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A systemic integrative framework to describe comprehensively a swine health system, Flanders as an example

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ABSTRACT

A well-functioning swine health system is crucial to ensure a sustainable pig production. Yet, little attention has been paid to understand it. The objective of this study was to unravel the complexity of a swine health system by using a systems-thinking approach for the case of Flanders (Northern part of Belgium). To that end, qualitative interviews were held with 33 relevant stakeholders. A hybrid thematic analysis was conducted which consisted of two phases. First, an inductive thematic analysis was conducted and second, the resulting themes were classified into the building blocks of a systemic framework. This framework combined a structural and a functional analysis that allowed to identify the key actors and their functions. Additionally, a transformational analysis was performed to evaluate how structures and the entire swine health system enable or disable functions. Findings revealed that the Flemish swine health system presents several merits such as the synchronization of policies and sector's agreements to reduce the antimicrobial use in the pig sector and the presence of a rich network of universities and research institutes that contribute to the education of health professionals. Nevertheless, several systemic failures were observed at different levels such as the lack of a good professional body representing the swine veterinarians, the tradition that veterinary advice is provided for 'free' by feed mill companies, and the shortage of reliable farm productivity data. Both latter failures may hinder swine practitioners to provide integrative advice. While few veterinarians are remunerated per hour or per visit by farmers, the most common business model used by veterinarians is largely based on the sale of medicines. Thus, veterinarians encounter often a conflict of interest when advising on preventive vaccinations and, in turn, farmers distrust their advice. On a positive note, alternatives to the traditional business model were suggested by both veterinarians and farmers which may indicate that there is intention to change; however, the broader institutional and socio-cultural environment does not enable this evolution. The results of this study can aid policy makers to anticipate the effects of proposed interventions and regulations so that they can be fine-tuned before they are enforced.

1. Introduction

On average Belgian pig production generated €1.5 billion/year between 2006 and 2013 which renders it the most important livestock production accounting for about 36% of the livestock value of production (Anon., 2015). Besides being an important economic sector, societal interest in pig production processes and systems relates to their potential environmental impact and to their impact on food safety as well as food and nutrition security. With regards to this, society expects from the swine sector the production of pork that is safe, sustainable, and affordable, and for this, a well-functioning swine health system is crucial. A health system is comprised by a set of organizations, actors and actions whose primary intent is to promote, restore or maintain health (World health organization, 2007). While this definition was conceived for human health systems, livestock health systems share the same goal. We define the swine health system as the set of organizations, enterprises and individuals that is involved in, influenced by and/or influential to the health of pigs and ways to manage this. The swine health system is further characterized by institutions (formal and informal rules as well as habits that shape individual behavior and interactions between actors), infrastructures, networks, and capabilities. Collectively, the swine health system is

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what drives pig health management on farms. Conceptually, it bears much resemblance to the concept of Agricultural Innovation Systems (AIS), which is defined as the network of organizations, enterprises, and individuals focused on bringing new products, new processes, and new forms of organization into economic use, together with the institutions and policies that affect their behavior and performance (World Bank, 2006). The AIS framework has extensively been used in order to identify and understand the driving forces of agricultural innovation and why agricultural production processes evolve in certain directions and less in others (World Bank, 2006). One central actor of the swine health system is the veterinarian as he/she delivers crucial services to the farmer such as diagnosing diseases and delivering medicines to treat and prevent these, performing small surgeries, scanning the sows to confirm pregnancy, guiding farmers to optimize health, production and animal welfare, safeguarding the absence of disease and public health. While the role of the veterinarian has been investigated in the pig sector (Alarcon et al., 2014) and other livestock sectors such as dairy (Klerkx and Jansen, 2010; Richens et al., 2015; Duval et al., 2016, 2017) and sheep (Kaler and Green, 2013; Bellet et al., 2015), it has not yet been attempted to use a systemic and comprehensive methodology to explore the external forces that shape pig health management in general and the veterinarian-farmer relationship more specifically. Recently, Poizat et al. (2017) performed a study which was based on the farming systems concept. However, a detailed description of the swine health system that reveals the functioning and interconnectedness among different actors, within and also beyond the farming system is currently lacking.

The complexity of systems is fully recognized by the systems-thinking approach which arose in the 20th century as an alternative to the prevailing Cartesian scientific method by which phenomena are understood by dividing it into parts. Contrarily, systems-thinking applies elements of complex adaptive systems theory and, thus, recognizes that systems are dynamic architectures of non-linear counter-intuitive interactions and synergism unpredictable and resistant to change, self-organizing, constantly changing, tightly linked, governed by feedback, history, external society, through laws and regulations, costumer demands, NGO-pressure and public opinion, as well as tradition dependent (de Savigny and Taghreed, 2009). Systems thinking approaches have already been used to increase the understanding of specific problems such as antibiotic resistance (Tomson and Vlad, 2010), tobacco control (Best et al., 2003), obesity (Wallinga, 2010), diabetes (Kalim et al., 2006) and malaria (Webster et al., 2013). However, to-date little attention has been paid to comprehensively describe a whole health system by applying a systems thinking approach.

While WHO proposed a systemic framework to describe health systems (de Savigny and Taghreed, 2009), this fails to fully recognize the broad context where health systems are embedded. On the other hand, this element has been incorporated in several AIS frameworks. Recently, Lamprinopoulou et al. (2014) developed a framework comprised of a micro- and a macro-level analysis. The former consists of a structural and a functional analysis which are further examined to identify failures and merits. In the macro-level analysis, the functioning of the entire system is explored by evaluating to what extent its basic structural components and functions are sufficiently coordinated, aligned, and harmonized. The above mentioned framework was used as a means to operationalize the objective of the present study namely to comprehensively decipher the complexity of a swine health system. To that end, Flanders (northern part of Belgium) was used as a case, and qualitative interviews were held with 33 relevant stakeholders. The validity of the results of the qualitative data analysis was assessed by triangulation, a technique used to facilitate data validation by cross-verification from different data sources. In our case, the data that originated from interviews with actors in the swine health system were validated through document analysis and expert consultation.

2. Materials and methods

2.1. Overall procedure, selection of participants, and the conduct of interviews

In total 29 interviews with 33 interviewees were held between October 2016 and January 2017. The number of interviewees was determined by the concept of saturation which is extensively used in qualitative studies. Reaching saturation means that no new information is retrieved when more interviews are performed, after which the sample size is considered final (Bryman, 2012). Sampling started with the so-called key informants, participants who have a broad knowledge on the topic. Thus, during this first series of interviews, key informants were interviewed to set up the scene and understand the composition of the current swine health advisory system in Flanders. These key informants were found using our personal network of acquaintances and using snow ball sampling by asking them to suggest other key informants. The group of key informants (n = 9) was constituted of four veterinarians (two independent herd veterinarians, one veterinarian working for Animal Health Care Flanders (DGZ), and one veterinarian working for a pharmaceutical company), two scholars, one representative of a Flemish farmers' union, two governmental knowledge brokers whose function is organizing seminars for involved stakeholders in the pig production sector. During this first series of interviews, the main goal was to map and analyze the broad swine health system and more specifically to identify all types of actors within the swine health system, i.e. all types of actors with a vested interest in and/or a potential influence on the management of pig health. In a second series of interviews, 24 respondents were deliberately selected from those different actors' groups. The sample size was determined based on the concept of data saturation: new respondents were selected until no new information was generated (Bryman, 2012). These respondents were either nominated by previous interviewees (i.e. snowball sampling) or were found by using our network of acquaintances. As we wanted to provide a holistic overview of the swine health system we did not set many exclusion criteria for the respondents. Farmers could be selected from the three main kinds of pig farms present in Flanders: breeding, farrow-to-finish and finishing farms, hence excluding those farms whose main production is not pigs (i.e. mixed farms which besides farming pigs also farm other livestock species or crops from which they derived the major part of their income). The different types of veterinarians interviewed were chosen from veterinarians working with pigs, so excluding those who are mainly working in cattle, poultry or other animal species. The distribution of the different actors interviewed in both series of interviews is presented in Table 1. Most interviews were one-to-one or two-to-one, yet, three interviews were group interviews where more than one respondent was interviewed simultaneously. The duration of the interviews was on average 1 h 23 min (minimum = 38 min, maximum = 2 h 5 min).

The objectives of the study were explained twice to all respondents, the first time being when they were invited for participation, the second time at the start of the interview. All interviews were recorded and a written consent was given by the interviewees in which they gave permission for the recording and the use of all information, and in which the interviewer ensured that privacy was guaranteed.

We used qualitative interviews as a means to try to understand the interviewee's world from their point of view and to reveal the meaning of central themes in their world. The objective of qualitative interviews is understanding rather than measuring (Bryman, 2012). During the interviews, the interviewer(s) encouraged the interviewee to use their own words to describe their experiences and feelings. The main role of the interviewer was to focus the interview on themes of interest for our study using open questions. In the first series of interviews, the themes were limited to our preliminary understanding of the components of the swine health system, such as the types and roles of the actors involved, the interaction between different actors, practices, and habits of