



Exploring the role of small-scale livestock keepers for national biosecurity—The pig case



Carla Correia-Gomes*, Madeleine K. Henry, Harriet K. Auty, George J. Gunn

Scotland's Rural College, Kings Building, West Mains Road, Edinburgh, EH9 3JG, United Kingdom

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ABSTRACT

Small-scale keepers are less likely to engage with production organisations and may therefore be less aware of legislation, rules and biosecurity practices which are implemented in the livestock sector. Their role in the transmission of endemic and exotic diseases is not well studied, but is believed to be important. The authors use small-scale pig keepers in Scotland as an example of how important small-scale livestock keepers might be for national biosecurity. In Scotland more than two thirds of pig producers report that they keep less than 10 pigs, meaning that biosecurity practices and pig health status on a substantial number of holdings are largely unknown; it is considered important to fill this knowledge gap. A questionnaire was designed and implemented in order to gather some of this information. The questionnaire comprised a total of 37 questions divided into seven sections (location of the enterprise, interest in pigs, details about the pig enterprise, marketing of pigs, transport of pigs, pig husbandry, and pig health/biosecurity). Over 610 questionnaires were sent through the post and the questionnaire was also available online. The questionnaire was implemented from June to October 2013 and 135 questionnaires were returned by target respondents. The responses for each question are discussed in detail in this paper. Overall, our results suggest that the level of disease identified by small-scale pig keepers is low but the majority of the small-scale pig keepers are mixed farms, with associated increased risk for disease transmission between species. Almost all respondents implemented at least one biosecurity measure, although the measures taken were not comprehensive in the majority of cases. Overall as interaction between small-scale keepers and commercial producers exists in Scotland the former can pose a risk for commercial production. This investigation fills gaps in knowledge which will allow industry stakeholders and policy makers to adapt their current disease programmes and contingency plans to the reality of small-scale pig-keeping enterprises' health and biosecurity status. We predict that some conclusions from this work will be relevant to countries with similar pig production systems and importantly some of these findings will relate to small-scale producers in other livestock sectors.

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1. Introduction

Although the livestock industry and its officials do not always recognise the important role of small-scale producers, it is acknowledged that such producers should be considered part of the livestock industry as a whole. There is potential for health and disease management practices adopted by small-scale producers to pose a threat to the livestock industry; in an extreme situation – e.g. outbreak of exotic disease – the sustainability of the industry could be at risk. The importance of small-scale producers will vary

in terms of productivity and scale between countries (i.e. for some countries they will be the majority of the producers while for others their contribution to overall production is marginal). However, with regard to the introduction and spread of an exotic or endemic animal disease, small-scale producers are considered by livestock officials and regulators to be a high-risk sector (Limon et al., 2014; Schembri et al., 2015; Tornimbene et al., 2014). Further information on the characteristics of this type of production and the biosecurity protocols adopted is therefore of value to several sectors: for regulators to adapt their contingency plans in case of exotic diseases, for livestock officials to adapt their control programmes for endemic diseases and for academics to include this information into models and their research activities. Due to the integrated nature of pig production we have focused on small-scale pig production in

* Corresponding author at: SRUC/SAC Research, Epidemiology Research Unit, An Lóchrán, Inverness Campus, Inverness, IV2 5NA, United Kingdom.
E-mail address: carla.gomes@sruc.ac.uk (C. Correia-Gomes).

Scotland as an example of how important small-scale keepers can be.

Backyard pigs have been identified as playing a role in the epidemiology of African swine fever (ASF) in the Russian Federation (Food and Agriculture Organization, 2013) and classical swine fever (CSF) in Bulgaria (Alexandrov et al., 2011); it would be prudent to assume that similar management systems would have similar levels of importance in terms of sustaining or spreading some endemic or exotic diseases. Backyard and small-scale pig producers are often considered to pose a threat to the commercial pig sector. There are a number of potential reasons why this may be the case. Firstly, in contrast with the commercial sector where many producers belong to assurance schemes, small scale producers are generally not engaged with production organisations and are unlikely to be professional producers. This may have implications in terms of levels of knowledge and awareness of legislation and statutory requirements. In the absence of quality assurance criteria, small-scale producers may also have less impetus to implement good biosecurity and management practices (Laanen et al., 2013; Ribbens et al., 2008). Biosecurity is defined as “the implementation of measures that reduce the risk of the introduction and spread of disease agents; it requires the adoption of a set of attitudes and behaviours by people to reduce the risk in all activities involving domestic, captive/exotic and wild animals and their products” (Food and Agriculture Organization, 2010). Small scale producers are likely to differ from commercial producers in implementation of both external biosecurity (the prevention of pathogens entering a herd) and internal biosecurity (reducing the spread of pathogens within a herd (Laanen et al., 2013; Lambert et al., 2012; Gunn et al., 2008)). Secondly, whilst low biosecurity may result from lack of awareness or knowledge, it is also influenced by production type; in outdoor systems, for example, the potential for wildlife contact is one factor contributing to lower biosecurity (Bailey et al., 2013; Ribbens et al. 2008). Thirdly, small-scale pig producers frequently keep other livestock species as well as pigs, with up to 80% of pig herds having cattle or sheep also present on the same property (Porphyre et al., 2014). Mixed farms have more animal contacts than single species farms and therefore pose an increased risk for disease transmission (Nigsch et al., 2013).

Despite these potential risks, knowledge of the management practices and production systems associated with these producers is not well studied and backyard and small-scale pig producers represent an important knowledge gap in management of the pig sector. Only through attempts to improve our knowledge of the approach to biosecurity taken by all pig-keepers in this sector can estimates of any potential risk they may or may not pose be refined. There have been a number of studies on small scale pig production outside Europe, for example in Madagascar, Vietnam, Philippines and Cambodia (Alawneh et al., 2014; Costard et al., 2009; Roessler et al., 2009; Tornimbene et al., 2014). Such studies are not directly comparable to the UK situation however, as small-scale pig producers are responsible for 70%–80% of total pig production in those countries (Alawneh et al., 2014; Roessler et al., 2009). Although small-scale pig production in Scotland and Europe has not been well characterised, it is likely to differ significantly from this scenario. Due to lack of information, small-scale production systems are often left out of disease models. This could be a significant omission, making it difficult to assess the importance of these systems with regard to disease transmission and control; it must, therefore, be a focus for future work. A recent study tried to assess this gap in knowledge for England (Gillespie et al., 2015).

Further information on small-scale producers may help to target knowledge transfer and management practices appropriately to reduce the risk that these producers could pose to animal health at a national level and to increase the likelihood of compliance with disease control or surveillance activities. Knowledge of potentially

vulnerable areas in this production system and the identification and characterisation of different profiles of management and biosecurity practices will assist the development of tailored recommendations for pig producers and will also allow a better focus for disease control and surveillance activities (Alawneh et al., 2014; Costard et al., 2009).

The Scottish swine sector comprises over 318,000 pigs in total of which almost 31 thousand are breeding (DEFRA, 2016; RESAS, 2016) but accounts for 6.7% of the UK pig herd (DEFRA, 2016). The industry contributes about 3% of the Scottish Agricultural Output (approximately £85 million) (RESAS, 2016). In addition to commercial producers, Scotland has a number of small-scale pig producers. This sector of the industry represents a small proportion of the swine industry in terms of the numbers of animals reared (Porphyre et al., 2014), but a substantial proportion in terms of the numbers of producers involved: around 72% of the producers with fattening pigs in Scotland report that they keep less than 10 pigs (RESAS, 2016).

The objective of this study was to explore the role of small-scale livestock keepers for national biosecurity using small-scale pig keepers as an example. For this the small-scale pig production in Scotland was characterised according to motivation, management and also biosecurity, with a focus on the potential risk the latter could pose to the pig industry on a larger scale.

2. Material and methods

2.1. Target population

The target population for this cross-sectional survey was small-scale pig keepers in Scotland, i.e. those involved in pig-keeping without a major commercial component. The chosen definition of small-scale pig keepers was those producers owning less than 50 finishing pigs (pigs over 12 weeks old kept for meat production) or less than 15 adult pigs (over one year old) or having finished less than 100 pigs during 2012. According to UK law, pig keepers are required to register the location at which pigs are kept with the local Rural Payments and Inspections Directorate Office. The sampling frame for the survey was a list of registered pig keepers in Scotland in 2011, obtained from Animal and Plant Health Agency, APHA (formerly Animal Health Veterinary Laboratories Agency). This list was cross-checked with a list of quality assured pig keepers obtained from Quality Meat Scotland (QMS). Any producers that appeared on both lists were removed from the sampling frame, on the assumption that quality assured producers registered with QMS were more likely to be involved in pig production at a commercial level. Name, address and county/parish/holding (CPH) number were available for all producers. Holdings which were not located in Scotland were also removed from the list. In total around 5% of holdings were removed from the original list.

2.2. Sample size calculation

The survey was conducted via a postal questionnaire that was also made available online. Calculation of the required sample size dictated the number of postal questionnaires sent, while the online survey was considered an additional tool to help maximise response rate. Assuming, given the lack of knowledge of the sample population, that 50% of respondents answer as yes or no in the case of yes/no questions, and with a desired confidence level of 95% and an error of $\pm 6.0\%$, the sample size was calculated to be 244 when adjusted for the total population size of 2799 small-scale pig keepers registered with APHA in Scotland (this figure does not contain the quality assured producers). The response rate for mailed questionnaires tends to be low (around 50%) but highly variable (from

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