



Sveriges lantbruksuniversitet
Swedish University of Agricultural Sciences

**Faculty of Veterinary Medicine
and Animal Science**

Department of Biomedical Sciences and
Veterinary Public Health

African swine fever in Uganda

Attitudes and possible interventions to limit the spread
of the disease

Frida Crafoord



Uppsala

2014

Degree Project 30 credits within the Veterinary Medicine Programme

ISSN 1652-8697

Examensarbete 2014:66

African swine fever in Uganda

Attitudes and possible interventions to limit the spread of the disease

Afrikansk svinpest i Uganda

Attityder och möjliga insatser för att begränsa spridningen av sjukdomen

Frida Crafoord

Supervisor: *Karl Ståhl, Swedish University of Agricultural Sciences,*

Department of Biomedical Sciences and Veterinary Public Health

Assistant Supervisor: *Sofia Boqvist Swedish University of Agricultural Sciences,*

Department of Biomedical Sciences and Veterinary Public Health

Field Assistant Supervisor: *Erika Chenais National Veterinary institute,*

Department of Disease control and epidemiology

Local Assistant Supervisor: *Charles Masembe, Makerere University,*

Department of Biology

Examiner: *Susanna Sternberg Lewerin, Swedish University of Agricultural Sciences,*

Department of Biomedical Sciences and Veterinary Public Health

Degree Project in Veterinary Medicine

Credits: 30 hec

Level: Second cycle, A2E

Course code: EX0751

Place of publication: Uppsala

Year of publication: 2014

Front page photograph: *Personal photo, Uganda October 2013*

Number of part of series: Examensarbete 2014:66

ISSN: 1652-8697

Online publication: <http://stud.epsilon.slu.se>

Key words: *African swine fever, Smallholder pig production, Pork value chain, Participatory epidemiology, Uganda, Gulu*

Nyckelord: *Afrikansk svinpest, Småskalig grisproduktion, Deltagande epidemiologi, Uganda, Gulu*

SUMMARY

The objective of this study was to investigate the attitude towards African swine fever (ASF) primarily among smallholder pig farmers but also among other actors along the pork value chain in Gulu district, Uganda. More specifically, the study aimed to investigate the specific challenges facing both farmers and other members of the pork value chain using participatory epidemiology (PE).

ASF is a feared viral disease of pigs associated with high mortality, which is endemic in many parts of Africa. The recent history of Gulu district in Northern Uganda can be described as turbulent and the human population has suffered during decades of war and civil unrest. Pig keeping is considered a potential opportunity for business as well as a way of providing more animal protein in the diet. However, this is threatened by ASF as farmers can lose entire herds due to the disease.

This study can confirm some previously known factors and risk activities such as the free range system of pigs and movement of pigs and pork during ongoing outbreaks, which make disease control difficult. ASF has severe socio-economic implications for the pig owners and society as a whole. The study demonstrates that the local participants have relatively good knowledge about ASF and how to prevent disease although this knowledge was not always turned into practice. Many of the participants in the study showed a great willingness to change the current systems and establish new ways of keeping pigs to reduce outbreaks of ASF and improve pig production.

SAMMANFATTNING

Målet med studien var att undersöka attityder och erfarenheter av Afrikansk svinpest (ASF) inom småskalig grisproduktion i Gulu distriktet, norra Uganda. Studien ämnade beskriva specifika problem som grisbönder såväl som andra aktörer i värdekedjan mötte. För att samla in data och åsikter användes verktyg från fältet deltagande epidemiologi (PE).

ASF är en fruktad virussjukdom hos gris med hög dödlighet och är endemisk i stora delar av Afrika. Gulu distriktet i Uganda anses vara ett utsatt område och populationen har lidit under årtionden av krig och oroligheter. Grisproduktion anses vara en möjlighet för småskaligt företagande och erbjuder en källa till animaliskt protein i kosten. ASF utgör en hög riskfaktor i verksamheten då bönder kan förlora hela gruppen grisar vid ett utbrott av sjukdomen.

Denna studie kan dra slutsatser som visar på en komplex situation. En mängd riskaktiviteter såsom hållning av lösgående grisar, förflyttning av grisar och fläsk under pågående sjukdomsutbrott försvårar sjukdomskontroll. ASF har betydande socio-ekonomiska implikationer för individer såväl som för samhället som helhet. Studien visar att en hög andel av de småskaliga bönderna har god kännedom om kliniska symtom på ASF och gott om förslag på preventiva åtgärder vilket ger hopp om framtida sjukdomsprevention. Det fanns också en uttalad vilja att förändra gällande praxis inom grishållningen för att minska utbrott av ASF.

CONTENT

INTRODUCTION..... 1

LITERATURE REVIEW..... 1

 African Swine Fever 1

 Gulu, Uganda..... 2

 The pork value chain in Gulu, Uganda..... 3

 ASF in Gulu, Uganda 3

 Participatory epidemiology..... 4

OBJECTIVES 6

MATERIALS AND METHODS 6

RESULTS..... 7

 Study on farmers perceptions of ASF..... 7

 Study on the Value chain..... 15

DISCUSSION 18

ACKNOWLEDGMENTS..... 22

REFERENCES..... 23

APPENDIX 1 25

APPENDIX 2 42

INTRODUCTION

This study was performed as a Minor field study (MFS) funded by the Swedish International Development Cooperation Agency (Sida). It was carried out in connection with a larger, more long-term project on Africa swine fever (ASF) in Uganda coordinated by the Swedish University of Agricultural Sciences (SLU) in collaboration with Makerere University, Kampala, Uganda, and the International Livestock Research Institute (ILRI). The main objective of this MFS-project was to gain an insight into the attitudes and knowledge among smallholder pig farmers but also among the other actors along the pork value chain on control measures for controlling spread of ASF. The study was conducted in the Gulu district, Northern Uganda.

The study was performed using participatory epidemiology (PE) methods. These methods include different tools that can be used to collect the views and experiences from the participating villagers as accurately as possible. The study consisted of two parts: the first was performed in villages without reported outbreaks; the second focused on actors of the value chain other than farmers (i.e. butchers, middle men and pork joint owners).

To be able to evaluate the data obtained in the study a literature study was performed focusing on ASF, the methods used (PE) and the setting; Uganda and the situation in Gulu district as well as pig production in Uganda.

LITERATURE REVIEW

African Swine Fever

ASF is caused by a DNA virus classified within the *Asfarviridae* family. Three different epidemiological cycles have been described; a sylvatic involving ticks (*Ornithodoros*) and wild suids, a domestic cycle with pig-to-pig transmission and an intermediate cycle with tick-to-pig transmission (Anderson et al., 1998, Penrith and Vosloo, 2009). The disease is spread in the domestic pig population through direct contact with infected pigs, indirect contact through contaminated equipment as well as infected, non-heat treated products of pork. The virus is known to spread through blood, faeces, saliva and urine from infected pigs (Penrith and Vosloo, 2009). The virus survives in infected pig tissues and processed pork for long periods of time and swill feeding is a known cause of outbreaks in endemic areas as well as introductions into areas previously free of ASF (Rowlands et al., 2008, Costard et al., 2013).

Clinical disease in domestic pigs is usually acute or peracute. High fever, shade seeking, vomiting, ataxia, bloody diarrhea, abortions may be observed in some animals before death (Costard et al., 2013). The primary cause of death is often lung edema and animals are sometimes found dead without premonitory signs (Blome et al., 2013). Disease spread is possibly complicated by the existence of subclinically or chronically infected pigs which have been shown to survive for several weeks, but no long term carrier state has been found (Costard et al., 2013). There is some evidence of increased resistance to the virus in some populations but this quality has not proven to be a genetic trait (Penrith et al., 2004). No safe and efficacious vaccine has yet been developed and there is no available treatment for ASF (Costard et al., 2013).

Gulu, Uganda

The human population in Uganda is about 34 million people (Uganda Bureau of Statistics, UBOS, 2012) with 24.5% living in poverty (World Bank, 2009). Unemployment rate is very high and a majority of people are dependent on self-employment and other means of income. Especially in the rural areas agriculture is a crucial part of the majority's livelihoods and serves both to provide food as well as income (UBOS, 2007). A part of the agricultural sector, pig keeping is on the rise (UBOS, 2010) and may be considered a way for farmers in rural areas to make money quickly with an increasing demand of pork both locally and in urban areas (Kidoido, 2013).



Figure 1 Map of Uganda (from Wikipedia, adjusted in photoshop) with Gulu district shown in blue.

Gulu district (Figure 1) has been a region of political, social, economic and military unrest for a considerable amount of time. The population was severely affected by the war between the government and the rebel group, Lord's Resistance Army (LRA), and a large part of the population lived in refugee camps between the years 1986 and 2007 (Branch, 2013). Rebuilding society after the conflict has proven challenging in many aspects. In short, loss of capital in the form of cattle, housing or land, because of the dislocation of the population to camps, created poverty both for individuals and groups. Increasing urbanization (the population of Gulu town increased from less than 40 000 people in 1990 to 154 000 in 2012) put a strain on infrastructure as well as health and sanitation (Van Acker, 2004, Branch, 2013). Unemployment in Gulu district is high, especially among the youth. It is a district attempting to rebuild society with success in some areas but not all and reports are indicating continued economic problems (Branch, 2013).

The pork value chain in Gulu, Uganda

Pigs are efficient converters of feeds to animal protein and have a high fecundity thus constituting a potential way to solve problems of poverty, malnourishment and protein deficiency in the rural setting (Muhanguzi, 2012, Penrith et al., 2013).

The main purpose of keeping pigs in Gulu district, Uganda, is to generate income for the family by selling them at a marketplace. People buying pigs from marketplaces are either butchers, middle men or other farmers (District Veterinary Officer, Gulu district, Uganda, Tony Aliro, 2013 Personal communication). Slaughter of the pigs takes place at designated places, often at a concrete slaughter slab outdoors, (see Figure 2a) or on the ground in the absence of a slaughter slab (see Figure 2b). Pork is distributed to the consumers via markets, pork joints or restaurants, Figure 2c shows a shed where pork is sold (District Veterinary Officer, Gulu district, Uganda, Tony Aliro, 2013 Personal communication).



Figure 2, a-c, a) Slaughter slab in central Gulu Town b) Rural slaughter place without slab c) butchery selling pork in Gulu Town. (Personal photos).

ASF in Gulu, Uganda

The consequences of the endemic presence of ASF in Gulu are severe for the pig farmers. It has been described as one of the factors which can drive rural smallholders into chronic poverty with devastating effects to smallholder pig producers (Edelsten and Chinombo, 1995).

During a period of 18 months (Oct 2010-March 2012) at least 40 outbreaks were confirmed in the district and more outbreaks are being reported continuously (Swedish University of Agricultural Sciences, Karl Ståhl, 2013 personal communication).

Furthermore, ongoing research in Uganda indicates that the virus is maintained within the pig population and spread is being facilitated by transportation of infected pigs, infected carcasses or meat and possibly subclinical carriers (Tejler, 2012). There is thus strong evidence from Uganda and elsewhere that control measures should be based on limiting these transports rather than focusing on controlling the virus in the natural reservoir hosts, such as the bushpig and warthog (Penrith et al., 2013). This means that all actors in the pig value chain (breeders, farmers, middle men, butchers, restaurant owners and consumers) are, to some extent, responsible and involved in continued spread of disease (Penrith et al., 2013, District Veterinary Officer, Gulu district, Uganda, Tony Aliro, 2013 Personal communication).

The control of ASF in Uganda is limited to quarantine of pigs and movement restrictions in affected districts. The impact of imposed control measures on further spread of disease has never been evaluated but is likely limited. This is because many smallholders are reluctant to report outbreaks and once a control measure has been implemented, compliance is often low and little resources are available to enforce pig and pork movement bans. The lack of compensation schemes could make it difficult to restart pig production after an ASF outbreak (Swedish University of Agricultural Sciences, Karl Ståhl, 2013 Personal communication, District Veterinary Officer, Gulu district, Uganda, Tony Aliro, 2013 Personal communication).

Participatory epidemiology

The field of PE has developed since the 1970s and has been used in veterinary medicine, mainly in low income countries, since the 1980s (Catley et al., 2012). This method can be used in projects that try to better understand local factors governing spread of disease and was, for example, used in the eradication of rinderpest (Roeder et al., 2013).

Participatory epidemiology is used to gather information, often using group interviews and preferably by open rather than closed questions. Cultural and lingual barriers often prevent researchers from being facilitators and asking questions themselves hence a local facilitator is often used. The facilitator uses pre-written material and should, if possible, not take notes but remain focused on the group and the discussion at all times, therefore a note taker is often used. The facilitator probe the answers to get a consensus within the group and there are often opportunities to cross check information given later on in the interview. The answers can later be analyzed by triangulating information – comparing to what is known from other sources and possibly diagnostic tests. The term “participatory” indicates the importance of local involvement of the communities and is essential (Catley et al., 2012).

Proportional piling, seasonal calendar

Proportional piling is a visual way of estimating numbers. A hundred beans or stones are placed under different categories and compared. The facilitator probe to see that the proportion is generally accepted in the group (Catley et al., 2012).

This method can be used to make a seasonal calendar. A number of questions are asked, one at a time, and the group relates different events to the seasons and months by proportional piling of the beans/stones (see Figure 3). For example, the first row may represent rainfall during one year; this question may serve as a way of letting all the participants grasp how to perform the task.



Figure 3, Meetings performed September-October Gulu, Uganda 2013 (Personal photo).The participants are asked a variety of questions from a prepared material where they raise their hands, place beans and discuss answers. The answers are probed further by the facilitator and finally written down by the note taker.

Listing, hand counts and key informants

The group interviews are conducted as structured discussions, involving the whole group. The participants are often asked open ended questions and their answers are written down, making a list of suggestions. These may be ranked or not. The facilitators may address the more quiet individuals personally, asking for their opinions. The participants may also be asked to raise their hands to answer questions and then the number of raised hands is counted and noted (see Figure 3) (Catley et al., 2012).

A key informant may be selected to provide local knowledge about the general situation in the area. This enables general information to be gathered, for example, about the wealth of the villages involved as well as recent local problems. One or a few participants can be moved to a separate location and supply this information, and may return to the group afterwards. They may also be asked to draw a map of the village with roads, rivers, wells, schools, churches and markets (Catley et al., 2012). Separating a key informant from the group can also be a

way to remove dominant speakers, to give room for the rest of the group to share their experiences more freely.

OBJECTIVES

The main objectives:

- To get a general overview of pig keeping in Gulu, Uganda and an understanding of what difficulties the farmers face – from the farmers perspective
- To describe attitudes towards ASF among farmers and other actors of the value chain
- To investigate the level of knowledge of the disease and in relation to this describe challenges facing all actors in the value chain
- To gain personal knowledge of veterinary medicine and research in low-income countries

MATERIALS AND METHODS

For the complete interview material with questions and guidelines see appendix 1 and 2.

The study was performed during September and October 2013. It was sub divided into two parts: one sub-study focusing on smallholder pig producers (Study 1), and one sub-study focusing on the other actors of the value chain (referred to as Study 2).

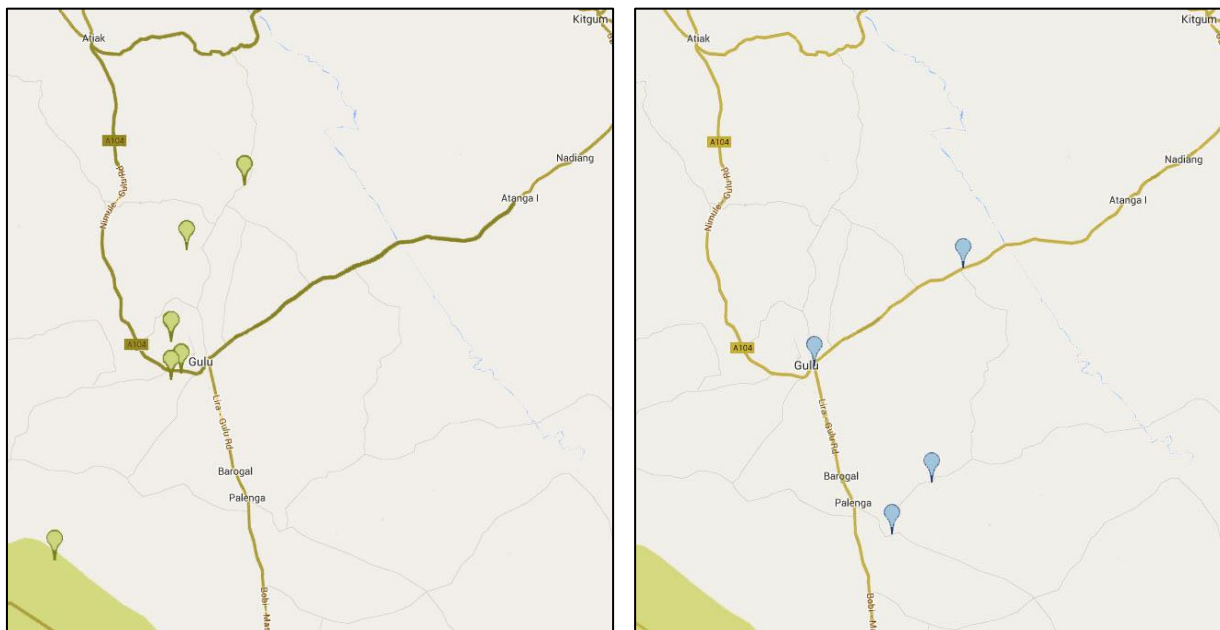


Figure 4, *a and b*, GPS locations of sub-studies. *a) Study 1 shown in green (left) b) Study 2 shown in blue (right)*. The town of Atiak located to the north west of Gulu and Kitgum to the north east has been included in maps for reference.

Study 1 was performed at eight locations as group meetings, advertised beforehand by mobilisers to gather local pig producers from the nearby area, sometimes only involving one village and at times several villages. In total, at least 10 different villages were involved. The selection of villages was made by the district veterinary officer and was based on convenience but with an ambition to get data from rural areas as well as areas close to Gulu town. All the meetings were performed by one team of facilitators (see Figure 4a for GPS locations marked

in green) and the mean duration for one meeting was 2 hours and 36 minutes (ranging from 2 hours and 15 minutes to 3 hours and 21 minutes).

A total of eight group interviews were conducted with an average of 13 participants per group (range 7-17 people). In total the study involved 105 participants.

The pre-written material for Study 1 started with questions concerning the participants' pig-keeping, their knowledge of ASF in terms of clinical signs and disease spread mechanisms. Proportional piling was used for a seasonal calendar and estimation of outbreak severity. The participants were asked about which methods they used to prevent ASF in their pigs as well as methods they knew about but did not implement. In the end of the meeting the participants were asked questions related to the future, challenges in regards to ASF and projects they thought could improve pig keeping in the area. Finally the groups were asked why they had not reported outbreaks of ASF, since all of the groups had experienced outbreaks and there were no official reports at the district veterinary office.

Study 2 was performed to get an overall description of the challenges facing the other actors along the value chain, apart from the farmers, e.g. slaughterers, butchers, traders, middle men, pork joint owners and skin sellers. Five meetings were performed with a total of 48 participants (mean 9.6 participants per meeting, the number of participants ranging from 7-14 people). In this study there were five females and 43 males. The GPS locations shown in Figure 4b are marked in blue. The mean duration of a meeting was 3 hours and 10 minutes (ranging from 2 hours and 35 minutes to 3 hours and 30 minutes).

The pre-written material for Study 2 differed slightly from Study 1. The first questions related to the participants activities and ability to recognize ASF in pigs and pork. Proportional piling was used for a seasonal calendar. Additional weight was given to the disease spread mechanisms by asking both for general mechanisms as well as more specific relating to the participants activities. The final questions resembled Study 1 and focused on challenges in relation to ASF.

RESULTS

Study on farmers perceptions of ASF

Production and Housing systems

The results on types of pigs kept and their housing are summarized in Table 1. The majority belonged to the "breeder and grower" category. Some participants explained that this mixed system was considered a more stable and secure system which allowed them to profit well if they had good parent stock. A few participants in "Only breeder" explained that this gave a higher profit compared to keeping the piglets and selling them later for pork.

Table 1 *Production and housing systems, Study 1. Data from all eight groups, each participant could only belong to one activity but use several systems. Percentage is shown on group level, hence adjusting for large/small groups*

| Activity | Study 1 | Total number of participants |
|--|----------------|-------------------------------------|
| Only breeder | 2.6% | 2 |
| Only grower | 15% | 16 |
| Breeder and grower | 82% | 87 |
| Other | 0 | 0 |
| System | | |
| Free range | 88% | 96 |
| Tethered | 71% | 76 |
| Housed/fenced | 71% | 74 |
| Other | 0 | 0 |
| Total number of participants: 105 | | |

The high percentage of responders in all three housing systems agreed well with the descriptions from the farmers that they generally used many different systems according to season and various other circumstances, such as access to housing or feeds.

When asked why they preferred the different housing systems a few general governing factors could be concluded. The season (crop/ not crops in the fields) largely govern when the pigs were on free range. This system was preferred by the farmers in many cases as it allowed the pig to scavenge for feed and hence reduced both costs and labour. Some farmers also preferred a free range system as it gave the pigs opportunity to exercise and although they were considered to grow slower they get more muscle. Tethering was considered practical, but some responders also mentioned that it can give rope-related injuries. The farmers report that housed systems are more expensive both in feeds, labour and material but with benefits such as improved growth rate and reduction in thefts. Many of the groups interviewed described that housed systems were preferred during cropping season, as well as in the more populated villages or in Gulu town area and especially during ASF outbreaks. The seasonal variation in housing/management based on consensus within the group is shown in Figure 5.

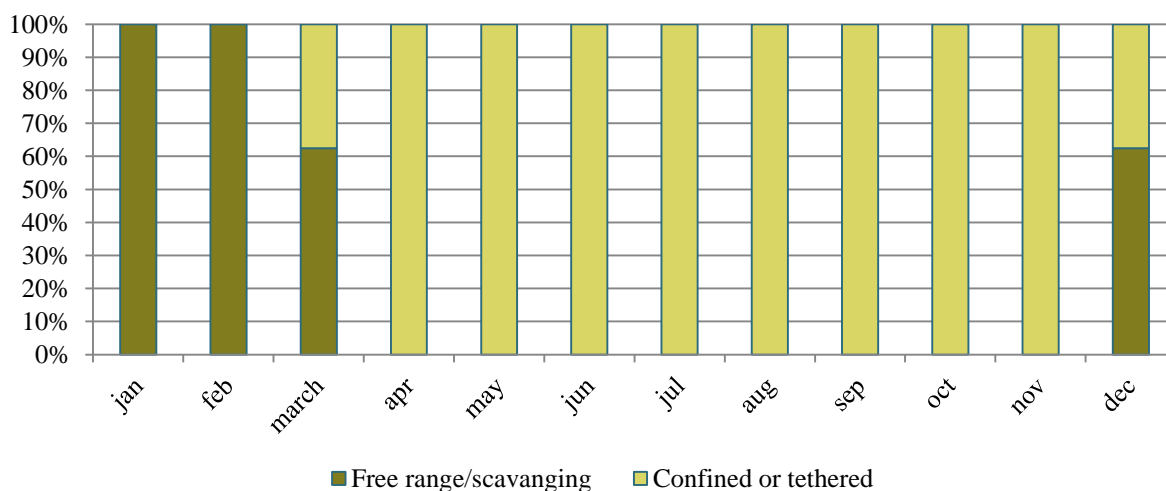


Figure 5, Study 1, Pig keeping system, distributed by month and system, derived by group consensus using the seasonal calendar. All groups give the same system but for the months of March and December where about 60% of the groups describe use of a free range system while the rest use confinement or tethering.

Awareness and knowledge of clinical signs of ASF

The participants mentioned several names for ASF, however, all eight groups mentioned “Orere”. The clinical signs of ASF most commonly mentioned were a pig suffering from inappetence, lethargy, cough with a frothy salivation and red skin/ears. Also, three of the eight groups mentioned abortions in pregnant sows. No clinical signs that are inconsistent with what is known of ASF were mentioned, although the vaguer “urine is yellow” was mentioned by two groups from the same sub county.

At some meetings participants clarified that some of the clinical signs were very vague and it was the overall picture that determines whether it is ASF. When asked if they were certain that the clinical signs described were a result of the pig suffering from ASF 92% answered YES. When asked to mention other plausible causes to the signs five of the eight groups suggested poor husbandry, poor feeds or bad housing. One group also mentioned tape worms.

There was a general agreement that ASF affects both young and adult pigs and all breeds, local as well as “improved”. Two participants, in different groups, explained they had not seen sick piglets themselves and therefore were uncertain.

Awareness of disease spreading mechanisms

Each group interviewed gave several suggestions of disease spreading mechanisms and the results are shown in Figure 6. Some groups noted that transmission was high in December, which was considered a “windy” month thus emphasizing the belief that ASF was borne by wind over long distances. The “Consumption of human faeces” can be considered an incorrect spread mechanism as there are no reports of transmission this way. This was probably a misconception from previous projects aiming to emphasize the importance of latrines in the epidemiology of other diseases, for example cysticercosis.

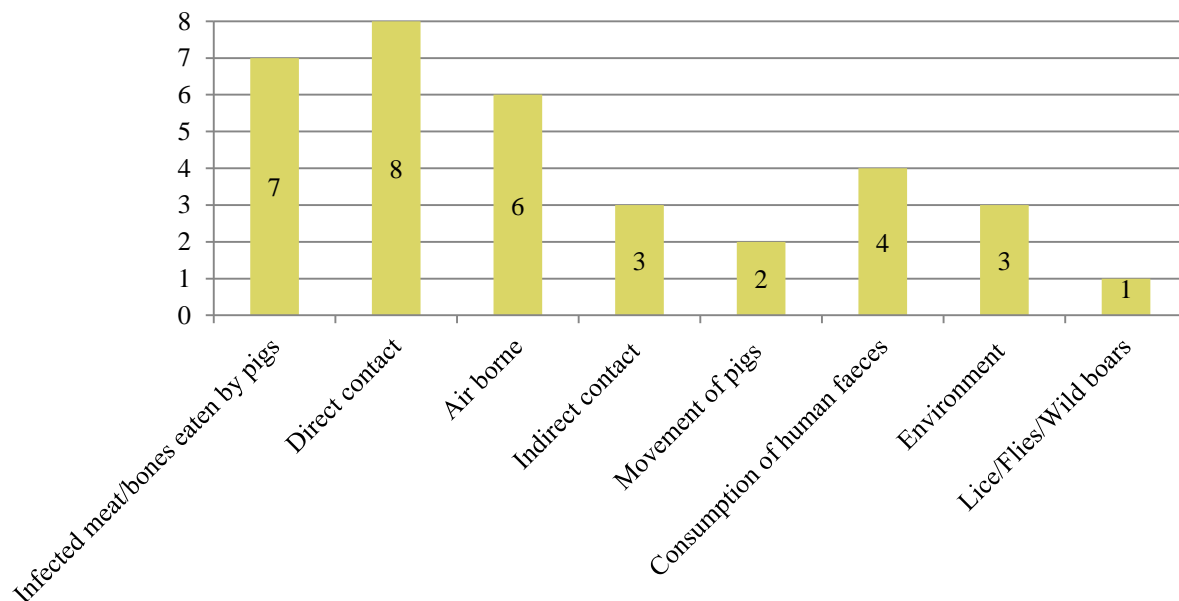


Figure 6, Study 1, Disease spread mechanisms mentioned by the groups. All eight groups mentioned direct contact as a mechanism while only two of the groups mentioned movement of pigs.

Recent outbreaks and their impact

The notes connecting to the most recent outbreaks, shown in Table 2, gave some comments of outbreaks starting in neighboring villages and then spreading; hence many farmers were able to confine their pigs before the disease spread to their village.

Table 2, Study 1, Recent outbreaks and their severity estimated by proportional piling. The figures represent all eight groups estimations and are derived from a group consensus within each group

| | Most recent outbreak | Second most recent outbreak |
|---------------------------|----------------------|-----------------------------|
| Farmers affected | 53% | 68% |
| Farmers unaffected | 47% | 32% |
| Pigs dead | 57 % | 74% |
| Pigs recovered | 1.4% | 1.8% |
| Pigs healthy | 41% | 25% |

Figure 7 summarizes the described consequences of outbreaks. At times the facilitators probed specifically, for example “Unable to pay school fees”, to get the group to mention more specific items than “Loss of income”. Each group mentioned several consequences. A participant acknowledged that there could be conflicts after an outbreak because people in the community started blaming individuals for possibly causing the outbreak.

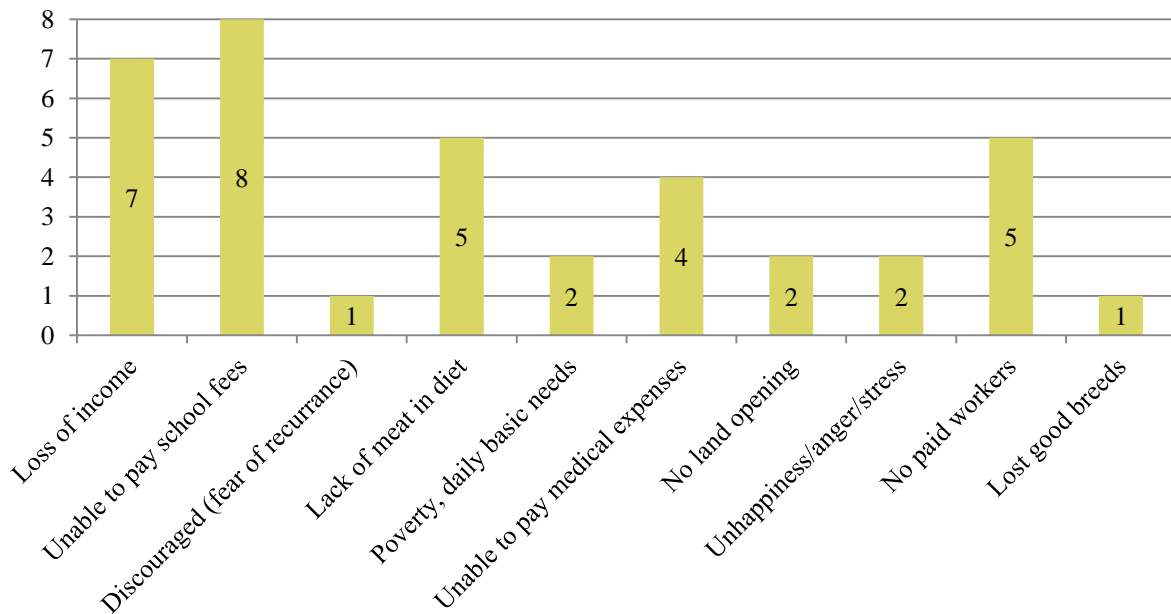


Figure 7, Study 1, Consequences of outbreaks listed by the participants and grouped by the author. All eight groups mentioned unable to buy school fees as a consequence.

Seasonal patterns

Figure 8 displays some of the seasonal changes in relation to ASF. Peaks in slaughter and sale concur with major holidays (Easter – April/May, Ascension Day- August, Independence Day - October and Christmas/New Year’s Eve – December/January) as well as when school fees are due. Furthermore some groups explained that they tried to anticipate outbreaks and sell/slaughter pigs before.

Observations of wild pigs in the communities seemed to vary and the participants were more likely to note wild pigs during cropping season as they uproot cassava and eat maize, ground nuts or mango. One group reported that the wild pigs often were seen during November-December when the bush is burned down.

The pattern of “Occurrence of ASF” was explained by the participants; some said that December is a windy month and claimed ASF spreads by wind. The heat of the dry period was also brought up as a contributing factor to spread of ASF and also the ability of rain to clear up the outbreaks. Many participants attributed the spread of ASF to the free range system and referred to the seasonal concurrence of outbreaks and free range.

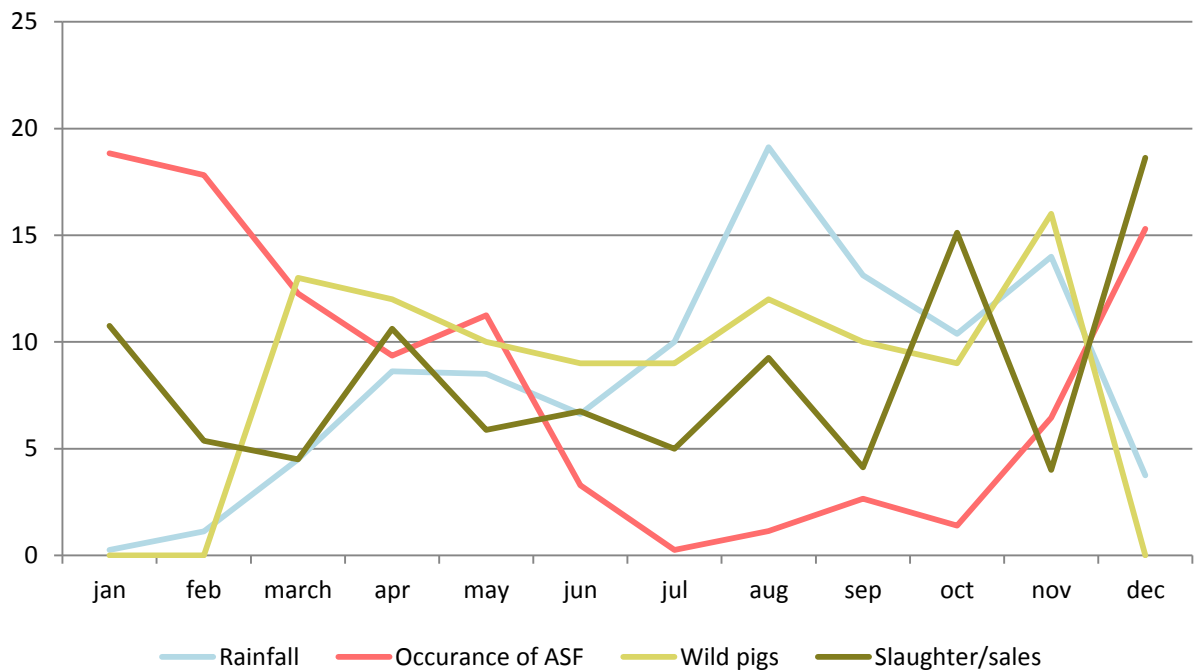


Figure 8, Study 1, Seasonal patterns derived by use of the seasonal calendar and proportional piling. The results from all eight groups have been included and the numbers represent a percentage spread out over one year. For example: the participants estimated, using 100 beans, that about 19% of the rainfall occurred in august.

Farmers knowledge about control/biosecurity measures and willingness to adopt them

The most commonly adopted control measure during outbreaks was isolation or tethering of pigs near the house (Figure 9). The participants explained that it was also considered beneficial to isolate the pigs far from the village and hence separating their own pigs from potential infection from neighbor’s pigs. Another factor the participants considered important was to isolate the pigs in a cooler place for example in a valley or near a stream as heat was considered a risk factor for ASF. This related to comments in other questions where good pig keeping in many participants’ definition included providing the pigs with a place to wallow and cool themselves.

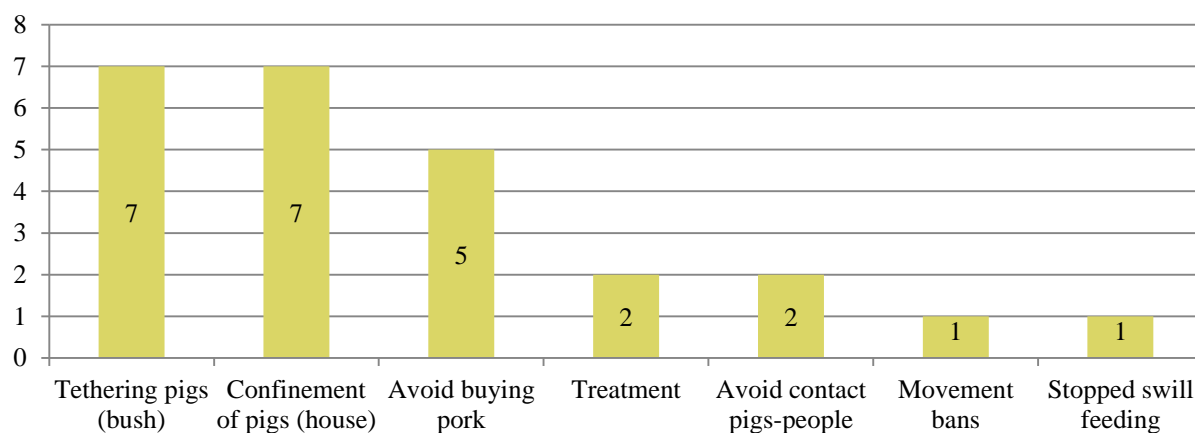


Figure 9, Study 1, Measures used by farmers during outbreaks. For example, seven of the eight groups explained that they used tethering of pigs as a preventive measure. The measures were used by one participant, several or given as group consensus.

Sixty-six percent of the participants said they knew other measures of disease prevention than those currently adopted. These other measures are summarized in Figure 10.

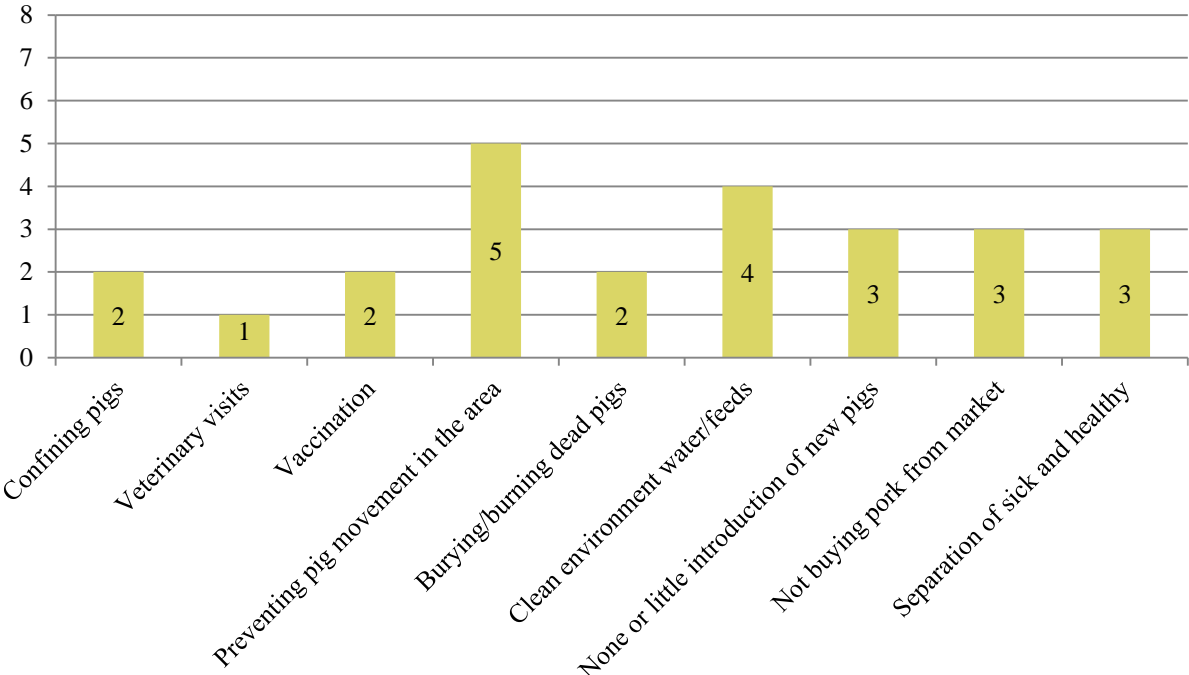


Figure 10, Study 1, Other preventive measures that the participants themselves had not used to protect their pigs against ASF. The measures were suggested by one participants, several or given as group consensus.

Many of the participants (54%) knew farmers who had been particularly successful in their pig keeping. As an example, a model farmer who hadn't had ASF in his pigs for 14 years was mentioned. The participants identified the key to the various model farmers' success as multifactorial. Factors such as access to good housing, feeds, regular veterinary visits, general cleanliness and reduced access for visitors was considered important. Also, an interest in pig keeping and affording workers were mentioned to further enhance the image of a person being a successful pig keeper.



Figure 11, a-c, a and b from one model farmer (showing a runaway pig and the housing built with local materials) and c from another one (showing fenced area in the background and tincture of benzyl penicillin, flagyl and a local detergent which he treats all pigs with per os) (Personal photo).

One model farmer (Figure 11 a and b) had recently built housing for his own pigs as well as his sons. He explained that he was hoping to keep several sows and sell the piglets. His ambition was to keep his own boar. Yet another model farmer (Figure 11c) showed his pig housing and homemade remedy of benzyl penicillin, flagyl and a local detergent. This tincture was given to his own as well as neighboring free ranging pigs per os when suspecting an approaching outbreak.

Challenges facing farmers in relation to ASF

The majority of groups wanted projects providing housing or feeds, vaccination campaigns, and training in the fields of ASF as well as good pig husbandry. The challenges described are summarized in Figure 12 and there are evident connections between the categories. For example an answer may be given as “Poverty” but in the explanation the participants express the lack of funds and knowledge for building proper housing or feeding pigs – hence it is connected to “Uncontrolled movement” and the free range system as well as “Poor husbandry” where lack of feeds are categorized.

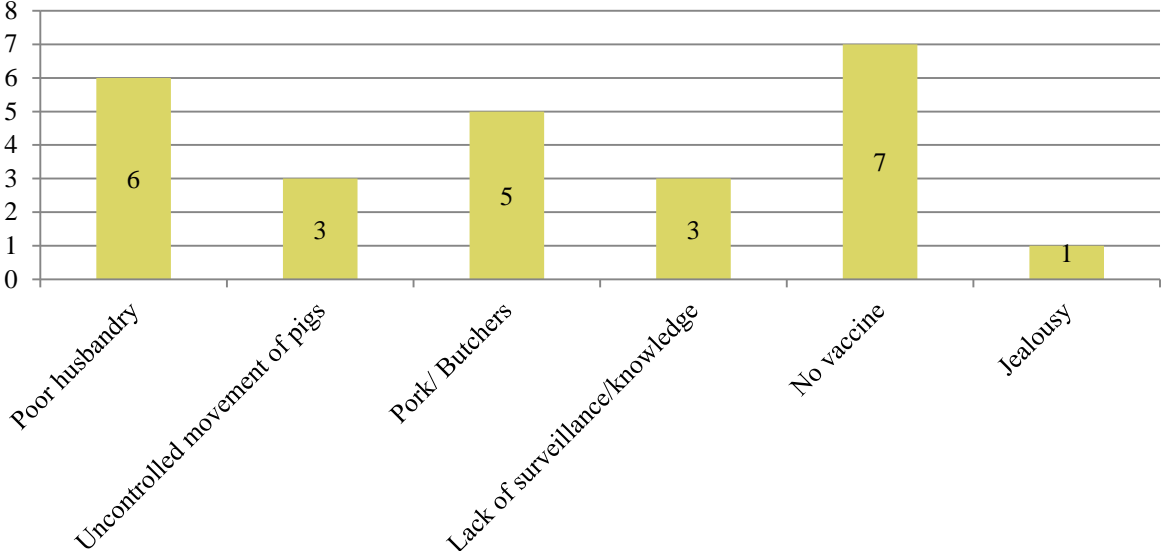


Figure 12, Study 1, Challenges faced by the participants in relation to ASF in their pig keeping. Seven of the eight groups gave “No vaccine” as a challenge.

Some participants expressed challenges like “weak local leaders and laws” as they wanted stricter regulations which everyone must adhere to. They describe that it was the poor husbandry and free range system in combination with the farmers living so close to one another that caused the problems. The “No vaccine” category involved both participants expressing that there should be a vaccine and calling for more research and participants who think there was a vaccine and thus wanted it to be distributed.

The “Lack of surveillance/knowledge” category included many valuable opinions calling for veterinary attention to the areas affected by ASF even when an outbreak was not occurring. The participants suggested organizing farmers into groups to enable easier spread of information and knowledge.

Finally the participants were asked why they had not reported outbreaks of ASF to the DVO. Three of the groups claimed that they had reported to the sub county office, which then in turn should have reported to the DVO. Two groups claimed that they didn't know that they should report. In the three remaining groups some of the participants knew that they should have reported but gave different reasons as not to have reported. One of these three said that they didn't have good relations or a telephone number to the DVO making reporting difficult. Another of the groups said that they feared costs of bringing veterinarians into the area. The final group said that pigs were not highly valued and that they reported other livestock diseases, mainly in cattle, which were considered more valuable.

Study on the Value chain

Activities in pig value chain

The participants of the study represented many of the areas of the value chain and most of them were involved in several activities, shown in Table 3.

Table 3, *Study 2, Showing activities of the actors in the study of the value chain. Each participant was allowed to sign up for several activities*

| Activity | Percent of participants (in groups) | Number of participants |
|----------------------------------|--|-------------------------------|
| Middle man | 48% | 23 |
| Slaughterer | 65% | 30 |
| Butcher/trader | 60% | 28 |
| Pork kiosk owner | 62% | 28 |
| Pork joint | 53% | 25 |
| Own/breed/grow pigs | 53% | 26 |
| Other | 15% (Skin sellers) | 6 |
| Total number of participants: 48 | | |

Awareness and knowledge of the clinical signs of ASF

Like in Study 1 the participants were familiar with the signs of ASF in live pigs. Furthermore they were asked about the signs in meat and gave a general description of the meat being of poor quality and spoiling quickly. It was also described to contain blood and smell bad even after proper cooking. Two groups described changes to organs like liver, spleen and kidney saying they were blackish or dark red and that the lungs were congested. All participants responded that they were certain of the diagnosis ASF when they saw the clinical signs in live pigs and all, except for one person who hadn't seen meat with pathological signs indicating ASF, were certain of the signs in meat.

Half of the participants involved in selling/buying live pigs responded that they had sold/bought live pigs with the clinical signs of ASF and about 80% of the participants involved in selling meat responded that they had sold meat with signs of ASF. The facilitators probed further to get a sense of what the participants not selling/buying live pigs did when they came across the disease in their own stock. The answers were usually along the lines of; I sell my pigs/slaughter them before they get sick, or that they had had ASF among their own. One group reported never selling sick pigs, they slaughter them instead.

Human health risks

About half of the participants considered ASF infected pork to be associated with human health risks. Some of these participants acknowledged listening to the radio talk show given by the DVO where they had learnt that there were no specific risks from ASF to humans but that they cannot be sure that the pig died of ASF and thus they should be careful. Seventy-nine percent of the participants knew other pig diseases associated with human health risks if humans consumed the pork.

Seasonal pattern

Like in Study 1 the participants were asked to relate events to the months of the year in a seasonal calendar. The results are shown in Figure 13 and are notably similar to Figure 8. The questions of presence of wild suids and of pig keeping system were removed.

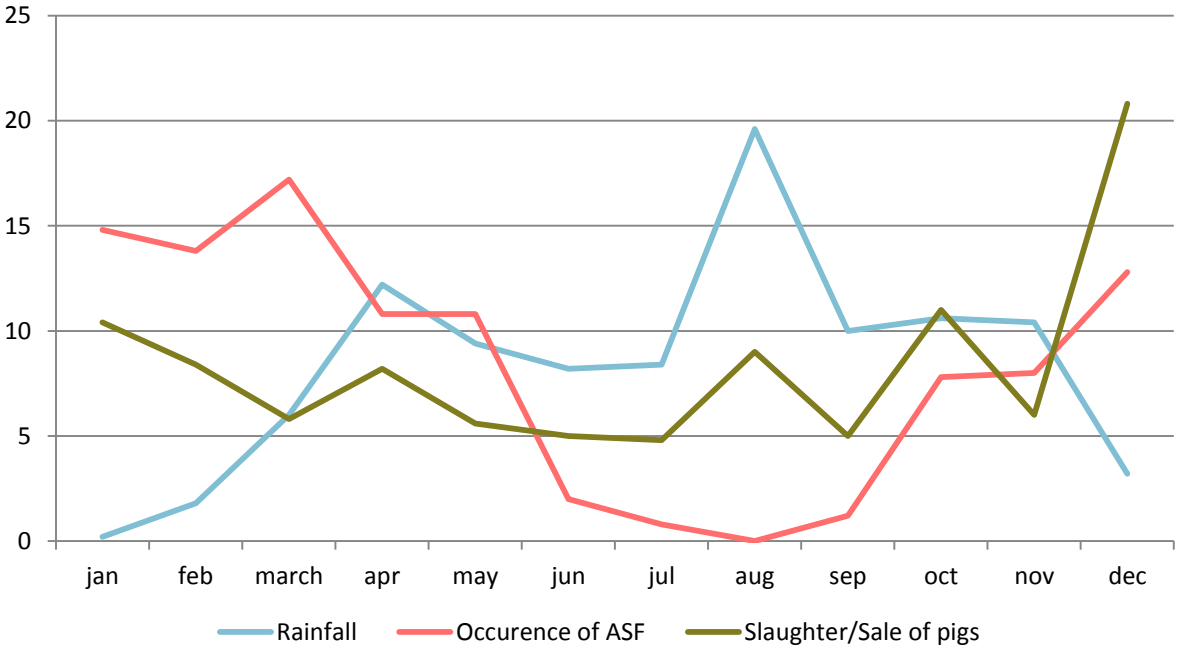


Figure 13, Study 2, Seasonal patterns derived by use of the seasonal calendar and proportional piling. The figure shows the results from all five groups and the numbers are derived by group consensus. A hundred beans are distributed over the months of the year and hence give a percentage. For example, over 20% of the estimated slaughter/sale of pigs in a year occurs in December.

Recent outbreaks and their impacts

The participants reported consequences of ASF outbreak such as loss of income and customers, mainly because of fear of spreading the disease or because the pork tasted bad. They were also troubled as the scarcity of pork following an outbreak made it impossible to

keep a sustainable business. The movement bans and quarantines were mentioned as blessings and curses as it made business more difficult and yet many of the participants of this study realized the necessity.

In contrast to Study 1 these participants also reported positive outcomes of outbreaks of ASF. They mentioned the opportunity for merchants to buy pigs cheaply from farmers, either because the pigs were sick or the farmers were frightened of consequences of ASF. Many participants agreed that the fortune made from an outbreak was short lived as there were few pigs left after outbreaks, although a few described that this also was an opportunity because if some of their own pigs survived, they were suddenly very valuable. It was difficult to summarize a general picture from the descriptions as every participant had circumstances affecting whether an outbreak was a financial disaster or opportunity.

Only one participant had left the business after an outbreak due to lack of capital to restart although many agreed that the financial situation could be tough and alternative ways of generating income was considered a necessity.

Disease spreading mechanisms

Similarly to Study 1 the participants in this study described general disease spreading mechanisms and mentioned many of the same examples. The knowledge of spread through infected pork was mentioned by all groups. Some also mentioned spread by wind to new areas and that human faeces, if the person has eaten infected meat, could spread the disease.

Specific risk activities associated with spread of ASF were probed for. Several participants mentioned selling infected pork and movement of infected pigs as well as not washing equipment or proper disposal of offals and blood. Some very specific activities were mentioned e.g. selling cassava peels from the pork joint to farmers (the pork joints served pork with cassava and made a small profit of selling the peels from the cassava to farmers wanting feed for their pigs, the equipment in the kitchen was not cleaned between handling pork and cassava). One group mentioned the risk of people knowingly infecting other people's pigs with ASF.

The participants were asked whether they think they were responsible in trying to control ASF and 86% answered YES, 8.2% answer NO while 5.8% had no opinion. The facilitators probed further and asked why so many of the participants still partook in risk activities i. e. selling pigs or meat with signs of disease. The participants clarified that the veterinarians were rarely available during an outbreak to confirm the diagnosis and they considered themselves to be unable to incur such losses. The participants describing themselves to be responsible and generally talked about a collective responsibility while the few participants admitting no responsibility were focused on their individual economic gain and the hopelessness of the situation as a whole.

Control measures

Like in Study 1, the members of the pork value chain were centered on confining pigs during outbreaks and some mentioned isolation in the bush. They also claimed to teach buyers how to handle pork properly to reduce risk of spreading infection further this way and also

communicated to farmers when they suspected their pigs to be sick. They also reported being more thorough with cleaning equipment used for slaughter, leaving the equipment at the slaughter place (not taking it home to be used in other cooking) and some mentioned burying offals and remains.

A large proportion (89%) of the participants was aware of more preventive measures than which they themselves adopted. Several suggestions were made, most similar to Study 1: confinement of pigs, reduction of consumption of pork, restricted movement and quarantine, burying or burning of dead pigs along with proper waste disposal.

Challenges facing the actors in the value chain

When asked about specific challenges many answers resembled Study 1 but some were more specific to the activities of these particular participants. One group mentioned laziness and greed (expressed as “over demand of money”). They described that the lack of enforcement of movement restrictions caused some to take high risks in attempts to profit from the outbreaks.

Three of the five groups named model farmers and the reasons for their success were listed largely like in the farmers’ studies; access to good housing, feeds, and husbandry methods as well as an interest in the enterprise.

DISCUSSION

General overview of smallholder pig keeping and the pork value chain in Gulu, Uganda

The participants showed diversity in their pig keeping and emphasized the necessity of having income from several sources. The use of the free range system of keeping pigs seemed widespread and was generally attributed to lack of funds or land for supplying feeds. This was connected to lack of funds, material or knowledge to build proper pig housing. In the question of whether the participants knew a model farmer and what qualities or resources that person had; the participants provided almost a definition of “good pig keeping”. Generally they mentioned proper pig housing, access to feeds and commitment to pig keeping. This was further reflected in the final questions when the participants requested more resources and training.

A potential problem facing the smallholder pig farmers is the expressed low status of pig keeping. According to the participants and some sources the cultural traditions in the area value keeping cattle much higher than pigs as wealth is traditionally measured in herds of cattle (Van Acker, 2004, Branch, 2013). This may prevent committing to pig production and the preventive measures necessary to combat diseases like ASF. When discussed with the local team of facilitators and veterinarians this was expressed as an underlying problem in pig health.

Also the other actors in the value chain targeted in study 2, faced similar problems as the farmers. They also diversified their business in order to spread the risks. On the final day two meetings were held and it became clear that the first question of what category each person belonged to was difficult to answer because it was entirely dependent on time frame and definitions. It was therefore difficult to draw more specific conclusions other than that the

study involved different categories of the value chain. The members of the pork value chain also faced problems of ASF due to lack of resources and training.

Level of knowledge of ASF among the participants

The participants in this study showed a general understanding of ASF. This applied in particular to the ability to recognize clinical signs of ASF and knowledge of many of the routes of transmission. There was also agreement on the naming of ASF as “Orere” although other names occurred.

It was clear from answers that the risk of an outbreak influenced some participants’ pig keeping and caused them to sell or slaughter to reduce their own loss if an outbreak occurred. It was also clear that the participants themselves recognized the free range system as a potential risk of acquiring ASF in their pigs and it seemed general knowledge that confinement was a good preventive measure.

Certain misconceptions were cause of concern as they may prevent effective disease prevention. Many participants brought up ASF being airborne over long distances “Spreading from diseased area to disease-free area”. There is no evidence of this in current scientific literature and ASF is considered air borne only on short distances (Wilkinson et al., 1977, de Carvalho Ferreira et al., 2013). This belief may cause problems in compliance with movement bans. Furthermore the general idea of knowing when the outbreaks will occur and having time to implement precautions makes it more difficult to have certain safety measures implemented even when an area is currently unaffected. For example it might be difficult to motivate farmers to keep their pigs confined at all times or to get the butchers to have separate equipment for slaughter and domestic use.

It may also be said that belief that a vaccine will come and solve the problems with ASF might prevent the farmers from adapting other methods. However this project can conclude a great willingness to change and develop a better system of keeping pigs. The ability of many participants to recognize the model farmers’ resources for success is a hopeful sign that given time, resources and the right conditions, the participants will be able to use necessary tools to at least limit the spread of ASF. Several sources indicate benefits of farmer based control rather than control measures imposed on the farmers by authorities (Edelsten and Chinombo, 1995, Costard et al., 2009, Penrith et al., 2013).

ASF disease control is complicated by the difficulty of spreading information efficiently to the target population and getting a high level of compliance. The question given to the participants in Study 1 of whether they knew that they should report ASF to the DVO shows the diversity of this problem. This study cannot draw conclusion as to what the most common reason to not reporting is, but it gives a hint of the many different reasons. If anything it shows problems not only in the flow of information to and from the farmers but also from the sub county level.

The participants were aware of the human health risks in eating pork of diseased pigs. However, there are indications of practices of eating meat from animals that died from disease anyway, due to necessity (Edelsten and Chinombo, 1995, Tejler, 2012). The difference

between knowledge about what should be done and actual practice may influence the answers given to these questions. In short, the participants may have given us answers they knew we wanted, in this case “Yes, eating meat from diseased animals may be harmful” while the perhaps more truthful to their actual practice “but I do it anyway” is not picked up by this study. This is also in the nature of the way the question is given.

Assessing impact of ASF in smallholder pig production

This study showed that ASF was widely spread in the area and had implications for farmers and other actors in the value chain. There appears to exist some model farmers able to prevent introduction of ASF to their own herd using preventive measures like confinement.

This project has also demonstrated social implications of ASF where the suspicion of deliberate spread of ASF as well as placing guilt on individuals after outbreak, burdens the communities. This is furthered by the economic implications for the individual; as described in the literature ASF can contribute to poverty and therefore have a profound negative impact on people’s everyday lives (Nana-Nukechap and Gibbs, 1985, Edelsten and Chinombo, 1995, Costard et al., 2009). With the presence of ASF, keeping pigs becomes a high risk business.

In a larger perspective the economic implications of ASF for society must be considered; the instability of the pig keeping sector creates uncertainty that is devastating to a society so reliant on individual small scale businesses and entrepreneurship. The Gulu district can be described as a society in the process of rebuilding itself. Study 2 described how the market was greatly destabilized by outbreaks of ASF creating both opportunities and great losses. The opportunities in this case constituted by high risk purchases of cheap pigs and sale of pork or keeping healthy piglets to sell when many farmers need to restock. The potential losses can generally be described as loss of pigs and pork to the disease. It gets difficult to make small scale pig farming sustainable and most often other sources of income must be combined with the pig/pork business.

As long as movement bans and quarantines are not fully enforced, individuals will have an opportunity to profit by taking risks although this creates an unfair advantage to high risk takers as compared to the ones attempting to follow the regulations in place. In the long term, it seems to be clear to most members of the value chain that the situation is unbearable and joint actions must be taken to prevent spread of ASF. There will probably be difficulties in relation to the lack of collaboration between competitors. Some participants stand out with their sensible cooperation, for example butchers and traders forbidding sale of pork of unknown origin at their trading center.

General strengths and limitations of the studies and the use of Participatory epidemiology

Participatory epidemiology methods were chosen for this study because of the strengths in gathering data based on a group discussion rather than from individuals. A great strength is also the possibility to probe answers and cross check information given earlier in the meeting. Participatory epidemiology is also suitable for gathering data from areas with a generally low level of education (Catley et al., 2012).

Some sources of error, for example in relation to gender or rural versus non-rural, could have been reduced by including a larger study size in both Study 1 and 2. Due to lack of time and resources this was not possible. The time needed for each meeting tired the participants, the facilitator and the note taker giving room for errors. A potential risk is that the facilitator and/or the note taker neglected to probe or write down some of the answers given due to lack of time.

In a few groups it was evident that when one or a few of the more influential or loud spoken individuals raised their hands, so would the rest of the group follow. Furthermore, it was difficult to say for certain that all the information listed were considered important by all members of a group or if one or a few dominant speakers had too much influence. Another general issue was that women tend to be quieter when in mixed groups compared to all-female groups. Unfortunately no all- female groups were included in this study.

There is a possibility of errors in the more sensitive material for example when asking the participants why they haven't reported the disease outbreaks. Since the questions were asked by the local veterinary staff there was concern that the participants would lie to protect themselves from repercussions. Also, in the study on the value chain the question of selling live pigs or meat with signs of ASF could pose a problem to the individuals' reputation. However, these sensitive questions were identified by the team beforehand and asked with great care and the answers probed.

Despite these limitations, PE was found to be a useful tool in this study and the quality of data is of high value, if interpreted with consideration to the sources of error.

CONCLUSION

In short, pig keeping and disease control is challenged by lack of knowledge and resources. However, this study showed that the participants had a generally good understanding of ASF and knew several general as well as specific spread mechanisms and possible preventive measures. It was clear that the preventive measures implemented by the participants themselves were dependent on knowing whether there was an ongoing outbreak. The participants showed great willingness to change current pig housing and management systems to prevent disease outbreaks.

ACKNOWLEDGMENTS

Great thanks to my supervisors: Karl Ståhl, Erika Chenais, Charles Masembe and Sofia Boqvist. Without them this project wouldn't have been possible. It is evident that for planning, practical work as well as writing a report; supervisors are needed. Also, without the personal relations connecting Makerere University with the Swedish University of Agricultural Sciences – the experience wouldn't have been the same.

To everyone in the project in the field: Tony Aliro, Peter Okweng, Simon Peter Otema, Solomon Alier, Bruce Wokorach, Sam Wokos, The car drivers Dennis and Julius. I never felt lonely and I'm privileged to have had so many different persons to ask questions.

To my travel companions: Peter Svanström and Johan Thorell.

To my examiner Susanna Sternberg Lewerin for great comments and input.

Finally thanks to Sida for the MFS-scholarship as well as the training before the project.

REFERENCES

- Anderson, E. C., Hutchings, G. H., Mukarati, N. & Wilkinson, P. J. (1998). African swine fever virus infection of the bushpig (*Potamochoerus porcus*) and its significance in the epidemiology of the disease. *Vet Microbiol*, vol 62, ss 1-15.
- The World Bank. (2009). Last update 2013-04-16. Poverty headcount ratio at national poverty line (% of population) Available: <http://data.worldbank.org/indicator/SI.POV.NAHC/countries/UG?display=graph> [Accessed 2013-11-18 2013].
- Blome, S., Gabriel, C. & Beer, M. (2013). Pathogenesis of African swine fever in domestic pigs and European wild boar. *Virus Res*, vol 173, ss 122-30.
- Branch, A. (2013). Gulu in War ... and Peace? The Town as Camp in Northern Uganda. *Urban Studies*, vol 50, ss 3152-3167.
- Catley, A., Alders, R. G. & Wood, J. L. (2012). Participatory epidemiology: approaches, methods, experiences. *Vet J*, vol 191, ss 151-60.
- Costard, S., Mur, L., Lubroth, J., Sanchez-Vizcaino, J. M. & Pfeiffer, D. U. (2013). Epidemiology of African swine fever virus. *Virus Res*, vol 173, ss 191-7.
- Costard, S., Wieland, B., de Glanville, W., Jori, F., Rowlands, R., Vosloo, W., Roger, F., Pfeiffer, D. U. & Dixon, L. K. 2009. African swine fever: how can global spread be prevented? *Philos Trans R Soc Lond B Biol Sci*, 364, 2683-96.
- De Carvalho Ferreira, H. C., Weesendorp, E., Quak, S., Stegeman, J. A. & Loeffen, W. L. (2013). Quantification of airborne African swine fever virus after experimental infection. *Vet Microbiol*, vol 165, ss 243-51.
- Edelsten, R. M. & Chinombo, D. O. (1995). An outbreak of African swine fever in the southern region of Malawi. *Rev Sci Tech*, vol 14, ss 655-66.
- Kidoido, M. M. Korir, L. (2013). The Uganda Pig Value Chain Impact Pathways Narrative. Published by ILRI 2013-05-31 Available <http://hdl.handle.net/10568/27946> [Accessed 2013-12-12].
- Muhanguzi, D. L., V.; Mwiine, F. N. (2012). Factors that influence pig production in Central Uganda - Case study of Nangabo Sub-County, Wakiso district. *Vet. World*, 2012,, Vol.5(6), ss 346-351
- Nana-Nukechap, M. F. & Gibbs, E. P. 1985. Socioeconomic effects of African swine fever in Cameroon. *Trop Anim Health Prod*, 17, 183-4.
- Penrith, M. L., Thomson, G. R., Bastos, A. D., Phiri, O. C., Lubisi, B. A., Du Plessis, E. C., Macome, F., Pinto, F., Botha, B. & Esterhuysen, J. (2004). An investigation into natural resistance to African swine fever in domestic pigs from an endemic area in southern Africa. *Rev Sci Tech*, vol 23, ss 965-77.
- Penrith, M. L. & Vosloo, W. (2009). Review of African swine fever: transmission, spread and control. *J S Afr Vet Assoc*, vol 80, ss 58-62.

- Penrith, M. L., Vosloo, W., Jori, F. & Bastos, A. D. (2013). African swine fever virus eradication in Africa. *Virus Res*, vol 173, ss 228-46.
- Roeder, P., Mariner, J. & Kock, R. (2013). Rinderpest: the veterinary perspective on eradication. *Philos Trans R Soc Lond B Biol Sci*, vol 368, 20120139.
- Rowlands, R. J., Michaud, V., Heath, L., Hutchings, G., Oura, C., Vosloo, W., Dwarka, R., Onashvili, T., Albina, E. & Dixon, L. K. (2008). African swine fever virus isolate, Georgia, 2007. *Emerg Infect Dis*, 14, 1870-4.
- Tejler, E. (2012). *Outbreaks of African swine fever in domestic pigs in Gulu district, Uganda*. Swedish University of Agricultural Sciences. ISSN 1652-8697. Online publication of this work: <http://epsilon.slu.se>.
- UBOS. (2007). Ugandan Bureau of National Statistics. *National Labour Market Indicators* [Online]. Last update 2009-02-06 Available: <http://www.ubos.org/index.php?st=pagerelations2&id=43&p=related%20pages%202:Labour%2026%20Employment> [Accessed 2013-11-18]
- UBOS. (2010). Ugandan Bureau of National Statistics. *Agriculture Livestock 2008-2010*. Last update 2011-07-03 Available: http://www.ubos.org/onlinefiles/uploads/ubos/pdf%20documents/Agric_T1_2011.pdf [Accessed 2013-12-12]
- UBOS. (2012). Ugandan Bureau of National Statistics. Last update 2013-12-30 Available: <http://www.ubos.org> [Accessed 2014-01-07].
- Van Acker, F. (2004). Uganda and the Lord's resistance army: The new order no one ordered. *African Affairs*, vol 103/142, ss 335-357.
- Wilkinson, P. J., Donaldson, A. I., Grieg, A. & Bruce, W. (1977). Transmission studies with African swine fever virus. Infections of pigs by airborne virus. *J Comp Pathol*, vol 87, ss 487-95.

APPENDIX 1

ILRI-SLU Study on Farmers perception and experience with ASF outbreaks (villages without reported outbreaks)

Date_____ Starting time_____ Finish time_____

Name of village_____ Subcounty_____ Subgroup:_____

Total number of participants in the group:_____

Facilitator_____

Note-taker_____

Objective: The objective is to compare villages without reported outbreaks of ASF with villages with reported outbreaks and assess farmers' perceptions on the ASF outbreaks, experiences, coping strategies and willingness to adopt biosecurity measures as a preventive strategy.

Methodology: Farmer group discussions using PRA tools

Material: Flip chart, digital camera, tape recorder, counters (beans or stones), colored markers, manila paper, masking tape, big sheet of paper, pencil, rulers.

Introduction by the facilitator

1. Welcome the participants and have one of them open with a word of prayer.
2. Introduce yourself and the team.
3. Have them introduce themselves – can be done through a short role play.
4. Setting the scene: Introduce the project, highlighting the objectives and the important role of the participants in meeting the objectives.
5. Take them through the planned process of the farmer group discussions.
6. Ask for consent to use tape recorders and cameras (if any).
7. Set the ground rules together with them.

A. Production system types

Purpose: This activity aims at understanding the pig production components that the pig producers in the group are engaged in.

Tool: Hand count

Facilitator: Ask the different types that they are engaged in and do a hand count to assess the numbers of producers engaged in each.

Data capture:

| Type of activity | Hand-count |
|---|------------|
| Only breeder (sell piglets) | |
| Only grower (buy piglets, and sell for slaughter) | |
| Breeder & grower | |
| Other: | |

B. Housing systems

Purpose: Attempt to get a sense of the relative importance of housing types in the group

Tool: Hand count

Facilitator: Enquire on how the farmers keep their pigs, and why do they prefer this type. Probe to find out if any certain housing is used especially for adult/young.

Data capture:

| Type of housing | Hand count | Remarks |
|--------------------------|------------|---------|
| Free- ranging/scavenging | | |
| Tethered | | |

| | | |
|------------------|--|--|
| Housed/fenced in | | |
| Other: | | |

C/1. Predictability of the disease (specific seasons, periods, etc)

Seasonal calendar

Purpose: To understand the seasonality of factors that affect the occurrence of ASF

Tool: Seasonal calendar and scoring method

Facilitator: Explain that we'd like to talk about occurrence of ASF throughout the year and create a calendar that represents the past two years. Note where the events fall on the calendar. Be familiar with local terminology and descriptions of seasons and how these relate to the months of the year (from key informants). The seasonality of different events or activities of interest is then demonstrated by indicating the timing of occurrence or scoring occurrence in relation to the seasons using 100 counters for each factor.

For confinement types by season just note which confinement type is used during which season (no piling).

For each factor in the calendar – please probe WHY piles are put at that place and remark in the box on the following page.

Data capture:

| Event | Months | | | | | | | | | | | |
|--|--------|---|---|---|---|---|---|---|---|---|---|---|
| | J | F | M | A | M | J | J | A | S | O | N | D |
| Local name of season | | | | | | | | | | | | |
| Rainfall | | | | | | | | | | | | |
| Occurrence of ASF/diseases killing pigs | | | | | | | | | | | | |
| Presence of wild pigs in the community | | | | | | | | | | | | |
| Presence of vectors (ticks, flies, rodent, etc...) | | | | | | | | | | | | |
| Pork production=slaughter or sales | | | | | | | | | | | | |

| | | | | | | | | | | | | | |
|--------------------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Pig confinement type by season | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |

C/2. Perception of farmers of the clinical signs of ASF

Purpose: To find out about the groups' perception of the symptoms of ASF

Tool: Listing and hand count

Facilitator: Ask the questions mentioned in the table. List all perceptions that are mentioned, even if any group members dominate and have different opinions. Note if answers are group census or individual opinions in the remarks-column.

If none in the group knows the disease: Describe the symptoms and ask if they have seen it. Write a note if you need to describe the symptoms: ex high mortality among pigs, shivering, red ears etc. If they still don't recognise ASF – go to C/3(b)

Data capture:

| Characteristics | ASF | | | Remark |
|---|-------|-----|----|--------|
| Local name | | | | |
| What is the main signs of the disease in the pigs? (listing) | | | | |
| When you see the symptoms you described are you sure that it is ASF? (hand count) | Yes | No | | |
| | | | | |
| If no, what other disease could it be? (listing) | | | | |
| What kind of pig is affected (adult/young) (hand count) | | Yes | No | |
| | Adult | | | |
| | Young | | | |

| | | | | |
|--|----------|-----|----|--|
| | | | | |
| Which type of breeds are affected (hand count) | | Yes | No | |
| | Local | | | |
| | Improved | | | |
| | Both | | | |

C/3. Recent outbreaks and their impact?

Purpose: To assess the impact of the recent outbreaks of ASF

Tool: Listing, proportional piling and hand count

Facilitator: Ask the farmers about the recent outbreak they witnessed; how many of them were affected or not affected, and how many pigs were sick and died, were sick but recovered, or not affected at all. Scores will be made by proportional piling separately for farmer/pigs and for each outbreak.

Additionally, probe on what SPECIFIC consequences the loss of pigs had for the family (i.e could not marry away daughter, kids could not go to school), if the farmer are back in pig production and if not, why.

Data capture:

It's not certain that there have been outbreaks recently or ever: probe to see when the last outbreak was and ask if they remember enough to describe it. If not – go to C/3(b)

| Last outbreaks in the area | Date (month/year) | Farmer score (proportional piling) | | Pig score (proportional piling) | | |
|----------------------------|-------------------|------------------------------------|--------------|---------------------------------|-------------------------------|----------------------|
| | | Affected | Non-affected | Dead | Recovered (sick but survived) | Healthy (never sick) |
| | | | | | | |

| | | | | | | |
|---|--|--|--|--|--|--|
| Outbreak 1 | | | | | | |
| Outbreak 2 | | | | | | |
| Outbreak 3 | | | | | | |
| <p>Consequences of outbreaks (listing)</p> <p>PLEASE PROBE and SPECIFY and ask for EXAMPLES</p> | | | | | | |

| | | |
|------------------------|-----|----|
| Back to pig production | | |
| | Yes | No |
| Hand count | | |
| Why not (listing) | | |

C/3 (b) Not aware of ASF

Purpose: To be used if no outbreaks have occurred or if the participants are unaware of ASF

Tool: Listing and hand count

Facilitator: Ask the participants for how many years they have kept pigs (doesn't have to be uninterrupted), which diseases affect their pigs (signs and symptoms), known disease spread mechanisms and what methods they have adopted to prevent disease in their pigs.

Data capture:

| Years of pig keeping | Less than 1 year | More than 1 year but less than 3 | More than 3 years |
|----------------------|------------------|----------------------------------|-------------------|
| Hand count | | | |

| Disease affecting pigs | Symptoms | Disease spread mechanisms | Number aware (hand count) |
|------------------------|----------|---------------------------|---------------------------|
| | | | |
| | | | |
| | | | |

| | | | |
|--|--|--|--|
| | | | |
| | | | |
| | | | |
| | | | |

If any disease with symptoms like ASF comes up – ask where they have seen it/when, and possibly go to C2 again

| Preventive measures | Hand count | Remarks – why adopt measure? Against which disease? |
|---------------------|------------|---|
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |

C/4. Are you aware of ASF disease spread mechanisms? (list and discuss and hand counts of those aware of the different spread mechanisms).

Purpose: To assess the knowledge of farmers on disease spread mechanism

Tool: Listing and hand counting

Facilitator: Ask the farmers if they are aware of any disease spread mechanism. If yes, list them and get the number of farmers who are aware of each mechanism.

Data capture:

| Disease spread mechanisms | Number aware (hand count) | Describe mechanisms known |
|---------------------------|------------------------------|---------------------------|
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |

If nothing comes up; disease spread mechanisms to hint in the direction of:

Pig to pig direct contact

Feeding of infected pig meat/swill/offal to pigs

Indirect contact via fomites, vehicles, other physical vectors, persons, equipment, dogs etc

Ticks

Other insect vectors

Wild pigs/bush pigs/warthogs

C/5. Perceptions on human health risks from eating pigs that have died from ASF or other diseases

Purpose: To assess the knowledge and perceptions of farmers on risks for human health when eating animals that have died from diseases

Tool: Listing and hand counting

Facilitator: Ask the farmers if they think it is a risk to eat meat from pigs that have died from ASF or from other diseases. If yes, get the number of farmers who are aware of these risks by hand count.

Data capture:

| | Yes | No | Not aware |
|--|-----|----|-----------|
| Do you think it is a human health risk to eat meat from pigs that have died from ASF? (hand count) | | | |
| From other pig disease? (hand count) | | | |
| If yes, from what pig diseases? (listing) | | | |

C/6. Have you adopted any measures to control the disease? How effective are the control measures?

Purpose: To get information on the control measures adopted by farmers during ASF outbreak

Tool: Listing and hand count

Facilitator: Will ask the farmers about the control measures they adopt during outbreak and their effectiveness – probe on the answers!

Data capture:

| Control measures | Hand-count | Effectiveness (**very effective; ** little bit effective; * not effective) |
|------------------|------------|--|
| | | |
| | | |
| | | |
| | | |

D. Farmer's knowledge of other control/biosecurity measures and their willingness to adopt them

Purpose: To assess the knowledge of farmers on ASF control measures other than those that they have used and their willingness to adopt these measures

Tool: Hand count and listing

Facilitator: Ask the farmers if they are aware of any other ASF control measures than those they have used and listed above. If yes, they should list them. Probe more to see if they are willing to adopt these measures.

Data capture:

| 1. Are you aware of any other biosecurity measures (than those you have used) to control ASF? (hand count) | Yes | No |
|--|-----|----|
| | | |
| a. If yes – what measures? (listing) | | |
| b. What prevent you from adopting those biosecurity | | |

| | | | |
|--|-----|----|---------------------|
| measures? (listing) | | | |
| c. What could be the incentive for you to adopt them? (listing) | | | |
| 2. Do you know any model farmer in the community who was successful in pig breeding and keeping the pigs healthy? (hand count) | Yes | No | Name of that farmer |
| | | | |
| a. If yes what do you think his success was due to? (listing) | | | |

Continue probing more depending of the kind of answer you get from the farmers and your objectives in this section. A lot of discussion and interaction should go on and farmers should be able to tell their opinions on how they see the problem of biosecurity at a local context.

If no ideas come up; examples of measures to suggest and have opinions on:

Safe disposal of offal and blood

Safe disposal of meat

Safe processing of meat (heat treatment)

Slaughtering only in official abattoirs

Strict confinement of pigs

Restricted access of middle men to farms

No buying live animals from middle men and collection points

Movement bans

Closing of markets

Personal disinfection on entry to farms

Vector control

Keep domestic pigs from mixing with wild pigs

E. Challenges faced in connection with ASF

Purpose: How do producers perceive challenges in connection with ASF?

Tool: Listing, ranking, problem opportunity matrix,

Facilitator: Tell the farmers that we would like to hear their thoughts on the challenges they face in connection with ASF. List all challenges, and then rank them and probe more on the top 5.

Go through each challenge one-by-one, starting with the challenge ranked as number one. What initiatives are you aware of that have already been done to address this issue? What was the level of success/failure? What solutions do you have that could improve the situation, including what should be done, who should do it, and how it could get done?

Example of what the problem-opportunity matrix will look like

| | Challenge 1 | Challenge 2 | Challenge 3 | Challenge 4 | Challenge 5 |
|--|-------------|-------------|-------------|-------------|-------------|
| What is already being done | | | | | |
| Level of success/failure of what is already being done | | | | | |
| What more can be done | | | | | |
| Who has to do it | | | | | |

| | | | | | |
|--------------------|--|--|--|--|--|
| How it can be done | | | | | |
|--------------------|--|--|--|--|--|

F. Conclusion

Facilitator: We are almost done. We just have a couple more questions.

What projects on pig health would you like to see go forward?

From those suggested projects, what would be most helpful for you as a farmer?

Do you have any other questions?

Thank you very much for your time and cooperation!

APPENDIX 2

ILRI-SLU Study on perception and experience with ASF outbreaks - other members of the value chains than farmers

GPS-koordinates _____

Date _____ Starting time _____ Finish time _____

Villages' represented _____

Subcounty/ies: _____

Total number of participants in the group: _____

Facilitator _____

Note-taker _____

Objective: To assess perceptions on the ASF outbreaks, experiences, coping strategies and willingness to adopt biosecurity measures as a preventive strategy for other members of the value chain than farmers.

Methodology: Group discussions using PRA tools

Material: Flip chart, digital camera, tape recorder, counters (beans or stones), colored markers, manila paper, masking tape, big sheet of paper, pencil, rulers.

Introduction by the facilitator

8. Welcome the participants and have one of them open with a word of prayer.
9. Introduce yourself and the team.
10. Have them introduce themselves – can be done through a short role play.
11. Setting the scene: Introduce the project, highlighting the objectives and the important role of the participants in meeting the objectives.
12. Take them through the planned process of the farmer group discussions.
13. Ask for consent to use tape recorders and cameras (if any).
14. Set the ground rules together with them.

A. Activities in the pig value chain

Purpose: To understand which value chain activity the participants are engaged in

Tool: Hand count

Facilitator: Ask the different types of activities that they are engaged in and do a count of hands

NB: participants can be engaged in several categories!

Data capture:

| Type of activity | Hand-count |
|--|------------|
| Middle man (buy and sell live pigs) | |
| Slaughterer (slaughter pigs) | |
| Butcher/Trader (buy entire slaughtered pigs or parts thereof and sell to restaurants or consumers) | |
| Owner of pork kiosk | |
| Pork joint | |
| Own/breed/grow pigs | |
| Other (Please specify) | |

B. Perception of participants of the clinical signs of ASF

Purpose: To find out about the groups' perception of the clinical signs of ASF

Tool: Listing and hand count

Facilitator: Ask the questions mentioned in the table. List all perceptions that are mentioned, even if any group members dominate and have different opinions. Note if answers are group census or individual opinions in the remarks-column.

Data capture:

| Characteristics | ASF | | Remark |
|--|-----|----|--------|
| Local name | | | |
| What are the main signs of the disease in live pigs? (listing) | | | |
| What are the main signs of the disease in the meat/slaughtered pig? (listing) | | | |
| When you see the signs you described are you sure that it is ASF? (hand count) | Yes | No | |
| | | | |
| Have you seen those signs in live pigs? | | | |
| Have you seen those signs in slaughtered pig/meat? | | | |
| Have you sold live pigs with those signs? | | | |
| Have you sold meat with those signs? | | | |
| What other disease could give those signs in live pigs or in meat? (listing) | | | |

C. Predictability of the disease

Seasonal calendar

Purpose: To understand the seasonality of factors that affect the occurrence of ASF

Tool: Seasonal calendar and scoring

Facilitator: Explain that we'd like to talk about occurrence of ASF throughout the year and create a calendar that represents the past two years. Note where the events fall on the calendar. Be familiar with local terminology and descriptions of seasons and how these relate to the months of the year (from key informants). The seasonality of different events or activities of interest is demonstrated by indicating the timing of occurrence or scoring occurrence in relation to the seasons using 100 counters for each factor.

For each factor in the calendar – please probe WHY piles are put at that place and remark.

Data capture:

| | Months | | | | | | | | | | | |
|--------------------------------------|--------|---|---|---|---|---|---|---|---|---|---|---|
| Event | J | F | M | A | M | J | J | A | S | O | N | D |
| Local name of season | | | | | | | | | | | | |
| Rainfall | | | | | | | | | | | | |
| Occurrence of ASF | | | | | | | | | | | | |
| Pork production (buy/slaughter/sell) | | | | | | | | | | | | |

D. Recent outbreaks and their impact

Purpose: To assess the impact of the recent outbreaks of ASF

Tool: Listing, proportional piling and hand count

Facilitator: Ask the participants about the recent outbreak they witnessed. Probe on what SPECIFIC consequences the outbreak had for the participants and if the participants are back in/still in pig production and if not, why.

D1. Consequences

| | |
|---|--|
| <p>Consequences of outbreaks (listing)</p> <p>PLEASE PROBE and SPECIFY and ask for EXAMPLES</p> | |
|---|--|

| | |
|--|--|
| | |
|--|--|

D2. Still in business?

| Back to/still in business in the pig production value chain | | |
|---|-----|----|
| | Yes | No |
| Hand count | | |
| Why not (listing) | | |

E. Disease spread mechanisms

E1. Perceptions on general disease spread mechanisms

Purpose: To assess the general knowledge of participants on disease spread mechanism

Tool: Listing and hand counting

Facilitator: Ask the participants if they are aware of any disease spread mechanism. If yes, list them and get the number of participants who are aware of each mechanism.

Data capture:

| Disease spread mechanisms | Number aware (hand count) | Describe mechanisms known |
|---------------------------|------------------------------|---------------------------|
| | | |

| | | |
|--|--|--|
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |

If nothing comes up; disease spread mechanisms to hint in the direction of: pig to pig direct contact, feeding of infected pig meat/swill/offal to pigs, indirect contact via fomites, vehicles, other physical vectors, persons, equipment, dogs, ticks, other insect vectors, wild pigs/bush pigs/warthogs

E2. Perceptions on disease spread in relation to value chain components

Purpose: To assess the participants perceptions on disease spread in relation to their businesses

Tool: Listing and hand counting

Facilitator: Ask the participants if they are aware that their business could contribute to disease spread. If yes, ask how, list and get the number of participants who are aware of each risk-activity.

If they fail to realise that their business/behaviour could spread disease BUT have answered on the general disease spread mechanisms, point out some examples that relates to their businesses.

| Disease spread risk activity | Number aware (hand count) | Describe mechanism |
|------------------------------|------------------------------|--------------------|
| | | |

| | | |
|--|--|--|
| | | |
| | | |
| | | |
| | | |
| | | |

Examples: sell live pigs from middlemen, middlemen entering pig farms, mix pigs at middle men, handling of blood and offals at slaughter, selling of rest products (hide, head) at slaughter, slaughtering infected pigs etc

E3. Perceptions on disease control in relation to value chain components

Purpose: To assess the perceptions of participants on their responsibility for control of disease spread risks

Tool: Hand count

Facilitator: Ask the participants if they think it is their responsibility to help to control spread of ASF/minimize the risks mentioned in the question above? Get the number by hand count.

| | Yes | No | No opinion |
|---|-----|----|------------|
| Do you think it is your responsibility to help control spread of ASF? (hand count) | | | |
| | | | |

E4. Perceptions on measures to control disease spread during ASF-outbreaks

Purpose: To get information on the control measures adopted by participants during ASF outbreak

Tool: Listing and hand count

Facilitator: Ask the participants if they have adopted any measures to control the disease spread and the risk activities during ASF-outbreaks? How effective are the control measures? Probe on the answers!

Data capture:

| | | |
|------------------|------------|---|
| Control measures | Hand-count | Effectiveness (***very effective; ** little bit effective; * not effective) |
|------------------|------------|---|

| | | |
|--|--|--|
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |

E5) Perceptions on human health risks from eating pigs that have died from ASF or other diseases

Purpose: To assess the knowledge and perceptions of participants on risks for human health when eating animals that have died from diseases

Tool: Listing and hand counting

Facilitator: Ask the participants if they think it is a risk to eat meat from pigs that have died from ASF or from other diseases. If yes, get the number of participants who are aware of these risks by hand count.

Data capture:

| | Yes | No | Not aware |
|--|-----|----|-----------|
| Do you think it is a human health risk to eat meat from pigs that have died from ASF? (hand count) | | | |
| From other pig disease? (hand count) | | | |
| If yes, from what pig diseases? (listing) | | | |

F. Participant’s knowledge of other control/biosecurity measures and their willingness to adopt them

Purpose: To assess the knowledge of participants on ASF control measures other than those that they have used and their willingness to adopt these measures

Tool: Hand count and listing

Facilitator: Ask the participants if they are aware of any other ASF control measures than those they have used and listed above. If yes, they should list them. Probe more to see if they are willing to adopt these measures.

Data capture:

| 2. Are you aware of any other biosecurity measures (than those you have used) to control ASF? (hand count) | Yes | No | |
|--|-----|----|------------------------|
| | | | |
| b. If yes – what measures? (listing) | | | |
| c. What prevent you from adopting those biosecurity measures? (listing) | | | |
| d. What could be the incentive for you to adopt them? (listing) | | | |
| 3. Do you know any model farmer in the community who was successful in pig breeding and keeping the pigs healthy? (hand count) | Yes | No | Name of that pig owner |
| | | | |

| | |
|---|--|
| a. If yes what do you think his success was due to? (listing) | |
|---|--|

Continue probing more depending of the kind of answer you get from the participants and your objectives in this section. A lot of discussion and interaction should go on and participants should be able to tell their opinions on how they see the problem of biosecurity at a local context.

If no ideas come up; examples of measures to suggest and have opinions on:

Safe disposal of offal and blood

Safe disposal of meat

Safe processing of meat (heat treatment)

Slaughtering only in official abattoirs

Strict confinement of pigs

Restricted access of middle men to farms

No buying live animals from middle men and collection points

Movement bans

Closing of markets

Personal disinfection on entry to farms

Vector control

Keep domestic pigs from mixing with wild pigs

G. Challenges faced in connection with ASF

Problem opportunity matrix

Purpose: How do members of the value chain perceive challenges in connection with ASF?

Tool: Listing, problem opportunity matrix,

Facilitator: Tell the group that we would like to hear their thoughts on the challenges they face in connection with ASF. List all challenges, and then rank them and probe more on the top 5.

Go through each challenge one-by-one, starting with the challenge ranked as number one. What initiatives are you aware of that have already been done to address this issue? What was the level of success/failure? What solutions do you have that could improve the situation, including what should be done, who should do it, and how it could get done?

Example of what the problem-opportunity matrix will look like

| | Challenge 1 | Challenge 2 | Challenge 3 | Challenge 4 | Challenge 5 |
|--|-------------|-------------|-------------|-------------|-------------|
| What is already being done | | | | | |
| Level of success/failure of what is already being done | | | | | |
| What more can be done | | | | | |

| | | | | | |
|--------------------|--|--|--|--|--|
| Who has to do it | | | | | |
| How it can be done | | | | | |

H. Conclusion

Facilitator: We are almost done. We just have a couple more questions.

What projects on pig health would you like to see go forward?

From those suggested projects, what would be most helpful for you as a businessman?

Do you have any other questions?

Thank you very much for your time and cooperation!