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Gendered perceptions of biosecurity and the gender division of labor in pig farming in Uganda

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African swine fever (ASF) is a highly infectious and lethal transboundary swine disease, which has devastating effects on the industry, especially in sub-Saharan Africa. Given the absence of a vaccine or effective treatment, on-farm biosecurity measures are the only means of controlling it. Women and men are both involved in pig farming but the implications of the gender division of labor in relation to ASF biosecurity measures have, until now, been unexplored. We use the Gender Dimension Framework to investigate the gender division of labor in pig farming, as well as gendered perceptions of biosecurity. Findings include that typical gender roles and the perceptions of men and women towards biosecurity undermine effective implementation of biosecurity measures. The paper contributes to a better understanding of the gendered dimension of ASF control. This knowledge will serve to improve ASF control measures and support better management of the disease, both during outbreaks and to effectively prevent them.

Keywords: African Swine Fever, Biosecurity, Gender Roles, Perceptions, Pig Farming, Uganda.

Introduction

Pig production in Sub-Saharan Africa is dependent on small-holder farmers who face multiple challenges, including a high disease burden. One of the most challenging diseases for farmers is African swine fever (ASF) (Dione et al. 2014). ASF is a highly infectious and mostly lethal transboundary swine disease, which has devastating effects on the industry, especially in Sub-Saharan Africa. Outbreaks of ASF have been linked to a strong negative impact on pig farmers' socio-economic status with a loss of revenue and return into more severe poverty (Chenais et al. 2017; Ouma et al. 2018). To date, there is no effective vaccine or treatment for ASF. To prevent and control the disease, proper implementation of biosecurity measures on farms is a prerequisite. An outbreak simulation model developed by Barongo et al. (2016) predicts that in East Africa biosecurity measures implemented within 14 days of the onset of an epidemic can avert up to 74 percent of pig deaths due to ASF. The widespread occurrence of ASF outbreaks in Uganda is a sign of gaps in ASF control measures in the region. This has been attributed to poor biosecurity

measures on most pig farms due to farmers' limited knowledge about best practices and insufficient capacity to implement them (Dione et al. 2020).

In Uganda, most pig farming households are male headed. In these male-headed households, the female spouse often plays a major role in initiating pig production through purchasing the first stock. In terms of production, men and women divide tasks up between them. Men often build the pigsties and to some extent work on the animals' health, while women take care of the pigs, which includes cleaning the sties, mixing feed, and bringing water for the animals. Sometimes women also take on non-traditional roles that require advanced knowledge, such as providing health care (Dione et al. 2014). Given the distinct and complementary roles men and women play in pig farming, the improvement of ASF disease control requires further understanding of gender dynamics in pig farming and biosecurity. Few studies have explored gender roles in biosecurity and ASF control in smallholder pig farms, and no studies of this kind exist for Uganda, making our research even more pertinent. To this end, our study examined the gender roles and gendered perceptions

in ASF biosecurity and control, and documented constraints on men and women in the adoption of biosecurity practices.

Literature review

African swine fever and biosecurity

African swine fever is a contagious and highly lethal hemorrhagic swine disease and is the greatest obstacle to development of the swine industry in sub-Saharan Africa, where it was first characterized in 1921 (Penrith 2009). Outbreaks have also occurred in Europe, South America, South East Asia and the Caribbean region (Revilla et al. 2018). African swine fever virus (ASFV) is maintained in a sylvatic cycle involving wild pigs (such as warthogs and bush pigs) and soft tick vectors (*Ornithodoros moubata*). Transmission to domestic swine occurs via ingestion of infected tissue of warthogs or bush pigs, which develop an unapparent infection, or by the bite of infected soft ticks. Epizootic outbreaks of ASF thus arise in two ways. Live warthogs infested with the insect vector may intermingle with domestic swine, providing infected ticks with the opportunity to transmit the virus. Or, domestic swine can be exposed to the carcasses of infected warthogs, which they feed on, thus contracting the virus directly. The virus spreads by contact with aerosol droplets, blood, feces and other virus-infected tissue (Foster 2018). In domestic swine, the incubation period ranges from five to 15 days, and the clinical features of ASF include a wide variety of symptoms, including fever (41–42 °C for about 4 days), diarrhea, inappetence, dyspnea, incoordination, prostration, coma, and death. In regions where the disease is exotic, mortality rates often reach 100 percent (Penrith 2009). In endemic areas, ASF cases can be predominantly subclinical and persistent (Murcia et al. 2009). The symptoms' resemblance to other swine hemorrhagic diseases makes early detection and laboratory diagnosis essential for controlling and managing the disease (Sánchez-Vizcaíno et al. 2012). Measures to prevent and control the disease include strict biosecurity measures on farms and along the pork value chain, as well as quarantine or slaughter of affected animals. ASF endemicity is well established in Uganda, and the role of management systems and biosecurity in the control of disease outbreaks is well documented (Saka et al. 2010; Fasina et al. 2012; Awosanya et al. 2015; Okello et al. 2015; Maduka et al. 2016).

Biosecurity is a strategic and integrated approach to analyzing and managing relevant risks to animal health and associated risks for the environment. The overarching goal of biosecurity is to prevent, control, and/or manage risks to life and health with measures approved in the sector (INFOSAN 2010). In the context of pig production, on-farm biosecurity would consist of actions that prevent ASFV from entering a susceptible farm and sick animals from infecting other pig farms or actions that contain the disease on farms that are already infected. Such biosecurity actions include farm hygiene, such as cleaning and disinfecting, manure disposal, processing swill for feeding, vector control of ticks and flies, farm fencing, control of farm visits, disposal of dead animals, disease reporting, movement control, and setting up training plans for farmers on best practices of farm man-

agement. The adoption of biosecurity has significantly reduced the incidence of outbreaks on farms (Saka et al. 2010.; Maduka et al. 2016). However, in low income countries like Uganda, pig husbandry systems as well as biosecurity could be further improved in order to better control the disease and its transmission (Sánchez-Vizcaíno et al. 2012). While improvements have been made by some farmers in adopting biosecurity measures, many farmers are lagging. The major limiting factors for the adoption of biosecurity measures by Ugandan farmers are poor knowledge about best practices and farmers' low capacity to implement better husbandry practices due to limited financial resources. Furthermore, gender and local sociocultural factors such as community stigmatization have been reported to influence the adoption of biosecurity measures (Dione et al. 2020).

The gender division of labor in livestock farming and disease control

Gender roles and relations are of key importance given that disadvantaged persons and groups such as women and children are a priority in development initiatives, and their participation is essential for sustainable development (Quisumbing et al. 2014). While women's roles in livestock production and marketing differ from one production system to another, from region to region, and country to country, women do provide most of the labor in livestock in sub-Saharan Africa (Njuki and Sanginga 2013). Traditional farm tasks for men differ from those for women, resulting in women and men having different knowledge, skills, and experiences, as well as needs and constraints (Quisumbing et al. 2014). Studies assessing the gender division of labor in dairy farming indicate that women farmers play a predominant role in milking, watering, cleaning out the pens, and feeding the animals (Kristjanson et al. 2010; Flintan 2011). Men tend to have a larger role in activities related to animal health, such as artificial insemination and seeking veterinary treatment, and in marketing of live animals and meat (Gallina 2016). In mixed crop-livestock systems of Ethiopia, women are dominant in livestock management and husbandry practices compared to men and other household members. Aspects of animal husbandry such as care of the young, pregnant, or sick animals, processing of milk, and the sale of dairy products and milk in pastoral systems are mainly undertaken by women (Tangka et al. 2000; Ali and Neka 2012). Men concentrate on a few roles such as purchase of animals and feed, and sale of milk in intensified systems (Tangka et al. 2000). In Nigeria, Ayoade et al. (2009) reported that women feed and manage vulnerable animals (calves, small ruminants, and sick, injured, and pregnant animals), clean barns, milk cows, and make butter and cheese, but are not involved in livestock marketing or managing livestock diseases. A study in central and eastern Kenya reported that women were more engaged in feeding of cattle while men were more involved in watering and disease management (Njuki et al. 2004).

In most countries, animal health monitoring and delivery systems tend to be male-dominated, thus contributing to the exclusion of "women's livestock" from organized animal health activities (Miller 2011). A study in the dairy sector in Tanzania

found that both men and women respondents were involved in animal health management and had similar knowledge of diseases. Yet women were found to face more constraints than men in accessing veterinary services, information on diseases, and animal medicines (Galiè et al. 2014). In Kenya, women were more often involved in curative treatment, while men tended to be responsible for preventative animal healthcare, such as the purchase of tick dip and dewormers (Heffernan et al. 2003). In Rwanda and Uganda, male-headed households spent more on animal health than female-headed households (EADD 2009).

While most research on gender roles in livestock in sub-Saharan Africa has focused on the dairy value chain and pastoral systems, there is a paucity of literature describing the roles and responsibilities of men and women in pig-raising households on smallholder farms in east Africa as well as the ways benefit from the pig enterprise is shared among household members (Carter et al. 2017). While few studies have also explored the gender division of labor in pig production in sub-Saharan Africa, even fewer have addressed this topic in the context of the control of a highly fatal disease such as ASF.

Conceptual framework

The study adopted the Gender Dimensions Framework (GDF) to structure its areas of inquiry. The GDF was originally developed to provide guidance to United States Agency for International Development (USAID) staff and partner organizations working to promote equitable opportunities in agricultural value chains

(Barrett et al. 2009). It describes an approach to gender analysis that aims to help practitioners to learn about and analyze the gender issues relevant to value chain development programs; to identify gender-based constraints that affect efforts to increase agricultural productivity and entrepreneurship in order to strengthen horizontal and vertical linkages and the business enabling environment; and to learn about successful strategies to overcome these constraints. The framework focuses on four intersecting dimensions of social life: (1) patterns of participation and observed practices, (2) access to resources, (3) knowledge, beliefs and perceptions, and (4) laws, policies and regulations. This study looked at two of these dimensions: participation and practices, and knowledge, beliefs and perceptions, as these two dimensions are most relevant to the study’s focus. As such, the findings may not be generalizable beyond the framework measures employed.

Methodology

Site selection

The study was carried out in the central and northern regions of Uganda in December 2015. The selected districts of Masaka and Lira (Figure 1) were among the five project sites of an ongoing research project on smallholder pig value chain development in Uganda. Masaka and Lira represent two value chain typologies: a rural type, characterized by local pig production and consumption, and an urban type that is characterized by peri-urban production and consumption. The research project’s selection processes of districts and value chain typologies, referred to as value chain domains (VCDs), are described in Ouma et al. (2015). A purposive selection process was carried out to identify villages for the study. Within the sub-counties that were part of the project site, we targeted villages with a high pig population density. A total of 13 villages were selected for enrolment in the study, including six villages in Masaka and seven villages in Lira district (Table 1).

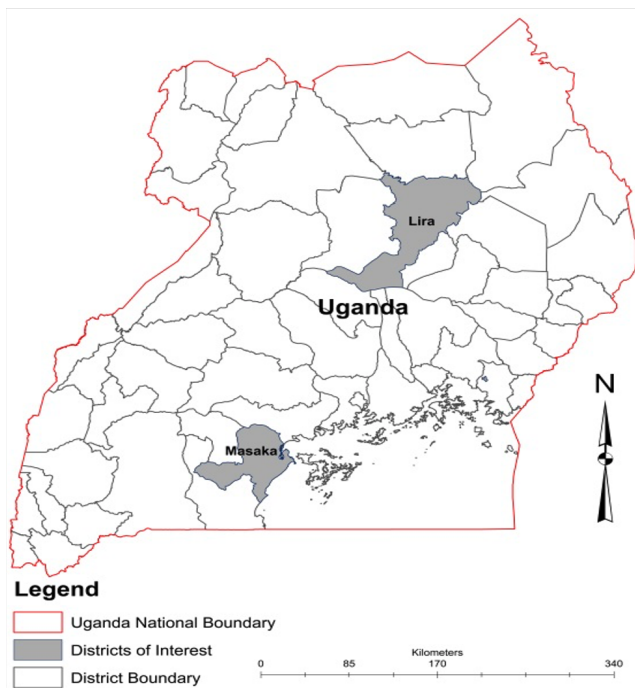


Figure 1 Map of Uganda highlighting the districts of interest

District	Production domain		Number of participants
Masaka	Rural	Lukindu	15
		Sserinnya	14
		Busagala	13
	Urban	Kirumba	10
		Kitovu Nmuwe	13
		Ssenyange A	12
Lira	Rural	Abolet-atingtwo	23
		Apikongo	15
		Barlwala-baropuu 'A'	20
		Teyatura	19
	Urban	Kakoge'ab' -Obutu welo A	18
		Akitenino-Anywalonino	16
		Starch Factory-Tetugu	15
Total			203
		Women	57.6 %
		Men	42.4 %

Table 1 Distribution of study participants

Participant selection

The target population comprised men and women smallholder pig farmers in urban and rural settings of pig value chains in Uganda. Most smallholder farmers in both rural and urban settings of Uganda are faced with recurrent outbreaks of ASF, which negatively affects pig productivity. In each village, participants were randomly selected from a list of farmers generated by local partners in the Smallholder Pig Value Chain Development (SPVCD) project. As can be seen in Table 1, a total of 203 farmers were enrolled in the study; 57.6 percent of participants were women, and 42.4 percent were men.

Data collection procedure

i. Survey tools

Interview tools for the Focus Group Discussions (FGDs) were developed and reviewed by a panel of animal health scientists, pig value chain researchers, and gender experts. The tools consisted of two sections, as seen in Table 2. The first section contained simple questions related to “who does what and why” in pig husbandry, biosecurity and disease control. The second section was made up of a set of statements, focusing on key biosecurity practices, that were used to elicit gender perceptions that influence roles and responsibilities in disease control. Prior to this study, the research team had developed a training manual on biosecurity targeting the pig farmers in the study area. The manual was adapted to the local context and local terms for “biosecurity” and the local name of the disease “African swine fever” were confirmed by local veterinary officers stationed in the area in consultation with key informants. Therefore, understanding of the key terms used in the study was harmonized across sites so

that during research implementation there was no ambiguity in their interpretation. The tool was pretested to assess adequacy and applicability and administered by well-trained enumerators in local languages. The field-testing exercise helped the team to adapt the tool for clarity and logical flow of the questions, and to assess the test duration. Final changes were made before data collection. Data quality was ensured through enumerator training and by employing people proficient in the local dialects (Luganda for Masaka and Langi for Lira) and with broad knowledge of pig production, especially in relation to health.

ii. FGD interviews

Six FGDs were carried out in the Masaka district and seven in the Lira district (Table 1). Each FGD session comprised of 13 to 14 pig farmers. Each session included both mixed-gender groups at the first phase of the meeting and same-gender groups at the second phase of the meeting, each lasting an average of three hours. The FGDs were facilitated by a moderator and two notetakers. Each session opened with a brief explanation of the research to ensure participants had a good understanding of the objectives and why the expected outputs would be important for the development of the pig value chain. The team then, together with participants, reviewed some best practices for group work, including management of time and discussions. During the first step of FGD sessions, mixed-gender groups discussed their roles and responsibilities in pig husbandry. During the second step, they were then split into same-gender groups to discuss a set of statements about key biosecurity practices, aimed at eliciting gendered perceptions that influence roles and responsibilities in the control of ASF and other pig diseases. During these sessions, three statements were read to the same-gender groups by the facilitator in order to guide the discussion.

Theme	Objective	Guiding question/statement
Gender division of tasks and roles in pig farming and ASF control	To find out who does what, and why. What are the challenges faced?	List actions taken by farmers to control/manage ASF. For each action, list who does it: women, men, or both. List constraints associated with each activity. Explain the causes of each constraint. Look at activities by gender, and discuss why it is, that only that gender is responsible for it. What would happen if the task was carried out by the someone of the other gender?
Gendered attitudes that influence roles and responsibilities in ASF control	To draw out what attitudes, norms, and behavioral aspects shape gendered roles and responsibilities in the control of ASF and other pig diseases.	“Women are more concerned about biosecurity practices.” “Only men are allowed to bury dead pigs.” “Women are not allowed to report a disease outbreak.”

Table 2 Guiding questions and statements used during the FGDs

We selected these statements as a proxy to assess farmers' perceptions towards key biosecurity practices.

Statement 1:

"Women are more concerned about biosecurity practices."

Statement 2:

"Only men are allowed to bury dead pigs."

Statement 3:

"Women are not allowed to report a disease outbreak."

To depict and support the statements, illustrations of the current situation were used to guide the farmers to reflect on their own practices through visualization. For example, a drawing of a pig farm with women carrying out routine activities such as cleaning and feeding was made and presented to the farmers.

Participants then expressed agreement (or disagreement) with each statement by physically moving to a place along a continuum – from agree to disagree – that matched their perspective (see Figures 2, 3, and 4). If someone was undecided, they would stand in the middle. For each statement, people on the same side of the opinion spectrum discussed why they agreed or disagreed with each statement (or why they were undecided). They then chose a spokesperson who shared their reasons with the whole group. Those who were undecided shifted their position if/when they were convinced by the arguments presented. The facilitator then guided a reflection exercise. Following discussion and consultation among participants, differing opinions were recorded.

During the discussion, data was transcribed in the local language by the moderator onto flip charts and then translated into English and recorded by a notetaker at the end of the session. Field team debriefs were held every day after the data collection exercise to share lessons and challenges in order to ensure a common interpretation of the responses.

Data analysis

Data was analyzed by a team of researchers with expertise in pig value chains in Uganda. The team was composed of an animal health scientist, who is an expert in pig health, an agricultural economist, who is an expert in pig value chains, two gender scientists, and two research technicians who supervised the field data collection. A two-day writing workshop allowed the team to interpret the primary data-collection sheets and field reports. Raw data was analyzed using conceptual matrixes to facilitate identification of themes and patterns. Further data analysis involved the extraction and linking of information on the key aspects of the study. Collected field notes, including transcribed interviews, were condensed and sorted into key categories. Statements were classified in tables by gender, VCD, and district to pull out trends and make critical observations across those categories.

Ethical approval

Local leaders, partners to the study, and all interviewees were informed about project goals and the topic and type of questions

before the start of the interview, as well as about their right to decline participation, interrupt, or withdraw from the conversation at any time. Oral informed consent was sought prior to each interview and documented by the researcher. Anonymity and confidentiality of participants' information was guaranteed by ensuring that the information provided was anonymized. The study was approved by the Uganda National Council for Science and Technology (UNCST) with registration number A516.

Results

Gender division of labor in pig farming and disease control

As illustrated in Table 3, results showed that daily routine tasks such as processing feeds, heating swill, and cleaning pigsties are mainly carried out by women. Typical responsibilities for men included the construction of pigsties, deworming, spraying, feeding pigs with specific feed resources such as brewer's waste, taking care of the community boar for servicing, and initiating the implementation of by-laws for the control of ASF. Most biosecurity activities were carried out jointly by both men and women and included disinfection of farm material, construction of foot-baths, and compliance with movement control of pigs and their products. Knowledge acquisition on pig production was also a shared activity, implying that both men and women participated in pig husbandry training.

Women believed that they were well-placed to perform specific tasks and responsibilities, such as cleaning of the pigsties and feeding, given their experience, dedication and availability in the home. They said they performed these tasks because they resemble their domestic work and that it would be disrespectful to let the men/husbands clean the pigsties, because they are family heads. Women perceived that men despise cleaning and consider it a dirty job and, therefore, that it would be shameful for men to be seen cleaning. However, the same women reported that if the men were to clean or prepare pig feed, it would ease the labor burden on women, and the pigs would grow much faster. They indicated that men's support would lessen arguments about the benefits from pig sales and would make women feel happier and loved. On the other hand, men said that they would not know how to perform such tasks well as they are considered "a woman's job".

They [women] have a lot of domestic work at home like cooking and cleaning the house and compound. That is why most of their work deals with domestic work like cleaning the pigsty and feeding the pigs. This is related to their daily activities in their homes.

(FGD participant, male farmer, Lira District, Uganda, 14 December 2015)

It was also noted that it is normal practice for men to leave "in search of money" (to buy feed, for instance), leaving women to carry out the tasks of caring for the pigs on their own. However, some women did not believe that the men are always busy seeking income for the household when they go out, as illustrated below.

Biosecurity	Activities	Male	Female	Both
Construction	Constructing the pigsty, including roofing	✓✓✓		
Feeding	Mixing feed		✓	
	Treatment (heating) of swill before feeding		✓✓✓	✓✓✓
	Giving pigs rock salt		✓	
	Giving pigs human urine every morning		✓	
	Giving pigs local brew waste and spirits	✓		
Cleaning the pigsty and hygiene	Cleaning the pigsty/pigs and feeding troughs, and maintaining farm hygiene		✓✓✓	✓
	Constructing a footbath			✓✓
	Isolating sick pigs from healthy ones			✓✓✓
Treatment	Deworming pigs	✓		
	Spraying pigs/pigsties	✓✓		
	Treating pigs for other diseases	✓		✓✓
	Sterilizing tools used in treating pigs			✓
Breeding	Keeping own boar for breeding and not allowing use by others			✓
	Taking precautions when boars are borrowed/hired for breeding	✓		
Disposing of and disinfecting infected material	Burning and burying pigs that died of ASF	✓✓		✓✓✓
	Burying offal			✓✓
	Burning the utensils used on sick pigs			✓
	Removing waste products			✓
	Disinfecting the place where sick pigs had been kept			✓
Restricting movement to the farm	Restricting visitors/buyers from accessing pigsty			✓✓✓✓
	Restricting dogs during outbreaks			✓
	Wearing boots and stepping in disinfectant before going into the pigsty			✓
Disease reporting	Calling a veterinarian to treat pigs	✓		✓✓
	Reporting the ASF outbreak to a veterinarian	✓		✓✓
Movement control of pigs and their products	Supporting District Veterinary Officers in the setup of quarantines			✓
	Stopping loitering/movement of pigs from one farm to another		✓	✓✓✓✓
	Stopping the buying of pork from unsafe providers/butcherries for home consumption or transport	✓		✓✓
	Initiating the enactment of by-laws and following up on enforcement	✓		
Knowledge sharing	Getting trained in ASF control	✓		✓✓
	Spreading information about outbreaks to other farmers			✓
	Exchanging phone contacts			✓

✓ Each check mark indicates one group.

Table 3 Gender roles and practices in biosecurity and management of ASF

The men are not always home; they go away to look for money but branch off to drink or play cards for money and party with their friends at the drinking joint, leaving women at home doing all the cleaning and feeding pigs in addition to their normal work and shared responsibilities.

(FGD participant, woman farmer, Lira District, Uganda, 11 December 2015)

Men reported they were knowledgeable in pigsty construction, spraying, administering drugs, and reporting disease outbreaks. Men’s relationships with veterinary officers, who are mostly men, was closely associated with their ability to contact them easily through their networks; especially since it is more socially acceptable for a man to contact a man than for a woman to do so. In addition, in a patriarchal society, men are more likely to be taken seriously by the male veterinarians when reporting an outbreak. Participants reported that it is difficult for women to engage with men (including veterinarians) because, culturally, particularly married women’s interaction with men is perceived negatively and discouraged, even in the event of needing to report a disease outbreak.

During an ASF outbreak, tasks were more likely to be carried out jointly. Activities predominantly carried out by men, such as disease outbreak reporting and the disposal of dead pigs, were performed by women if men are absent from the home-stead. Likewise, activities usually in the domain of women, such as processing swill and cleaning pigsties and water troughs, can be carried out by men during an outbreak. Participants felt that the threat of ASF was great enough for both women and men to realize, either from previous experience of losing many pigs in a short time or from their neighbors’ experiences, that they need to work together to control or manage the disease. This is illustrated by the following quotes:

Our husbands are very negligent during all activities of pig production, but when it comes to an outbreak of African swine fever, they are very quick to react.

(FGD participant, woman farmer, Masaka District, 11 December 2015)

The disease [ASF] brings farmers together, because the level of communication among them, during outbreaks, is very high.

(FGD participant, woman farmer, Masaka District, 11 December 2015)

Men also reported that they were more proactive regarding policy-related issues such as the creation of community by-laws for the control of pig disease, especially in Lira District. Men further reported that as household heads they were concerned about ASF outbreaks because the disease threatens the local pig industry and thus increases the risk of income and health insecurity for their households.

Perceptions of women and men about biosecurity

i. Concerns about biosecurity practices

The statement “Women are more concerned about biosecurity practices.” was used to elicit reactions from men and women.

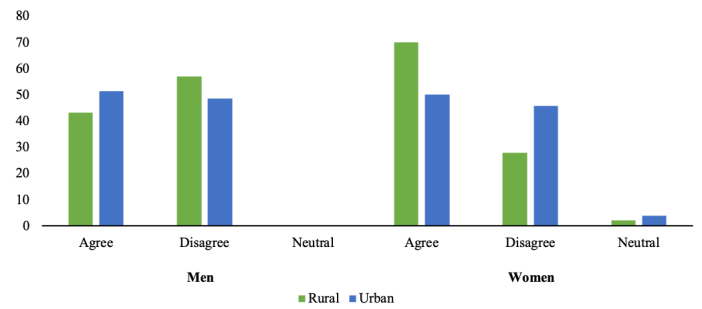


Figure 2 Farmers’ responses to the statement “Women are more concerned about biosecurity practices.” (%)

While women in rural VCD tend to agree more with this statement, there was no clear trend for both men and women in the urban VCD, as illustrated in Figure 2.

The argument that women are more concerned about biosecurity, as supported by the majority of women in rural VCDs, is in line with the fact that women carry out pig husbandry tasks that are associated with a high risk of contamination through a biological agent or injury. These tasks include sweeping the compound of dust, cleaning the pig pen, processing of swill, collecting human urine in the morning to feed the pigs, and handling the pigs with bare hands. Both men and women said they believed caring for pigs to be a woman’s responsibility. Hence, men tended to offer very little help. As illustrated by the quote below, rural women perceived men to care less, while urban women perceived men to care more about biosecurity practices.

When a man buys a pig and brings it home, it is like he has given you another job. He may be gardening nearby, but he cannot bring the greens to feed the pigs. I do everything concerning the pigs.

(FGD participant, woman farmer, Masaka District, Uganda, 9 December 2015)

For women, caring for pigs is seen as comparable to looking after their own children, and due to financial pressure on the households, women in urban VCDs are also increasingly involved in rearing pigs. This is reflected in their willingness to attend pig husbandry training and the diminishing interest in such training on the part of men. Women reported that they put into practice what they learn, unlike men, whom they reported to be busier in activities outside of the home.

The women are more involved in managing the pigs [looking after them]. So, she needs to attend training to get more knowledge on the enterprise.

(FGD participant, women farmer, Masaka District, 7 December 2015)

According to women, men perceive themselves as neat and do not want to see or associate with anything dirty or shameful, in case friends or visitors come over. If women fail to adhere to expected gender roles and tasks, they experienced disapproval, with some reporting that they were vulnerable to violence, i.e. being beaten by their husbands, as a result. Men – particularly

in rural VCDs – were also detached from caring for pigs to the extent that, when informed of sick pigs, the most they would do was inform animal health workers and not necessarily pay for the treatment. The men were, however, perceived to be very active during pig sales, as illustrated by the following quote:

A month can pass without the man checking on pigs, but when it comes to selling time, he appears as the owner.
(FGD participant, woman farmer, Lira District, 11 December 2015)

Generally, regardless of the VCD, men held prejudices against some biosecurity practices. They considered practices such as the removal of waste to be dirty and smelly and regarded it as shameful to be seen cleaning pig pens. They said that other men would ridicule them if they found them engaging in such activities. As a result, men often did not want to be associated with pig keeping, and some feared carrying the smell of pigs on their bodies or clothes when out meeting friends. Rural men perceived it as their duty to supervise women at work, and if women did not perform to men’s expectations, there were repercussions such as domestic violence. Meanwhile, urban men reasoned that women are mentored from childhood for some tasks and are, therefore, better suited to those tasks than men, who might forget some of the biosecurity practices and continue to spread disease.

Cleaning is a woman’s job.
(FGD participant, male farmer, Masaka District, 12 December 2015)

ii. Disposal of dead pigs

Most participants disagreed with the statement “Only men are allowed to bury dead pigs.”, as can be seen in Figure 3. However, the proportion of farmers who disagreed was higher in the urban VCD. The proportion of women who disagreed was higher compared to men in both urban and rural VCDs.

According to farmers who disagreed with the statement, there are circumstances when women cannot avoid the task. For instance, because the household includes no men or because women whose husbands are unwilling to help or away from home may be unable to wait for the men to return. In such cases, women are allowed to perform the task or to get someone to help them in order to avoid the spread of disease.

If women can dig from morning to noon, it is possible for them to dig a hole and bury a dead pig.
(FGD participant, male farmer, Masaka District, 9 December 2015)

In case a man is sick, or he has gone to attend to something for the family, then the woman should come in and take the responsibility of burying dead pigs immediately in order to prevent disease spread.
(FGD participant, women farmer, Lira District, 8 December 2015)

Farmers also reported that, when both husband and wife were available, sometimes the task of burying dead pigs would be shared. However, activity sharing was more pronounced in urban VCDs. A mature dead pig can be heavy and requires collective

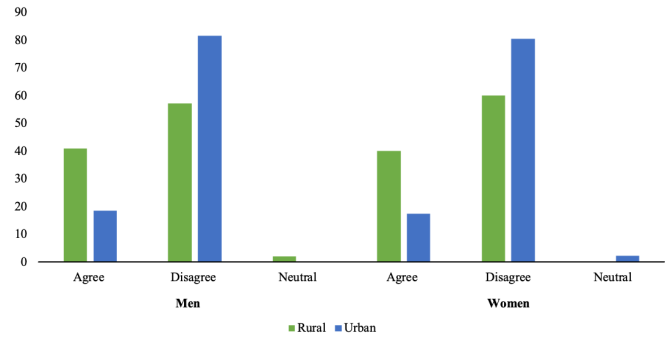


Figure 3 Farmers’ responses to the statement “Only men are allowed to bury dead pigs.” (%)

effort and team work to lift and bury. In addition, everyone must be aware of the burial location to help keep away other pigs and animals. Because of the fear of the disease spreading, some women also reported defying the ingrained cultural norms and beliefs and burying dead pigs when necessary. Some rural women even recommended that women should perform the task in situations where their husband was not trained in handling dead animals. However, they also reported that since some people consume dead pigs affected by ASF, burying a pig carcass without the approval of the male household head can lead to conflict in the house.

Men can end up selling or eating dead pigs without burying them because compared to women men have lots of appetite for pork.
(FGD participant, woman farmer, Lira District, 10 December 2015)

According to farmers who agreed with the statement, a first reason for this might be that both men and women perceived men to be emotionally and physically stronger and therefore best placed to bury the dead animals. Men viewed themselves as “the stronger sex” who could quickly execute the task, unlike women, whom men perceived to be afraid of dead pigs or pits and not energetic enough to perform such tasks.

It is natural and a common norm here in this society that men are responsible for burying or digging holes or graves. As men, we have more strength to dig deep holes where we can bury such dead animals.
(FGD participant, male farmer, Masaka District, 7 December 2015)

Further, because men tend to be landowners, they also have the power to allocate burial land and know the right burial locations – power and information which women do not possess. As a result, when men are away from home, some women– to show honor and respect for their husbands – wait for them to return to bury any dead pig(s).

The land belongs to the man.
(FGD participant, woman farmer, Lira District, 8 December 2015)

In addition, some women also believe that men are better suited to the task, since they are the ones who attend meetings and training sessions and are hence more knowledgeable about ASF control measures.

In some communities, especially in Lira District, it is considered a taboo for women to bury a dead animal; it is the responsibility of men to bury or dig graves. The act is viewed as a lack of respect for elders and condemned by some husbands as a crime. It was also reported by women that it would be abnormal for women to dig graves and especially unacceptable for pregnant woman to bury animals or even visit a graveyard. In these villages, women are forbidden to dig and bury anything while still in their reproductive age, and by disrespecting this, women would risk misfortune. Some women reported that their emotional attachment to the pigs made them feel like burying a dead pig was akin to burying a child. This is illustrated by the following quotation:

Pigs are dear to some women and burying one is like burying their child.
(FGD participant, woman farmer, Lira District, 15 December 2015)

Instead, when there was a dead animal on the farm, women preferred for someone else – even a child – to carry out the task of burying it. In addition, women reported that they were already overburdened by other household chores, which left them with no time to bury dead pigs.

Women do all the other activities before the pig dies, so how can the men fail to bury dead pigs?
(FGD participant, woman farmer, Lira District, 15 December 2015)

iii. Reporting a disease outbreak

The majority of farmers in both urban and rural VCDs disagreed with the statement “*Women are not allowed to report a disease outbreak.*” (Figure 4). Those who disagreed with the statement argued that reporting a disease outbreak was everyone’s responsibility, since pig farming is a family business and an ASF outbreak can occur anytime, thus requiring whoever is available to attend to the problem immediately. Since women are more likely to be at home, they must report an outbreak right away if they detect any signs and symptoms in order to prevent the spread of the disease. Men further argued that reporting disease outbreaks is no longer a challenge for women due to the availability of mobile phones. They also cautioned not to underestimate women’s ability to report a disease outbreak, as illustrated by the following quote:

It is impossible that a woman cannot inform [the vet] either by phone or go there. If a woman can put a child on the back and go to hospital, why can she not go to the animal health service provider for her animal.
(FGD participant, male farmer, Masaka District, 8 December 2020)

It was also argued by women that they sometimes have no choice but to report disease outbreaks by themselves. This may be necessary when there are either no men in a household, as is

the case for some single women, or the women are solely in charge of the pig enterprise and the men are not involved. Some women participants who supported women reporting diseases also contended that women are more responsible and better at reporting an outbreak compared to men. They said women treated disease matters with urgency, unlike men, who were likely to get distracted by other things, such as a chat with friends or drinking alcohol. To demonstrate their concern, the urban women’s FGD had this to say:

Women cannot eat or listen to the radio when their animals fall sick; they have to call a vet before doing anything else.
(FGD participant, woman farmer, Masaka District, 11 December 2015)

Among the few farmers who agreed with the statement, there was higher proportion of men. Those men considered disease reporting to be their responsibility, saying they were best placed to perform the task because they knew the animal health providers and could more easily utilize their resources to contact them. They said that contacting the veterinarian was their decision to make and therefore it would be disrespectful for women to take over the role. So, if women wanted to make decisions, they would project. To illustrate their point, one of the men in an urban FGD said:

If the woman has the money and wants to do things their way, let her take the project to her parents’ home.
(FGD participant, male farmer, Lira District, 16 December 2015)

Besides men considering themselves more suitable for the task of reporting pig diseases, they did not trust their wives to report disease outbreaks to veterinarians. Men, and some women, feared that women might be taken advantage of or commit adultery instead of reporting the outbreak. According to women who disagreed with the statement, another reason why men should be reporting outbreaks was that women do not control the money necessary for treating animals. Some women considered reporting a disease outbreak to be a waste of their time, as they were already burdened with other responsibilities.

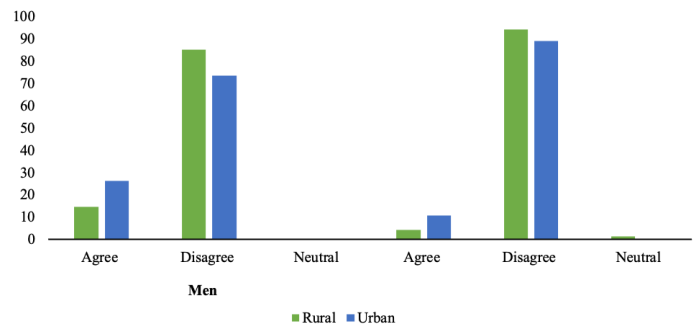


Figure 4 Farmers’ responses to the statement “*Women are not allowed to report a disease outbreak.*” (%)

Constraints faced by women and men in the implementation of biosecurity measures

As indicated in Table 4 below, there are gendered variations in constraints on biosecurity. Women reported facing constraints mostly related to labor demands that are time-consuming in nature and also related to exposure to disease during the implementation of biosecurity. Their day-to-day routine of cleaning pigsties and feeding troughs was an additional responsibility to other domestic work and this was reported as a challenge by all the women, especially those in the rural VCDs. Many women reported a lack of cleaning detergents and protective wear, which leaves them susceptible to occupational diseases. Most of them reported being unable to afford the required detergents, while some were ignorant of which product to use. Protective wear is equally expensive for them. Those who live far from a water source must contend with long walking distances to collect water, while also facing other time constraints. Women in urban areas reported facing constraints such as the cost of fuel and a lack of cooking pans for swill feed preparation. Some women develop eye problems from the use of firewood while others lack information on how to treat swill. Women were, generally, also constrained by a lack of opportunities to improve their skills in pig management. Some women in Masaka reported that they are not allowed by their husbands to attend training, while others are constrained by too many household duties and are left with no time for training. The season and time of the day during which training sessions are organized were also reported as not suitable to some women farmers.

On the other hand, constraints faced by men are mostly periodic/occasional and related to social or community standing. The on-farm constraints reported in both rural and urban VCDs include lack of capital to construct pigsties and purchase farm tools/equipment (e.g. for digging pits to bury dead pigs), which is attributed to households' low incomes and absence of alternative revenue sources. This inadequacy is worsened by high taxation on building materials and farmers limited knowledge of construction. The lack of appropriate tools/equipment further results in poor disposal of pig carcasses in shallow pits below the recommended level. As pointed out by urban farmers, those wanting to spray pigs often do not know the right drugs to use nor where to buy them or how to mix them, while some are allergic to the drugs. Men also reported off-farm constraints including limited means of reporting disease outbreaks and getting authorities to respond. Men in the rural VCDs said it was expensive to reach veterinarians due to limited transportation facilities. They also said veterinarians are few and some are unqualified, while others fail to turn up or delay when called upon, partly because they are poorly facilitated. In managing pig movement controls, men in both VCDs reported being constrained by a lack of support from government authorities.

Discussion

Biosecurity tasks that are carried out by women are perceived as "lighter" but more labor-intensive tasks that require high time investment. They are considered an additional workload but are

never paid, since they are considered a domestic chore. In contrast, men do not experience a similar work burden and perform tasks that are more flexible and periodic in nature. Several studies in Africa and South East Asia have reported similar trends in the gender division of labor in pig management at the farm level. But few studies have specifically addressed biosecurity. A study carried out in a peri-urban area near Phnom Penh, Cambodia reported that pigs were generally managed by female household members (Ström et al. 2017). In a study in Nepal, it was also reported that women appeared to spend more time caring for pigs than men (Niraula et al. 2015), while other studies in Nigeria and the Philippines showed that the participation of women in livestock production tended to be related to feeding animals, cleaning pens and cages, and water provision (Ayoade et al. 2009; Perey 2017).

Women's lack of decision-making power undermines their abilities to effectively co-partner with men to prevent disease outbreaks, as tasks that require resources or decision-making, such as reporting disease outbreaks, seem to be controlled and carried out by men. The power to allocate resources also conveys the capacity to support the application of biosecurity on the farm, as for instance money needs to be allocated to the purchase of required materials such as disinfectants. A study in Zambia reported that gendered differences in participation in pig production were due to different levels of decision-making power. Overall, the study revealed that men made more decisions than women concerning what to produce and also had more control over both household productive resources and money (Kamwimba 2005). The gendered division of labor in households and the economy makes most women less able than men to control the resources and processes relevant to tackle crises (ILO 2003). Our analysis revealed that access to and control over land was an important factor in the disposal of dead animals. In all African societies, men, women, and children tend to have access to livestock, but access to land is often restricted to men (Quisumbing et al. 2014) which limits women's capacity to access land.

The gendered division of tasks is to some extent exacerbated by the perceptions held by both men and women. While participants to the study seem positive about both men and women engaging in all pig health-related activities, the practice remains largely unchanged.

Women are stereotyped negatively by men, who also lack respect for women's ideas and contributions. Men perceive women to be weak, ignorant, unworthy and powerless to make decisions; a perception upheld by some women as well. Thus, women are considered suitable only for "light" and unskilled tasks such as cleaning pigsties. The men hold prejudices towards some biosecurity practices, which hinders the fight against ASF. They perceive practices such as the removal of pig waste unbecoming to their standing in the home and community.

A study in Nigeria found that the major constraints faced by women in livestock production were preoccupation with household chores and dominance by their spouses (Ayoade et al. 2009). Both men and women adhere to this gendered division of tasks that disproportionately burdens one party. It is only when the

Gender/ value chain domain	Identified practice	Reported constraints	Causes
Women/ urban	Processing/ heating swill before feeding	<ul style="list-style-type: none"> • Lack of firewood in urban areas and high cost of charcoal • Lack of pans large enough to heat the swill • Exposure to smoke which can lead to eye problems • Lack of information on swill processing 	<ul style="list-style-type: none"> • Lack of money to buy heating materials and necessary equipment • Use of wet firewood causes excessive smoke • Inadequate training on swill processing
	Avoiding purchase of feed from unknown source	<ul style="list-style-type: none"> • No knowledge of safe feed sources during an outbreak 	<ul style="list-style-type: none"> • No resources about safe feed suppliers
Women/ rural and urban	Washing/ cleaning the pigsty or housing area and feeding troughs	<ul style="list-style-type: none"> • High workload • Limited access to detergents to clean and guarantee their own safety • Lack of protective clothing (cleaning with bare hands and feet) • Exposure to bad smells and jiggers (fleas) 	<ul style="list-style-type: none"> • Women's responsibilities already include cooking, taking care of children, etc. • High cost of detergents • High cost of protective wear like gloves and gumboots • Lack of awareness about good hygiene practices
	Training on ASF and biosecurity	<ul style="list-style-type: none"> • Limited reach of training announcements • Poor scheduling by organizers (during inappropriate seasons) • Husbands may not allow wives to attend • Too many household duties to attend 	<ul style="list-style-type: none"> • Poor organization of training • Husbands fail to trust their wives • Poor time management
Men/ urban	Construction of pigsties to confine pigs	<ul style="list-style-type: none"> • High cost of building materials • No knowledge of construction techniques • Laziness/reluctance to construct pigsties 	<ul style="list-style-type: none"> • High tax on building materials • Low income from pig farming and lack of alternative income sources • Lack of knowledge of possible pigsty layouts • Demotivation by continuous outbreaks of ASF
	Spraying pigs/ pigsties	<ul style="list-style-type: none"> • No knowledge of correct disinfectants and dilution process • Unavailability of disinfectants • Lack of spraying equipment 	<ul style="list-style-type: none"> • Absence of education on use of disinfectants • Low financial capacity
	Burying pigs that died of ASF	<ul style="list-style-type: none"> • Lack of appropriate tools/equipment to dig pits of the recommended depth • Foul smell from dead pigs • Delays in disposal of dead pigs 	<ul style="list-style-type: none"> • High cost of farm equipment • High cost of hiring labor • No compensation • Ignorance of why dead pigs are to be buried in the first place
	Avoiding community boar servicing	<ul style="list-style-type: none"> • High cost of raising own boar • Lack of knowledge of the correct precautions to take while using a community boar service 	<ul style="list-style-type: none"> • Pig enterprise not profitable • Limited access of farmers to training on biosecurity
Men/ rural	Restricting farm visits	<ul style="list-style-type: none"> • Bad perception by neighbors (being misunderstood as being unfriendly/uncooperative) • Dilemma for model farmers who rely on farm visits as a source of income 	<ul style="list-style-type: none"> • No knowledge of modes of ASF transmission
	Reporting a disease outbreak	<ul style="list-style-type: none"> • High cost of transport to reach veterinary officers • Unavailability of veterinarians or adequately qualified veterinarians • Vet does not turn up or response is delayed • Vet lacks equipment and drugs 	<ul style="list-style-type: none"> • High cost due to limited transportation options • Limited number of qualified vets • Circumstances under which vets are working make a quick response difficult
	Supporting quarantine to restrict animal movement and enforcing by-laws	<ul style="list-style-type: none"> • Non-implementation of quarantine restrictions by other farmers • Lack of understanding or ignorance of by-laws • Unhelpful by-laws can cause misunderstandings among farmers 	<ul style="list-style-type: none"> • Lack of action from authorities when people fail to follow regulations • People are not informed of by-laws

Table 4 Constraints on the application of biosecurity as reported by women and men

status quo changes – during times of ASF outbreak – that tasks become more interchangeable. This situation is meant to save the family pig enterprise. In such cases, the biggest concern is the ASF disease and farmers are preoccupied with controlling it, as it has a significant economic impact on their pig enterprises. The main reason given by farmers for changes in ASF control practices and gendered roles was an increased awareness of the importance of ASF control. This change was described in many crisis situations elsewhere. Unequal pre-crisis gender roles often change in crises, as women and men can step out of their socially ascribed roles as part of their coping strategies (ILO 2003).

Women reported facing daily competing demands on their time and labor, given their productive and reproductive roles in the household, in addition to poor working conditions and limited opportunities to improve skills in pig management. A heavy workload is known to lead to time poverty, which marginalizes women further; it restricts opportunities for women to participate, for instance, in training and other development processes. Men's constraints are more periodic and related to social standing. We also found that men in rural areas tend to face more constraints than their counterparts in urban areas. This could be caused by a lack of market opportunities and other services in more remote areas, compared to the peri-urban and urban farmers.

According to the farmers, the training they have received in pig husbandry and disease control from previous and ongoing projects has made them realize the importance of biosecurity measures in ASF control. As a result, there is increased involvement of men in some practices historically regarded as women's roles, such as the cleaning of pigsties. Cases of men and women working together to control pig diseases other than ASF were also reported. Some women farmers thought that women are increasingly considered equal partners in pig enterprises and, in some cases, make joint decisions with men. Because of the profitability of pig keeping, both men and women are taking an interest in the enterprise and in the management and control of diseases. These changes indicate that the management of ASF offers an opportunity for joint action by household members to improve pig farming. Experiences from this joint management of the disease could be used to promote income sharing and shared access to household resources. The allocation of resources for biosecurity measures, for example for purchasing farm equipment, could be an entry point toward this end.

Conclusion

Men and women hold distinct but complementary roles within pig farming. The perception of biosecurity differs by gender because of the different tasks. Widespread gender roles and perpetuated gender perceptions of men and women towards biosecurity undermine their ability to effectively implement biosecurity measures by limiting their choices and opportunities, with women being more negatively affected. However, during ASF outbreaks the division of labor seems to become less strict, since men and women are equally concerned about the impact of the disease on their farms, and tasks hence become a shared

responsibility. Therefore, the need for measures to systematically counteract unproductive gendered perceptions and practices cannot be overemphasized. The findings clearly show that involving women in decision-making during implementation of biosecurity and supporting cooperation between men and women in pig management will improve disease control.

Implications for ASF control and recommendations

If the ASF disease burden is to be reduced, concerted effort is required to address the imbalance of power in gender relations and to create an enabling environment in which both men and women can effectively participate in disease prevention and control. To this end, the attitudinal shift in practice born out of fear of the devastating disease during an ASF outbreak needs to be extended to the pig production cycle in regular times. Therefore, given the crucial role women play in pig husbandry and disease control and the overall purpose of improving the livelihoods of smallholder pig keepers, interventions must address underlying gender inequalities and women's workload, which inhibit improved ASF control and prevention. Addressing these issues would contribute towards creating an enabling environment for men and women to implement biosecurity measures. Engaging women and men producers in ASF disease prevention and control can promote more sustainable livelihoods along pig value chains and beyond. Through training for men and women on pig farming and disease control and through gender sensitization, some gains can be made to increase men's participation in taking on what are considered "women's tasks".

Training on biosecurity should explicitly target both men and women in households, reflect on the division of labor, open opportunities for women in the emerging labor market, and build on the gender role changes that have already occurred rather than revert to assumptions about women's traditional roles. Lastly, interventions to improve access to necessary resources to enable uptake of biosecurity practices should be set up as a priority.

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Availability of data and materials

The datasets used and/or analyzed in this study are available from the corresponding author upon reasonable request.

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