

Perceptions and recommendations of pig value chain actors regarding biosecurity measures for the control of African Swine Fever (ASF) in Masaka district, Uganda



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August 2014

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Background

During the ILRI pig value chain assessment with pig producers in Kamuli, Masaka and Mukono districts, African swine fever (ASF) disease and parasite infections especially worms and mange were identified as the common pig health problems. ASF was the most critical having a fatality rate of 77.5% according to pig farmers (Dione et al., 2014; Ouma et al., 2014). Though many farmers are threatened by the disease, there is not adequate information about the level of risk of disease spread along the pig value chain (from the input suppliers to the consumers). It is against this background that the ILRI team visited Masaka district from 29th September to 4th October 2014 to conduct Key Informant Interviews (KII) with key stakeholders and Focus Group Discussions (FGDs) with value chain actors that included input suppliers (vets, drug and feed stockists, piglet producers), pig producers (farmers and boar keepers), collectors and bulkers, transporters, wholesalers, retailers, processors, and consumers. This was aimed at appreciating the perceptions of the value chain actors about ASF as well as to document their recommendations towards sustainable biosecurity measures against the disease.

Objectives

The prime objectives of this fact-finding mission were;

- a. to identify the key management and operational functions identified by value chain actors as having the potential to affect the risk of ASF transmission among farms
- b. to have participants identify economically and logistically feasible operational approaches that are expected to reduce the potential risk of disease transmission and spread

Study sites and data collection

Study sites

Masaka district is located in the Central region and have the highest pig density in the country (>50 heads/km²) with three value chain domains (VCDs) represented, namely rural production for rural consumption (R-R), rural production for urban consumption (R-U) and peri-urban/urban production for urban consumption (U-U) (Ouma et al., 2014). The pig production is hindered by the endemicity of ASF which causes significant economic losses to farmers (Atuhaire et al., 2013; Dione et al., 2014). Several outbreaks are reported annually especially during the dry season.

Participant selection

The participants were randomly chosen by the District Veterinary Officer in consultation with the research team from different sub-counties participating in the smallholder value chain projects in Uganda.

Key Informant Interviews

Twenty key informants constituted by community and expert opinion leaders were invited in a meeting in the form of a half day workshop. The invited participants had knowledge about the disease and most of them have responsibilities in relation of the disease in the community. Among these, the deputy speaker of Kyesiiga sub-county, 4 Local Council IIIs, 3 area veterinary officers, the pig farmers cooperative leader, the district women leader, the district commercial officer, 2 police officers, the Masaka prison farm officer, the vice chairman of Kabonera sub-county, the district veterinary officer, the community youth leader, the district production secretary, butcher's leader and the trader's leader group leaders.

Focus Group Discussions

FGDs were undertaken with seven value chain actors: Farmers, communal village boar keepers, veterinary services suppliers, drug stockists, feed stockists, traders and butchers/pork joint owners were invited. In each category 8 individuals were invited to the session, except for farmers where 40 were invited (20 in the rural and 20 in the urban areas). FGDs sessions were conducted for each group and sessions were facilitated by trained local staff together with the project staff. The tool was pretested and refined before being used.

Group sessions and key informants interviews

The group sessions involved five major exercises as explained below;

Assessment of knowledge of ASF disease

Here, the participants were asked about their knowledge of the ASF disease. This included description of characteristics like the local name of the disease, its clinical signs, the main route of transmission and dissemination, its treatment, prevention measures and the main effect of the disease on pigs.



Group discussions with vet suppliers from Kabonera, Masaka (left) and Key informant interviews (right) (Photocredit: ILRI /Brian Kawuma)

Identification of hotspots of ASF along the value chain

With the aid of a value chain map, the participants were asked to discuss among themselves, the hotspots for ASF transmission along the value chain and reach a consensus about which value chain nodes rank highest in the spread of the disease. The focus group discussions utilised the proportional piling tool to rank the different hotspots across the pig value chain.



Veterinary service providers in Masaka district identifying hotspots for the spread of ASF using proportional piling. (Photo credit: ILRI /Brian Kawuma)

Constraints faced by VC actors in the prevention and control of ASF outbreaks

Here, the participants were guided through identification of the main constraints to prevention and control of ASF outbreaks and the use of pairwise comparison to determine which of those constraints are the most important. Five major constraints were selected by each focus group.

Problem-opportunity matrix

For this section, the participants reviewed the constraints identified above and were tasked with coming up with opportunities for tackling these problems in terms of what should be done, who should do it, and how it could get done.

Recommendation for biosecurity measures

For this exercise, participants were requested to deliberate on and recommend likely biosecurity measures against ASF, ranking them according to their effectiveness in ASF control, the ease of implementation, gender responsiveness and economic feasibility. For these parameters, the scale was high for positive rating (i.e. very easy, very effective, gender responsive, very feasible) and low for negative rating (hard to implement, ineffective, gender irresponsible or expensive). It was also pertinent to tag a timeline to these measures to illustrate how soon they could be implemented. The scale here was short (for 0 to 3years), medium (3 to 5 years) and long (more than 5 years)



Drug stockists from Kabonera sub county in Masaka district, discussing recommendations on biosecurity against ASF. (Photo credit: ILRI/ Brian Kawuma)

Recommendations for behavioural changes

For the last exercise, the participants were taken through a self-evaluation where they identified common practices or habits that they or their colleagues do intentionally or inadvertently, that pose great risk in the transmission of the disease. They were asked to further suggest ways of changing this behaviour and identify any foreseen barriers to this behavioural change.

Key observations

I. The common local name for African swine fever is, 'omusujja gw'embizzi'. Omusujja is the Luganda term for fever.

II. Among the common clinical signs of ASF as described by the participants are; shivering, standing hairs, red eyes, loss of appetite, vomiting, reddening of ears, high temperature, sudden and massive death, salivation, discoloration of skin and organs, staggering gait, pig becomes aggressive, pigs huddle together, blood stained stool, pig doesn't squeal, and a smell that attracts flies (kawawa).

III. The participants highlighted the following routes of transmission or dissemination of ASF;

- a) Serving pigs on contaminated feed, leftover pork meals, water from utensils,
- b) Vets using unsterilized equipment. Virus also carried on Vets' garments and motorcycle wheels as they move from farm to farm.
- c) Stray animals like free range pigs, dogs and cats that carry infected pig parts from slaughter places and farms
- d) Warthogs (wild pigs) and hunters that carry their meat into homes.
- e) Slaughter and sale of affected pigs.
- f) Brokers and traders that move from farm to farm with contaminated foot ware and garments
- g) Use of village boars
- h) Poor waste disposal at slaughter places.
- i) Poor disposal of bones by consumers
- j) Direct contact – infected female pigs
- k) People moving from infected places to the farm.

IV. Among the most common hotspots for ASF spread identified by the participants, the pig collectors, transporters and traders were ranked as carrying the highest risk because they traverse many different farms, villages and sub counties. They were followed by the slaughterers (poor waste disposal), pig producers (poor biosecurity and sale of sick animals) and input suppliers (village boars spread the disease and vet service suppliers through unsterilized equipment and lack of disinfectants). The participants highlighted a potential risk posed by the retailers and consumers but almost all agreed that the processors posed the lowest risk because of increased observance of quality standards.

Key constraints to ASF control

Among the major constraints to the prevention of ASF as identified by the participants were;

- i. Difficulty in restricting visitors on farms/ Farmers visit peers and carry disease to their farms
- ii. Poor Hygiene practices and limited use of disinfection technology e.g. footbaths
- iii. Weak laws and regulations regarding trade in dead and sick pigs, illegal movement and illegal slaughters, no proper procedures for buyers on the farm, lack of pork inspectors
- iv. Inadequate veterinary / extension services
- v. Poor infrastructure on farms and use of free range systems.
- vi. Use of village boars which increases risk of infection of sows and vice versa
- vii. Vet services providers moving from farm to farm and do not change equipment
- viii. Limited Knowledge about ASF epidemiology
- ix. Limited research on vaccine and epidemiology of ASF
- x. Corruption and unethical practices by value chain actors
- xi. Proximity to the forest which serves as a home for wild pigs that are vectors of the disease
- xii. Lack of organized farmer groups amongst actors at the same level which would act as a source of entry / training to such communities
- xiii. Lack of centralized slaughter place at parish level and a district abattoir which could be a collection point for pigs
- xiv. Social contract which requires farmers to share boars putting animals at risk
- xv. Poverty which causes farmers to reduce losses by selling sick animals and buyers to eat sick animals.
- xvi. Raw material for compounding feeds that are at time contaminated
- xvii. Stray dogs that move from butchers to farms spreading disease.

Key recommendations

Having identified the constraints above, the participants made the following recommendations towards the prevention and control of the spread of ASF:

- ✓ Conduct trainings on biosecurity measures for all Value chain actors (use of disinfectant, change pig's water daily, clean feed troughs before replacing food, restrict visitors to the pig farm)
 - ✓ Advise farmers to build proper housing structures / Have concrete floor pens
 - ✓ Each farm should have its own boar or where possible, have separate communal boar
 - ✓ Use of artificial insemination
 - ✓ Develop rapid diagnosis kits for ASF reaching village levels
 - ✓ Establishment of central slaughter places at parish levels & abattoir at district
 - ✓ Establishment of demos emphasizing good practices, conduct & management and organise see and learn tours for value chain actors
 - ✓ Put in place and enforce pig movement by-laws
 - ✓ Launch a campaign against the spread of ASF, seminars, radio talk shows, posters
 - ✓ Value chain actors to form organised groups (Associations or cooperatives) which will lead to behavioural change by peer influence
 - ✓ Vets should disinfect equipment between animals and farms
 - ✓ Desist from buying or selling sick pigs & products
 - ✓ Be vigilant about disease outbreak
 - ✓ Advise farmers to fence off their farms to keep off stray animals
 - ✓ Advise farmers to wash and disinfect clothing and boots used in pig houses
 - ✓ Awards / public recognition of model value chain actors
 - ✓ Put sign posts at gates of the farms with instructions of what the visitors/veterinarians/traders should do to or stop trespassing
 - ✓ Traders should buy piglets from known sources
- Specific recommendation by men farmers
 - ✓ Husbands should work together with wives and families
 - ✓ Both husband and wife should plan and budget together (wife and husband)
 - ✓ Both husband and wife should share benefits together
 - ✓ Separate farm from homestead
 - ✓ Change in cultural practices that expects households to welcome all visitors
 - ✓ Village teams & taskforces empowered and supported
 - ✓ Change from individualism to working in groups and cooperatives
 - ✓ Share benefits equally between men and women
 - Specific recommendation by women farmers
 - ✓ Make use of places of worships ask priests to incorporate the messages in their preaches
 - ✓ Learning by seeing
 - ✓ Arrange competition and awards for value chains in the same nodes
 - ✓ Training toward change of behaviors at sub-county level (awareness, social contract)
 - ✓ Trainings on what should be done (not to sell meat from dead animals; control illegal pig movement and guidelines for buyers)

Recommendation for behavioural changes

- ✓ Group formation will lead to behavioural change by peer influence
- ✓ Launch campaign against negative practices
- ✓ Mass media as a channel for education

- ✓ Awards / public recognition of model VC actors
- ✓ Counselling to reduce malice
- ✓ Sensitization about dangers in mindedness
- ✓ Sensitisation on negative attitudes about pig farming (e.g. *biyumba, ebimere, ebizzi*)
- ✓ Training with see and learn tours to those people with good slaughter facilities, butchers and pork joints will help the value chain actors involved to change their ways
- ✓ Join associations peer influence and by-laws will help the value chain actors affected to change
- ✓ Organise see and learn tours for farmers so that they will be encouraged to change their ways eg. take pig farming as a business
- ✓ Establish farmer village schools where farmers will be given sequenced organized knowledge on pig farming and disease control measures
- ✓ Incorporate farming in the school curriculum right from primary level up to tertiary level so that children will grow up when they like treasure farming
- ✓ Places of worship should take positively about cooperatives (farmers) to encourage people to join cooperatives ie.
- ✓ Change negative attitudes on cooperatives

Socio-cultural barriers to change

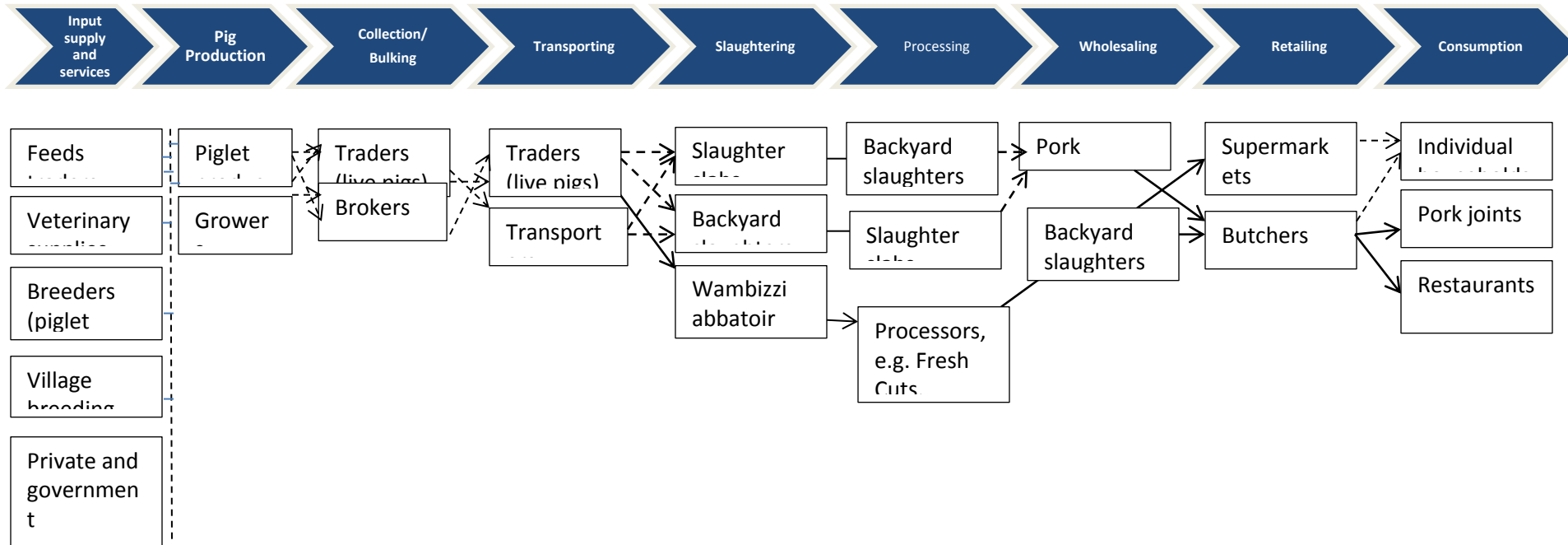
- ✓ Social contract (“Can’t say NO to visitors” it is not acceptable)
- ✓ Cultural believes that men are above women and make decisions
- ✓ Men having more than one woman, so do not have time for their pigs
- ✓ Lack of knowledge on benefits of group formation
- ✓ Individual inadequacies
- ✓ Apathy/stubbornness/indifference
- ✓ Low health status of VC actors (HIV). A lot may not be able to attend training
- ✓ Selfishness of some value chain actors (“they don’t mind as far as they are not affected by the disease”)

Ways forward

Analysis of the findings from these interviews and focus group discussions will inform the following action points;

1. Upgrade of the training module on biosecurity taking into account some recommendation from the value chain actors
2. Development gender sensitive participatory training on biosecurity for farmers and other value chain actors
3. Randomized Controlled Trial studies to test the effectiveness of training of farmers and other value chain actors on biosecurity measures

ANNEX 1: Uganda smallholder pig value chain map (*Ouma et al., 2014*)



Annex 2: Perception of value chains actors on the roles of other value chains actors in the disease dissemination of ASF

Value chain actors	Farmers	Boar keepers (rural)	Traders	Butchers/pork joints
Piglet producers/growers	<ul style="list-style-type: none"> ✓ Panic sales and movement of sick pigs ✓ Sell of sick pigs when not sure about what are they affected of 	<ul style="list-style-type: none"> ✓ Feed on swill ✓ Mix bones with swill sell sick animals ✓ Sell of sick pigs 	<ul style="list-style-type: none"> ✓ Panic sales, moving pigs with ropes; ✓ servicing at collection points; ✓ sell sick animals 	<ul style="list-style-type: none"> ✓ Sell sick pigs ✓ sell piglets without knowing their health status
Village boar keepers	<ul style="list-style-type: none"> ✓ Inevitable because most farmers go there when sows are on heat 	<ul style="list-style-type: none"> ✓ Serve many sows ✓ Some village boars are taken to client's place in case there are many sows to be serviced 	<ul style="list-style-type: none"> ✓ Boar serve several sows 	<ul style="list-style-type: none"> ✓ Many farmers within the same village use the same boar
Traders (live pigs) Brokers Transporters	<ul style="list-style-type: none"> ✓ Make efforts to cover all farms evenly, sometimes sell to farmers who wish to buy from hem ✓ farmers service at collection points 	<ul style="list-style-type: none"> ✓ Traverse several villages and move from farm to farm spreading the virus ✓ Huddle many pigs at collection points 	<ul style="list-style-type: none"> ✓ Movements ✓ Malice and greed to infect farms to lower the price 	<ul style="list-style-type: none"> ✓ They collect in big numbers and search for cheap animals from farm to farm
Backyard slaughterers Slaughter slabs	<ul style="list-style-type: none"> ✓ Improper disposable of waste and body part; poor set up causing transmission by passersby on shoes and clothes ✓ Virus carried here by dos and people's clothes/shoes ✓ Pork from different areas sold to many retailers from different areas 	<ul style="list-style-type: none"> ✓ Poor waste disposal ✓ Parts picked up by dogs that moves to farms ✓ Flies might transmit the virus 	<ul style="list-style-type: none"> ✓ Improper disposable of waste 	<ul style="list-style-type: none"> ✓ No proper disposal of waste
Pork retailers	<ul style="list-style-type: none"> ✓ Buy cheap but infected pork or carcass ✓ Sell to many households ✓ Supermarkets have lower risk 	<ul style="list-style-type: none"> ✓ Lower risk 	<ul style="list-style-type: none"> ✓ Buy cheaper but infected pork or carcass ✓ Sell to many households Supermarkets have lower risk 	<ul style="list-style-type: none"> ✓ Lower risk

Annex 3: Perception of value chains actors on the roles of other value chains actors in the disease dissemination of ASF (continued)

Value chain actors	Farmers	Boar keepers (rural)	Traders	Butchers/pork joints
Individual households, Pork joints, Restaurants	<ul style="list-style-type: none"> ✓ Homesteads buy infected meat and may feed their pigs on the leftover meat and waste water from utensils ✓ Poor disposal of waste by pork joints owners and consumers 	<ul style="list-style-type: none"> ✓ Homesteads buy infected meat and may feed their pigs on the leftover meat and waste water from utensils 	<ul style="list-style-type: none"> ✓ Poor disposal of left overs by consumers 	<ul style="list-style-type: none"> ✓ Homesteads buy infected meat and may feed their pigs on the leftover meat and waste water from utensils ✓ Poor disposal of waste by pork joints owners and consumers
Vets and village vets	<ul style="list-style-type: none"> ✓ Cover large areas and use unsterilized equipment 	<ul style="list-style-type: none"> ✓ Some of them are not licensed; serve many farms 	<ul style="list-style-type: none"> ✓ Cover large territories with contaminated material ✓ Quack vets who spread wrong information to make profit 	<ul style="list-style-type: none"> ✓ Provide fake drugs and do not disinfect
Feed suppliers	<ul style="list-style-type: none"> ✓ Contaminated ingredients and poor feed mixing 	-	<ul style="list-style-type: none"> ✓ Contaminated ingredients; poor mixing 	-
Vet drugs suppliers (drug stockists)	<ul style="list-style-type: none"> ✓ Less likely to spread the virus because the products are well packed and they don't usually travel from farm to farm 	-	<ul style="list-style-type: none"> ✓ Low risk 	-

Annex 4: Perception of value chains actors on the roles of other value chains actors in the disease dissemination of ASF (continued)

Value chain actors	Vet suppliers	Drug stockists	Feed stockists	Key informants
Piglet producers/growers	<ul style="list-style-type: none"> ✓ They sell piglets at a reduced price during outbreak ✓ pigs are left roaming; farmers do not want to lose alone hence knowingly affect other's pigs ✓ Sell sick piglets 	<ul style="list-style-type: none"> ✓ Farmers rarely buy animals from a known health status farm; farmers do panic sells during outbreaks ✓ Sell sick pigs at reduced price 	<ul style="list-style-type: none"> ✓ Poor housing and poor hygiene 	<ul style="list-style-type: none"> ✓ Source of sick animals because they do not confine their pigs ✓ Sometimes they are unaware about the disease and operate panic sales ✓ Sell piglets from infected farms
Village boar breeders	<ul style="list-style-type: none"> ✓ Often sick sows will be taken to boar without owner's knowledge ✓ few boars in village are used to serve many sows 	<ul style="list-style-type: none"> ✓ Serve sick sows from different places because most of the time, boar service carries higher priority than even treatment 	<ul style="list-style-type: none"> ✓ Boar service 	<ul style="list-style-type: none"> ✓ Serve several sows from different places
Traders (live pigs), Brokers. Transporters	<ul style="list-style-type: none"> ✓ They move from farm to farm with vehicles which are not disinfected ✓ Pigs stay at collection points days without treatment they buy sick pigs at a reduced price ✓ Sick pigs are moved across several villages hence spreading the virus on their way 	<ul style="list-style-type: none"> ✓ One collection points where pigs are huddled together and often sold back to farmers if market is not found ✓ Sick pigs moved to slaughter places, traverse different locations spreading the disease 	<ul style="list-style-type: none"> ✓ Movements from farm to farm 	<ul style="list-style-type: none"> ✓ Spread the virus across the village ✓ Seek for profit during outbreak because of low prices or may not be aware that pigs are sick
Backyard slaughters, Slaughter slabs	<ul style="list-style-type: none"> ✓ Poor hygiene conditions ✓ Improper disposal of waste; poorly constructed slaughter slabs ✓ Poor inspection of carcass post-mortem; virus disseminated in markets in different areas in bags and on motorcycles 	<ul style="list-style-type: none"> ✓ Poor waste disposal ✓ Division of tasks with some actors rewarded in kinds, ex. Body parts of sick pigs (head, hooves, offal's) 	<ul style="list-style-type: none"> ✓ Poor waste disposal ✓ Sell to too many retailers 	<ul style="list-style-type: none"> ✓ Do not observe hygienic standards ✓ There is poor waste disposal; open air slaughtering ✓ Butchers may detect the sick animals before slaughtering but choose to go ahead

Annex 5: Constraints faced by value chain actors in the prevention and control of ASF

Value chains actors	Constraint 1	Constraint 2	Constraint 3	Constraint 4	Constraint 5
Key informants	✓ Lack of knowledge on the existence of disease/virus and necessary control measures; Weak Vet Services	✓ Lack of proper slaughter facilities ✓ Lack of policies enforcement	✓ Lack of rapid response during outbreak (rapid diagnostic tests); Lack of Knowledge on detection & prevention	✓ Silent laws of transportation ✓ Corruption	✓ Lack of organized pig trading business ✓ Weak extension Services
Rural farmers (Men)	✓ No cure	✓ Unrestricted visitors	✓ Weak laws and regulation	✓ Village boars	✓ Free range pigs due to lack of housing.
Rural farmers (Women)	✓ Absence of farmer groups /association	✓ Limited knowledge on ASF disease and control	✓ Less prioritisation of pigs by all stakeholders	✓ Patriarchal cultures make women less assertive and hence compromise a lot.	✓ Lack of centralized slaughter place both at parish and district level
Urban farmers (men)	✓ Stray dogs	✓ Lack of knowledge	✓ Lack of boar	✓ Inadequate Vet services	✓ Perception of women on men's projects
Urban farmers (women)	✓ Lack of central slaughter place	✓ Few farmer associations	✓ Limited research	✓ Weak laws	✓ lack of knowledge
Boar keepers (rural)	✓ Limited knowledge	✓ No Central slaughter place	✓ Unethical behaviour of vets	✓ Social contract that compels farmers to help neighbours with boar service	✓ Corruption
Urban boar keepers	✓ No centralized slaughter place and organized markets	✓ Limited knowledge	✓ Inadequate vet services	✓ Few village boars	✓ Limited operational capital
Traders	✓ Limited knowledge	✓ Limited capital (to build proper structures, to	✓ Vets do not inspect butcher hygiene standards	✓ Unregulated movement	✓ Unfavourable policies

		disinfect farms and means of transport)			
Butchers/pork joints	✓ Lack of organized groups/associations	✓ Inadequate knowledge of ASF epidemiology	✓ Some vets specially privates ones do not offer genuine services (fake drugs)	✓ Failure to observe animal movement act. Pig are transported without movement permits	✓ Limited research on vaccine and epidemiology of ASF
Drug stockists	✓ Limited knowledge	✓ Selfishness	✓ Byelaws	✓ Organized groups	✓ Central slaughter place
Feed stockists	✓ Limited knowledge of VC actors on the disease, its detection and prevention	✓ Inadequate Veterinary services	✓ No centralized slaughter	✓ Bad attitude	✓ Unregulated movement of animals

ANNEX 6: Recommendations by specific value chain actors

Value chain actors	Recommendations
Farmers	<ul style="list-style-type: none"> ✓ Enforcement of laws and regulations; ✓ Establish guidelines to visitors ✓ Organize training for farmers ✓ Use disinfection (footbath) ✓ Construct better housing and increase hygiene ✓ Train village teams on biosecurity ✓ Create parish Information centres ✓ Farmers construct fences around their farms & foot bath with disinfectant ✓ Put sign posts at gates of our farms with instructions of what we want our visitors/Veterinarians/traders to do or stop trespassing ✓ Arrange trainings on bio-security measures ✓ Put in place central slaughter places at parish and district levels
Veterinary service suppliers	<ul style="list-style-type: none"> ✓ Follow Ethics as Veterinary service providers ✓ Disinfecting between farms (equipment and wear) ✓ Seek knowledge and share knowledge ✓ Advice farmers on improved pig housing ✓ Farmers should use footbaths with disinfectant ✓ Farmers should limit visitors into their farms ✓ Proper disposal of waste and carcasses ✓ Farmers should observe quarantine ✓ Disinfect equipment between animals and farms ✓ Centralized slaughter slabs ✓ Limited knowledge on vet laws and regulations
Drug stockists	<ul style="list-style-type: none"> ✓ Establishment of central slaughter places at parish levels & abattoir at district ✓ Value chain actors to form organized groups (Associations or cooperatives) ✓ Put in place and enforce pig byelaws ✓ Launch a campaign against the spread of ASF (MDD), seminars, Radio talk shows, posters Develop rapid diagnosis kits for ASF reaching village levels
Feeds stockists;	<ul style="list-style-type: none"> ✓ Have foot bath at feeds formulation unit ✓ No recycling of feed sacks (guinea bags) ✓ Construction of proper facilities for feed mixing
Traders & Butchers	<ul style="list-style-type: none"> ✓ Traders should buy and use a disinfection pump for themselves and their vehicles ✓ Strengthen the existing traders association so as to correct all bad practices related to collection, transportation, slaughter, selling of pigs and pig products

	<ul style="list-style-type: none"> ✓ Launch campaign to spread of ASF using media (radio), talk shows, meetings, brochures ✓ Establish central slaughter places at parish level and district to improve on the level of hygiene
Communal village boar keepers	<ul style="list-style-type: none"> ✓ Boil swill (from households and restaurants) before feeding to pigs ✓ Regular disinfection and cleaning of pig pens and farm structures ✓ Proper waste management of slaughter waste ✓ Proper disposal of food left over from homes (disposal pits) ✓ Stop village boar service especially during ASF outbreak
Key Informants	<ul style="list-style-type: none"> ✓ Enforce quarantine during outbreaks ✓ Routine supervision of Butchers & Traders ✓ Bye-laws to have all pigs housed ✓ Registering all butchers & traders ✓ Copy good works of Village Health Teams (VHTs) into ASF control ✓ Further study of Indigenous Technical Knowledge (e.g. Urine, Mululuza, other herbs)

Annex 7: Specific recommendation for biosecurity measures and their effectiveness for farmers (men)

Recommendation	Who is responsible in the VC?	Effectiveness (rate between low, moderate, high)			Gender responsiveness	Timeline: short term (0-3 years) medium term(3-5 years) and Long term (more 5 years)
		Disease control	Ease of implementation	Economic feasibility		
Enforcement of laws and regulations; a. Not to sell meat from dead animals b. Control illegal movement c. Guidelines for buyers	District Veterinary Officer (DVO); farmers taskforces	High	Low	High	High	Short
Guidelines to visitors	Task forces; farmers	High	High	High	High	Short
Training; Disinfection (footbath) Regulations Housing and hygiene Traders & butchers	Task force; vet extension staff; farmers	High	High	High	High	Short
Village teams on biosecurity	Pig farmers; DVO; ILRI	High	High	High	High	Short
Parish Information centres	Pig, farmers; area vets; DVO	High	Medium	High	High	Short

Annex 8: Specific recommendation for biosecurity measures and their effectiveness for farmers (women)

Recommendation	Who is responsible in the VC?	Effectiveness (rate between low, moderate, high)			Gender responsive ness	Timeline: short term (0-3 years) medium term(3-5 years) and Long term (more 5 years)3)
		Disease control	Ease of implementation	Economic feasibility		
Farmers construct fences around their farms & foot bath with disinfectant	Farmer	High	Moderate	High	High	Short
Let's put sign posts at gates of our farms with instructions of what we want our visitors/Veterinarians/traders to do or stop trespassing	Farmer	High	High	High	High	Short
Arrange trainings on bio-security measures Advocacy	Farmers; Value chain actors; farmer leader; district veterinary office; sub-county council; NGOs	High	Medium	High	High	Short
Put in place central slaughter places at parish and Dist levels	District council; S/county council; farmer leaders; ILRI; NGOs	High	Medium	High	High	Short

Annex 9: Specific recommendation for biosecurity measures and their effectiveness for urban village boar keepers

Recommendation	Who is responsible in the VC?	Effectiveness (rate between low, moderate, high)			Gender responsiveness	Timeline: short term (0-3 years) medium term(3-5 years) and Long term (more 5 years)
		Disease control	Ease of implementation	Economic feasibility		
Proper disposal of food left overs from homes (disposal pits)	Farmer	Medium	High	High	High	Short
Boil swill (from households and restaurants) before feeding to pigs	Farmer	High	Medium	Medium	High	Short
Regular disinfection and cleaning of pig pens and farm structures	Farmer	High	High	High	High	Short
Proper waste management of slaughter waste	Butchers	High	Medium	Medium	High	Short
Stop village boar service especially during ASF outbreak	Farmers; village boar keepers	High	Medium	Low	High	Short

Annex 10: Specific recommendation for biosecurity measures and their effectiveness for rural village boar keepers

Recommendation	Who is responsible in the VC?	Effectiveness (rate between low, moderate, high)			Gender responsiveness	Timeline: short term (0-3 years) medium term(3-5 years) and Long term (more 5 years)
		Disease control	Ease of implementation	Economic feasibility		
Improve hygiene at the farm	Farmer	High	High	High	High	Short
Each farm should have its own boar	Farmer	High	High	High	High	Short
Use of Artificial insemination	District veterinary office	High	Medium	Low	High	Medium
Restrict visitors from farm	Farmer	High	Medium	Medium	High	Short
Separate communal boar from other pigs	Farmer	High	Medium	Medium	High	Short

Annex 11: Specific recommendation for biosecurity measures and their effectiveness for traders

Recommendation	Who is responsible in the VC?	Effectiveness (rate between low, moderate, high)			Gender responsiveness	Timeline: short term (0-3 years) medium term(3-5 years) and Long term (more 5 years)
		Disease control	Ease of implementation	Economic feasibility		
Traders should buy and use a disinfection pump for themselves and their vehicles	Traders	High	High	High	High	Short
Training of all Value chain actors on biosecurity	Government; district veterinary office	High	High	Medium	High	Short
Proper housing structures for pigs to confine pigs	Farmers	High	Medium	Medium	High	Short
Do not feed pigs on pig products and share farm equipment with household	Farmers	High	High	High	High	Short
Restrict visitors to farm	Farmers	High	High	High	High	Short

Annex 12: Specific recommendation for biosecurity measures and their effectiveness for butchers

Recommendation to biosecurity	Who is responsible in the VC?	Effectiveness (rate between low, moderate, high)			Gender responsive	Timeline: short term (0-3 years) medium term(3-5 years) and Long term (more 5 years)
		Disease control	Ease of implementation	Economic feasibility		
Strengthen the existing traders association so as to find all bad practices related to collection, transportation, slaughter and selling of pigs and pig products	Traders; veterinary officers; DCO	High	High	Medium	High	short
Launch campaign to spread of ASF using media (radio), talk shows, meetings, brochures	Traders; veterinary officers; DCO	High	High	Medium	High	short
Establish central slaughter places at parish level and district to improve on the level of hygiene	Veterinary officers; district council; traders; farmer leaders	High	Medium	Medium	Medium*	short

*Any actions which lead to centralized collection of animals will not favor to women because it will involve labor for transporting the pigs from the farm to the location, which labor is provided by men only (they have motorbikes). Men might take over the activity and the returns from sales may not be shared with women at the household.

Annex 13: Specific recommendation for biosecurity measures and their effectiveness for veterinary suppliers

Recommendation	Who is responsible in the VC?	Effectiveness (rate between low, moderate, high)			Gender responsiveness	Timeline: short term (0-3 years) medium term(3-5 years) and Long term (more 5 years)
		Disease control	Ease of implementation	Economic feasibility		
Housing	Farmers	High	Medium	High	High	short
Fencing of farms	Farmers	High	low	low	High	
Buying from safe farms	Farmers	High	Medium	High	High	Short
Footbaths with disinfectant	Farmers	High	High	High	High	Short
Limit visitors	Farmers	High	High	High	High	Short
Proper disposal of waste and carcasses	Farmers, butchers	High	Medium	Medium	High	Short
Quarantine	DVO, local leaders	High	Low	High	High	Short
Disinfect equipment between animals and farms	Vet service suppliers	High	High	High	High	Short
Centralised slaughter slabs	ILRI, S/county	High	High	High	High	Short

Annex 14: Specific recommendation for biosecurity measures and their effectiveness for feed stockists

Recommendation	Who is responsible in the VC?	Effectiveness (rate between low, moderate, high)			Timeline: short term (0-3 years) medium term(3-5 years) and Long term (more 5 years)
		Disease control	Ease of implementation	Economic feasibility	
Have foot bath at feeds formulation unit	Feed stockists	Medium	High	High	Short
No recycling of feed sacs	Feed stockists; farmers	High	High	High	Short
Proper facilitation for feed mixing	Feed stockists	High	Medium	High	Short

Annex 15: Specific recommendation for biosecurity measures and their effectiveness for drug stockists

Recommendation	Who is responsible in the VC?	Effectiveness (rate between low, moderate, high)			Gender responsiveness	Timeline: short term (0-3 years) medium term(3-5 years) and Long term (more 5 years)
		Disease control	Ease of implementation	Economic feasibility		
Establishment of central slaughter places at parish levels & abattoir at district	District council; S/county councils; NGOs; ILRI	High	Low	Moderate	Low	Medium
VC actors to form organised groups (Associations or cooperatives)	District council; S/county vet officers; NGOs	High	High	Moderate	High	Short
Put in place and enforce pig by-laws	District council; S/county councils	High	Moderate	Moderate	High	Short
Launch a campaign against the spread of ASF, seminars, Radio talkshows, posters	District & S/county Vet officers, Development partners (ILRI)	High	Moderate	Low	High High	Short
Develop rapid diagnosis kits for ASF reaching village levels	NARO; ILRI; MAAIF; Makerere University	High	Moderate	Low	High	Medium

Annex 16: Specific recommendation for biosecurity measures and their effectiveness for key informants (group 1)

Recommendation	Who is responsible in the VC?	Effectiveness (High, medium, low)			Gender responsiveness	Timeline: short term (0-3 years) medium term(3-5 years) and Long term (more 5 years)
		Disease control	Ease of implementation	Economic feasibility		
Training	Vet Services; ILRI	H	H	H	High	Short
Quarantine restriction	DVO; LCs; Police	H	L	L	High	Medium
Routine supervision of Butchers & Traders	Area Vets; local leaders	H	H	M	High	Short
Bye-laws to have all pigs housed	LC3	H	L	H	High	Short
Registering all butchers & traders	LC3	H	H	H	High	Short
Copy good works of VHTs into ASF control	ILRI	H	M	H	High	Medium
Further study of Indeginous Technical Knowledge (e.g. Urine, Mululuza, other herbs)	ILRI	?	?	?	Medium	Long

Annex 16: Specific recommendation for biosecurity measures and their effectiveness for key informants (group 2)

Recommendation	Who is responsible in the VC?	Effectiveness (High, medium, low)			Gender responsiveness	Timeline: short term (0-3 years) medium term(3-5 years) and Long term (more 5 years)
		Disease control	Ease of implementation	Economic feasibility		
Training	Vet Services; ILRI	H	H	H	Yes	Short
Quarantine restriction	DVO; LCs; Police	H	L	L	Yes	Medium
Routine supervision of Butchers & Traders	Area Vets; local leaders	H	H	M	Yes	Short
Bye-laws to have all pigs housed	LC3	H	L	H	Yes	Short
Registering all butchers & traders	LC3	H	H	H	Yes	Short
Copy good works of VHTs into ASF control	ILRI	H	M	H	Yes	Medium
Further study of Indigenous Technical Knowledge (e.g. Urine, Mululuza, other herbs)	ILRI	?	?	?	Yes	Medium

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