinate and establish biosecurity criteria. Control animal movements. Controlling sanitation campaigns and official diseases. Take samples. Managing registers of livestock farms with compliance to infrastructure, environmental, and welfare conditions. Issue reports according to urban planning regulations that include biosecurity measures and animal welfare. Authorise building permits on farms. Control and register medicine establishments.
	Regional (CC)	Coordinating and organising veterinary teams. Controlling different animal species. Inspecting and monitoring compliance with biosecurity regulations. Carrying out official control plans for animal identification and traceability. Communicate births, registrations, and deaths of animals. Control animal welfare and movements. Issue health certificates of animal movements, farm registers, and registration permits. Carry out hygiene, cleaning, and disinfection control plans. Inspect official control plans for all species. Controlling sanitation campaigns. Controlling and supervising tuberculin testing of suspect animals. Check qualifications. Carry out milk quality plan.

Europe was one of the continents with the highest incidence of positive cases of COVID-19, in Spain one of the main measures to contain its spread was a policy of confinement and, therefore, a substantial reduction in mobility (Apu et al., 2020; Henríquez et al., 2020). Thus, virtual and telephone interviews were used in this study, as was the case in other areas (Jones and Abdelfattah, 2020; Joshi et al., 2020). Although such interviews cannot completely replace face-to-face interactions, they can offer advantages such as reduced travel and costs, and scheduling flexibility (Davis et al., 2020). In-depth virtual interviews were conducted between 19 March 2020 and 19 October 2020. The interviews lasted between 45 and 120 minutes, and were recorded on audio. The interviews were semi-structured, which are useful for investigating diverse opinions, experiences, behaviours, as well as complex emotions (Longhurst, 2009). The thematic script (Table 2) included general topics such as: levels of administration, material and non-material resources, decisions and prioritisations, actions and proposals, and limitations; and specific topics such as: reality and problems of the farms, mandatory and minimums, training and accompaniment, and participatory meetings. In some interviews, key informants introduced additional information to the original questions. Interviews were transcribed, and those quotations that were related to the study objectives were initially selected to acquire an overall understanding of the content for analysis. The quotations finally used are in their original language in the Appendix. Results refer to the quotations with their respective number between parentheses.

Table 2: Thematic script about biosecurity measures.

General questions

What is your previous profession? What is your current position? How long have you been in that position? What are your daily tasks in relation to animal health?
What are the material and non-material resources available to the administration to promote and implement biosecurity measures on dairy farms? What resources do you use, or have you used? Why? How are they managed?
What biosecurity measures are currently a priority at your administrative level? Why? How are these decisions translated into action?
What is the current position of the administration regarding improved implementation of biosecurity measures? What position should it have? What actions are being taken for this purpose? What proposals exist or could/should exist for this purpose? How are these actions being carried out? How would these proposals be carried out? Why?
What limitations exist or could exist to improve the implementation of biosecurity measures? Why? What role does the official regulatory framework play in these limitations? How can biosecurity measures be improved within this current framework?
Specific questions
In previous studies, farmers and veterinarians have pointed out that the administration does not know what the reality of farms is, as it leads to various initiatives that are difficult to implement. What is your opinion on this lack of knowledge? Why? What is the reality, or problems, of farms in relation to biosecurity measures? How could/should the realities and problems of farms be better known?
In previous studies, farmers and veterinarians have pointed out that everything that comes from the administration is received with reticence, such as biosecurity measures with insufficient argumentation. What is your opinion on this situation? Why? What is your position on making some biosecurity measures mandatory? What measures could/should be mandatory? Why? How would such mandatory measures be implemented? Why? What would be the minimum measures that could/should be implemented? Why? What position could/should the administration take on mandatory and minimum measures? Why?
In previous studies, farmers and veterinarians pointed out that the administration has mainly a sanctioning role but could also have an advisory role. What is your position on the sanctioning role that farmers and veterinarians perceive the administration to have? Why? What is your position on the advisory role that the administration could/should have? Why? What actions could/should be taken to achieve this role? How?
Finally, the three points above share the idea that meetings between all agents should be held. What is your opinion of these meetings? Why? What limitations exist or would exist to hold such meetings? Why? How could such meetings be held? What is your position on binding participatory processes? Why?

Interviews were analysed using conventional content analysis. This is usually used to explore phenomena with limited sources, using inductive logic (Hsieh and Shannon 2005). Thus, the initially selected quotations were read back in order to develop categories and codes for each identified unit of meaning (Table 3). For greater validity and reliability, positionality, peer debriefer, sampling adequacy, data triangulation, and methodological consistency were included (Creswell, 2013; Morse et al., 2002). In this sense, the authors took a critical stance in relation to the participants' discourses, both in this study and in other studies. They held meetings and circulated the article, in order to have an external control on the first author, by providing different questions and

interpretations. They recorded saturation and replication of the data obtained from the various participants, where practically all aspects of the research question were reached. As a base element, they used previous studies in the same area, as well as those that contemplated elements in relation to the research question, providing validity to the data. There was congruency between the research question and the methods used, addressing the question specifically and incorporating all the variables issued around that question.

Table 3: Conventional content analysis categories and codes with definition.

Category	Code	Definition
Characterisation of biosecurity measures	Importance	Importance of biosecurity measures for the public administration and dairy farmers according to the public administration.
	Main measures	Main biosecurity measures that are implemented on farms according to the public administration.
Implementation of biosecurity measures	Resources	Resources (tangible and intangible) available to the public administration to implement biosecurity measures.
	Limitations	Existing limitations to implement biosecurity measures according to the public administration.
Promotion of the implementation of biosecurity measures	Mandatory	Mandatory biosecurity measures on farms according to the public administration.
	Roles of the administration	Sanctioning and advisory role of the public administration and its approaches and consequences.
	Training and awareness	Official and unofficial training and awareness plans for dairy farmers, veterinarians, and farm workers.
Possible actions to be carried out in, and with farms	Knowledge of the farms	Knowledge of the reality and problems of the farms according to the public administration.
	Feasibility of meeting	Feasibility of holding meetings between the different agents on the farms according to the public administration.

6.4. Ethics Statement

The Ethics Committee of the Universitat Autònoma de Barcelona approved the study proposal (CEEAH 4055) and helped to design the informed consent of the participants.

The informed consent explained the objectives of the study and the conditions and guarantees of the participants. It was also pointed out that the data collected would be confidential and analysed anonymously, that there would be no financial benefit from participating, and that the interviews would be recorded in audio or text form. The decision to participate in the study was entirely voluntary, and if they wished they could stop and leave the interview at any time. In this way, the informed consent was signed by the interviewee and the interviewer, with a copy for each.

6.5. Results

6.5.1. Importance of biosecurity

Representatives from the official veterinary services, either at national or provincial levels, considered biosecurity as a strategic line of work for the following years. They highlighted that biosecurity is important for the prevention and control of the entry and spread of infectious diseases on dairy farms (1); and that biosecurity measures are necessary and beneficial for health management (2). In this sense, autonomous levels would like all animal farms to implement adequate biosecurity measures (3); and national levels stated their wish to equal biosecurity levels on dairy cattle farms to those of other intensive production systems, such as swine and poultry (4). Similarly, they mentioned that biosecurity should be part of the daily routines of farms (5).

According to representatives from the provincial levels, dairy farmers implement certain measures effectively, such as those related to animal movements, as they are aware of their importance. However, other measures, such as those related to registers, are not carried out correctly (6). They also indicated that although some farmers are trying to implement biosecurity measures correctly, they have difficulties mainly due to traditions (i.e., routines that their parents and grandparents always used), which are difficult to modify (7). Despite the above, representatives from regional levels, which are the ones with a closer contact with farmers, mentioned that, in general terms, the importance of biosecurity is not embedded in farmers. One of the main reasons was attributed to an excessive administrative and labour burden on their particular farms difficulting to apply biosecurity measures (8). Furthermore, regional levels mentioned that farmers often implement biosecurity measures, without being aware of their importance, in order to obtain certain subsidies . They also commented that there are people who can even take advantage of the same subsidies, despite the fact that such subsidies may be detrimental to the sector itself, and which may, eventually, be heavily dependent on them (9). On the other hand, they described that, based on autonomous legislation (i.e., Decree 40/2014), they routinely inspect farms to evaluate aspects related to hygiene measures and facilities, as animal products require strict hygiene measures (10,11).

6.5.2. Biosecurity measures considered as most relevant

Representatives from regional veterinary services considered that keeping adequate records of visits of people to the farm was of utmost importance, as they provide an effective traceability to be maintained (12). Similarly, they mentioned that entry to farms should be restricted (13); and highlighted the importance of having means to verify and monitor the implementation of biosecurity measures (e.g., disinfection of vehicles) (14). They, along with autonomous levels, were also aware of the importance of implementing biosecurity measures to reduce the likelihood of spread diseases through animal movements (15, 16, 17); but they acknowledged that these measures were not audited, since they depend on the awareness of the farmers (18).

In the opinion of representatives of national levels, new dairy farms should comply with a set of minimum biosecurity measures. Old farms would not be exempt from this compliance, but they would have deadlines to carry out these measures in the context of the new legislation that will be implemented in Spain (19). In this sense, provincial levels agreed with the establishment of such minimum biosecurity measures (20), although, in their opinion, most of such basic biosecurity measures might be already stipulated in

autonomous legislation (i.e., Decree 40/2014) (21). Similarly, autonomous, provincial, and regional levels pointed out the importance of being flexible with the implementation of such a set of minimum biosecurity measures, by taking into account the conditions of dairy farmers and their farms (22, 23, 24).

6.5.3. Resources for the implementation of biosecurity measures

Representatives from the different official veterinary service levels agreed in the lack of budgetary resources allocated to improve biosecurity, with the exception of those measures associated with disease eradication programs (e.g., cleaning and disinfection procedures, in case of positive animals) (25, 26, 27, 28, 29, 30, 31). Nevertheless, provincial levels also commented that the specific budget they have for IPE (individual protection equipment) could be considered as a resource for biosecurity, and that there are some training budgets for biosecurity training programmes (32). In addition, personnel working in the official veterinary services were also considered as a resource that could promote biosecurity improvements at autonomous level (33). However, regional levels also highlighted the shortage of staff and their lack of time to perform such activities, due to the large amount of tasks that they are expected to perform in their daily work (33, 34, 35, 36). In relation to incentives for farmers to invest and improve biosecurity, representatives from autonomous levels indicated that if the sector requested such subsidies, the administration might open lines of assistance for this purpose (37).

6.5.4. Limitations in the implementation of biosecurity measures

Provincial and regional levels commented that monetary resources available to dairy farmers can be a limitation for the implementation of biosecurity measures (e.g., implementation of a perimeter fence or a vehicle disinfection system) (38, 39, 40). However, national levels highlighted the fact that there are biosecurity measures that do not require a high economic investment. Furthermore, in their opinion, on several occasions the economic argument was used to avoid responsibility for implementing biosecurity measures on their farms (41).

Old farms that shared paths with other farms or the existence of atomised farms (i.e., cattle located in different nuclei) in extensive systems, were limitations linked to infrastructures for the implementation of some biosecurity measures in dairy farms (42, 43, 44). In addition, herd size, where small farms would have more difficulties in carrying out certain biosecurity regulations, was also mentioned as an important limitation (45, 46). Similarly, regional levels mentioned the territorial administrative divisions as a limitation in relation to different criteria on some biosecurity measures related to infrastructures among territories (47).

6.5.5. Opinion about the existence of mandatory biosecurity measures

Veterinary officers did not agree that they should have a paternalistic role with permanent monitoring of the measures, and they highlighted that both (i.e., official veterinary services and farmers) should change their attitude (48). Nevertheless, they also pointed out that the existence of penalties for farmers, and also for veterinarians, is an instrument that is able to make sure that biosecurity measures are followed (49, 50, 51, 52).

Therefore, the national levels stressed that, because of these obligatory measures, which are given and must be enforced, the administration has been seen as an enemy by the farmers, although they believed that this vision is changing, as the administration is becoming closer to the farmer. However, they pointed out that the mandatory nature of some measures has been quite permissive (53). On the other hand, regional levels stressed that the obligatory nature of the measures helps the sector itself in terms of the image that the public has of them, as those who can trust their products are safe. In this sense, the obligation puts pressure on the whole sector to move in the same direction, and to have good levels of biosecurity (54). Finally, national levels highlighted the idea that it is an error to consider biosecurity as measures imposed from official veterinary services, and that the dairy sector should become much more involved in actions related to biosecurity improvement (55).

6.5.6. Public administration's sanctioning and advisory role

Representatives from national veterinary services did not agree with the sanctioning role that farmers and veterinarians attributed to them. In their opinion, they tend to ignore that public administration actions are focused to ensure public health (56). In fact, veterinarians from regional levels pointed out that they can also advise farmers and other veterinarians, although this possibility is unknown to most of them (57). Nevertheless, autonomous levels also acknowledged the difficulties of being seen as an advisory or collaborative institution, as they have to ensure that regulations are followed, with sanctions being an instrument for that. In this regard, they stressed that farmers must internalise the importance of biosecurity measures and not carry out certain actions just to avoid being sanctioned (58).

In this sense, provincial and regional levels also commented that they also try to inform and train farmers in advance whenever they have the opportunity, for example, through courses or visits from farmers to their services, on both legislative (e.g. what some basic requirements are), and practical (e.g. how to implement some types of registers) before any sanctions are made (59, 60, 61, 62).

Therefore, one of the main problems recognised by the autonomous levels is related to the simultaneous dual role (sanctioner/adviser) that official veterinarians have, as they are negatively associated due to their sanctioning role, even though they wish to be positively associated due to their advisory role (63). In this way, provincial levels also indicated that it would be ideal to have two different teams of veterinarians, one of inspectors and the other of advisors, so that, on the one hand, they could fully develop their roles, and, on the other hand, there would be no problems in the relationships with dairy farmers. However, they criticised the fact that the administration has prioritised one role over another at present, leaving the advice in the hands of private individuals. They also commented that, in the past, this advice was provided by the agricultural extension services, which unfortunately have disappeared (64).

6.5.7. Training and awareness of farmers and veterinarians

In opinion of representatives from national veterinary services, farmers tend to consider that public administration should prevent their farms from getting infected, but they do not assume their responsibility to implement biosecurity measures, due to a lack of

training and awareness (65). In this sense, provincial levels highlighted the importance of compulsory training for dairy farmers, so they understand arguments behind biosecurity measures and their importance. In their view, training should reach all farmers, and therefore be compulsory for those farmers that do not want to attend on a voluntary basis (66). However, they, along with autonomous levels, also highlighted their lack of time to perform such training, together with some negative attitudes of farmers, as in their view, they do not want to understand the logic behind biosecurity measures because they do not agree with some of those measures (67,68). Thus, it was commented that, although training plans for farmers are already being carried out, more training tools should be developed, so that the importance of biosecurity can be effectively internalised, especially by those farmers who are more difficult to persuade (69). On the other hand, provincial levels also commented that although they constantly try to explain issues related to certain infectious diseases to farmers , they stressed that farmers are aware of the consequences of such diseases on their farms. In fact, they had the perception that farmers are professionals who fully understand biosecurity issues (70). National levels also highlighted the challenges associated with increasing awareness in biosecurity through training, due to, i) lack of outbreaks of exotic diseases (e.g., Foot and Mouth Disease) in the country for several years, and ii) the fact that veterinarians have been focused on areas such as nutrition, reproduction, among other things, but not so much on prevention (71). Nevertheless, they commented that they try to train veterinarians on animal health issues (i.e., infectious diseases and biosecurity) in order to avoid delivering divergent messages to farmers (72, 73). National levels also believed that issues related to veterinary awareness should be the responsibility of the sectoral associations, as the administration is mainly focused on technical issues of veterinarians as they have limited economic and time resources (74). Hence, national levels pointed out that all levels of administration are trying to raise awareness of biosecurity at all possible levels with both dairy farmers and veterinarians (75).

6.5.8. Knowledge of the reality and problems of dairy farms

Veterinary officers did not share the idea that farmers had previously raised about their lack of knowledge about dairy farms (76), as they maintain close contact with farms, especially at regional level. However, at higher levels, where political decisions might be carried out, their knowledge about dairy farms might not be so accurate (77, 78, 79). Despite this, they also acknowledged the diversity of the personnel working in the official veterinary services, which can also influence their knowledge about farms and the flow of information (80). They also commented that the higher levels of the official veterinary services should be more involved with farms, and have more direct contact and communication with people in the field, such as veterinarians and farmers. Similarly, regional levels stressed that the sector cannot be constantly sanctioned, especially if they are small farms that already have difficulties of their own, but rather they must facilitate things with regulations that are viable to implement (81). They also mentioned their personal conflicts for not agreeing with some measures that they must enforce (82). In addition, some veterinary officers acknowledged that spending most of their time in the office was a limitation to understanding the daily problems of farms. In this sense, they wish to participate in meetings that would allow them to better understand the reality of the farms, such as their problems, and where information would flow reciprocally

between both parties. However, they also pointed out the possible difficulties in initiating and developing such meetings (83). In fact, regional levels proposed that, in relation to the lack of knowledge that the administration has regarding the sector, it would be ideal to generate meeting points where effective communication channels could be established to improve this situation (84).

6.5.9. Feasibility of meetings in the dairy sector

National levels agreed on the possibility of holding meetings among the different agents of the dairy sector, open to all sectors (public or private). Furthermore, although they pointed out that time constraints are the main limitation for this they commented that the importance of biosecurity is addressed whenever they can participate in collective meetings (85, 86). Autonomous and provincial levels also agreed with holding these types of meetings, and they pointed out that they could lead to consensus recommendations that everyone would believe, based on the opinions of the participants. Although autonomous levels stressed that the whole sector would have to participate in them, and that it would be necessary to explore how these recommendations would be stipulated legislatively (87, 88). A similar situation was described by national levels who commented that, if such meetings were to be held, they should physically reach all sites, and involve all types of farms in the discussions. Furthermore, they added that, in these meetings there should be no sanctioning intervention by the administration (89). In this sense, regional levels commented that by involving the whole sector, people also become aware and convinced. Thus, they believed that these meetings could be held if there was a willingness on the part of all the agents in the sector. This would not be imposed and the farmers would feel that they were their own, for example, by facilitating their participation (90). Regional levels also pointed out that the difficulty would lie in who would manage them, stressing that it should be the farmers' unions, who already have physical spaces for this, and not the administration, as is usually the case. They also mentioned that, in these meetings, farmers could learn from each other, in addition to the training that some agents receive, and even strengthen their own group in relation to their demands with the administration (91). In the same vein, national levels commented that farmers' associations have an important role to play in these meetings, which should be managed by them in the first instance, and not by the administration, and at the same time, establish communication channels so that they can raise awareness collectively, internalising the importance of biosecurity (92). In fact, autonomous levels also pointed out that it is the farmers who must organise and coordinate themselves collectively in order to solve their problems and put pressure on the administration, as they do not have an organisation to manage all this; adding further that they usually only express their discontent with the administration without doing anything else (93). In line with the above, national levels recognised that it should be the farmers who seek and propose initiatives to improve biosecurity, since these levels of administration do not have the means or resources to call for meetings for the sector (94).

However, autonomous levels highlighted the difficulties that exist for dairy farmers to meet, mainly due to political issues that permeate various areas, such as biosecurity, as they prioritise these political positions over possible solutions to their problems (95, 96). Another possible difficulty, would be the spending time of farmers, since they can easily get tired of these meetings, even though they may have a voice and can be heard (97).

Contrary to the above, some provincial levels opined that the viability of holding meetings between all the agents in the sector is complicated because, specifically, the farmer and veterinary groups are two different worlds, with their own languages, interests, and understandings, for example. Furthermore, they pointed out that some agents, such as dairy farmers, have individual interests that can be opposed to the collective interest promoted by the administration (98). In the same vein, although these provincial levels also indicated that they are in favour of these meetings as spaces of information and persuasion, and problem-solving, they stressed that there are areas that cannot and should not be addressed in such meetings, such as legislative issues, as opposed to routine practical issues (99).

Despite all the above, provincial levels commented on the existence of sectoral round tables, with representation from the different groups in the sector, in which various issues are discussed, such as biosecurity (100). Similarly, the national levels also highlighted the so-called "local sanitation commissions" that still exist in certain places, where representatives of the administration, veterinarians and farmers meet to coordinate actions on an annual basis, and also the possible solutions to specific problems in certain areas. However, these commissions have gradually disappeared due to the lack of personnel available for this purpose (101).

6.6. Discussion

Based on results from this study, dairy farmers and private veterinarians could mainly be aware of the sanctioning role, above the advisory role. This could be because the latter is insufficient or inefficient, since the administration might not have enough training tools and time to promote such role. In addition, people in the administration may also not receive continuous training on how to train dairy farmers or veterinarians. Therefore, it would be interesting to design training programmes for the administration itself, or at least for the regional levels, which are the ones that have a direct relationship with local farmers and veterinarians. In the same vein, even though the advisory role of public administration is currently limited (Moya et al., 2021), there is a growing interest at local levels to provide ongoing advice to farmers. Thus, it is interesting to note that this advisory role was previously carried out by the agricultural extension services, which, unfortunately, have disappeared. Its objectives were: technical advice and dissemination, suggestion of effective practices, organisation of training events, and technical-scientific updating and dissemination (MAPA, 2006). Therefore, it might be important to re-inforce this role, for example through the veterinarian responsible for the farm (Regulation 2016/429; Royal Decree 993/2014; Law 8/2003), or by the Health Defence Associations (HDA) veterinarian, whose tasks include advising on biosecurity measures for certain infectious diseases. Increasing private veterinarian awareness on biosecurity is also of paramount importance, as they have room for improvement in terms of disease prevention (as has been described elsewhere; Derks et al., 2013; Derks et al., 2012; Da Silva et al., 2006; Lievaart and Noordhuizen, 1999). Thus, it is important to establish the figure of the biosecurity advisor veterinarian, who would have the same importance as the clinical, reproduction, milk quality or nutrition veterinarian, for example.

As regards the implementation of biosecurity measures, the question arises as to which part of the triad (i.e., farmers, private veterinarians, and official veterinary services) is

really failing to raise awareness. In fact, it should not be forgotten that in Spain, as in other places, farmers resort to administration and veterinarians to obtain reliable information (Paquette, Schemann and Ward, 2020). Therefore, it might be interesting to look more closely at whether the implementation of biosecurity measures should be monitored, and sanctioned, through mandatory measures, or whether it should be internalised, and advised, through biosecurity training. It could even be possible to rethink both approaches, and propose new strategies that have not been explored so far, such as the possibility of having a compulsory continuous training for the whole dairy sector, including the public administration itself. On the other hand, training promotion on the implementation of biosecurity measures can also have drawbacks. According to Moore et al. (2008), training materials for farmers may vary in their recommendations on these measures, leading farmers not to implement them because of confusion. Thus, recommendations should be standardised based on evidence. In turn, the training itself should consider regional differences related to the age of farmers and herd sizes, along with effective dissemination (Sayers et al., 2013).

According to dairy farmers and veterinarians, the reality and problems of dairy cattle farms are unknown to the public administration, since they generate regulations and legislation that are complicated to implement, as was the case with perimeter fencing (Moya et al., 2019, 2021). However, the administration at local level differs from this approach, although it recognises that this may indeed be the case at higher levels (which is reflected in such legislation). Despite this, a positive perception was observed on the feasibility to hold participatory meetings among the various agents in the sector, in order, among other things, to find out their current situation. Although participatory meetings among all the agents in the sector, which can be binding, do not exist as such, there are certain meetings that allow for the discussion of certain legislation with representatives of the sector. However, the administration believes that the holding of participatory meetings should not address legislative issues, but rather problems that may have practical solutions. In this sense, these meetings should be characterised as to who, how, and what their objectives are, beyond what the administration can say, since possibly no one wants to assume such responsibility, as the administration does, who directs it mainly to the farmers. In fact, responsibilities for biosecurity on livestock farms should not only lie with farmers, as indicated by legislation, but also with other actors, such as the dairy industry or transport companies, and even the public administration, which encourages such practices (Maye and Chan, 2020). In this sense, such participatory meetings could be designed taking into account some participatory methods and formal consensus decision-making, for example (Cioni, 2008). In this way, these meetings and decision making could increase the commitment, motivation and satisfaction of local participants, and could also contribute to a better understanding among the various actors and levels, as is similarly the case in other areas (Elegbe and Ibikunle, 2015). However, it is necessary to look further into these participatory meetings in studies dedicated exclusively to this, considering similar experiences such as those by Vaaarst et al. (2007) and Bugeza et al. (2017) in Uganda, and even initiatives such as some rural living labs like LIVERUR (EC, 2018), or projects that consider them, such as AgriLink (2019).

It was also described that the public administration has limited economic and human resources for the direct implementation of biosecurity measures, since these are generally reflected into animal health programmes, as is the case with bovine tuberculosis (MAPA,

2020) based on Royal Decree 2611/1996, or infectious bovine rhinotracheitis based on Royal Decree 554/2019. However, there is also the possibility that dairy farmers themselves can apply for subsidies from the public administration. In this sense, such incentives could be beneficial to motivate farmers to implement biosecurity measures (Oliveira et al., 2018; McWilliam and Balzarova, 2017). Thus, public administration could encourage farmers to actively propose biosecurity measures to be subsidised, which could generate positive feedback to farmers, allowing them to know what their needs are. Similarly, incentives alone may not be effective, and must be accompanied by awareness programmes. Being able to access certain subsidies could even mean carrying out training with evaluation and implementing some biosecurity measures at the same time.

Finally, it should be noted that there are practically no studies involving public administration in biosecurity (e.g. Kristensen and Jakobsen, 2011, and Hovi, Mcleod and Gunn, 2005). In this sense, it would be interesting to incorporate their vision in future research on these issues, since there is a tendency to constantly question public administration by dairy farmers and veterinarians. These could generate new perspectives to understand certain dynamics, such as the heterogeneity in the implementation of biosecurity measures in dairy cattle farms (Denis-Robichaud et al., 2019b; Renault et al., 2018b; Sahlström et al., 2014; Brennan and Christley, 2012).

6.7. Conclusion

Public administration, as an institutional actor, has hardly been addressed in studies on biosecurity. Results from this study highlight the wish of the official veterinary officers to reconcile both the dairy sector vision and their own institutional vision, and to improve dairy sector biosecurity. It is, therefore, necessary to consider the vision of the public administration in future studies on biosecurity in order to determine the viability of certain initiatives, which could be proposed by a coordinated dairy sector.

6.8. References

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General Discussion

Chapter VII

The set of studies conducted in this PhD research intended to investigate the various psychosocial factors that might affect the implementation of biosecurity measures in dairy cattle farms in Spain. For that purpose, a qualitative research has been used, which is currently being increasingly approached by the various fields of the natural sciences. In fact, qualitative researchers in One Health are increasingly relevant as they can develop interventions that consider the various social, political, and cultural contexts (Degeling and Rock, 2020). However, beyond the purely standardised issues of these studies, such as their diverse procedures, it is necessary to ask about the possible impacts they might have, such as their practical and theoretical repercussions.

From a practical standpoint, this PhD research has tried to cover as many psychosocial factors as possible based on the data collected. In this sense, it is possible to appreciate a considerable magnitude of these factors that must be taken into account in order to carry out a given biosecurity intervention, such as a particular biosecurity programme. However, it is not only their quantity that is relevant, but also their articulation, where these factors are interdependently related to each other. Thus, these factors cannot be approached in isolation, but neither can they be seen in global contexts, but must be approached as a whole in each of the actors, who are in a given context. For example, a network of psychosocial factors of a dairy cattle farmer of a dairy cattle farm, who is related to a veterinarian, who in turn has another articulation of these factors, and is also related to other dairy cattle farmers of other dairy cattle farms in a region. Because of this fact, there is a high complexity to incorporate all these factors in a given biosecurity intervention, although it is necessary to keep in mind those factors that are dependent on key elements, such as sources of information, such as veterinarians and all the factors that surround these agents, as has been described elsewhere (Brennan et al., 2016; Shortall et al., 2016). Equally, it is possible that, during intervention processes or new research, new factors and nuances may emerge with a different articulation, where the intervenor or researcher must be open to such a scenario.

Meanwhile, from a theoretical point of view, while a global positivist view was prioritised in the studies, each study was explored from a constructivist paradigm. However, the theoretical elements were mainly reflected in the study designs, which were related to the concept of biosecurity. In this sense, these elements were not deepened in the questions that could have been drawn from the data itself, which had a theoretical potential. Thus, it is necessary to point out two main areas that could be interesting to explore in future studies based on these data. On the one hand, there are the relations of power and resistance among all the agents present: farm workers, farmers, veterinarians, and public administration, from Foucault's perspective (Balan, 2010; Heller, 1996). And, on the other hand, there is biopower and biopolitics, from the perspective of Foucault and Agamben, where, in addition to the agents described above, the management of the animals themselves becomes important, and even the collateral management of the human populations that may consume their products (Patton, 2007; Genel, 2006). Thus, this type of theoretical exploration could be useful not only to understand certain decision mechanisms in relation to biosecurity, but also to enable the design of biosecurity programmes that can have a greater scope in relation to the final implementation of their measures.

In relation to the psychosocial factors explored, although qualitative research was used to obtain an overview of these factors, it is interesting to consider other alternatives that may be complementary, or that may even delve deeper into each of these factors separately. In this sense, it is possible to point to participatory action research, which from its design to its realisation is carried out by the participants themselves. Therefore, its research objectives and questions are conducted from a view of science and practice; the very participation of the people in a given context being important (Muntean and Havadi, 2017; Bergold and Thomas, 2012). However, not only farmers and veterinarians should be considered, but also other actors in the chain, who have not been explored in these studies, but who could be of significant importance, especially considering that they are actors who have close contact with the animals, such as animal transporters. There is also another agent that may be interesting to address, who are not usually explored in this field and are in the first line of contact with the animals, the farm workers. However, it is also important to bear in mind that there could be considerable ethical implications, as they are the ones who carry out biosecurity practices, but they are also the last link in the chain, and may have important conflicts of interest not only with farmers, but also with other actors in the sector.

Following on from the above, it would not only be interesting to go deeper into each of the various psychosocial factors explored, but also to formulate new research questions. In this case, it is possible to suggest two questions that can emerge from these studies. The first relates to what and how the various biosecurity measures can be adapted to the various dairy cattle farms proposed by veterinarians from the perspective of those who are permanently in the field, such as farmers and farm workers, but considering a final validation by experts outside the field. For this, one could consider the study carried out by Duval et al. (2016), which used a participatory point of view to adapt certain indicators, in relation to herd health monitoring, proposed by scientists to the criteria of farmers. In their findings, all participants adapted these indicators to their specific animal health and production situation, with various unique combinations depending on their particular objectives. In this way, the study provided insight into the reasons behind the selection and adaptation of certain indicators by farmers and could contribute to joint planning with them. The second is linked to the generation of participatory action programmes in relation to biosecurity with the actors themselves, who could develop plans from their design to their realisation that are adjusted to the situation in each of their contexts, but only from a practical implementation point of view, being advised at all times by experts in the field. In this sense, if both questions converge at a meeting point, ranges of adaptation of biosecurity measures could be established along with programmes for their implementation.

Two actors that have not been considered in these studies, and could be interesting to address, are the final consumers or civil society, with their opinions, perceptions, attitudes towards biosecurity on dairy cattle farms. In fact, this could be even more interesting if one bears in mind that people are nowadays permanently informed about the current global developments in relation to the COVID-19 pandemic (Glatter and Finkelman, 2020; Pitlik, 2020), where biosecurity has become even more important (Albert, Baez and Rutland, 2021; MacLeod and Spence, 2020; Salem and Jagadeesan, 2020). In the same vein, a new biosecurity quality index could even be generated at consumer level, as was

once the case with animal welfare, which is also closely related to biosecurity (Broom, 2010; Botreau, Veissier and Perny, 2009).

Regarding data collection methodologies, there were certain processes that could affect the various analyses. In this sense, it can be pointed out that the configuration of the focus groups could have been a determining factor for the homogeneous participation of the people. Thus, it is possible to point out that the number of participants per group was sometimes excessive, which could have meant that not everyone was able to express their opinions adequately. It should not be forgotten that the focus groups were constituted with a minimum of 5 and a maximum of 14 people, since the possible absence of some participants was taken into account, which did not happen. In any case, it should be kept in mind that ideally focus groups should be composed of between 4 and 12 people depending on the depth of the study (Tritter and Landstad, 2019; Hopkins, 2017, Carey, 2015), although in this research there were possibly too many, and it may not have gone into the data in sufficient depth. In this sense, this could also affect the dynamics where facilitators may have had complications in knowing who exactly said what, due to such a group size (Hopkins, 2017). In fact, it was decided to characterise the groups and make the opinions explicit without detailing exactly who had said them, a situation that adds to the technical complication of transcribing the recordings when more than one participant was speaking at the same time. Furthermore, it should not be forgotten that as a result of the number of participants, some people were also able to influence others who were not as active as they were during the session, an issue known as groupthink, where generally people who are not sufficiently educated can be influenced by the common opinion of the group (Carey, 2015).

On the other hand, in the ethnographies there were also various elements that could have affected the data collection in some way. Although an audio and video recorder could have been used to collect data from the participants and the various situations observed, as well as for a self-reflective record, this was not done (Levon, 2013). One of the main reasons for this was the participant observation itself, as in the field the ethnographer worked directly with the farmers or workers using their hands at all times, so it was impractical to have any device that would allow this, as well as the risk of breaking it. Similarly, this was not done because the ethnographer did not wish to make the participants uncomfortable, and that they in turn might change their attitude, affecting research as a result of the Hawthorne effect (McCambridge et al., 2014; Tenny et al., 2020). In this sense, it should be remembered that when one is aware that one is being observed, certain beliefs about the researcher's expectations are generated that produce a modification of people behaviour in relation to social conformity and desirability; although there may also be other mechanisms that explain such changes in behaviour (McCambridge et al., 2014).

In the transcription of the data collected, it can be noted that there were elements that could have helped to understand more deeply the meanings and contents of the participants' messages but were not used. This is the case of Jefferson's symbology, which could be used in grounded theory, ethnography, discourse analysis or content analysis. This type of transcription allows for a verbatim transcription, being a similar reflection of the participants' own words, including non-verbal elements (Moser and Korstjens, 2018; Hepburn and Bolden, 2013; Jefferson, 2004).

It is also important to highlight the language in which the data were collected. In the three methodologies used, the data were collected in Galician, Catalan and Spanish, which in the transcription process were first translated into Spanish for analysis, as it was the first researcher's mother tongue, and then into English, as it was the language in which the studies were to be disseminated. In this sense, it is important to consider that both the transcription itself and the translation of the data are a type of interpretation, which can generate greater complexity in the handling of the data (Nikander, 2008). However, the use of an audio recorder could facilitate processing, and the accompaniment of original language material could provide support for transparency (Davidson, 2009; Nikander, 2008). In any case, the meaning of the content must always be kept in mind in order to avoid changing it during translations, otherwise it may affect the interpretation of the data itself. It is for the above reasons that the data were handled in Spanish at all times, to reduce possible misinterpretations.

A variety of methodologies were used in the studies conducted, including the three main qualitative methodologies: interviews, ethnographies, and focus groups. These methodologies were used in different studies, but they sought to explore the same objective. In this sense, the very use of different methodologies to explore a phenomenon is related to the quality of a research, in this case specifically through the criterion of triangulation (Tenny et al., 2020; Chowdhury, 2015; Kawulich and Holland, 2012). Similarly, there are other criteria that were important in the studies conducted, such as audit trail through the preservation of all records obtained through such methodologies, as their various procedures carried out (Tenny et al., 2020; Jamierson, 2016; Chowdhury, 2015; Kawulich and Holland, 2012).

In relation to this last criterion, it is important to point out that there is the possibility that during these processes certain degrees of data omission were generated in the analyses, and consequently in the results themselves, as well as the elimination of data that were not linked to the research question. This omission of data could be due to various elements, one of the main ones being the fact that qualitative research must be synthetic in its writing, as not all data can be addressed given its extensions (Weiner-Levy and Popper-Giveon, 2011).

One element to bear in mind in all these studies is that there may have been sufficient involvement of the researcher with the participants to have generated various consequences on their contexts. In this sense, there is research that provides certain strategies to deal with this, such as reflexivity, which refers to an active recognition by the researcher that their actions and decisions inevitably have an impact on the context in which they are doing research (Horsburgh, 2003). In this way, such reflexivity can go some way to reducing such consequences, at least as far as possible. In fact, the people who participated in these studies could eventually be followed up to see if they have changed any biosecurity measures or ideas in relation to them. Similarly, this reflexivity is linked to the degree of knowledge and the positions that a researcher may have on a context, which can facilitate the study of certain data in greater depth. And, equally, it should not be forgotten that, in order not to generate an influence on the data on the part of the researcher, there are criteria linked to the use of registers, repeated review and peer review (Berger, 2013).

Finally, it would also be interesting to explore other types of research in addition to qualitative research in relation to whether people on a farm would implement certain biosecurity measures or participate in certain biosecurity programmes, along with addressing the elements that might affect such implementation or participation. In this regard, it is possible to refer to studies such as the one carried out by De Lauwere et al. (2020). In this study, they investigated elements that could influence farmer participation in a hypothetical dairy health programme to improve animal health and welfare standards in relation to bovine viral diarrhoea (BVD). However, it is important to note that a quantitative methodology and analysis was used. In this regard, it may also be interesting to consider research such as that conducted by Jack et al. (2020), which examined the elements that could influence farmers to participate in a participatory programme through a mixed methodology and analysis. Consideration could therefore be given to generating future quantitative or mixed research to understand the elements that may be relevant for such agents to implement particular biosecurity measures or participate in particular biosecurity programmes, using tools such as the analytical hierarchy process, which addresses multi-criteria decision making (Vaidya and Kumar, 2006). Thus, each of the psychosocial factors could be assessed in comparison to others, with their respective criteria, to see how relevant they are to implementation or participation, for example. One could even consider the idea of assessing such psychosocial factors in these contexts, such as perceptions or attitudes, or generate tools to enable their assessment (Clifton and Carrasco, 2018).

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General Conclusions

Chapter VIII

1. The main set of factors influencing farmers' implementation of biosecurity measures are their individual elements (i.e., their adaptation, predisposition, and individual experiences), sources of information, internal and external social dynamics, and availability of time and space.

2. Veterinarians have an important role in the decision making of farmers to implement biosecurity measures. Therefore, all aspects that may affect communication between farmers and veterinarians, such as their level of training and confidence in their knowledge and skills, may be relevant to improve biosecurity.

3. Farmers and veterinarians often blame each other for the degree of implementation of biosecurity measures. For this, the development and establishment of participatory meetings involving both farmers and veterinarians, both intra- and inter-collectively, could be favourable to improve biosecurity.

4. The dynamics between the traditions of farmers and the recommendations of veterinarians need to be taken into account in order to understand the performance of psychosocial factors in relation to the final implementation of biosecurity measures from a practical point of view.

5. There is a widespread position among farmers, veterinarians, and public administration to generate meetings among all actors in the dairy cattle sector that could be beneficial to improve biosecurity.

Appendix

Chapter IX

9.1. Research Note

9.1.1. Abstract

This research note explores an autoethnography based on a study using ethnographies on dairy cattle farms in Spain. The ethnographic research involved various interactions with dairy farmers and farm workers, with whom different degrees of reflection were experienced from different positions. This study was structured to understand the different processes behind data collection and analysis from the researcher's point of view. In general, autoethnographies are conducted by researchers from the social sciences, although in this case it was conducted by one from the natural sciences, a veterinarian who was familiar with the research field. However, both types of autoethnographic perspectives can have pros and cons. One of the most important is the questioning that can be made of the practices carried out as an agent (veterinarian) who is part of a system (dairy cattle farms).

9.1.2. Introduction

Dairy cattle farms are an unknown universe, including their various practices and problems. In fact, the media and social networks only show a part of this universe, which can lead to criticism of this sector due to a lack of knowledge of the other parts. Moreover, it should be borne in mind that all these farms are different from each other, with their own dynamics. Thus, autoethnographic approaches are a possible option to investigate aspects that may be generally unknown.

Autoethnography is complex to define precisely because there are different terms that can vary in their meanings and applications (Ellingson and Ellis, 2008). Initially, this concept was proposed by Heider (1975), to describe the cultural practices of a community; and further developed by Goldschmidt (1977), to incorporate ethnographies, which favour personal perspectives. Thus, autoethnography can be associated as a qualitative approach that involves self-observation and reflection in the context of ethnographic research (Maréchal, 2010). This approach uses the researcher's personal background to describe and interpret different cultural practices, experiences, and beliefs of a social setting through their relationship (Adams, Holman and Ellis, 2015). In this sense, our ideas based on our experiences can sometimes generate our interpretations exposing, harming, or shaming others (Ellis, 1995). However, we must protect and respect the people who participate with us, who become characters in our stories; therefore, this approach is humanising, as it focuses on lived life with all its complexities, where those involved matter (Adams, Ellis and Holman, 2017).

In general, autoethnographic forms feature action, emotion, embodiment, self-awareness, and introspection represented in dialogues, characterisations, and scenes. In this sense, the researcher upholds the conventions of literary writing and expression (Ellis, 2004), being a communicator who participates in the telling of a story to gain an understanding of people's lives and circumstances (Bochner and Ellis, 2006). However, there are authors who express their concern about its possible transformation into a narcissistic and indulgent document due to an exclusive use of the self in its production (Sparkes, 2000; Coffey, 1999; Denzin and Lincoln, 1994), suggesting that it should contain elements of greater dimension related to social life (Krizek, 2003).

It is possible to find different currents within autoethnographies, such as evocative or analytical (Anderson, 2006; Burnier, 2006). According to Montagud (2016), evocative autoethnography generates an evocative and aesthetic text, where thoughts, emotions, and actions of the researcher are shown, as far as possible, to reach diverse audiences that traditional research does not reach. Whereas analytical autoethnography produces a precise, objective, and scientific report on a phenomenon, which allows for broader theoretical questions to be addressed, with explanations and knowledge productions that go beyond mere individual experiences. Thus, while the former defies any attempt at systematisation, the latter attempts to link the ethnographic tradition and other emerging forms of personal narrative. Thus, the main differences between the two currents are the narrative of the subject, the analytical process, and the capacity for generalisation. Therefore, the use of one or the other depends on the specific characteristics of the study and its objectives (Vryan, 2006). In the case of this research note, an analytical autoethnographic approach was used.

It should be noted that this research note is part of a study carried out by Moya et al. (2020), which addresses the implementation of biosecurity measures on dairy cattle farms through security ecologies. In this sense, the aim of this research note is to give a detailed account of the process behind their (auto)ethnographic approach, with special emphasis on the role of the researcher. And in turn, to reflect and rethink on such an approach in disciplinary fields where it is not usually used. The following sections address each of the stages experienced in the ethnographies of the original study from an autoethnographic point of view.

9.1.3. The first contact: Between dairy farmers and farm workers

First contacts are complex to manage and crucial for steering the next encounters. To address these contacts, a researcher from the original study intervened as a mediator, explaining to the participants who (researcher), what (general and specific objectives) and how (procedures and actions) such a study would be conducted, so that they could assess whether they wanted to participate in it. One of the elements that was highlighted in these contacts was the who, because in an ethnography it is relevant to make our positions explicit.

In the description of the who, the background of the researcher who would carry out the ethnographic approach, who was a veterinarian by profession with a background in psychosociology, was set out in detail. In this sense, we must ask ourselves to what extent such an introduction might have affected the data collection and analysis and what might have happened if they had only presented themself as a veterinarian or as a psychosociologist. Finally, the present research notes that it was carried out on dairy cattle farms with dairy farmers and farm workers, playing a role primarily as a veterinarian and secondarily as a farm worker. Thus, from the researcher's point of view, the researcher was initially associated as a professional reinforcement to the daily activities, to whom dairy farmers could raise their technical questions and farm workers could show their working conditions. However, the role of the veterinarian had more impact with the dairy farmers than with the farm workers; and therefore, it was decided to give more importance to veterinary training. Thus, the initial presentation of the researcher may generate a greater or lesser willingness to collaborate with study by participants depending on their

background and considering the context of intervention. In this case, both farmers and workers were favourably willingness. Thus, both roles allowed us to explore different lived experiences, power relations and cultural taboos through the position of farmers and workers (Adams, Jones and Ellis, 2015). Despite the above, moments of tension were generated, particularly in relation to public administration, as participants made associations between it and the researcher. In the face of this, an attempt was made to disengage from such an association by making comments that could mainly coincide with that of the farmers, such as the lack of involvement it has with dairy cattle farms from a participatory point of view, or at least with those who participated in this study.

In the role of farm worker, one only had to follow the tasks given by the dairy farmers. Despite this, there were occasions when some of them were questioned, as the veterinary training emanated from the researcher. To manage this, the researcher directly changed their role to that of a veterinarian in order to be able to talk to the farmer and let them know what was happening and what could be done about it, in a kind of awareness-raising dynamic. But then one might ask, what was the point of having been adopted a worker role at certain times. The answer would be precisely this, that there were dynamics that broke with the researcher's own schemas by being in a position that was not their own and questioning the daily dynamics of the farms.

In general, this type of ethnographic study is carried out by researchers linked to the social sciences, although this study was carried out by a researcher from the natural sciences. Thus, it is necessary to ask what elements can help to enhance the use of this type of approach, whether a person who has had approaches to the area of social sciences and has notions of it or a person with the opposite characteristics. In fact, this reflexive question was present throughout the study, especially in order to know exactly how to act in these approaches. Unfortunately, the limited number of ethnographic approaches conducted on dairy cattle farms, coupled with the low probability of conducting one with similar conditions to this one, given the particularities of each farm, makes it difficult to compare this study with other research. However, the answer could be much more complex, although it is possible to point out that it could depend on the convenience of each of the moments, especially in times of conflict, where direct interpellation could affect the research.

9.1.4. Veterinary researcher on dairy cattle farms

The reality of dairy cattle farms is complex to deal with, as they have several elements that create a unique system, such as production times, animal management, material resources, agents, and regulatory frameworks, among others. However, all these elements are not usually known or closely linked to research processes.

In this research, one of the most important elements were the agents of the farms, who could have hindered this ethnographic approach from a logistical point of view, as they had free entry and exit from the farms. In fact, at one time there could be zero agents and at another time six in the same place at the same time, who were not fully identified, as some of them simply came and went for very limited periods of time. For example, commercial agents who only looked for the farmer for no more than five minutes. In this sense, requesting information from these agents was difficult, which could have been interesting for the research, so it was only limited to observing their entry and exit.

Moreover, some of these agents did not frequent the farms on a regular basis. But what alternatives could be had for such cases, possibly none. Thus, although at first one might think that these are agents that, due to their limited involvement, could have little impact in these contexts, this is not the case, as it depends directly on the type of agent. For example, there are actors who could change the overall farm contexts in just one minute, such as people from the public administration.

Another element that needs to be considered is the different hierarchical layers within these systems, which can have an impact not only on data collection but also on data analysis depending on the position of the researcher. In this research, there were three main positions that were empathised with at different times. The first was related to the dairy farmers, who had several ongoing conflicts with the public administration, but also with the farm workers, but to a lesser extent. The second was linked to the farm workers, who had different conflicts with the dairy farmers. For example, on one farm one of the workers was dismissed for repeatedly confronting the farmer, while on another one was hired to ease the workload of the other workers, and in both situations, interpellations were made to the researcher. And finally, the third, which was related to the veterinarians, a position the researcher already held, due to their profession. It is important to note that the researcher was clearly neither a dairy farmer nor a farm worker, even if they had experienced a rapprochement with these agents. Therefore, it is practically impossible to be completely in one position given the distances to both agents. However, in relation to the positioning with the veterinarians, although one might have thought that there would be a greater empathy with them, this did not happen. The veterinarian positioning was much more critical from the point of view of their actions, this is precisely because there was already an approach to them. Similarly, there were positions that were marginalised because the actors related to them did not participate in the research, such as mainly those from the public administration and the rest of the dairy sector. Regardless of the above, although it is practically impossible to take a neutral position, an attempt was made to consider all possible positions within the data collection and analysis. And, where it was not possible to collect or analyse such data, new studies were suggested, as in the case of public administration.

The positioning taken in the different moments of the ethnography, due to the interpellation made by the participants, provoked a dynamic that can be called expository (i.e., the researcher's thinking was made evident and explicit throughout the process). As a result, strong relationships were generated between participants and researcher, as well as further enquiry and deepening of some data, such as interpersonal relationships. Furthermore, because of this, it was possible to enter spaces that would otherwise not have been possible, such as the personal spaces of dairy farmers and farm workers, which were accessed through the farms' own facilities (i.e., workspaces) or outside of them (i.e., relaxation spaces). However, such a situation could have led to biases if there was no control over the exposition dynamics themselves. In this way, all positions were permanently transparent, keeping the main objective of the original study as a constant reference. Although at the time this action could have caused difficulties in continuing with the research, there were no drawbacks due to the relationship generated with these strata.

9.1.5. Questioning the position of veterinarian

One of the tensest moments came when the researcher took on the role of veterinarian. While the researcher felt more comfortable, they experienced several internal conflicts. One of these conflicts was to doubt the researcher's own biosecurity measures, possibly due to the influence of the views of the dairy farmers and farm workers themselves. Thus, the researcher crossed boundaries that could invalidate their own knowledge, prioritising the arguments of farmers and workers, but adapted to their own background to try to make sense of them and make them coherent. However, instead of further questioning the measures themselves, the researcher tried to understand why this questioning had occurred. The main reason was due to an alternative implementation of these measures, which can be seen in the original study (Moya et al., 2020). These kinds of processes are not easy to deal with, as they have a strong ethical-moral component where not necessarily contradictory, but disparate visions in terms of lived experiences, power relations and cultural taboos, such as those of dairy farmers and veterinarians, or farm workers and veterinarians, confront each other.

So, what about an ethnographer's ability to question. Initially, on a practical level, a social science ethnographer from another field might have approached such questioning from an external and global perspective. Whereas this ethnographer, from the natural sciences, may have had difficulties in abstracting from their own field, as they did not have sufficient tools to do so. However, it is possible that both a social and a natural ethnographer can carry out such fieldwork, where one of the main differences may be the spaces they can approach and the resources they may have to reduce their biases. Similarly, it is important to note that it is not intended that all disciplines can cross their boundaries and occupy each other's spaces, but rather the opposite. The intention of all this is to show and acknowledge various shortcomings that one possesses as a natural science researcher with a social science background in an ethnography, being able to contribute different knowledge to that which a simple and pure veterinarian or sociologist may have. And, along the same lines, other advantages can be found when an ethnography is carried out by a researcher such as the one presented here, as it allows for interesting internal reflections, even questioning issues that are taken as absolute and the only truth.

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9.2. Study I: Annex

9.2.1. Thematic guide and topics used for the in depth-interviews

1. Knowledge:

- What do you understand by "biosecurity"? How did you get to that definition?

- Do the bovines on your farm have any interaction with external agents (new bovines, other domestic or wild species, shared machinery or equipment, or external people)? How important is? Why?

- What do you think about infectious diseases (ID)? Why?

- Which ID do you think is the most important and threatening for your farm? Why?

- How do you think the ID got into your farm? What consequences do you think that could cause in your farm?

2. Direct Actions:

- Did you notice any increase in any ID on your farm or somewhere near? What would you do in that case? Why?

- What biosecurity measures do you apply? Why? What are your criteria to prioritize measures?

- How biosecurity protocols get established in your farm?

- How do you make the final decisions? Which are the factors or risks that you keep in mind to make those decisions? Why?

- Which do you think are the benefits or limitations of implementing biosecurity measures in your farm? Why?

- What is your opinion about vaccination as a biosecurity measure? Why?

3. Sources of Information:

- Where do you get information about ID and biosecurity measures?

- What do you think about the information received by veterinarians, institutional authorities, or other dairy farmers?

- What is the profile or type of veterinarian that you consider as a reference for biosecurity assessment (clinical, reproduction, animal health, or others)? Why?

4. Experiences:

- Have you, or someone you know, suffered from any disease transmitted by animals? What would you do if that happened (in relation to the biosecurity measures implemented on your farm)?

5. Expectations:

- How much are you willing to accept the implementation of biosecurity measures? Which factors should be complied with for that?

- In general, what do you think other dairy farmers do? And comparing to them, how do you think you are regarding the application of biosecurity measures?

- Which is your opinion about existing programs, legislation, and/or rules related to biosecurity measures?

9.2.2. Spanish citations used in the present study

1 Information sources

1.1 Material information sources

1.1.1 Papers and publications

- *FC5: "(...) Básicamente del veterinario, si no de revistas (...), publicaciones (...). Van saliendo cosas, y te vas enterando de alguna cosa (...)"*

- *VC6: "(...) Revistas divulgativas del sector (...), prensa nacional escrita (...)"*

- *FG2: "(...) Leo mucho, la parte que me aportan en la producción, clínicos y técnicos de campo, aparte de eso suelo leer mucho. Más que leer documentos en sí, información de otros países (...). Muchas veces lo comento con los técnicos de ADS (...)"*

1.1.2 Courses

- *FC6: "(...) Yo he hecho muchos cursos, muchas charlas por mi cuenta, no soy veterinario ni tengo estudios técnicos, pero he leído tantos libros y tantas revistas (...)"*

- *FC8: "(...) Hice un curso de emprendedora, y durante dos años estuvimos trabajando un poco esto del manejo de granjas, hicimos un poco de todo, aprendí alguna cosa (...)"*

- *VG3: "(...) Básicamente de los técnicos que los asesoramos, y después cuando ellos salen a congresos y jornadas, y las publicaciones que reciben también (...)"*

1.1.3 Mass media

- *FG6: "(...) De internet, saco todo de internet, es donde más miro, porque miro muchas cosas para informarme (...)"*

- *VG4: "(...) Desde redes sociales, revistas especializadas (...). Pero yo creo que sigue siendo la fuente fundamental de información los técnicos que van (...). Asisten a jornadas (...)"*

- *VG6: "(...) Es muy efectivo un programa de televisión que hay en Galicia los domingos, a las dos menos diez, sobre el agro en general. Hablan muchísimo de vacas y cultivos, eso lo ven todos (...), es muy eficaz (...)"*

- *VG8: "(...) El mundo de las redes sociales, audiovisual y la tecnológica (...). Formación como tal, las charlas, los congresos (...), el verdadero foro son las reuniones. Incluso los medios audiovisuales nos han transportado, porque es distinto que te den una charla pura y dura, a que te la ilustren y te la enseñen (...)"*

1.2 Human information sources

1.2.1 Veterinarians sources

1.2.1.1 Confidence and influence

- *FC2: "(...) Si no estuvieran ustedes (...) te olvidas de qué es un riesgo, porque lo asumes como una cosa cotidiana, y a veces no piensas sino te van recordando (...). El veterinario es el que más te hace hincapié, por ejemplo (...), pinchar una aguja por vaca (...)"*

- *FC9: "(...) Te dejas aconsejar yo creo, como es el veterinario de toda la vida, te dejas aconsejar por él, yo creo que es lo más fiable en nuestro caso (...)"*

- *VC5: "(...) La decisión final es siempre del ganadero, lo que pasa es que hay ganaderos que toman decisiones con mucho soporte técnico, y hay ganaderos que el soporte técnico les importa muy poco, las toman sin necesidad de soporte técnico (...)"*

- *FG1: "(...) Primero de los veterinarios que tengo, porque conocen bien la explotación, saben mejor lo que se puede adaptar a la explotación. Y después casas comerciales (...)"*

- *FG3: "(...) De bastantes sitios, los técnicos son los primeros (...), con otros ganaderos, a veces en internet. De algo concreto que igual quieres saber, lo buscas (...), incluso dependiendo del tema tienes información de varios sitios (...)"*

- *VG5: "(...) Si me preguntan les digo, pero si no preguntan no, yo no les intento convencer de nada, no creo que sea mi función, y él va a pensar que lo hago por venderle algo (...)"*

1.2.1.1.1 HDA veterinarians

- *FG1: "(...) Las explotaciones que están en ADS, sí que llevan un programa de vacunación (...), yo no estoy en ADS (...)"*

- *FG2: "(...) Ayuda también muchos talleres en la ADS. En temas de diarreas de terneros pequeños (...) nos ha ayudado mucho (...), se reducen las muertes (...). La ADS insiste mucho que vamos a hacer esto y tal, poco a poco, pero insiste en muchas cosas. Es un buen técnico (...), muy implicado (...)"*

- *FG3: "(...) Se entró en la ADS, se miraron a los animales (...). Entonces a raíz de allí la decisión que se tomó fue a algunos eliminarlos ya en el momento, y a otros, que no tenían síntomas, que estaban bien, se fueron eliminando poco a poco (...)"*

- *FG5: "(...) En ADS tenemos un plan de vacunación, porque aquí no tenemos por ahora recría, entonces compramos muchas vacas de fuera, entonces necesito un plan de vacunación (...)"*

- *FG6: "(...) Aquí tenemos una ADS (...) para analizar IBR, BVD, todo eso (...). La ADS hace analíticas todos los años, si hay un problema de aborto, tú miras a ver si hay algo (...)"*

- *FG7: "(...) Se les hace sangrado periódico, la ADS lo hace cada seis meses (...)"*

- *VG2: "(...) Tuve dos brotes importantes de IBR (...), uno de casi 500 cabezas, y otro de unas 100 (...). Desde que llevamos trabajando en ADS, los números fueron disminuyendo (...). Somos los de ADS los que hacemos el trabajo de bioseguridad en el 90% (...)"*

- *VG4: "(...) La responsabilidad directa en protocolos de vacunación está depositada en las ADS (...). Tiene que ser en plan de grupos, por eso están bien las ADS (...)"*

- *VG5: "(...) El de ADS (...) va todos los meses (...), conoce mucho mejor cómo está el ganadero, y hablan mucho más (...). Les exigen normas mínimas (...) y les aconsejan (...)"*

- *VG8: "(...) Para mí hay un antes y un después de las ADS. Yo viví el comenzar de las campañas de saneamiento, que cubrían brucelosis y tuberculosis, entonces ponían la prueba de la tuberculina y se analizaba en sangre. Era voluntario (...)"*

1.2.1.2 Relationship

1.2.1.2.1 Based on time

- *FC6: "(...) La relación es muy buena, es el mismo que ha estado siempre (...). Me refiero a que él me escucha y yo le escucho (...), a veces él me dice una cosa y yo digo otra, y a veces no es la suya ni la mía (...)"*

- *VC7: "(...) Es muy buena (...). Los ganaderos los veías casi cada día, y si no cada semana (...), cualquier cosa llamabas, era una relación muy próxima (...)"*

- *FG1: "(...) Somos casi como amigos. De hecho, llevamos con los que tengo a diario muchos años, no cambiamos cada poco tiempo de veterinario. Con el de reproducción llevamos toda la vida, con el nutriólogo, ahora cuatro años (...), el de calidad de leche debe llevar sobre tres años, y el clínico también lleva toda la vida (...)"*

- *FG2: "(...) Bien (...), más confianza quizás en el clínico porque lleva más años (...)"*

- *FG7: "(...) Los de saneamiento vienen una vez al año, hace muchos años que va todo bien (...), y la relación es buena, pero los ves una vez al año, nada más (...)"*

- *VG3: "(...) La relación de un asesor, nosotros hacemos visitas semanales, quincenales o mensuales (...), y fruto de la relación de muchos años tenemos cierta complicidad (...)"*

1.2.1.2.2 Based on treatment

- *FC3: "(...) Muy bien (...), siempre estamos de bromas (...). Si no me contesta nadie, al cabo de un rato uno me contesta (...), porque sé que están todos con trabajo y todos tienen crías (...). Todos nos equivocamos, no pasa nada (...), porque vas con tantas cosas en la cabeza que es fácil que te pase (...)"*

- *VC1: "(...) El ganadero y nosotros acabamos siendo amigos casi, no es una relación profesional, pero con algunos más y algunos menos, depende del trato que tengas con ellos (...), pero acaba siendo bastante próxima (...). Son ganaderos que son de un tamaño relativamente pequeño y es fácil llegar a conocerlos bastante profundamente (...)"*

- *VC2: "(...) La relación en general (...) mi intención es que sea muy seria, muy profesional, pero a la vez es muy personal, porque pasamos muchas horas juntos (...), vas a bautizos, vas a bodas, vas a entierros, y ellos vienen a los tuyos (...)"*

- *VC6: "(...) Ser amigo de los clientes (...) creo que sería un error (...). Pero digamos que con los años se toma un nivel de confianza (...) entre las partes, y ya salta un poco lo profesional (...), entra un poco en la dinámica personal (...). No creo (...) que alguien use la relación personal (...), nos pagan para que les digamos las cosas (...). Cuando hay otros intereses (...), se prioriza (...) el interés propio y no el del ganadero (...)"*

- *VC8: "(...) Yo los considero compañeros de trabajo (...), pienso bastante como ellos en algunas cosas al final (...)"*

- *FG5: "(...) Es muy buena, la verdad no me puedo quejar de cualquiera de ellos, de todos los que tengo, no puedo quejarme de ellos (...). Yo miro los resultados, por ejemplo (...), llamas al clínico, simplemente le cambia un medicamento (...), y funciona (...). Hay uno de ADS, el clínico, el de reproducción y la nutrióloga (...)"*

- *VG3: "(...) Dependiendo de (...) la confianza que tiene depositada en mí, ese trato es más cercano o (...) menos, pero siempre entre cliente y (...) asesor (...)"*

- *VG4: "(...) Es variable, en muchos casos es de amistad (...), en algún caso (...) he visto crecer, casarse, tener hijos y nietos (...). En otras es (...) cordial. No entiendo el trabajo nuestro si no está basado en la confianza (...). En cuanto surja algún (...) problema en el cual la confianza falla, tienes que cesar, no es una cosa que se mantenga por rutina (...)"*

- *VG5: "(...) Si tienes un trato cercano con el ganadero, un error se te perdona, incluso dos errores. Pero si tu trato es distante y déspota (...), que los tratan desde un nivel superior, entonces allí los errores no se perdonan (...)"*

1.2.1.3 Training of veterinarians

1.2.1.3.1 Lack of training

- *VC3: "(...) La bioseguridad (...) no sabemos cómo se acota, cómo se traslada a granja (...), no tenemos formación suficiente, o no hemos tenido el interés suficiente por formarnos más en este sentido (...). Muchas áreas de formación son autodidactas (...)"*

- *VC7: "(...) Yo quiero hacer las cosas bien (...), pero necesitaría poderlo argumentar (...). Yo creo que necesitaría como una ayuda, unas bases, unos cursos, una formación (...)"*

1.2.1.3.2 Power of convention

- *VC4: "(...) Yo no sé si podemos convencerlos suficientemente, porque me hace gracia que a lo mejor tú les dices o recomiendas que utilicen o hagan cualquier cosa, y es capaz de venir un señor a venderles un tractor (...). No tenemos poder de convicción (...), llega un momento que dice: 'ya es normal que vengas tú y me digas esto, y viene este y me diga lo otro' (...)"*

- *VC7: "(...) Si se les argumenta bien, y si se les repite muchas veces (...). Creo que necesitan sedimentación las ideas con los ganaderos (...)"*

- *VG2: "(...) Aquello que es demostrable o que tú puedes demostrar que existe, o que tú puedes hacer que deje de existir, es lo que es más palpable (...). Es un trabajo nuestro (...) demostrarle o convencerlo de lo que puede pasar (...), pero cuesta más cuando no es palpable (...)"*

- *VG4: "(...) Es algo que está tan implantado que no resulta fácil decir: 'hay que hacer esto y esto' (...), creo que faltan más formas de proponerlo (...). Yo no creo que la gente esté cerrada, creo que quizás hacemos pocos apostolados (...)"*

- *VG7: "(...) Estar un poco más encima, de insistirles, tienes que hacer esto y esto, porque muchas veces es por dejadez (...)"*

1.2.1.4 Veterinarians gender

- *VC7: "(...) En esa zona habían trabajado veterinarias mujeres (...). Lo note mucho, el respeto al hecho de ser mujer (...). En un mundo masculino (...), yo reivindicada: 'no, que yo puedo, que yo soy fuerte' (...)"*

- *VC8: "(...) Además, que siendo (...) mujer, en las granjas (...) te explican cosas que (...) son personales (...). Esto de que llegas y tienes que almorzar en cada casa (...) es algo muy típico (...), es muy acogedor (...)"*

- *VG7: "(...) Sufrí al principio, pero después es cierto que en el momento que ven que al final haces lo mismo, dicen: 'bueno', te aceptan (...). Ahora yo estoy trabajando con niños que me vieron desde que eran críos, y lo ven como algo normal, no les extraña, cuando yo empecé quizás sí que les chocaba, una mujer trabajando en esto (...)"*

1.2.2 Other farmers sources

1.2.2.1 Confidence and influence

- *FC3: "(...) Normalmente del veterinario. Si ves a algún granjero: 'oye, pues mira yo hago esto y esto', y 'yo hago esto y esto', y ya está (...), pero no toda (...)"*

- *VC1: "(...) Otros porque han hablado con el ganadero, un ganadero habla con otro y dice: 'pues yo vacuno y pues muy bien' (...), 'va, yo también vacuno, quiero vacunar'. Y son ellos mismos que te dicen que quieren vacunar sin que tú les hayas dicho nada (...)"*

- *VC3: "(...) Mucha de la información depende de la información del bar, es decir, de compañeros ganaderos, de la gente que tiene capacidad de hacer de altavoz en el sector. En algunos casos somos técnicos, pero en otros casos (...) ganaderos (...)"*

- *FG6: "(...) Entre los ganaderos consultamos. A mí me gusta mucho preguntar a otros ganaderos, pero normalmente hay muy pocos ganaderos que te transmiten lo que les pasa en su explotación (...)"*

- *VG2: "(...) Normalmente rebaños grandes y gente innovadora, es decir, gente que se atreve a tomar decisiones que los demás no. Entonces son un poco los pioneros que van por delante (...), entonces se toman como modelo (...)"*

- *VG4: "(…) Las conversaciones entre ellos, o sea, el bar sigue siendo un lugar importante de adquisición de conocimientos, no siempre bueno, pero sí (…)"*

1.2.2.2 Journeys

- *VG4: "(…) A mí me da muy buen resultado llevar a ganaderos a visitar otras granjas que ciertas cosas las hacen bien, o sea, que realmente lo vean. Y cuando lo ven (…) dicen: 'vamos a hacer esto', imagino que en bioseguridad será igual (…)"*

- *VG8: "(…) Hemos hecho viajes, o visitas a una granja, y bueno, allí yo veo que se saca mucho provecho en la formación (…). Y visitar otras estructuras, visitar otras zonas de España, otras zonas en Europa, a todos nos gusta viajar (…). Luego el visitar otro tipo de granja, estructuras, cooperativas, asociaciones, productores (…). La diversidad yo creo que es lo que enriquece (…), están dispuestos (…)"*

1.2.2.3 Neighbours farmers

- *FC8: "(…) Cuando tuvimos diarreas masivas en terneros (…), el vecino puede ser que tenga (…), a raíz de eso empezamos a vacunar (…). En esta zona estamos bastantes cerca las unas de las otras (…), dices: 'vacunando esto se neutraliza' (…)"*

- *VC2: "(…) El factor que más les afecta es que uno de sus vecinos tenga un problema gordo de cualquier enfermedad, y que vean que el tío lo está pasando mal, allí despiertan todos (…)"*

- *VC3: "(…) Un valor que es importante también, es lo que le ha pasado al vecino, es decir, si el vecino ha tenido algún problema de brucelosis, ya me cuidaré (…). Por los fracasos o éxitos de proximidad (…)"*

- *FG1: "(…) Por ejemplo, gente que han traído animales de fuera, pueden traer un problema (…)"*

- *VG5: "(…) Si (…) hay un brote cerca, es fácil convencerlo, porque está viendo al vecino que está teniendo problemas (…). Vacunas normalmente todas las explotaciones que están cerca, y sí que te hacen caso (…), eso sí que lo ven (…)"*

2 Internal world of the farmer

2.1 Age

- *VC1: "(…) Los ganaderos más jóvenes están puestos en las nuevas tecnologías (…), son más modernos trabajando (…), más abiertos a lo que tú les puedas proponer (…), a mejorar (…), son más competitivos (…). La gente que (…) se va a jubilar (…), las inversiones ya no se tienen en cuenta, vamos a aguantar hasta que jubile y ya está (…)"*

- *VC7: "(…) Había de todo, desde (…) joven y súper meticuloso (…), controlan mucho todo, y te dicen casi lo que tienes que hacer, hasta una granja que no tiene idea (…). El que tengo (…), que es un chico joven (…), es un desastrillo porque no entiende de vacas (…)"*

2.2 Farms size

- *VC6: "(...) Ganaderías más grandes (...) el nivel de profesionalidad es mayor y filtran mucho, es decir (...), para conocer un poco qué está ocurriendo en el sector (...), contratando a un profesional (...), me mantiene informado (...)"*

- *VC8: "(...) Hay ganaderos que son verdaderos profesionales (...), van a buscar servicios veterinarios específicos (...). Y luego hay otros ganaderos que no tienen ese nivel de profesionalización, que a lo mejor son explotaciones más familiares (...)"*

2.3 Habits

- *VG1: "(...) Supone un cambio, y las personas (...) tenemos miedo a los cambios. De hecho, la gente que más progresa es la que mejor se adapta a los cambios, y no todos estamos preparados para adaptarnos a los cambios, sobre todo cuando son bruscos (...)"*

- *VG2: "(...) No todos los ganaderos perciben el riesgo y (...) toleran un cambio de la misma manera, entonces allí es donde entra el conocer a cada ganadero (...)"*

- *VG6: "(...) Es por hábitos (...), es que el establo es el centro de reunión (...). No puede entrar gente a la explotación, eso lo llevan fatal porque no lo entienden (...)"*

2.4 Predisposition

2.4.1 Viability predisposition

- *FC2: "(...) Soy muy reacio a hacerlo, o lo hago sin darme cuenta (...). Ya tenemos una edad, no estamos tan habituados o concienciados (...), los años nos hacen más tercos (...). Lo que sí es muy costoso es la pereza humana (...), el cambiarse de ropa, incluso ducharte (...), cuesta más verle el rendimiento (...)"*

- *VC4: "(...) Lo que le genera el mínimo trabajo y la máxima eficacia (...)"*

- *VG5: "(...) Deben tomar medidas de ese estilo, te cuesta mucho trabajo de que las implementen en las explotaciones, muchísimo (...). No quieren, no lo consideran prioritario y les causa muchas molestias (...), a lo mejor a la que te hacen caso (...)"*

2.4.2 Benefit predisposition

2.4.2.1 Favourable predisposition

- *FC4: "(...) No habrá crecimiento, ni habrá negocio (...), sin tener el tema de bioseguridad bien (...), no puede, no va a haber (...)"*

- *FC5: "(...) A corto plazo a lo mejor no los ves. Pero es seguridad (...), evitar los riesgos (...), por prevenir, por no tener problemas (...)"*

- *FC7: "(...) Para mí es una garantía para mis animales, una garantía de salud para mis animales y de renta para mí (...)"*

- *FC9: "(...) No cogen nada, excepto las propias enfermedades del ordeño o lo que sea, pero no tienen ninguna enfermedad externa (...). Yo creo que es esencial, sino se puede ir a pique todo, todo el negocio (...), si se va a pique esto, nos vamos a pique todos (...)"*

- *VC2: "(...) El prevenir que no te entre esta enfermedad, o minimizar el riesgo de que entre esta enfermedad (...)"*

- *VC6: "(...) Proteger de un riesgo, un temor (...), así duermo tranquilo (...)"*

- *FG1: "(...) Veo que problemas aquí no hay de ningún tipo (...)"*

- *FG2: "(...) Económicos y sanitarios, problemas de enfermedades como tuberculosis, BVD (...). Te evitas muchos problemas (...) si no entran animales (...). Es importante porque te puedes evitar muchos problemas (...)"*

- *FG5: "(...) Bastante, sobre todo cuando hay un problema y no sabes de dónde viene el problema. Yo tengo amigos y aparecen casos de vacas enfermas, y no saben de dónde viene ese caso, ni reaccionan a medicamentos ni nada (...)"*

- *FG7: "(...) Para mí es una de las principales causas de ir muy bien, o muy mal (...)"*

- *VG3: "(...) Buen estatus sanitario, tienes animales sanos, vas a tener un retorno económico gracias a tener animales sanos (...), vas a tener imagen de empresa (...)"*

- *VG7: "(...) Mejor estatus (...), el funcionamiento es más fluido, va todo mejor, que las vacas preñan bien (...), les evita el estrés (...), te favorece a nivel de manejo diario (...)"*

2.4.2.2 No favourable predisposition

- *FC1: "(...) Es muy importante, pero tampoco. En los cerdos hay muchísima bioseguridad, pero también se les mueren muchísimos (...), y en los pollos lo mismo (...). Tengo muchas más historias, porque hago prevención (...), si no hiciera prevención sería otra cosa (...)"*

- *VC7: "(...) Tienen muchas otras preocupaciones, quizás para él no es importante las palomas en la comida, seguro que sí, pero tiene otras bastantes preocupaciones (...)"*

- *VG2: "(...) Es fundamental (...), para los ganaderos también, pero (...) es la asignatura pendiente, y es el pilar básico sobre el que se debería sostener toda la trasmisión de enfermedades infecciosas (...), está totalmente abandonado (...)"*

- *VG4: "(...) El gran problema es que el efecto (...) no es inmediato (...)"*

- *VG5: "(...) No es tema prioritario porque es muy complicado hacerlo, a nivel de veterinario, por ejemplo (...)"*

2.4.3 Economic predisposition

2.4.3.1 Favourable predisposition

- *FC6: "(...) Yo lo que quisiera es (...) vallarla, bien vallada, esto es un factor interesante, lo que pasa es (...) que como cuesta dinero (...)"*

- *FG1: "(...) Yo soy partidario de gastar en prevención, y no después en curar (...), siempre te vas al tema económico (...), sin duda alguna (...)"*

2.4.3.2 Dependent predisposition

- *FG5: "(…) Te alarman aquí en lo alto y tú estás en lo bajo, entonces hacemos una cosa media (…). Utilizamos así los protocolos más o menos que veo rentables (…)"*

- *VG3: "(…) Llevar a cabo medidas de bioseguridad supone hacer inversiones económicas más o menos grandes (…). Hay ganaderos que consideran que son imprescindibles hacerlas y otros que no las consideran tan imprescindibles, o no las ven tan urgente (…)"*

2.4.3.3 No favourable predisposition

- *VC3: "(…) Económico, es un sector que no gasta en crisis, no hay abundancia para invertir, y si se invierte, se invierte para crecer (…)"*

- *VC4: "(…) La gente ha dejado de trabajar en prevención (…), por tema únicamente de coste (…), me cuesta tanto dinero, mi efectivo no me lo permite, no vacuno (…)"*

2.5 Previous experiences

- *FC1: "(…) Si te entra como me entró (…), que no estaba vacunado (…), hasta que no me pasó eso, la realidad era esta, yo no la había vivido (…). Me entró esto, y dices (…): 'sí que tengo que hacer prevención' (…)"*

- *VC3: "(…) A partir de un problema contagioso, lo intentamos trasladar para prevenir en el resto de las granjas, a partir de experiencias (…). Si no hubiese vivido un tema de este tipo, quizás la bioseguridad para mí sería secundaria, no sería una prioridad (…)"*

- *VC4: "(…) Hasta que tú no lo ves y no te dan el palo, no te enteras, es lo que hay, aprendes de esto a base de garrotazos, aprendes (…)"*

- *FG2: "(…) Hace un par de años tuvimos problemas con el BVD, me ayudó a entender un poquito la enfermedad, a vivirla directamente (…), quizás no le daría la importancia que tiene. Supongo que cuando vives una situación, de las situaciones malas aprendes (…)"*

- *VG1: "(…) Supongo que también es de vivencia (…), yo tuve la mala suerte de vivir un par de brotes de BVD, pues al final temes, ves que es espectacular (…). Cada vez hay más gente que implanta normas de bioseguridad (…)"*

- *VG3: "(…) Una forma, la más trágica, es que haya tenido un episodio desagradable (…), esa es una forma de aprender, con golpes es más fácil aprender (…)"*

2.6 Training of farmers

2.6.1 Lack of training

- *VC3: "(…) Yo creo que es una falta todavía de formación por parte de los ganaderos (…), están dispuestos a pagar unos servicios, pero en muchos casos no lo corrigen (…)"*

- *VC7: "(…) Por costes pueden no querer gastar tantas agujas, pero creo que los ganaderos son más porque no son tan consientes (…), porque no han recibido la formación de los patógenos que los rodean (…)"*

- *FC1: "(...) El camión del unifeed que reparte a 70 explotaciones, pero va por el comedero (...) y descarga, no va pisando nada, no sé qué riesgo puede tener, ¿El veterinario? Igual la maquinaria al yo no tener tractor, cojo maquinaria de la cooperativa (...)"*

- *FG2: "(...) Animales salvajes hay (...). No sé si la fauna salvaje puede ser un riesgo o no, si está allí puede ser portador (...)"*

2.6.2 Necessity of training

- *VC2: "(...) Yo no le puedo plantear al ganadero de que BVD (...) le está causando problemas y ya está, porque el ganadero de hoy en día me va a reclamar más información (...). Te exigen que le argumentes eso sí, y eso está muy bien (...)"*

- *VC4: "(...) Son ellos los que te demandan información, si tú les das 10, ellos pedirán 100, es un escalado de menos a más (...)"*

2.6.3 Type of training

- *VG3: "(...) Que el ganadero tenga formación y vea a través de la formación lo importante que es en su negocio llevar medidas de bioseguridad (...). Digamos que la formación se la damos en el día a día, siempre que vas a visitarlo le estas asesorando con formación (...)"*

- *VG8: "(...) Todavía queda mucho (...) en la parte de formación (...). El ganadero tiene que recibir formación de ganadero, el ganadero no puede recibir formación de veterinario, ni de ingeniero agrónomo, porque para eso tendría que acudir a una universidad (...)"*

3 Social dynamics (internal and external)

3.1 Society

- *VC4: "(...) A nivel de cerdos (...), estamos a años luz para poder solucionar, que todos queremos implementar historias, pero es muy complicado, es muy difícil. Yo no sé si es la idiosincrasia nuestra, pero yo creo que no nos favorece (...). Un mismo problema enfrentado en tres granjas distintas (...) depende de la idiosincrasia de la granja (...)"*

- *VC6: "(...) Quieras o no, también la presión social (...), alarmas sociales (...). Yo cuando veo intoxicación de alimentos (...), Salmonella, un problema (...) con leches maternizadas (...), esto crea unas alarmas, o el famoso tema de las vacas locas en los 90s (...)"*

- *FG4: "(...) Si hay una persona allí, no puedo decir: 'no entres aquí' (...). Si un vecino te entra aquí al lado, no se le puede decir (...)"*

- *VG1: "(...) Y tenemos una idiosincrasia o una tradición de lo que es el vacuno que hasta hace no mucho distaba bastante de ser una empresa, lo que te decía, era la prolongación de la cocina (...). Hoy sí, hay otro enfoque, la medicina de producción (...)"*

- *VG2: "(...) Yo lo veo como una cuestión social, es decir, la idiosincrasia de un pueblo no es la misma que la de una ciudad, ni la de una aldea (...). Aquí es muy grande*

la influencia social a todos los niveles (…). Y a nivel de grupos de población pequeños es más grande, se observa más lo que hace el vecino (…)"

- *VG4: "(…) También juega un papel muy importante la tradición, realmente el cambio que ha experimentado la ganadería es brutal (…). El ganadero tiene las puertas abiertas, no sé si es por hospitalidad o costumbre, para todo el mundo que entra en su granja (…)"*

3.2 Social cohesion

3.2.1 Current social cohesion

- *VC4: "(…) Somos mundos paralelos (…). La gente que está en la administración está cumpliendo unos protocolos (…) establecidos (…). La relación con la gente que estamos trabajando fuera no existe (…)"*

- *VC5: "(…) En base a un trabajo conjunto entre nosotros, el veterinario y el propietario, tú dices: 'nosotros proponemos, junto con el veterinario clínico de la explotación, y dispone el propietario' (…)"*

- *VC6: "(…) Hay mayor sensibilización por parte del técnico que le transmite al ganadero, y por parte de la administración que lo presiona con normativas (…). Al final, entre la administración, los técnicos y el sector, también se ve presionado (…)"*

- *VC7: "(…) Mi papel es entre la administración y el ganadero (…)"*

- *VG2: "(…) Los de la administración no se implican de la manera que nos implicamos los demás técnicos en el trabajo, están un poco fuera del sector (…)"*

- *VG6: "(…) La ADS en esta zona (…) somos los intermediarios entre los servicios veterinarios oficiales y el ganadero. Entonces siempre que hay un problema con los servicios veterinarios oficiales estamos nosotros, los primeros que vamos (…), estamos más a pie de establo. Entonces siempre estás en el medio de todo (…)"*

3.2.2 Expected social cohesion

- *FC6: "(…) El contacto administración-ganadero tiene que mejorar en el sentido de que tiene que ser estrecha (…)"*

- *VG2: "(…) Fundamental que el resto de los profesionales que acuden (…) incidan en el mismo tema (…)"*

- *VG4: "(…) Tiene que ser un rollo coordinado y todo el mundo tiene que ir en la misma dirección, todo el mundo tenemos que hacer bioseguridad (…). Una forma no sencilla de hacerlo sería que las centrales lecheras se involucraran (…)"*

- *VG8: "(…) Yo siempre he demandado que debemos conectarnos (…). Yo estoy en el campo y veo una realidad, la universidad puede gestionar muchas bases de datos (…), y la administración tiene el conocimiento de la legislación, de otros escenarios (…). Nos puede ayudar muchísimo a mejorar (…)"*

3.3 Farm Workers

3.3.1 Profile

- *VC7: "(...) Están los empleados que trabajan allí (...), chicos jóvenes o chicos de fuera, o gente que no dominan nada de sanidad, simplemente saben ordeñar (...)"*

- *FG6: "(...) Hoy por hoy hay muy poco donde elegir, debería haber más personas formadas. La junta debería preparar más eso porque es un trabajo como los otros, y es unas horas que tienes que venir a ordeñar, dar de comer al ganado (...)"*

- *VG1: "(...) Aquí hay desde gente joven de 20 años a gente mayor de 55, mujeres, gente nacional, gente extranjera. No cumple un perfil, como se trabaja más a protocolos, buscas un trabajador que los cumpla y listo (...), son operarios de granjas (...)"*

- *VG8: "(...) Es muy variado, comenzó por ser personal de la zona que eran, o ganaderos que habían abandonado (...), luego gente con pocos conocimientos que ellos formaban, tanto de la zona como gente extranjera (...)"*

3.3.2 Availability

- *FG1: "(...) Ahora mismo estamos interesados en máquinas automáticas de ordeño, esto porque la mano de obra está cada día más complicada de encontrar, gente que realmente sirva (...)"*

- *FG5: "(...) Si no hago instalaciones, no, para tenerlas mal. Estoy cansado de tener las cosas mal, y además da mucho trabajo. Y la mano de obra es muy escueta, no hay mano de obra (...). La mano de obra hace falta (...)"*

4 Official veterinary services, bad policemen or necessary enemies?

4.1 Obligatory

- *FC5: "(...) El vallado como no es obligatorio (...), y no me genera problemas (...), si no te da problemas y no es obligatorio, pues de momento pasamos (...)"*

- *VC6: "(...) Quien hace avanzar es la presión normativa de la administración en todo lo que es temas externos, controles de desinfección, etcétera (...)"*

- *FG3: "(...) Después (...) lo que es una ley o tal, tienes que cumplirla, en unas cosas se puede estar más de acuerdo y otras menos (...). Algunas cosas son obligadas (...), pero es algo que veo bien, porque igual si no fuera, mucha gente no lo haría (...). También es cierto que no, porque sean obligatorias, hay cosas que no se podrían mejorar (...)"*

- *VG1: "(...) Solo hacemos las cosas si son obligatorias, lo voluntario no se hace (...), porque como es voluntario, igual no es tan importante, esa es la idea de mucha gente (...)"*

4.2 Feasibility

- *FC1: "(...) Por ejemplo, yo si quiero cerrar mi explotación lo tengo casi imposible, porque aquí detrás hay no sé cuántos metros de diferencia con un vecino, que dónde va la valla, si aquí abajo, arriba (...). Cada cosa tiene que tener unas normas diferentes (...)"*

- *FC4: "(...) El Estado Español estaba fuera del mercado común de Europa (...). Luego aquí cambiaron muchos aspectos del tema agrícola ganadero, al cabo de poco*

tuvimos el tema de las cuotas lecheras (…). Todo esto incidió en unas variables (…) difíciles de llevar a cabo, a una velocidad más rápida de la que tendría que ser (…)"

- *FC8: "(…) Lo del vallado (…), la manera que querían que lo hiciéramos la normativa no lo decía (…), no había una estándar, ni una oficial (…)"*

- *VC8: "(…) No hay unas directrices muy específicas, supongo que también es porque las explotaciones son muy diversas (…)"*

4.3 Distrust

4.3.1 Questions

- *FC2: "(…) Se morían terneros, les salían gotas de sangre por la piel (…). Empezamos a encontrar que en Alemania se habían retirado unas vacunas (…) porque daban los mismos síntomas (…). Dije: 'no quiero ver ni al apuntador aquí con las vacunas' (…). Pero claro, el no gastar en ninguna vacuna (…) también es un riesgo (…)"*

- *FC3: "(…) Eso de la lengua azul (…). Toda esta zona tuvo que vacunar (…), luego veías un montón de vacas que te iban abortando, y era por culpa de esta vacuna (…)"*

- *VC8: "(…) La primera vacunación (…), por la reacción de la vacuna (…) no hubo muchas vacas muertas (…), pero sí que hubo caídas de producción súper bestias los días de vacunación (…). ¿El ganadero va a vacunar de lengua azul sabiendo lo que le ha pasado? Le tiene mucho miedo (…) porque piensan que es muy perjudicial (…)"*

- *VG5: "(…) Aquí tuvimos muchos casos de lengua azul (…), era mucho peor vacunar que no vacunar (…). Yo les recomiendo a todos mis clientes encarecidamente que no vacunen de lengua, no pasa nada (…), si te pilla con los animales vacunados lo van a coger igual, se va a trasmitir igual, no es una vacuna eficiente, no sirve para nada (…)"*

- *FC8: "(…) Lo del vallado de las granjas, era obligatorio (…) y se retiró porque vieron que, si querían que la gente lo hiciera, lo tenían que enfocar de otra manera (…). Si tan importante era hacerlo, por qué lo quitas (…)"*

- *VC4: "(…) Hubo una época que la obligación era vallar (…). Pasa un riachuelo por la granja (…), la solución que le dieron es, valla este lado, valla el otro, y el río por el medio (…). Y otro caso, de pasar un (…) camino de paso, pero claro, dice: 'vallas la granja, pero dejas la puerta abierta'. Entonces para qué la vallo si dejo la puerta abierta (…)"*

- *VC8: "(…) Si pides un plan de mejora y lo incluyes, te dicen que no lo incluyas porque lo van a derogar, y esto lo dicen los servicios centrales (…). Por el medio de mi explotación, porque mi explotación es vieja, pasa un camino común, y entonces no puedo cerrar, ¿Vallo la mitad solo? (…)"*

4.3.2 Comparatives grievances

4.3.2.1 Equality between dairy farms

- *FC3: "(...) Vamos todos en el mismo barco o cada uno va por libre. Si todos fuéramos en el mismo barco me parece que muchas enfermedades ya no estarían (...). Se podrían mejorar algunas (...), a lo mejor sí, pero siempre todos remando en el mismo barco (...)"*

- *FC9: "(...) A nosotros nos obligaron a vallar la granja, y al cabo de tres meses no se obligó. Eso tampoco lo veo justo (...), por qué a unos sí y a otros no (...), es lo único que veo que no está bien. Para mí, si es para todos, es para todos, no unos sí, otros no (...)"*

4.3.2.2 Equality between animal productions

- *FC2: "(...) En el sector de las ovejas y las cabras, no se llevaba un control tan estricto como con las vacas (...). Nosotros tenemos que sacar sangre al 100% de los animales (...), en cambio en las ovejas solo es obligatorio sacar un porcentaje (...)"*

- *VC2: "(...) Es muy injusto a la presión que están sometidos, viendo a otros sectores, como el ovino o el caprino, que desde su punto de vista están dejados de la mano de Dios, comparado con el control al que están sometidos ellos (...). Ellos no demandan medidas más relajadas como otros, sino (...) que aprieten igual a los otros sectores (...)"*

4.4 Appreciations

- *FC2: "(...) Siempre llega tarde cuando se entera de algo (...), espera y espera (...), le cuesta enterarse de las cosas (...)"*

- *FC5: "(...) Ellos hacen su trabajo, cogen los papeles y ven (...). Pero depende de quién te puede orientar (...), esto es para ayudarte (...). Cuando hay un problema, aquí te quedas, pero si tienes dudas cómo hacer las cosas (...), esto preguntando no hay problemas (...)"*

- *FC9: "(...) Está bien porque regula todo, pero la burocracia es lenta, muchas veces es muy lenta, pero bueno, tiene que estar, yo creo que es esencial que esté (...)"*

- *VC2: "(...) Su percepción es que la administración siempre intenta penalizar, más que asesorar o ayudar a solventar el problema. Son gente que cuando vienen a controlar de manera rutinaria, o por sorpresa, una explotación, siempre intentan buscar solo lo malo, esa es su percepción, es como cuando te para la policía y no sabes por qué (...)"*

- *VC3: "(...) La administración, en la mayor parte de las granjas, es concebida como el policía malo (...), es un enemigo necesario (...). Inspectores que tienen cero empatía (...), también hay alguno que (...) se le considera como aliado en la granja (...)"*

- *FG1: "(...) La gente que está allí no entiende mucho de lo que es una explotación, deberían saber más de lo que es una explotación (...). Deberían sacar otras cosas que fueran relacionadas a cada zona (...)"*

- *FG2: "(...) La relación con el responsable del área de sanidad es buena, yo pienso que tienen que cumplir su trabajo y lo hacen (...), que errores los tiene todo el mundo, pero sí que son muy comprensivos y pienso que se defienden en su área (...)"*

- *FG4: "(...) Dictan cosas sin mucho conocimiento de lo que hacen, no conocen bien el tema (...), cómo deben sacarlo (...). Para hacer una cosa hay que conocer el terreno y saber lo que se hace, y tampoco hacer cosas imposibles (...)"*

- *FG5: "(...) Estoy de acuerdo con que hagan sus inspecciones y que miren bien las cosas, y todo eso, lo que pasa es que bueno, a veces tocan un poco las narices (...). Ellos tienen que hacer su trabajo, y cuanto mejor hagan su trabajo (...) mejor para nosotros, pero bueno, no generar problemas donde no los hay (...)"*

- *VG5: "(...) La administración, a mi modo de ver, es un desastre, saca normas que no se pueden cumplir (...). No ven la realidad del campo e intentan crear normas que no se pueden cumplir y que es absurdo cumplir (...), tiene que pisar más el campo (...)"*

4.5 Regulation

4.5.1 Penalties

- *VG4: "(...) Si fuera básico para la salud humana, y se implementara a bases de poner multas, te aseguro que todo el mundo lo haría, aprenderíamos con el mazo (...)"*

- *VG6: "(...) ¿Cuándo ellos son más susceptibles para hacerlo? Cuando saben que van a tener una inspección, porque los van a penalizar en la PAC (...)"*

4.5.2 Incentives

- *FC2: "(...) Es un error grande que un negocio funcione por la subvención que te da el gobierno (...). Tienes que poder manejar el negocio por lo que te da el negocio (...)"*

- *VC4: "(...) Tienes que (...) ser un poco más eficiente, no depender tanto de una subvención (...)"*

- *FG1: "(...) Ella se encarga solo del tema de las subvenciones (...). Estamos ahora interesados en comprar un aparato para el purín (...), es la que tramita todo el tema de subvenciones (...)"*

- *FG6: "(...) Si usted quiere hacer una sociedad con su hijo, pues usted tiene que darle más participaciones de las que tiene usted, y si no, pues usted no cobra la ayuda (...). Y hay gente aquí que hace la incorporación y cobra la subvención (...)"*

5 Variables of time and space

5.1 Time

5.1.1 Time farmers

- *FC7: "(...) Hemos ganado tiempo (...), porque es un trabajo que tú lo puedes dedicar más a inspeccionar los animales, porque claro, al tener más número de animales, lo que veíamos era una falta de tiempo material, es decir, inspeccionar, ver (...). No teníamos tiempo material ni personal para actuar de inmediato (...)"*

- *FG6: "(...) Los ganaderos somos muy restrictivos para ir a reuniones porque no tenemos tiempo, no podemos andar en esas cosas, pero hay muchas cosas que (...) aprender (...)"*

- *VG8: "(...) Tenemos un problema también con la disponibilidad de tiempo, ese es un problema grave para la formación, y muy importante (...). El personal del que disponen y el tiempo, porque el tiempo es un bien muy preciado porque es escaso (...). Es falta de tiempo real, porque (...) asume demasiadas horas, demasiado tiempo (...)"*

5.1.2 Time veterinarians

- *VC7: "(...) El veterinario no se destina tiempo a esto, a decirle al ganadero que esto es muy importante o que puede perder dinero (...)"*

- *VG6: "(...) Otros veterinarios (...) yo creo que van muy pillados de tiempo, entonces van a lo suyo (...). Siempre estás (...) hablando con ellos, dedicamos mucho tiempo a hablar con ellos, muchas veces, aunque no tengas nada que hacer (...)"*

- *VG7: "(...) El clínico muchas veces va y no tiene tiempo de pararse a hacer nada más (...)"*

5.2 Extra space

5.2.1 Extra space farmers

- *FC3: "(...) El espacio (...), eres una granja que no eres grande ni eres pequeña, pero como (...) te dejan construir equis metros cuadrados, te tienes que apañar con lo que tienes. ¿Nosotros podríamos solucionar este problema de mamitis? Seguramente, si pudiéramos hacer otra nave (...). Hay mucha densidad para tan poco espacio (...)"*

- *VC1: "(...) El que va a comprar fuera es porque no recría bien, o porque no tiene espacio y no puede recriar, entonces compra (...)"*

9.3. Study III: Appendix

9.3.1. Quotations in the original language

(1)FG1: "(...) La mejor medida es que traiga las botas limpias, debidamente limpias. De nada te vale que llegue con las botas llenas de mierda, se ponga unas calzas y después que vaya arrastrando los pies, cuando llegue de aquí allí las calzas se rompen y al final el contacto evidentemente lo hay igual. Entonces yo creo que eso debería partir del veterinario, no tendría el ganadero que pedir eso.

Además, no les gusta que se los digas (...)"

(2)FG1: "(...) A algún veterinario incluso le cuesta ponerse algunas calzas, ya empezando por allí.

Es que hay que estar pendiente si es necesario, incluso con la gente que viene a enseñar. Con los veterinarios hay que estar muy pendientes de que se pongan las calzas, dicen que se resbalan. Ellos vienen para tener una granja limpia y la vienen a ensuciar.

Yo creo que los de saneamiento se basan en que siempre antes de empezar les echan un líquido a las botas.

En cambio, un clínico sí que viene con botas, entra y cuando sale se lava, pero sin desinfectar (...)"

(3)FG1: "(...) En una época hubo un veterinario de ADS que venía con unas botas rotas, era imposible que las lavara. Y me dijo: 'si quieres me pongo unas bolsas', no tenía ni unas calzas en el coche. Estuvo muy poco tiempo. Era un chaval joven que no hace mucho había acabado la carrera, que es lo más grave aún (...)"

(4)FG1: "(...) En mi caso, el veterinario en temas de bioseguridad no te aconseja nada.

En algunas cosas, el veterinario de la ADS te explica cómo debes hacerlo. O le preguntas si tienes un problema, cómo lo vas a resolver. O sino tampoco te explican mucho (...)"

(5)FG1: "(...) Yo también veo que a veces no coinciden los criterios de unos y otros, y luego tú te haces un lío. Te viene el de reproducción, te dice de una manera, luego te viene el clínico y te dice otra. Y a veces no coinciden los criterios. Te hace un poco pensar qué vas a hacer.

El caso es cuando desde los propios de la ADS no están de acuerdo.

Y hay cuestionamientos de pensar qué vas a hacer. Si ya no lo tienes muy claro y no te orientaron a una cosa concreta. Te da qué pensar (...)"

(6)VC1: "(...) Dependiendo de la experiencia de cada uno, en una granja recomendarán una cosa y en otra pueden recomendar una diferente. Y si falta la herramienta para demostrar que es mejor lo tuyo o lo del otro [criterio], puede llevar a este choque (...)"

(7)VG1: "(...) Yo creo que formación todos tenemos la misma, después la especialización de cada uno. Nosotros salimos de la facultad sabiendo todo sobre bioseguridad, lo que pasa es que después cada uno en su perfil lo aplica (no lo aplica), le es más fácil aplicarlo, le es más difícil, es muy distinto (...)"

(8)VG1: "(...) Hay distintos técnicos que van a la misma granja, calidad de leche, clínico, reproducción, nutriólogo o ADS. Si es que vienen [a la granja], ¿qué dice cada uno?

Allí lo que hay que hacer, y eso independientemente de que seamos del mismo equipo de trabajo, cuando hay un problema en una granja y nos afecta a todos, reunirse y hablar (...)"

(9)VG2: "(...) A mí ahora me dicen: 'Tengo problemas de Diarrea Viral Bovina'. Habla con el ADS, lo controlan ellos y te metes en la ADS para que lo controlen ellos. Yo lo que decía 'Yo no tengo tiempo para dedicarme a venir aquí cada vez que te nace un becerro, no tengo tiempo, ni es mi especialidad'. Yo creo que la especialización nos está encaminando a eso, a buscar la colaboración.

Falta un momento de encuentro (...)"

(10)VG2: "(...) En resumen, no hay trabajo colaborativo. El único que aglutina todo es el ganadero, y en teoría es quien tiene que decidir porque es el que paga. Lo que pasa es que no suele estar capacitado, no se ve como el líder para dirigir equipos de veterinarios.

El tema es que, si las ganaderías funcionaran como empresas, ¿quién puede pilotear eso? Yo creo que hay ganaderos que están perfectamente capacitados para pilotarlo. Pero

igual creo que hay otros que no lo están. No sé qué figura podría haber allí. O si los que no estén capacitados directamente están condenados a desaparecer.

Hablando de la figura, yo no sé quién tiene que ser, yo realmente creo que debería ser el ganadero, pero igual el ganadero necesita asesoramiento técnico para percibir algún problema. El concepto de tener algún problema es muy subjetivo, cada ganadero lo percibe diferente (...)"

(11)VG2: "(...) Muy poquitas veces hay conflicto directo. Yo no me encuentro en situaciones en las cuales se tenga que decir a un ganadero: 'Decide, o me haces caso a mí y le pones una vacuna marcada [veterinario que la entendía como una medida de bioseguridad], o le haces caso a ese y le pones otra cosa'. Pero lo que sí pasa es que nos pasamos la pelota de unos a otros (...)"

(12)FC2: "(...) Cuando viene la administración a la granja, el 99% de las veces es sancionador, no vienen a enterarse sobre lo que hacemos. En otras zonas de España es diferente, allí la administración está más a su nivel, porque allí el sector primario es el único que hay. Y cuando viene un tío de fuera [veterinario oficial] te pones en guardia (...)"

(13)FC2: "(...) Tendrían que ayudarnos [veterinarios oficiales], lo que tendrían que hacer es colaborar, guiarte un poco. Ellos vienen con la excusa de que como son normativas que vienen de Europa tienen que aplicarlas. No es que lo hagan porque quieren, porque están como obligados a implementar esa normativa. Esa es una parte de la administración. Pero la otra parte dices tú: 'Un poco de colaboración, de ayuda o de asesoramiento estaría bien, que no fuese que siempre vengan en plan de sancionar' (...)"

(14)VG1: "(...) La administración, desde mi punto de vista, es un poco garante de que todo más o menos funcione. Se está produciendo un alimento de consumo humano, y es supervisar un poco que todo el sector funcione correctamente. Es un árbitro importante que tiene que estar allí.

Yo creo que la administración debería implicarse más en la formación. Yo creo que debería ir más por la formación que no por el palo, como siempre. Formar a los ganaderos y a los veterinarios incluso.

Yo creo que tendría que tener un rol doble. La administración debe dinamizar recursos, recursos importantes para formación e implantación para establecer programas sanitarios, me parece fundamental. Y después está el papel del control, creo que el control es necesario, creo que ver a la administración como coleguita no funciona (...)"

(15)FC1: "(...) Medidas para controlar la población de fauna salvaje que hay en el país.

Somos los afectados. Hace mucho tiempo que eso a la administración se le está escapando de las manos, y cada vez hay más población salvaje y el problema es para nosotros. Es 100% responsabilidad suya.

Nosotros podemos ser responsables de las puertas para dentro, pero de las puertas para fuera se debe responsabilizar la administración.

Es distinto vacuno que pollo o cerdo.

Aparte de fauna salvaje tenemos otros problemas. Hay zonas con otros animales de granja en que hay muchos problemas, no es sólo de fauna salvaje (...)"

(16)VG2: "(...) Para que una empresa láctea pueda exportar a terceros países, pues alguno de los requisitos para determinadas enfermedades. La calidad de la leche al final se consiguió en base a penalización de la industria. Esto es igual (...)"

(17)FG2: "(...) Como puntos para acceder a la subvención debes tener eso hecho. No es obligatorio, pero si quieres acceder a una subvención la administración te da puntos por eso (...)"

(18)FC1: "(...) Yo creo que obligatorio no debería de ser, porque si hay una enfermedad la entras tú a tú granja.

Yo creo que debería haber cosas obligatorias y voluntarias. Yo no estoy de acuerdo personalmente con el vallado en todas las granjas o un arco de desinfección. Si es que un día eso lo considera la administración obligatorio, entonces eso sí que se ha de ayudar a subvencionar.

Muchas medidas ya las estamos implantando de manera voluntaria.

Obligatorio en primer lugar lo que pudiera ser perjudicial desde tu granja para otra, pero si sólo te puede perjudicar a ti, es responsabilidad tuya, voluntario (...)"

(19)FC2: "(...) Yo pienso que hay que tener un poco de sentido común, haciendo las cosas bien. Es un problema que se ha de buscar la solución, un poco de sentido común y hacer las cosas como se deben hacer. No debería haber problema y no se habría de vallar ni esas cosas.

El sentido común es muy diferente, para una persona una cosa puede ser normal y para otra un disparate.

Yo lo veo muy complicado, yo creo que la administración debería tener unas mínimas normas para aplicar, que nos pueden agradar o no (...)"

(20)FC2: "(...) Que las medidas sean realmente efectivas. Si la administración te hace poner una mochila, esto no lo veo, la mochila se queda allí y ya está. Ahora si te obligan a poner un paso para los camiones con desinfectante que te controlen, eso sí tiene efectividad, pero lo otro no.

Es igual que cerrar el perímetro, no puedes cerrar todas las hectáreas, es inviable (...)"

9.4. Study IV: Appendix

9.4.1. Importance of biosecurity

1. MN2: "(...) No cabe duda de que una prioridad muy importante actualmente para la prevención y control de las enfermedades de transmisión epizoótica es la bioseguridad en todas sus facetas. Y la bioseguridad en las explotaciones en particular es muy importante, tanto para prevenir la entrada de la enfermedad como para controlar más fácilmente el foco, para evitar su dispersión en caso de que entre (...). Ahora no recuerdo

bien si eran cuatro o cinco ejes estratégicos los que hemos planteado desde el punto de vista de la sanidad, pues uno de ellos es la bioseguridad integral en todos los sectores ganaderos (...)"

2. GP1: "(...) La bioseguridad es muy buena, ya no puedes gestionar sanitariamente una explotación si no hay unas buenas medidas de bioseguridad, no es factible (...)"

3. CA: "(...) La administración está totalmente de acuerdo en aplicar todas las medidas necesarias para implementar bioseguridad, porque tenemos diferentes peligros que nos asechan (...). El servicio cree en la bioseguridad y, en todo lo que podamos, intentaremos que se vaya implementando en todas las especies (...)"

4. MN2: "(...) En el porcino y las aves es donde más desarrollada está la bioseguridad actualmente en España. Sin embargo, uno de los ejes estratégicos de nuestra actividad (...) para estos años que vienen es avanzar en temas de bioseguridad y equiparar otros sectores, como podría ser el vacuno de leche, a nivel de bioseguridad al que existe ahora mismo ya en porcino y en aves (...)"

5. MN2: "(...) La bioseguridad no debe ser usada como un medio para una falsa tranquilidad, al final es algo constante que debe estar en el día a día del trabajo en el campo (...). La bioseguridad necesita de la atención diaria y constante y eso es una idea muy importante (...)"

6. CP2: "(...) Bioseguridad básica en una explotación lechera, y eso sí que se cuida, es todo el tema de las entradas, la adquisición de nuevos animales, y eso sí que está muy cuidado, eso sí que son muy conscientes todos (...). Creo que deberían controlar de una forma más exhaustiva la documentación, que eso no se hace o no se hace mucho, que esté correctamente cumplimentada (...). Se ha de mirar de incidir porque la sensación que tengo es que hay tres o cuatro cosas que sí, pero sólo tres o cuatro cosas (...)"

7. GP1: "(...) El sector ganadero aquí en la zona, que es gente muy abierta y que intenta hacer las cosas bien (...), con mucha frecuencia tienen rutinas adquiridas y te cuesta cambiarlas porque ya lo hacían tus padres, tus abuelos (...)"

8. CC1: "(...) Lo primero que pienso es que los ganaderos, y no sólo los de bovino de leche, el tema de la bioseguridad no lo tienen muy interiorizado. Para mí, creo que ellos no son conscientes de la importancia de la bioseguridad (...). Quizá tienen un exceso de carga administrativas, de trabajo en la explotación, y entonces después les cuesta todo lo que serían estos registros o estos protocolos llevarlos al día (...)"

9. CC2: "(...) Lo necesitan, pero están tan acostumbrados a venir a preguntar qué subvenciona hay. Para mí, quizás sí, a veces va bien y la gente que la utiliza, bien, pero para otra gente es aprovecharse un poco (...). No tienen la conciencia a veces, está bien dar ayudas, pero a veces las ayudas entorpecen un poco (...). Ellos mismos a veces lo entienden así, que vivir de subvenciones no es bueno tampoco, porque se depende demasiado, pero claro, sin subvención quizás no podrían funcionar, es difícil (...)"

10. CC1: "(...) Actuaciones básicas referentes a la bioseguridad, por ejemplo, cuando realizamos las inspecciones de plan de control oficial que te comentaba, básicamente las de higiene. Cuando realizamos un acta de higiene nosotros valoramos una serie de puntos que van desde la limpieza de las instalaciones, la limpieza de los

animales, el tipo de agua que beben, y también del agua que se utiliza para la limpieza (...), verificamos el control de plagas, por ejemplo, de los roedores, verificamos la limpieza y desinfección, si los vehículos entran o no a la explotación, y si hay un sistema de desinfección de vehículos, si las explotaciones están valladas o no, que ese es otro tema importante (...)"

11. CC2: "(...) Higiene básicamente, hacemos unas inspecciones de higiene muy completas que va incluida la bioseguridad. Entonces en esas inspecciones, que van ligadas, ponemos bastante enfoque en muchos temas de higiene (...). Ponemos mucho énfasis, no sólo en los papeles, sino en realmente ver que esta todo un poco decente, limpio, la ropa, que haya suficientes botas para todo el mundo, que se vea que hay limpieza y una higiene general. Ponemos mucho énfasis en lo que se ve en la granja, no sólo en los registros (...). Básicamente el registro de entrada, el registro de visitas (...), un registro de biocidas, por los biocidas que se utilizan la granja, registro de tratamientos. Esto es lo más imprescindible que pedimos (...). Es muy importante, es la higiene, estamos trabajando con un producto de la granja a la mesa, es un producto que tiene que llegar con las condiciones de higiene impresionantes (...)"

9.4.2. Biosecurity measures considered as most relevant

12. CC1: "(...) Debe tener un registro de visitas, que para nosotros es fundamental (...), es básico para que quede una trazabilidad de todas las personas que han estado en la explotación (...). El único medio que tenemos de garantizar o de verificar que eso se está llevando a cabo, es mediante los registros (...)"

13. CC2: "(...) Se lleva un poco como se lleva, ya sabemos que entra y sale la gente como quiere, es lo que siempre nos peleamos (...). Intentamos concienciarles de que deben tener la puerta bastante cerrada, y que al menos se entre sin el coche hasta dentro mismo (...). Al menos al personal que trabaja cada día sí que les hagan parking fuera, que cuando entren, pues entran y ya está, los que trabajan todo el día allí no hace falta que entren el coche (...)"

14. GC2: "(...) Cualquier medida que quiera tener la administración, para mí, fuera de una declaración, debe tener un control. Si tú quieres verificar cualquier sistema que implementas hay que tener retornos y tenerlo monitorizado, y si lo tienes monitorizado, muy bien. Por ejemplo, si quieres saber si hay desinfección en los vehículos que entran en la explotación, deberás tener registros y monitorizarlos y controlarlos, y ver de vez en cuando si el vehículo realmente se ha desinfectado, y no hay, para mí, ningún tipo de monitorización. También cada vez que un vehículo carga y descarga animales debería realizarse una desinfección (...), venir al centro de desinfección (...). Tienes que monitorizar y saber qué cantidad de desinfectante están usando, sino por lo demás es lo que te cuentan ellos, te lo crees o no te lo crees (...)"

15. GC1: "(...) Pero para mí las vías de contagio más importantes son los animales que compras, evidentemente tú mismo si vas a otras granjas (...). En las granjas grandes, por ejemplo, ya los becerros cuando los vienen a cargar los sacan afuera, no dejan entrar, como la gente es un poco más profesional saca a los animales (...)"

16. GC2: "(...) Para mí sería controlar el movimiento de ganado (...), el resto dices no son importantes, movimientos y determinados orígenes (...)"

17. GA: "(...) El programa nuestro, que tenemos sobre todo en bovino, es obligar a todas las explotaciones a que los animales que se incorporen tienen que ser chequeados antes, sobre todo, exigimos principalmente que sea en origen. Pero a veces no puede ser y, lo que obligamos es que, si los introduce en la explotación, tienen veinte días para chequearlos, muestrearlos, y tenerlos durante ese tiempo en un lugar de cuarentena (...). Es donde vimos que mejorábamos mucho, es donde se obtienen resultados muy objetivos (...), disminuye mucho lo que es la prevalencia de las enfermedades que estamos controlando (...)"

18. GC2: "(...) En bovino de leche no hay nada que se controle objetivamente fuera de la buena voluntad del ganadero, que se controle directamente, salvo la incorporación de animales en explotaciones que están en ADS, que allí los animales antes de entrar a la explotación se sangran. Y hay determinados programas sanitarios que, si aparece un animal, por ejemplo, un PI saben que tienen que matarlo (...)"

19. MN1: "(...) Si nos referimos al sector de leche, se deberían cumplir unas condiciones mininas, por ejemplo, sobre todo las granjas nuevas. Yo entiendo que para las granjas que ya están instauradas es más complicado, pero al menos, por ejemplo, las granjas de nueva constitución tendrían que cumplir unas ciertas condiciones (...). Deberían ser cuestiones mínimas obligatorias dentro de un programa de bioseguridad en una explotación de leche (...). Cuando se publique la nueva normativa para las explotaciones nuevas será obligatorio, y para las explotaciones que ya están en funcionamiento, las cuestiones fundamentales, se les dará un plazo para que las puedan ir implementando (...)"

20. CP2: "(...) Yo lo que creo es en un programa con unos mínimos y después, que aquel programa lo adaptes, pero unos mínimos han de haber, y estos mínimos que sean obligatorios (...). Estas tres o cuatro cosas si o si, y después vamos haciendo y lo adaptas a las condiciones de la explotación, también valorando las condiciones del ganadero. Hay ganaderos que no pueden poner recursos (...)"

21. CP1: "(...) Yo pienso que obligatoria tiene que haber, unos mínimos de bioseguridad, y voluntario eso ya entra dentro de lo que son las guías de buenas prácticas en las que los ganaderos pueden mejorar, para diferenciar su producto, para conseguir incluso más ayudas a nivel de Europa (...). Las obligatorias son unas mínimas, que ya te digo que son las que tenemos recogidas en esta normativa (Decreto 40/2014) y que creo que son muy básicas (...)"

22. CP2: "(...) Yo lo que creo es en un programa con unos mínimos y después, que aquel programa lo adaptes, pero unos mínimos han de haber, y estos mínimos que sean obligatorios (...). Estas tres o cuatro cosas si o si, y después vamos haciendo y lo adaptas a las condiciones de la explotación, también valorando las condiciones del ganadero. Hay ganaderos que no pueden poner recursos (...)"

23. CC1: "(...) Se le da un plazo para corregirlos y si transcurrido ese periodo no ha corregido esas deficiencias, se envía el acta y el informe a asesoría jurídica para que se le abra un expediente sancionador en función, ya te digo, del grado de deficiencias. No todas las deficiencias tienen un expediente sancionador, pero si se considera que era un requisito que tenía que cumplir obligatoriamente en función de la normativa, pues

entonces se tramita como expediente sancionador. Es, digamos, la única manera que nosotros tenemos para presionar un poco al ganadero (...)"

24. CA: "(...) Obligar, igual que como en porcino, poco a poco, y a medida que puedan las vayan implementando (...). En bovinos de leche si somos proactivos, y si lo vamos a aplicar se tendrá que ver qué medidas son las principales, no pueden tener todas lo de las pajareras, no están estabulados. Se tiene que ver cuáles son aquellas medidas, que los expertos nos digan cuáles son las más adecuadas (...). En una granja de leche todo es más complicado (...), son sectores mucho más complicados, se tendrá que ser un poco más laxos, pero poco a poco se tendrán que implementar medidas, y pasar un poco, sino no las hacen (...)"

9.4.3. Resources for the implementation of biosecurity measures

25. MN1: "(...) En medidas de bioseguridad no tenemos financiación. Nosotros financiamos lo que son los programas de erradicación de enfermedades, las actuaciones, como son las compras de reactivos de diagnósticos, la indemnización a los ganaderos por el sacrificio de animales, la limpieza y desinfección tras el sacrificio de animales positivos, todo eso es lo que nosotros gestionamos (...)"

26. CC2: "(...) Hay una serie de inspecciones al año y tal, pero no hay unas específicas de bioseguridad. Normalmente te toca visitar esta granja, tienes la inspección, pero no algo directo de que tienes que hacer esa inspección de bioseguridad. En principio directo no, no hay ninguna partida presupuestaria que vaya dedicado sólo a eso (...)"

27. GA: "(...) Directamente no tenemos (...)"

28. GC1: "(...) Yo no tengo ningún recurso para bioseguridad (...)"

29. CP1: "(...) Cuando aparece una alarma, servicios centrales es el que hace la gran compra, porque de esta manera suministra a todas las territoriales, y de esta manera también gestiona mejor el presupuesto. Nosotros el presupuesto que tenemos en una campaña normal es limitado (...)"

30. CC1: "(...) Hay dinero para, por ejemplo, promover determinados programas sanitarios o de bioseguridad, esto depende todo siempre de servicios centrales, cuando se dan ayudas, cuando hay programas (...). Todo eso lo gestionan desde servicios centrales. Nosotros desde las oficinas no tenemos partidas presupuestarias (...)"

31. CP1: "(...) En vacuno de leche hoy en día los recursos que tenemos son recursos transversales, son los mismos elementos que tenemos para la lucha con otras enfermedades o con otras especies (...). Cada servicio territorial posee un presupuesto, pero es un poco limitado. Y ese presupuesto nosotros lo utilizamos para, por ejemplo, lavar los monos en las lavanderías, para comprar alguna pieza que se nos ha acabado (...)"

32. CP2: "(...) El único presupuesto para eso, que no es un tema de bioseguridad, es porque hay una normativa de trabajo, es el control de EPIs, es el único presupuesto específico (...). Lo que sí que "tenemos", un cierto presupuesto, para jornadas de formación (...), está a disposición a través del centro de formación, escuelas agrarias. Sí

que nosotros con el visto bueno suyo podemos organizar jornadas (...), lo gestionan las escuelas agrarias y los centros de formación (...)"

33. GA: "(...) Tenemos los inspectores que realizan las inspecciones tanto de bienestar animal como de los distintos programas que se están llevando a cabo (...)"

34. GC2: "(...) Tienes unos recursos de personal que ya están establecidos (...). Imagínate, te piden que hay que hacer el 2% de las explotaciones porque hay que controlar que los animales estén correctamente identificados. Eso viene determinado un tanto % por la Unión Europea, y otro % según como fue el resultado del año pasado. El personal es el mismo si te toca hacer diez o 200, somos los mismos veterinarios, no varía en personal, ni se contrata, somos fijos (...). El FODA según las ayudas que cobran, y en función del número de incumplimiento que nosotros pusimos el año pasado, determina la muestra (...). A partir de allí nosotros nos repartimos y establecemos (...)"

35. CC2: "(...) En el año vamos inspeccionando, pero claro, para poder estar más encima de ellas, pues faltaría más recursos humanos (...). Falta personal para estar más encima cada día y vigilándoles más directo (...). El único problema es que no podemos llegar a todas las granjas, si pudiéramos inspeccionar todas las granjas todos los años, la presión ésta elevaría el nivel. La limitación es que quizás no se puede estar tanto encima como se debería estar, ese es el problema (...), tampoco hay tantísimo personal como para hacerlo (...)"

36. CP2: "(...) Personal, muy poco para el volumen que representa esta provincia, la sección está muy poco dotada, eso no sólo pasa en temas de ganadería, también pasa en temas agrícolas y forestales (...), y la dotación de personal es notoriamente insuficiente (...). Para que te hagas una idea, en temas de sanidad animal (...) me están dando soporte dos personas. Otra cosa es que después en controles específicos que se puedan hacer, yo pueda destinar personal (...)"

37. CA: "(...) Otra cosa que podría hacer la administración es dar ayudas, es dar subvención si tú vas a hacer ciertas medidas. Se puede decir vamos a dar una ayuda para que no te cueste tanto a ti estas medidas (...). Hoy en día no tienen ninguna línea de ayuda para esto, pero si al final ellos en vez negarse, hablasen (...), esas líneas de ayuda a veces se abren (...)"

9.4.4. Limitations in the implementation of biosecurity measures

38. GC2: "(...) Otro factor que nos limita a nosotros, ustedes tienen que poner esto y esto, y hacer un vado y no sé qué, y dice, no tengo un duro, se acabó (...)"

39. CP1: "(...) La limitación suele ser el dinero prácticamente, el tema monetario, porque el ganadero de leche tiene una cierta producción a nivel de dinero (...)"

40. CC1: "(...) En el caso del vallado perimetral que hablábamos, o del sistema de desinfección de vehículos, un sistema con cara y ojos, yo creo que la limitación básica, por una parte, sería económica (...)"

41. MN2: "(...) Una idea también muy central de la bioseguridad, que el sector o los ganaderos quizá a veces tienen confundida, es que parece que todo dependiese de que haya dinero para invertir. Muchas cosas de bioseguridad no tienen un coste económico,

es más temas de organización, es tema del trabajo del día a día, es tema de pensar en ello, y no es un tema de hacer grandes inversiones en la granja (...). Muchas veces los ganaderos se agarran a eso para evitar, a lo mejor, asumir su propia responsabilidad en cuanto a esta materia (...)"

42. GC2: "(...) No es lo mismo una explotación que lleva 200 años funcionando y que tienen una serie de infraestructuras propias, que es muy difícil a lo mejor, o explotaciones que comparten caminos, entradas, salidas. Entonces no lo mismo una explotación nueva que tú sí puedes establecer unas medidas (...). Es muy difícil dada la diversidad de las explotaciones que tenemos (...), un control verdadero sobre la bioseguridad es muy jodido (...)"

43. GP1: "(...) En vacuno lechero, con la estructura que tienen las ganaderías aquí en la zona, es un poco más complicado porque son explotaciones abiertas (...)"

44. GC1: "(...) El ganado aquí no está metido en una nave, algunos sí, lo tienen totalmente intensivo todo, pero otros no, salen por los caminos, las llevan por los caminos, entonces no puedes tratarlo de la misma manera que a una explotación de cerdos que está cerrada (...). Aquí cada vez van a ser más intensivos, pero nosotros somos más explotación hacia la tierra, nosotros somos mucho de ver vacas de pradera (...)"

45. GC2: "(...) En bovino de leche no tenemos ningún control específico (...). En porcino y en avícola tenemos unos protocolos específicos (...), y allí se bareman unas cosas más que otras, pero en leche no. Las explotaciones de vacuno que tenemos aquí en Galicia, a lo mejor tenemos 40.000 o 50.000 explotaciones, y son muy diversas, hay explotaciones con 800 vacas de leche, que es una industria propiamente, y hay explotaciones que a lo mejor tienen ocho o nueve vacas (...)"

46. GC1: "(...) Unas dificultades para enfrentarse, para cumplir las normativas, que ven muy difícil todo, porque son muy pequeñas, con muy pocos ingresos, que tienen que luchar mucho para sobrevivir (...)"

47. CC1: "(...) Y la segunda, sobre todo en el caso del vallado perimetral, podría ser una limitación a nivel administrativo, porque en función de donde este situada la explotación ganadera, si, por ejemplo, hay un camino que es una vía de paso cercana o, por ejemplo, hay alguna vía de agua, podría haber alguna limitación administrativa porque el ayuntamiento no le dejase instalar el vallado, o a lo mejor solo una parte del vallado quedaría afectada (...). El resto de las medidas de bioseguridad yo creo que son prácticas y fáciles de implementar por parte del ganadero (...)"

9.4.5. Opinion about the existence of mandatory biosecurity measures

48. MN2: "(...) Nosotros no es que vayamos a obligar por obligar, no, es que son cosas que ellos ya debería estar haciendo, pero como sabemos que no las hacen, pues al final tenemos que imponerlas de alguna forma y la forma es aprobándolas en un Real Decreto (...). No es la administración con esta relación paternalista, que muchas veces venimos de ella antes en el pasado, pero todos tenemos que cambiar el chip, tanto la administración como el ganadero (...). Es como la limpieza y desinfección de vehículos, nosotros, como administración, no podemos estar detrás de cada camión (...)"

49. GA: "(...) Yo creo que tienes que hacerlo así (...). Tenemos siempre que buscar estímulos para que la gente haga algo en la explotación (...). Muchas penalizaciones que tenemos están reflejadas en la orden anual que hacemos (...). Y después, respecto a bovino, incluso se penalizan a los veterinarios (...)"

50. GC1: "(...) Mejor es que se fijen por norma, es decir, tú debes tener un muelle de carga, a los animales les tienen que hacer una serie de pruebas, en porcino todo eso se está haciendo porque deben tenerlo, sino no pueden funcionar y se te cierra (...)"

51. GP1: "(...) La palabra obligatoria es un poco fuerte y no me gusta, pero sí creo que las deben conocer y hay que utilizarlas (...)"

52. CC1: "(...) Se le da un plazo para corregirlos y si transcurrido ese periodo no ha corregido esas deficiencias, se envía el acta y el informe a asesoría jurídica para que se le abra un expediente sancionador en función, ya te digo, del grado de deficiencias. No todas las deficiencias tienen un expediente sancionador, pero si se considera que era un requisito que tenía que cumplir obligatoriamente en función de la normativa, pues entonces se tramita como expediente sancionador. Es, digamos, la única manera que nosotros tenemos para presionar un poco al ganadero (...)"

53. MN2: "(...) Es la cruz que tenemos que llevar. En España es cierto que, a lo largo de los últimos años, creo que eso está cambiando, pero creo que sí que es verdad que partimos de la base de que se vea a la administración como el enemigo (...). Creo que ahora mismo cada vez tenemos una administración más cercana, que se percibe como más cercana (...). Pero los ganaderos muchas veces, pues tampoco se ponen en el lugar del veterinario que llega allí, no es un capricho personal, algunas medidas pueden ser demasiado duras, otras no, pero también es algo que nos obligan nuestros socios comerciales (...). Pero, hasta ahora, hemos sido la administración, en tema de bioseguridad, muy comprensiva, demasiado quizás (...)"

54. CC2: "(...) No habría ningún problema en poner obligatorio, un poco más de nivel porque a los ganaderos al final lo que les interesa también es que tengan una buena imagen frente a la sociedad y que puedan decir que mi producto es bueno. Entonces si no les ponemos los mínimos, porque hay gente que se queda atrás, yo creo que daña al colectivo, porque no lo hacen bien. Entonces si la administración ya pone esos mínimos un poco elevados, sabe que los tiene que cumplir, entonces queda bien todo el sector (...). Tiene que dar buena imagen en la sociedad y sería buena imagen que tuvieran una buena bioseguridad (...)"

55. MN2: "(...) A veces te quedas alucinado con las ideas, con los errores o con las ideas falsas que tienen respecto a muchos temas, y este es uno de ellos. O sea, lo siguen tomando como algo impuesto, como algo que tienen que cumplir por obligación, que los lleve a otro gasto innecesario (...). Esta concepción de la bioseguridad como algo impuesto desde la administración es algo obsoleto que no ha funcionado (...). Los veterinarios oficiales, o de la administración, deben estar para hacer ciertos controles oficiales mínimos, pero debe ser el sector el que se auto involucre y se conciencie en cuanto a la importancia de la bioseguridad y en cuanto a las medidas que hay que aplicar (...). Son ellos (los ganaderos) los que tienen que tomarse en serio y los que tienen que hacer muchas cosas que puedan mejorar el tema de bioseguridad (...)"

9.4.6. Public administration's sanctioning and advisory role

56. MN1: "(...) En el tema de sancionador, yo no entiendo que la administración tenga un rol sancionador, controlador sí, porque evidentemente hay unos programas que son obligatorios, de obligado cumplimiento, principalmente porque están encaminados a asegurar que de las explotaciones salgan productos seguros para la salud pública, y tenemos que ejecutarlos (...). Y cuando una explotación tiene problemas, siempre va un veterinario oficial a informar al ganadero de, no sólo de cuáles son las restricciones que tiene su explotación, sino cómo tiene que gestionar adecuadamente (...). Lo que pasa es que los ganaderos se quedan sólo con la parte negativa de su actuación (...). Pero nosotros estamos pensando en solucionar cosas para que eso no vuelva a pasar (...)"

57. CC1: "(...) Les da la impresión de que estamos demasiado para hacer cumplir la norma y no tanto para aconsejar, ayudar, y yo creo que es una vertiente o una faceta que la gente desconoce de nosotros (...)"

58. CA: "(...) Yo creo que no tiene que ser visto como sancionador. Es que vernos como colaboradores tampoco nos van a ver. Yo creo que es difícil, tiene que ser como facilitador, soporte, pero de imposición a aquellos que no lo hagan bien (...). Están los que lo hacen bien y los que no lo hacen tan bien, y los que no lo hacen tan bien, a estos sí. A veces se tiene que hacer, sino volvemos al mismo problema, quien lo hace bien al final se piensa que es tonto porque sale perdiendo, porque ha gastado un dinero (...). Si tú tomas medidas de bioseguridad qué ganas, ganas la salud de tus animales, pero la bioseguridad tiene que estar aquí (en la cabeza), no en los expedientes con la administración (...). Es un cambio de pensamiento, no es para evitar una multa (...)"

59. CC1: "(...) En esos cursos se intenta explicar a los ganaderos cuáles son sus responsabilidades en diferentes ámbitos, y uno de ellos, pues es en el de la bioseguridad o en el de la higiene de las explotaciones. Por qué te digo esto, porque el trabajo de la administración no es sólo sancionar, sino que antes de sancionar hemos hecho una formación. Se ha intentado llegar a todo el sector explicándoles cuáles son las normas, cuáles son las formas en las que han de trabajar (...). Ya que nosotros no podemos ir a todas las granjas, cuando ellos vienen a hacer cualquier trámite, nosotros aprovechamos para explicarles las novedades de la legislación o aquellos requisitos que son básicos para su funcionamiento (...). Y, sobre todo, intenta hacer las cosas de esta forma o mira, yo te paso unos modelos de registro porque tú tienes que controlar las visitas, controlar las desinfecciones, o controlar la desratización (...)"

60. GC2: "(...) Yo creo que la función de asesor nuestra es vital (...). O lo sancionas o lo convences, yo creo que siempre hay que convencer a la gente. Tú les explicas, y además ellos te preguntan sobre, por ejemplo, incorporación de ganado de programas de erradicación, te preguntan dónde los pueden comprar, entonces tú les explicas los riesgos que pueden tener (...). Tienes que hacerles incidencia antes sobre qué medidas tienen que tomar para poder controlar y poder introducir animales (...). Ya no es valorar el peligro sino valorar que riesgo tiene ese peligro, qué importancia puede tener para ti ese peligro, entonces allí es donde incides más sobre los riesgos que son más importantes. Para mí tendría mucho más sentido, decir bueno, de un peligro que tiene un riesgo de un 2% y otro del 80%, pues céntrate en el del 80%. Y allí es donde tienes que hacer hincapié (...)"

61. GC1: "(...) Nosotros cuando vamos a las inspecciones, o cuando vienen aquí (oficinas comarcales) por cosas, ya les comento muchas cosas (...), en el sentido de que primero aviso, salvo que sea una cosa rarísima (...). A veces vienen y me preguntan, incluso los administrativos que tengo en la oficina, que están muy formados, por cierto, les avisan de muchas cosas (...). En muchas cosas aviso, y ya en la siguiente no aviso (...)"

62. GP1: "(...) No me parece bien que se vaya con la cuestión sancionadora. Primero te informo y te digo mira, esto es así, pero te explico por qué es así. No es porque un iluminado y tal, no, esto es bueno por tal y te va a evitar esto (...). No creo que en la mente ningún inspector veterinario, cuando va a hacer una inspección, va a sancionar. O sea, lo que pretende, aparte de las inspecciones, todo el personal que conozco es una labor formativa también, muy importante (...), explicar todo, el por qué, se le informa de toda la normativa que hay. Luego, si hay incumplimientos (...) la labor inspectora desde luego, pero un porcentaje muy importante es formativo (...)"

63. CA: "(...) El problema es que la misma administración, sobre todo la que ellos contactan, que son las de las oficinas, un día les asesoran y les ayudan, y al siguiente tiene que ir allí a hacerles planes de control (...), y les cae el palo de expedientes (...). La administración aquí sí que les puede ayudar, pero tienen que dejar de mirarnos como un ogro. Tienen que vernos como que colaboramos, pero nosotros como les expedientamos si les faltan un crotal, o sobre una condicionalidad, es un problema, es cierto (...)"

64. CP2: "(...) Es difícil de asesorar cuando haces de inspector (...), sobre todo cuando has de hacer una inspección en tres horas que de normal necesitaría tres días (...). No sería mala idea de crear un cuerpo de inspectores, aquel señor para inspección y punto, y si lo tienes mal, lo tienes mal (...). Y que después haya otros veterinarios que sin hacer tareas de inspectores puedan asesorar las explotaciones, eso no lo estás haciendo bien (...). La administración, y eso ya hace años, desde mi punto de vista es un error, pero bueno, no decido yo, ha "abandonado" el asesoramiento (...). El servicio de extensión agraria era eso, no existe (...). Y la administración, sobre todo la catalana, eso lo ha "dejado en manos" de la privada y también en las asociaciones, unión de ganaderos (...). En Galicia se recuerdan más porque el servicio de extensión agraria no fue hace mucho que desapareció (...)"

9.4.7. Training and awareness of farmers and veterinarians

65. MN1: "(...) El problema es el tema de la formación (...). Ellos (los ganaderos) no ven una rentabilidad física y monetaria inmediata de las medidas que están aplicando (...). Entonces, lo que nos decían los ganaderos, es que quien tiene que asegurar su bioseguridad, en una explotación de leche, es la administración. Es decir, el mensaje que dan muchos ganaderos es que en su explotación pueden entrar jabalís, pero nosotros lo que tenemos que asegurar es que todos los jabalíes de España no tengan enfermedades (...). A nosotros ya nos gustaría poder chequear a todos los jabalís que hay por el monte y ver si están sanos o no, y los sanos, dejarlos libres. Es muy difícil concienciarles de que quien debe tener medidas de bioseguridad son ellos, porque si no tiene un vallado perimetral en una explotación, te puede entrar un jabalí (...). Hay muy poca concienciación entre los ganaderos, la verdad, siempre piensan que su problema ha

venido por la administración que ha ido allí y que, al ir la administración a hacer pruebas, les hemos sacado animales positivos, cuando la realidad es que tienen un problema dentro de la explotación del que no son conscientes (...)"

66. CP1: "(...) Al final siempre intentamos hacer formación para que la gente intente entender aquello a lo que se le obliga, se obliga por algo, se lo tienen que creer ellos (...). Esta misma normativa (Decreto 40/2014), aparte de las instalaciones, aparte de unas obligaciones, también obliga a una formación. Esta formación que se obliga al ganadero, o ese programa sanitario, es el que después la administración tiene que intentar incidir para explicar o intentar que entienda la gente para qué se han implementado esas medidas legales. Yo creo que la función de la administración es esa primero, legislar e intentar formar voluntariamente o de manera obligada a la gente para que entiendan este tipo de normativa. También se hacen muchísimos cursos, el departamento hace muchísimos cursos de formación, pero esos cursos son un poco voluntarios, la gente se apunta, no se apunta, pero sí es verdad que nuestra normativa exige una formación, y es allí donde tienes que incidir para que entiendan las motivaciones de la normativa (...). En el punto C habla de conocimientos básicos del personal de la explotación en materia de bienestar animal, sanidad animal y bioseguridad. De alguna manera obligamos a que la gente tenga este tipo de conocimientos, que nos los pueden justificar con los cursos que hayan hecho en las diversas plataformas, pero sí que deben tener una formación (...)"

67. MN1: "(...) Muchas veces (los ganaderos) no entienden las medidas que nosotros tenemos que tomar (). Pero a veces lo que no nos da tiempo es explicarles todas las medidas y por qué hacemos las cosas, en eso sí estoy de acuerdo (...). Lo que les pasa a los ganaderos, es que muchas veces, lo que no les gusta, no lo entienden (...)"

68. CA: "(...) También te digo que los ganaderos siempre van a ahorrarse todo lo que hay de más. Y a veces lo científico se lo estás explicando y explicando, y no lo entienden y no lo quieren entender (...)"

69. CA: "(...) Creo que formación de granjeros ya se hace, pero quizás insistir más para que vean que estas medidas, o algunas medidas, son en beneficio suyo y de sus animales, creo que esto es muy interesante. Lo que pasa es que se ha de insistir mucho, pero ya te digo yo que algunos son muy duros (...). Creo que la formación y educación ya sea con escritos, con dípticos, con revistas (...), con jornadas, eso yo creo que sería interesante (...)"

70. CP1: "(...) De hecho, nosotros siempre antes intentamos que, los coches se queden fuera de las explotaciones, llevamos unas mochilas para desinfectar ruedas. Intentamos explicarles, porque el tema de la aftosa no la han vivido, pero sí que lo han vivido por lo menos en la tele, sí que han vivido el tema de encefalopatías; con lo cual saben perfectamente qué enfermedades de estas características les funden los mercados, y son conscientes (...). A nivel de terreno pienso que el ganadero de bovino de leche es un ganadero muy profesional y entiende perfectamente el protocolo de bioseguridad (...)"

71. MN1: "(...) Nos falta mucha formación y no es fácil diseñar un programa de bioseguridad en el cual, por nuestra situación actual, no tenemos grandes patologías,

grandes enfermedades, que nos pudieran suponer un problema. No tenemos ni fiebre aftosa, no tenemos enfermedades de ese tipo que pudiesen provocar grandes problemas en las explotaciones, y por eso no se ve su rentabilidad (...). Los ganaderos tienen muy poca formación y muy poca conciencia, y muchos compañeros veterinarios igual porque han estado centrados siempre en asesorar las explotaciones en cuanto a rendimientos productivos, en cuanto a la clínica, pero no sobre prevención, las medidas que deben tener de prevención y de bioseguridad. Ese es el problema principalmente (...)"

72. MN1: "(...) En todas las explotaciones estamos trabajando principalmente la formación de los profesionales veterinarios, tanto públicos como privados, sobre todo los privados. Date cuenta de que si un veterinario oficial va cuando aparece una de estas enfermedades, va y le cuenta al ganadero lo que tiene que hacer, y después va el veterinario de la explotación y le dice que todo lo que le ha contado la administración no vale para nada, y le da unos mensajes distintos, pues el ganadero, obviamente, a quién va a creer es a quién tiene más cerca, que es su veterinario de explotación (...). Nosotros formamos específicamente a los veterinarios, puede ser el veterinario de la explotación el que haga esa auditoria de bioseguridad con una formación específica en bioseguridad, porque es el que mejor conoce la explotación y la zona, y es el que mejor la puede hacer (...). Estoy de acuerdo en que tenemos que informar más a los veterinarios de la explotación, de lo que ha pasado, de lo que estamos haciendo y de lo que vamos a hacer en el futuro (...)"

73. MN2: "(...) Yo estoy a cargo de la fiebre aftosa (...). Para nosotros es muy importante el tema de la bioseguridad en las actuaciones veterinarias, porque es una enfermedad altamente transmisible. Entonces, en este sentido, tenemos varias cosas, tenemos cursos online destinados a veterinarios, en las cuales la bioseguridad en esta actuación, ante una sospecha, es importantísima, y se dedica un módulo exclusivo para eso (...). Tenemos incluso varios materiales de divulgación en cuanto a las medidas de bioseguridad que deben adoptar los veterinarios a la hora de dar una granja sospechosa de fiebre aftosa (...). Ahora estamos planteando un nuevo curso (...)"

74. MN2: "(...) Nosotros podemos dedicarnos mucho al tema de veterinarios porque es un colectivo en el cual ponemos muchos recursos, un poco más técnicos quizá, que no los dedicados a la concienciación (...). Pero hace falta una serie de requisitos que deberían, en mi opinión, estar abordados desde el punto de las asociaciones sectoriales y de los propios veterinarios de campo que trabajan para ellos, porque a nivel general de la Administración del Estado nuestros recursos y nuestro tiempo es limitado (...)"

75. MN2: "(...) Todos colaboramos en la concienciación, todos los que estamos en la Administración General del Estado, y por H o por B tenemos relación con el tema de la bioseguridad, pues intentamos concienciar allá donde vamos, en charlas, en simposios, en cursos (...). Concienciación a todos los niveles, sobre todo a nivel de ganaderos, pero también a través de las organizaciones representativas del sector, y también al sector veterinario, que es muy importante en esto de la bioseguridad (...)"

9.4.8. Knowledge of the reality and problems of dairy farms

76. MN1: "(...) Creo que los servicios veterinarios comarcales de las oficinas comarcales veterinarias tienen un profundo conocimiento de todas las explotaciones y de

la situación (...). Los servicios veterinarios oficiales conocen perfectamente su zona y las explotaciones y la problemática que tienen, claro que las conocen (...)"

77. GP1: "(...) En el ámbito que yo me desenvuelvo todos los veterinarios que trabajan en la zona conocen perfectamente bien el sentir de las granjas porque están todos los días en ellas. Y creo que eso en las inspecciones que haces, en los resúmenes que hay, se transmite a nuestros superiores. O sea, creo que sí, que la realidad de las granjas sí que se conoce por la administración, por lo menos esa es mi percepción en Galicia (...)"

78. GC2: "(...) Tú sabes que hay determinadas personas que trabajan en la administración, que son funcionarios (...), hay gente más formadas más involucrada, menos formada, pero a partir de determinado punto son decisiones políticas, gente que toma decisiones, te hablo a nivel autonómico (...). La administración sabe, depende del consellero, del político, del director general, que este de turno, pero yo creo si quieren saber exactamente, pueden visitar las explotaciones, y si toman medidas o no es otro cantar (...)"

79. CC1: "(...) Creo que cuando te hacen ese discurso hablan más de los que deciden cuáles serán las normas que seguir (...). Es cierto que la gente tiene la perspectiva de que los que legislan no conocen cuál es la realidad, pero yo creo que, en nuestro caso particular, la gente que estamos en la base, somos la parte inferior de la cadena (...), yo te podría decir que conozco perfectamente a los ganaderos, conozco no sólo su forma de trabajar, sino los problemas que tienen, porque nosotros intentamos hablar mucho con ellos. Quizá no lo conozco todo, porque ellos a veces tampoco nos lo explican todo (...). Ellos tienen la percepción de que lo que yo les estoy pidiendo no se lo pido yo como veterinaria comarcal, sino que es algo más grande, que está detrás de mí (...)"

80. MN2: "(...) Hay muchas administraciones, mucha gente en la administración, hay muchas realidades (...). Nosotros tratamos de estar muy pendientes de la realidad del campo, el problema es que a veces el flujo de información no llega o llega mal o llega incompleto. Nosotros estamos con voluntad de conocer esa realidad (...)"

81. GC1: "(...) Lo sé perfectamente, pero si es cierto, y yo también lo corroboro, que las altas instancia no saben lo que pasa en una granja, no tienen ni idea, porque las normas muchas veces son muy difíciles de cumplir y cosas que no tienen importancia se valoran mucho, se penalizan, y cosas que muchas veces no estoy de acuerdo (...). Las altas instancia, los jefes digamos, tienen que andar por el campo y tener más contacto con los veterinarios que estamos en el campo, implicarse más (...), deberían comunicarse más con nosotros y con los ganaderos, es mi punto de vista (...). Asesores y directores generales deberían tener más comunicación directa con los ganaderos y con nosotros, yo eso lo tengo clarísimo. Creo que todos tenemos que cumplir las normativas e intentar hacerlo bien, pero no se puede achichar a la gente, la gente está luchando mucho por sobrevivir con esto (...). Tenemos que facilitar las cosas, no poner trabas, intentar que la normativa se pueda cumplir y no poner normas que a veces son estúpidas (...)"

82. GC1: "(...) Nosotros estamos en la Unión Europea y muchas normas vienen dictadas por la Unión Europea (...). En la Unión Europea somos muchos países y cada uno con su idiosincrasia, y nosotros en Galicia tenemos una idiosincrasia que asumo que

es muy diferente a la de Catalunya (...). Hay unos plazos reglamentados de la Unión Europea que son plazos para dar las bajas y para dar las altas, compras y ventas, y para identificar los terneros (...). Son estupideces y yo lo veo así, me parecen que no tienen sentido y se les penaliza las ayudas de la PAC (...), me parece injusto, hay cosas que no tienen trascendencia, parecen normas que no deberían ser tan exigentes (...). Por ejemplo, los plazos y cosas así, yo no puedo escapar de eso (...). Hay cosas que puedo hacer más laxas, otras que no, y cuando hay cosas de la condicionalidad que son de la PAC allí no puedo, yo pongo lo que hay, allí no puedo moverme (...)"

83. GA: "(...) A veces a nosotros nos hace falta más contacto directo con el ganadero para estar más al día de los problemas que tienen (...). Yo estoy siempre a favor de lo que son la formación y del contacto con la gente, de que haya un flujo de información, de tanto nuestra para ellos y ellos para nosotros, para saber por dónde. No es lo mismo estar en el despacho y estar ahí todo el año sin entrar en contacto, y estar dándole a la cabeza y a ver cómo hacemos esto, a que hables directamente con la gente, y la gente te explique por dónde, cuáles son sus inquietudes, y qué es lo que quiere que se mejore. Yo estoy totalmente de acuerdo, pero todo eso es muy difícil de poner en marcha (...)"

84. CC2: "(...) Que hubiera grupos de trabajo, por ejemplo, que se reunieran, entonces que fuéramos nosotros también, también es bueno invitar a la administración. Si vas, te encuentras y hablas, pues cuando te conoces y te hablas, entonces entiendes a los otros, y quizás sería eso, la comunicación. La comunicación siempre es muy importante (...), cuanto más hablamos, más podemos mejorar (...)"

9.4.9. Feasibility of meetings in the dairy sector

85. MN2: "(...) Creo que esos son buenos foros para esa conexión, esa comunicación entre los diferentes agentes que están implicados en esta producción. Siempre que podemos, o tenemos la oportunidad de asistir y participar, siempre intentamos meter algún aspecto, siempre recalcamos la importancia de la bioseguridad porque nos parece que es un elemento que tratamos de tener en cuenta siempre (...). Al final de esa confianza entre veterinario público y veterinario privado, dependen muchas cosas importantes de bioseguridad, de vigilancia pasiva, la comunicación de sospechas (...)"

86. MN2: "(...) Nosotros estamos abiertos a cualquier tipo de iniciativa, e incluso prestamos nuestro apoyo a cualquier iniciativa que surjan desde las administraciones autonómicas y también desde las asociaciones sectoriales. De hecho, participamos ya en muchas y podríamos participar en más, lo que pasa que a veces la falta de tiempo del personal no nos permite estar en todos los foros y en todos los sitios, pero en la medida de nuestras posibilidades tratamos de prestar nuestro apoyo a todo este tipo de iniciativas (...). En realidad, lo que queremos es cambiar hacia una administración que realmente preste su apoyo a iniciativas privadas, y en materia de bioseguridad es muy importante (...)"

87. CA: "(...) Yo creo que sería súper interesante hacer este grupo y que de allí salieran unas recomendaciones que al final todos se creyeran. Por un lado, el sector, por otro lado, la administración, y que se aplicaran (...). Tendríamos que ver si el sector estaría de acuerdo en participar (...). Se tendría que ver cómo se aplica, si de allí salen

una serie de ideas interesantes de bioseguridad en las explotaciones, si se va a plasmar en un marco normativo para que todo el mundo las tenga que aplicar (...)"

88. GP1: "(...) Los espacios de encuentro creo que cada uno puede exponer claramente sus opiniones (...), me parece bien que tengan voz y que se les oiga (...)"

89. MN2: "(...) Este tipo de entornos donde haya intercambio de información. No llegar sólo a los grandes, porque en España tenemos sectores muy diversos, tenemos grandes, pequeños, medianos, los medios típicos como internet, a muchos ganaderos que no les llega. Hablo más de visitas físicas, de entornos físicos, llegar a los pueblos, llegar a las zonas rurales, para crear este tipo de entornos donde se pueda discutir, donde se pueda hablar, sin que haya veterinarios oficiales que vengan a ponerte una sanción (...)"

90. GC2: "(...) Yo creo que eso es vital, es la única manera de funcionar (...). A veces tú colocas una medida que teóricamente es muy buena, y luego no se puede llevar a cabo. Entonces tienes que hacer partícipe a todo el sector, que la gente este concienciada y convencida, después ver cómo puedes llevar a cabo esa medida, cómo puedes controlarlas, porque en el papel todo funciona (...). Tienes que hacer cosas que sean fáciles de hacer, baratas, y que esté bien mentalizado (...). El que recoge la leche, el que mueve el ternero, el conductor de camión, el veterinario nutriólogo o el clínico, el de ADS, el asesor, el que vende, el de la administración, todo el mundo (...). Yo creo que, si hay voluntad y ganas de trabajar, de la administración y todos los demás, siempre se puede (...). Si se lo pones impuesto te va a decir que es una mierda, que no vale para nada, otro que así no se puede hacer (...). Si le dices cómo lo haremos y él te dice de una manera, como ya es algo propio, ya se lo toman de otra manera (...)"

91. CC2: "(...) Estaría muy bien, eso sería importante. Estaría bien que se hicieran en un sitio cosas así, de puntos de encuentro (...), aparte de los cursillos que se les hacen y tal. Que sepa no hay reuniones de este tipo. Y eso sí que sería interesante, estaría muy bien (...). Lo que pasa, como todo, quién empieza, quién organiza. Por ejemplo, yo creo que sería por los sindicatos de ganaderos, podría ser un sitio, que tienen un sitio físico y tal, estaría bien, tendría que ser así, porque siempre esperamos a la administración, pero yo creo que sería interesante (...). Yo le veo ventajas, porque siempre la experiencia del otro puede servir al siguiente, nunca se sabe, estaría bien (...). Siempre se suele pedir ayuda al sector privado, y si es un sector privado, fuerte, potente y trabaja mucho, se le escucha más que a un ganadero sólo individual normalmente (...)"

92. MN2: "(...) Yo creo que al final todo pasa por las asociaciones, allí tienen un importante papel en crear esos espacios para que los ganaderos interactúan entre ellos, las asociaciones sectoriales me refiero, o incluso la interprofesional, pero sobre todo las asociaciones sectoriales. Creo que podrían tener una importante oportunidad desde la confianza que tienen con los ganaderos, y los ganaderos creen en ellos mucho más que quizás en la administración (...). Intercambiarán de tú a tú ideas sobre esto que estamos hablando, de la importancia que tengan bioseguridad (...). Creo que está en manos del ganadero con sus propias asociaciones sectoriales o debería estar ahí, es donde yo creo que se le podría dar mucho impulso a este tema concreto (...). Creo que hace falta una labor de concienciación constante desde ya, como te digo, y ahí creo que el sector y los ganaderos mismos deberían, al menos entre ellos, hablar, comunicarse, llegar al

acuerdo, que es el único acuerdo posible, que la bioseguridad es muy importante para ellos, es lo que les mantiene su economía (...)"

93. GA: "(...) A veces también ellos dicen mucho, tienen mucha lengua para decir que la administración no se mueve, pero es que ellos tampoco se mueven nada, ellos no se juntan para nada, porque lo lógico es que se juntasen entre ellos e hiciesen fuerza para solucionar los problemas, o para planteárselos a la administración. Pero ellos no tienen organismo a través del cual puedan gestionar los problemas y planteárselos a la administración, allí es por dónde tendrían que partir ellos (...). Tienen que ser ellos los que pongan algo de su parte. No puede ser, sólo dame la ayuda y nada más (...)"

94. MN2: "(...) Ese enfoque de arriba a abajo, no podemos hacerlo porque no tenemos medios ni recursos para llegar a cada explotación (...). Que ellos mismos (ganaderos) sean los que propongan, los que lleven a cabo iniciativas, los que al fin y al cabo mejoren la bioseguridad, es el único camino posible (...). Esa mejora pasa porque se hagan iniciativas desde los propios ganaderos, desde el propio sector porque, como te digo, es el único camino (...)"

95. GA: "(...) Aquí está todo muy influenciado todo por la política. Juntar a unos que piensan de una manera, como de otra, ya es tiempo perdido porque los vas a poner esa discutir entre ellos (...)"

96. GA: "(...) Después están las cooperativas, me parece genial la función de las cooperativas, pero unos piensan de una manera, otros piensan de otra, no hay una unidad, una unidad que pueda transmitir los problemas a la administración (...). Los ganaderos de una zona están todos metidos en una cooperativa que son de un bando político, y el resto de otro, y no quieren saber los unos de los otros, no se quieren juntar, y eso les perjudica porque no pueden constituir una ADS (...). Anteponen eso a los beneficios que podrían obtener (...). En el fondo todos tienen el mismo problema, muy parecidos, es lo que decía, siempre anteponen otras cosas que no tienen nada que ver (...)"

97. GA: "(...) A veces hacen jornadas que son de ese tipo de ámbito, ganadero, veterinarios, empresas lecheras, que participan todos y todos saben que tienen voz. Pero así de rutina, que se hagan reuniones con ganaderos es muy difícil. El ganadero anda en lo suyo y es muy difícil que se preste para venir, puede venir un día, pero el segundo ya se aburre de los temas que estás hablando con ellos y ya se quiere ir (...)"

98. CP2: "(...) Es complicado de gestionar porque se hablan lenguas diferentes. Yo no me puedo dirigir igual, cuando se hace el saneamiento de una explotación, si estoy hablando con el veterinario que, si estoy hablando con el ganadero, el lenguaje que usas no debe ser el mismo (...). Además, luego puedes encontrar que los intereses, que son perfectamente respetables, del ganadero no son los mismos que los del veterinario. Posible es todo, pero mi experiencia es que es complicado de gestionar (...). Hablar con el ganadero, mirar, entender qué es lo que quieren, después reunirte con el veterinario, mirar lo suyo (...). Es difícil de gestionar. El ganadero está "defendiendo" su bien individual, y en cambio, yo estoy defendiendo un bien colectivo (...)"

99. CP1: "(...) Creo que la administración hay ciertas cosas en las que no puede discutir, hay unos aspectos legales y hay unas obligaciones en las que tú puedes explicar

y motivar, pero no llegar a más. Hay otros aspectos que sí que pienso que sería interesante, por ejemplo, a nivel de veterinario, a nivel de granja, para avanzar en problemas (...), dudas de los veterinarios, de los ganaderos, de cómo hacer algún tipo de actuación o de implementación en infraestructuras (...). Yo pienso que hay unas líneas rojas que no pueden estar sujetas a debate, que son normativas en las que se basa las calificaciones sanitarias de las granjas y de los países. Te lo digo porque siempre es un punto en el que hay mucha controversia (...). Ahora, el resto de las cosas a nivel de infraestructuras, de cómo hacer el cerramiento, de cómo intentar hacerlo de la manera óptima, yo pienso que sí, que estaría muy bien (...)"

100. CP2: "(...) Sí que alguna vez han salido temas de bioseguridad, eso se hace a través de las mesas sectoriales. Hay una figura que es la mesa sectorial, donde hay representada una serie de gente, básicamente no es gente, son asociaciones. La tabla sectorial se reúne periódicamente (...), lo que se hace es discutir sobre temas determinados. Sí recuerdo que hubo una mesa sectorial donde se habló de temas de bioseguridad, en concreto en una tabla sectorial del porcino, también me acuerdo hace dos o tres años alguna del bovino (...)"

101. MN1: "(...) Estaba descrito en la legislación lo que se llamaban las "comisiones locales de saneamiento" (...). Antes de iniciar una actuación en un municipio convocábamos a todos los ganaderos, a los representantes del ayuntamiento, a los veterinarios de la zona. Y la administración explicábamos qué era lo que íbamos a hacer, un calendario de actuaciones a lo largo del año, para que los ganaderos o los veterinarios nos trasladasen la problemática que veían frente a estas actuaciones y frente a estos calendarios, y se abordaban los problemas específicos de la zona. Eso se continúa haciendo en algunos sitios, pero no en todos (...). Antes éramos muchos más veterinarios en las oficinas comarcales veterinarias y, por las restricciones que ha habido en los últimos años, cada vez hay menos personal en las oficinas comarcales con muchas más tareas, con lo cual tienen mucho de menos tiempo para hacer esas actuaciones (...)"