Food and Agriculture Organization of the United Nations

World Organisation for Animal Health
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African Union

GF-TADs for Africa

African Swine Fever (ASF)
Standing Group of Experts (SGE)
for Africa

Third meeting

01 – 03 August 2023

Abidjan, Cote d'Ivoire

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Recommended Citation

WOAH and FAO. 2023. *Third GF-TADs for Africa meeting of the* Standing Group of Experts *(SGE) for African swine fever. Report of the event, 1 – 3 August 2023. Abidjan.*

Introduction and background to the meeting

The situation of *African swine fever* (ASF) has become of increasing concern, not only in Africa where it originated, but globally. Indeed, beyond Africa, despite the best prevention and control efforts, ASF continues to persist in domestic and wild pig populations. Being a transboundary animal disease, ASF poses a serious negative impact on production and productivity, therefore affecting national economies and social structures of the pig producing countries.

The *Standing Group of Experts* (SGE) for *African swine fever* (ASF), was established in March 2022, following its approved by the 11th Africa *Regional Steering Committee* (RSC) of the *Global Framework for the progressive control of Transboundary Animals Diseases* (GF-TADs) in October 2021. The SGE is comprised of the founding member countries (Cameroon, Côte d'Ivoire, Dem. Rep. of Congo, Kenya, Nigeria, South Africa, Togo, Uganda and Cabo Verde) that have reported ASF. Mali was invited as an observer.

The first meeting of the SGE ASF (held in March 2022) endorsed a workplan of topics that should be addressed by the SGE ASF in the coming months. The second meeting which was the first thematic was dedicated to understanding the live pig and pork value chains in Africa while the present (third) meeting discussed biosecurity along the value chains, as well as surveillance, including diagnosis.

Objectives and narrative report of the meeting

The third meeting of the SGE ASF for Africa was organised by the WOAH Regional Representation for Africa, in its capacity as the Secretariat of the GF-TADs for Africa RSC, with the support of the FAO, AU-IBAR and the GF-TADs ASF Working Group.

The meeting was held via hybrid mode i.e., presential in Abidjan, Cote d' Ivoire and through video conference (Zoom platform) on 01 to 03 August 2023.

The meeting was attended by all 9 member countries, i.e. Cabo Verde (online), Cameroon, Côte d'Ivoire, Dem. Rep. of Congo, Kenya, Nigeria, South Africa, Togo and Uganda. Also present was the African Union *Pan-African Veterinary vaccines Centre (PANVAC) and* FAO and WOAH Regional Representations, the *International Livestock Research Institute,* as well as two selected national reference laboratories : the *National Veterinary Research Institute* (NVRI), Vom, Nigeria and the *Laboratoire National de l'Elevage et de Recherches Veterinaires* (LNERV) in Dakar-Hann, Senegal, part of ISRA.

Also present was the Onderstepoort Veterinary Research Institute (OVRI, ARC), both a WOAH Reference Laboratory for ASF, WOAH Collaborating Centre and FAO Reference Centre for ASF (South Africa). Also present were experts from research centres and academic institutions in Belgium (UG), Cote d'Ivoire (LIRED), France (CIRAD), Hong-Kong (CityU) and Tanzania (SUA). Only one *Regional Economic Community* (REC) attended the meeting (online) the *Inter-Governmental Authority of Development* (IGAD, covering the Horn of Africa) through the IGAD *Centre for Pastoral Areas and Livestock Development* (ICPALD).

In addition, the meeting was attended by Mali as an observer country (interested future member), along with observers from the GF-TADs for Europe (European Commission, DG-SANTE).

Overall, the meeting was attended by 50 participants, 10 of whom attended online. Only 15 percent (15 %) of participants was female. The list of participants is presented as **annex 2.**

Based on the agreed workplan, adopted at the first SGE meeting in March 2022, the following agenda was prepared, fostering as much exchange of information and discussion between participants as possible, following a few (4) technical orientation presentations and discussions (agenda as delivered).

Programme, as delivered (including ~~deletions~~ and additions)

Third Meeting of the Standing Group of Experts (SGE) on African swine fever (ASF) of the GF-TADs for Africa

Abidjan, Cote d'Ivoire  1 – 3 August 2023

Tuesday 1 August 2023		
08:00 – 09:00	Arrival of participants	
Session 1. Welcoming remarks by the Bureau of the Regional Steering Committee 		
09:00 – 09.20	~~• African Union~~ • Food and Agriculture Organisation • World Organisation for Animal Health	~~Nick Nwankpa~~ Andriy Rozstalnyy Roland Dlamini
09:20 – 09:30	Adoption of the agenda Objectives and expected outputs of the meeting	Karim Tounkara, Secretary of the GF-TADs for Africa, WOAH, Bamako
09:30 – 10:00	Break	
Session 2. Governance aspects 		
10:00 – 10:15	Presentation of the minutes of the 2nd SGE meeting	Patrick Bastiaensen, Sub-Regional Representation for Eastern Africa, WOAH, Nairobi
10:15 – 10:25	Overview of the action points of the 2nd SGE meeting and their level of implementation	Viola Chemis, Regional Activities Department, WOAH, Nairobi
10.25 – 11.25	Regional updates on the current disease situation • EAREN (IGAD) ICPALD • RESEPI Central Africa • SADC-LTC (EIS)	• W. Kinyangui • J-M. Feussom • M-L. Penrith
11.25 – 12.00	Discussion : current disease situation	Facilitator : Roland Dlamini

Session 3. Strengthen biosecurity for the control of ASF along the value chain 

12:00 – 12:30	Key-note • Cote d'Ivoire	Vessaly Kallo, Director of Veterinary Services, Cote d'Ivoire
12:30 – 13:00	Biosecurity in the different value chains • Sector 1 : Industrial, intensive • Sector 2 : Smallholder, semi-intensive • Sector 3 : Backyard, free-range, scavenging	Mary-Louise Penrith, University of Pretoria, South Africa
13:00 – 14:00	Lunch	
14:00 – 15:00	Member country presentations • Cabo Verde • Cameroon • Togo • Uganda	• Maria Conceição Evora • Marc Feussom • Daniel Batawui • Paul Lumu
15:00 – 15:30	Sector 1 : Biosecurity at farm-level	Jeroen Dewulf, Ghent University, Belgium
15:30 – 15:50	Sector 1 : Feed	Peter Evans, Veterinary Director, SAPPO, South Africa
15:50 – 16:10	Sector 1 : Compartmentalisation- principles	Charmaine Chng, Science Department, WOAH, Paris
16:10 – 16:30	Break	
16:30 – 16:50	Sector 1 : Compartmentalisation- application	Leana Janse – Van Rensburg, State Veterinarian, Western Cape Department of Agriculture, South Africa
16:50 – 17:10	Sector 1 : Movement control, quarantine, identification and traceability	Peter Evans, Veterinary Director, SAPPO, South Africa
17:10 – 17:30	Discussion : certifying ASF compartments for trade	Facilitator : M-L Penrith

Online or pre-recorded presentation.

Wednesday 2 August 2023		
08:00 – 09:00	Arrival of participants	
Session 3. Strengthen biosecurity for the control of ASF along the value chain (continued) 		
09:00 – 09:20	Sector 2 : Good biosecurity practices in the small holder sector : an example from Vietnam 	Pawin Padungtod and Nguyen Thi Tuyet Minh, ECTAD Country Programme, FAO, Vietnam
09:20 – 09:40	Sector 2 : Community engagement to support smallholders in Asia via *Community ASF Biosecurity Intervention* (CABI) programme. 	Yooni Oh, Animal Production and Health Officer, Regional Office, FAO, Bangkok
09:40 – 10:00	Sector 2 : Biosecurity along the value chain (pens, transport, slaughter slabs, markets)	Michel Dione, International Livestock Research Institute (ILRI), Dakar
10:00 – 10:20	Sector 2 : Feed and swill feeding	Casimir Marcel Ndongo – Kounou, Animal Health Expert, FAO, Yaounde
10:20 – 10:40	Sector 2 : Movement control of people (traders, animal health service providers) and animals (pigs, rodents, birds, etc…), on-farm quarantine, introduction of new animals, all-in / all-out, renting boars	Djassi Edoukou, Independent ASF consultant, Abidjan
10:40 – 11:10	Discussion : what are the incentives for reporting and the benefits of applying strict biosecurity	Facilitator : Edward Okoth
11:10 – 11:30	Break	
11:30 – 11:50	Sector 3 : Community-contracting and self-regulation at community-level (recording) 	Erika Chenais, Department of Disease Control and Epidemiology, Swedish National Veterinary Institute, Uppsala, Sweden
11:50 – 12:10	Sector 3 : FAO *Progressive Management Pathway for Terrestrial Animal Biosecurity* (PMP-TAB)- towards sustainable and resilient livestock production systems	Andriy Rozstalnyy, ASF Working Group, NSAH, FAO, Rome
12:10 – 12:30	Sector 3 : Scavenging for food and use of food waste	Edward Okoth, International Livestock Research Institute (ILRI), Kabete
12:30 – 13:00	Discussion : is community-based self-governance the solution ?	Facilitator : A. Rozstalnyy

13:00 – 14:00	Lunch	

Session 4. Enhanced surveillance and diagnostic capabilities for ASF control		
Topic :	Field surveillance, surveillance along the value chain	
14:00 – 14:20	• Purposes of surveillance : disease control or disease intelligence ?	Misheck Mulumba, Onderstepoort Veterinary Research (OVR) institute, South Africa
14:20 – 14:40	• Challenges in active and passive surveillance for ASF or for syndromic surveillance in the pig-sector and how to improve the systems (including abattoir and market surveillance)	Michel Dione, International Livestock Research Institute (ILRI), Dakar
14:40 – 15:00	• Understanding cross-border movements and spatial and temporal transmission of ASFV through molecular techniques	Gerald Misinzo, Sokoine University of Agriculture (SUA), Tanzania
15:00 – 15:20	• On-farm surveillance	Dirk Pfeiffer, Centre for Applied One Health Research and Policy Advice (OHRP), City University of Hong Kong
15:20 – 15:40	• Wildlife surveillance	Ferran Jori, UMR ASTRE, CIRAD, Montpellier, France
15:40 – 16:00	Break	
16:00 – 16:30	Member country presentations – field surveillance • South Africa • Nigeria	• Leana Janse – Van Rensburg • Ayuba Sini Ibrahim
16:30 – 17:30	Discussion : Indirect surveillance approaches (by proxy) : sentinel animals, carcass price monitoring, marketing volumes, environmental sampling, opportunistic sampling of wildlife…	Facilitator : Ferran Jori

Thursday 3 August 2023		
08:00 – 09:00	Arrival of participants	
Session 4. Enhanced surveillance and diagnostic capabilities for ASF control (continued) 		
Topic :	Diagnostics	
09:00 – 09:20	• New diagnostics considered for the Terrestrial Manual • FAO – WOAH Guidelines on ASF diagnostics • Pen-side tests and feedback from countries	Livio Heath, Onderstepoort Veterinary Research (OVR) institute, South Africa
09:20 – 09:40	Changes to the WOAH Terrestrial Manual (ASF Chapter)	Emmanuel Couacy-Hymann, Chair of the WOAH Biological Standards Commission, CNRA-LIRED, Côte d'Ivoire
09:40 – 10:10	Member country presentations- diagnostics • Congo (Dem. Rep.) • Kenya	• Roger Madiamba • Sam Kahariri
10:10 – 10:40	Break	
10:40 – 11:00	Building a regional ASF laboratories network	Livio Heath, Onderstepoort Veterinary Research (OVR) institute, South Africa
11:00 – 11:20	R&D and capacity building activities of the Joint FAO/IAEA Centre on ASF diagnosis and surveillance through the VETLAB Network.	Charles Euloge Lamien, Joint Division FAO/IAEA, Vienna
11:20 – 12:20	National reference laboratories' presentations • NVRI • LNERV - ISRA • ~~NAHDIC (AHI)~~ 	• Pam Luka • Mame Diouf • ~~Rufael Tesfaye~~
12:20 – 12:40	Twinning for ASF, an ongoing example • Ghana	Theo Odoom, Accra Veterinary Laboratory, Ghana
12:40 – 13:10	Discussion : Adopting molecular techniques so as to build capacity to differentiate wild from vaccine strains in the future, asymptomatic virus strains, differential diagnoses for ASF, and linking syndromic surveillance outcomes to diagnostic protocols.	Facilitator : M. Mulumba

13.10 – 14.00	Lunch	
14.00 – 15.00	Closed meeting of chairs and rapporteurs	
Session 5. Final deliberations, action points, next meeting		
15:00 – 15:15	Presentation of the draft action points	Rapporteurs
15:15 – 16:00	Discussion : draft action points	Facilitator
16:00 – 16:10	Proposed amendments to the Terms of Reference and to the list of technical items *(vaccines)*	Viola Chemis, Regional Activities Department, WOAH, Nairobi
16:10 – 16:15	Dates and venue / format of SGE nr 4	Karim Tounkara, Secretary of the GF-TADs for Africa, WOAH, Bamako
16:15 – 16:30	Closing statement by the Chair	~~Nick Nwankpa, Chair of the GF-TADs for Africa Regional Steering Committee, AU-IBAR, Nairobi~~
16:30	Break and departure of participants	

Group picture in front of the Silver Moon Hotel in Cocody, Abidjan. Picture © P. Bastiaensen (woah) 2023

Session 1. Welcoming remarks by the Bureau of the Regional Steering Committee

Dr Andriy Rozstalnyy, Chair of the GF-TADs ASF Global Working Group on behalf of FAO, and representing the Vice-President of the Regional Steering Committee, reiterated the support FAO is providing to Member countries to control ASF and welcomed all participants to the meeting.

The Vice-President of the Regional Steering Committee, on behalf of WOAH, Dr Roland Xolani Dlamini, WOAH Delegate of Eswatini and Member of the WOAH Council, after recognising all institutions present at the meeting, recalled the establishment of SGE-ASF in 2021. He posed three questions: why does one control ASF, what can be done and when should it be done? He emphasised that there is a need to follow WOAH standards, which take into account the (SPS) principle of equivalence to control TADs and as such, there should be no excuse for any country not to play their part in controlling ASF. Procrastination, he stated, is no excuse and resources flow to those who apply effort to access them.

The Representative of the Minister for Animal and Fisheries Resources, Dr Fadiga Kaly Diarrasouba, technical advisor, referred to the 1996 (and following) outbreaks of ASF in Cote d'Ivoire, that resulted in several billions of FCFA in losses. She acknowledged the efforts of the SGE to support countries to control ASF since the disease has to do without a vaccine, for now. She declared the meeting open.

The high table, with from front to back Dr Andriy Rozstalnyy (FAO NSAH, ASF WG), Dr. Fadiga Haida Kaly Diarassouba (Technical Assistant Representing H.E. the Minister of Animal and Fisheries Resources, Cote d'Ivoire) and Dr Roland Dlamini (WOAH Delegate Eswatini). Picture © P. Bastiaensen (woah) 2023.

Session 2. Governance Issues

The agenda was adopted as presented, with in addition the inclusion of a brief update about the Africa chapter of the Global African Swine Fever Research Alliance (GARA) by the representatives present in the meeting i.e. Drs Pam Luka (Nigeria) and Theo Odoom (Ghana).

The specific objectives of this meeting were reiterated as (topics 2 and 3):

2. To strengthen biosecurity for the control of ASF along the value chain ;
3. Enhance surveillance and diagnostic capabilities for ASF control, both in the field and at the laboratory.

The meeting was reminded of the minutes of the SGE II meeting (Patrick Bastiaensen), followed by a consolidated report of the degree of action taken by Members, based on the agreed action points (presented by Viola Chemis). The minutes outlined a short review of the 44 participants (30% women) who attended last year's online meeting over two days (21 – 22 September 2022). Focusing on the *pig value chain and methodologies for value chain analysis* (topic 1), a Zoom poll conducted the time outlined other diseases identified by countries as important, besides ASF. Member countries identified several constraints they faced in controlling ASF.

The report and video presentations in both English and French are available in the GF-TADs website for Africa : Second ASF standing group of experts meeting focuses on value chains - Africa

The consolidated progress report of action points included feedback from the Democratic Republic of Congo (DRC), Kenya, South Africa and FAO. In short, some countries have a good understanding of the pig value chain but still face information gap challenges in respect of the smallholder, communal/community and backyard piggeries. Kenya and Uganda have drafted national ASF strategic plans to guide their interventions.

The meeting indicated it would be ideal if the second edition of the Continental strategy were to validated, for countries to align and be encouraged to work towards a harmonised approach, considering the dynamics in ASFV epidemiology.

As part of capacity building, FAO, through its *Virtual Learning Centre* (VLC) delivered a training course on ASF control in limited capacity-settings, attended by nine eastern African countries. The training involved off-line learning and four live sessions.

In addition, FAO deployed a mission to Tanzania to develop its diagnostic capacity with training on the application of mobile thermocyclers for RT-PCR which show promising results. In consideration of other pig diseases of public health importance, the DRC is reportedly in the process of conducting laboratory screenings for trichinellosis, brucellosis and other swine infections.

Regional updates regarding the current disease situation were provided (on-line) by Dr. Wamalwa Kinyanjui for the Eastern Africa region on behalf of the *IGAD Centre for Pastoral Areas and Livestock Development,* ICPALD (and the *Eastern Africa Regional Epidemiology Network,* EAREN).

The update for Central Africa was presented by Dr. Jean-Marc Feussom (in-person), on behalf of the *Economic Community of Central African States* (ECCAS) and for Southern Africa, by Prof. Mary Louise Penrith (in-person), on behalf of the *Southern Africa Development Community* (SADC) *Epidemiology and Informatics Sub-Committee* (EIS). The presentations highlighted ASF as endemic in all of the sub-

regions, characterised by low reporting, inadequate diagnostic capacities, insufficient enforcement of existing regulations and limited resources to control the disease and support further research.

Map 1 shows a map of the ASFV genotypes circulating in the region[1]. Map 2, which focuses on the Southern Africa region, shows that all ASFV genotypes are circulating in the region, except XXIII which has been described in Ethiopia. The array of genotypes circulating in Africa complicates the potential use of future vaccines as there seems to be no known cross-protection across genotypes.

The epidemiology of ASFV in the Republic of South Africa is very dynamic, with the warthog – tick (sylvatic) cycle no longer limited to the previous controlled area of South Africa. Pig related outbreaks have occurred in all nine provinces of the Republic, caused by genotypes I and II viruses and not traceable to warthogs.

The presentation on behalf of SADC acknowledged that eradication is only a realistic goal in countries without wild pig or tick involvement. The increasing domestic pig outbreaks in South Africa pose a risk to previously uninfected countries (specifically Eswatini and Lesotho) hence the need for these countries to improve their risk assessments and emergency preparedness.

Map 1: ASFV genotypes, circulating in Africa. Source : Njau, Emma P., et al. "African swine fever virus (ASFV): Biology, genomics and genotypes circulating in sub-Saharan Africa." *Viruses 13.11 (2021): 2285.*

1

Map 2: Genotypes circulating in the SADC Region

The meeting noted the importance of the cross-border pig-trade as important in ASFV transmission and therefore the need for bilateral and regional collaboration. Largely non-existent compensation policies in the smallholder sector, arguably contributing to non-reporting, is somewhat being re-assessed through the adoption of participatory approaches with involvement of farmers and value chain actors to support implementation of recommended biosecurity measures and timely disease reporting.

The latter would benefit from increased access to *Point of Care* (PoC) test kits and guidance on the use and interpretations of results for veterinary teams to support early diagnosis and reporting.

A brief about the *Global ASF Research Alliance* (GARA) **African Chapter** was provided by Dr Pam Luka. He mentioned that this (new) branch of GARA exists to facilitate collaboration and contextual research needs in the continent in line with WOAH guidelines, support vaccine development, information sharing among researchers and collaboration internally and with international partners. The group was established during the GARA gap analysis workshop held in February 2023 in Kampala, Uganda and is currently developing an MoU with Members to facilitate structured information sharing.

Session 3. Biosecurity along the value chain (topic 2)

An overview presentation on the various pig value chains in Africa, with a focus on biosecurity in the different sectors was made by Prof. Mary-Louise Penrith from the University of Pretoria. She categorized pig production into three sectors :

- Sector 1: Characterized by industrial, intensive and commercial farms;
- Sector 2: Characterized by smallholder, semi-intensive production;
- Sector 3: Characterised by backyard, free-range, scavenging and extensive forms of production.

The intensive and industrial sector (1) is not practised much in Africa. The biosecurity in such farms is usually high and suitable for compartmentalisation. These are formal value chains, easy to document, and sometimes in contractual arrangements with large commercial abattoirs. *Hazard Analysis Critical Control Point* (HACCP) compliance is increasingly required in abattoirs. Challenges occur in the smaller herds, for which companies or owners find it difficult to invest in more technology.

The semi-intensive production system, sector 2 is characterised by small herds that are mostly confined, lacking the critical mass for profitability, relying on home-mixed rations with variable health care and targeting local markets. Basic biosecurity is usually in place.

The backyard free ranging and scavenging production system (3) is characterised by low input, limited health care, intermingling of pigs of different sources and age groups, and biosecurity is mostly non-existent. In backyard production systems, animals might be partly confined. Feeding is coming mostly from kitchen waste, swill, industrial, market waste or municipality garbage.

The understanding of the different sectors set the scene for the next presentations which were organised by sector (refer to the sections a, b and c below).

Following Prof. Penrith's presentation, the meeting agreed that biosecurity measures should be acceptable and practically applicable. The case of Tanzania which tried to promote controlled slaughter in affected farms under supervision of veterinarians was cited as an example. The meeting also noted the slaughterhouses as an important cause of contamination in urban areas and therefore the need to discourage farm visit by those supplying markets.

The opening country presentation was delivered by Dr. Vessaly Kallo, Director of Veterinary Services, Cote d'Ivoire, and host of the meeting. He stressed the importance of pig production on livelihoods, giving an example of outbreaks where about 30,000 animals were culled. He described the country's biosecurity strategy which emphasizes physical segregation, cleaning and disinfection; though he recognised that there are difficulties in implementing the latter as its effectiveness is dependent on many factors. He acknowledged the various biosecurity challenges occurring during transportation, slaughter and pork handling processes that are managed under poor hygienic conditions, thus posing a risk of disease spread.

Additional country presentations highlighting pig value chains and level of biosecurity were made by Cabo Verde (online), Cameroon, Togo and Uganda.

Pig production in all these countries is mostly of the backyard, free range or extensive type (sector 3), the target market being mostly domestic or to neighbouring countries. Production is depicted as having low levels of biosecurity along the value chain (production, harvesting, marketing transportation), weak institutional structures that make health monitoring difficult, resource limitations to support improvement and enforcement of existing legislation, including cross-border movement control. Some countries reported increased sales of live pigs on markets whenever disease strikes. Despite the challenges, countries are making diverse efforts to improve their capacities. For example, Togo has developed a new strategy for the control of ASF, but that is yet to be operationalised. Cameroon's veterinary services run an improved animal disease surveillance network *(Réseau d'épidémiosurveillance du Cameroun,* or RESCAM), established mobile rapid intervention teams with ASF as one of the priority diseases, developed *Standard Operating Procedures* (SoPs) for ASF surveillance, a web application for reporting and feedback (CAHIS) and community-based surveillance. Uganda has a modern diagnostic laboratory (a partnership of the National Animal Disease Diagnostics and Epidemiology Centre, NADDEC, Makerere University, and the National Livestock Resources Research Institute, NALiRRI) that can support outbreak confirmation within 72 hours and with support of projects conducting both passive and active surveillance. Cabo Verde has produced a manual to guide farmer awareness raising and training on biosecurity and -as did Cameroon- have conducted training on ASFV diagnostics for some of their staff. Additionally, Cabo Verde has operationalised a surveillance and epidemiology network for pig diseases that involves a range of

stakeholders at central, island and communal level to support reporting of cases using specific templates.

Session 3a: Biosecurity in industrial, intensive, commercial farms (sector 1)

Prof. Jeroen Dewulf from Ghent University, Belgium, in his online presentation, emphasised the role of human behaviour in disease transmission and the need to enhance behaviour change among stakeholders along the value chain. He defined biosecurity as to include management, behavioural and physical aspects to reduce introduction (external) and reduce spread (internal).

Biosecurity is therefore the basis for any disease control programme.

It is therefore important to translate biosecurity *principles* to biosecurity *measures*. To be successful, biosecurity has to be continuous, all the time and cannot allow for slack behaviour. Hence, getting the right attitude instilled to stakeholders takes time. The process of implementation will take time, it will need to be repeated, taught over and over again, with continued efforts to get the desired results. Considering that not every risk is equally important, it is critical to identify all risks and rank them in order to guide the prioritisation of interventions. The *principle* is to reduce the general infection pressure and burden on an animal's immune system. The risk-based scoring system should be based on scientific research and risk of transmission by direct *versus* indirect contact, in order to inform and determine priorities for control measures.

Prof. Dewulf provided a link to an online and free-to-use tool availed by Biocheck.UGent that provides a comprehensive questionnaire aimed at *conventional* farms. The survey can be used to determine the level of biosecurity at farm level and identify weak points. He also mentioned that a *free-range* questionnaire will soon be made available (by September 2023) while the *backyard* questionnaire is expected to be developed in future, subject to funding.

He further explained that there is a direct association between increased biosecurity and reduced use of antimicrobials and decreased resistance.

Dr Peter Evans *(South African Pig Producers' Organisation,* SAPPO) in his presentation about feeds mentioned that liquid feed systems are more likely to transmit ASFV than dry feed. He underscored the need for a reliable source of raw ingredients, delivered by clean vehicles. He reminded the meeting about the time and temperature factors for the inactivation of ASFV, with the potential to reduce infectivity by high temperature (heat treatment of ingredients) or with formaldehyde where it is allowed. He reiterated the high risks associated with feed in pig production industries, taking the example of such a case in Uganda. He concluded by stressing the need to check raw materials, encourage pelleting, bagging off, personnel management and controlled access to feed production areas.

Dr Charmaine Chng of the WOAH Science Department explained that WOAH has developed a set of compartmentalisation guidelines. She stressed that the objective is not just to facilitate trade but for disease control. The guidelines provide the possibility of countries to set up compartments in areas infected by ASF. She highlighted that compartments are not simply high biosecurity farms, but require a comprehensive systems approach ensuring that all risk pathways including upstream inputs (feed,

genetics etc) are covered, supported by robust surveillance, identification and traceability systems and regulatory framework.

Compartments usually require significant investment by private sector and therefore require strong public-private partnerships. Veterinary Services are encouraged to ensure supportive legislation to recognise compartments as provided in the guidelines. An important element relates to the trust between public and private sector, as well between trading countries or partners, which is reflected in the willingness to share disease information transparently and accurately. Compartment operations have to be consistently applied, any deviations should be immediately corrected, and Veterinary Services should have or build the capacity to monitor and ensure systems are functioning.

The meeting discussed the need for identification and traceability measures among compartments which should be under the responsibility of Veterinary Services. Such systems make it easier to enforce movement control and facilitate traceability. The meeting acknowledged the complexity of applying compartmentalisation when other swine diseases also have to be considered.

Dr Leana Janse Van Rensburg, State Veterinarian from the Western Cape Government in the Republic of South Africa (RSA) explained how compartmentalisation is applied in her country as a mechanism to facilitate trade and disease management. She explained that South Africa deals with a sylvatic cycle and that it is therefore difficult to eradicate ASF. Based on South Africa's experience, compartmentalisation should be practical, without hustles, and must have a documentation system supported by a legislative framework. RSA is in the process of reviewing its legislation on the *Veterinary Procedures Notice* (VPN), in order to adapt to the changing epidemiological situation. The weakest link is people; people must comply all the time, therefore there is need for buy-in of people, even when it seems inconvenient.

Compartments must target internal and external surveillance where there are epidemiological links, diagnostic capabilities, and functional couriers to transport samples. The system should ensure early detection and implementation of a preparedness plan in case of suspect cases and mechanisms to restore or recover free status. The *Veterinary Authority* (VA) must be the supervising authority to monitor and list compartments, and facilitate negotiations with trade partners, all this contingent on functioning *Public-Private Partnerships* (PPP). The entry of the *South African Pig Producers' Organisation* (SAPPO), a private sector entity that contributes through a PPP approach to animal health management, has led to decreased disease pressure since 2019. Prior to engaging into compartmentalisation, countries require a very carefully thought-out plan in case of need for intervention and the *Veterinary Authority* (VA) should be involved in the process. The representative, in closing, expressed the fact that there are challenges with trading partners in acceptance of compartmentalisation.

Dr. Peter Evans (SAPPO) explained that during peace time, when there is no disease, movement control should be emphasised in high-risk areas, however difficult to implement this may be. He mentioned that SAPPO established a movement tracking application with seven networks, that helps with forward and backward tracing. On the mobile application, all farm consultants can log their visits as part of passive surveillance. A biosecurity assessment application allows for self-assessment with seven mandatory questions and 31 scoring questions. The tool helps calculate a biosecurity rating out of 100. He mentioned that during a disease outbreak, compliance is easier in commercial farms. However, in other farms, Government tried to facilitate culling through incentives (not 100% compensation). He stated the need to consider the risk of transporting healthy pigs that are infected with ASF to abattoirs. Part of the control includes quarantine, slaughter of healthy pigs for salvage, euthanasia, disposal of dead animals, environmental contamination and legislation. He noted that identification and

traceability is a critical element, but also questioned both costs and methods, in addition to legislation and compliance. He stated that at the basic level of tracing, animals should be identified by farm-of-origin. SAPPO is using a movement application (farm and age group) to trace pigs, but it gets harder at individual animal level.

The discussion session on "certifying ASF compartments for trade", intended to focus on incentives for trade (in sector 1) ended up as an open conversation about different issues touching on research, vaccines, policy and reporting.

Session 3b: Biosecurity in Smallholder, semi-intensive production (sector 2)

Drs Pawin Padungtod and Nguyen Thi Tuyet Minh of the ECTAD Country Programme in Vietnam (FAO) shared their experiences with pig farming in Vietnam. The biosecurity conditions and practices of households and small farms is quite poor. FAO has been involved in pig farm biosecurity improvement programmes since 2020 in 14 provinces of Vietnam, through two projects supported by USAID. The programmes engaged farming communities to develop model farms, training materials, and a pool of trainers. Eight bio-secure model pig farms were built, which contributed to increase profits by 15.4% and reduce pig mortality by 55%. The programmes also led to decreased use of antibiotics, as biosecurity measures improved. Two checklists for biosecurity and pig management practices for households and small farms were developed, tested and recommended as supporting tools for the monitoring of implementation. Capacity development included a comprehensive training package on biosecurity and good management practices along the pig value chain that is delivered through a *Trainer of Trainers* (ToT) approach or extension system. Some of the lessons learnt include: careful identification of target farmers, encouraging the use of local consultants, introduction of local costs for technical measures, provision of appropriate timely advice and good coordination with the relevant Government departments and local partners. They also encouraged strengthening south-south cooperation in ASF control and other animal health initiatives.

The situation in the Asia-Pacific region was presented by Dr Yooni Oh of the FAO Regional Office for Asia and the Pacific (RAP) in Bangkok, Thailand. Her presentation focused on community engagement to support smallholders in Asia, through the *Community ASF Biosecurity Intervention* (CABI) programme. Her presentation showed that 18 countries officially reported ASF in the Asia Pacific region. The programme adopted a multi-dimensional approach and follows a conceptual framework to guide community engagement. An assessment, guided by a risk profiling questionnaire, showed that most countries were not prepared to deal with an emergency and/or a rapid response back in 2018. Capacity building activities started with online courses which led to in-country training through a cascade approach. The programme provided biosecurity packages to target farmers, laboratory reagents and consumables to support diagnostics and it published diagnostic protocols. CABI also developed a number of communication materials (in different languages) including a documentary video, all available on the ECTAD regional webpage (African swine fever)

YouTube https://youtu.be/VIOwydNgAVY

Dr Yooni Oh also cited a programme piloted in the Philippines in 2022, with the ambition to implement it in 5 other countries. The estimated cost for the CABI programme is about USD 325 per farm. FAO

has been working to release a self-learning course targeting smallholders, which is now available on FAO's virtual leaning center (https://virtual-learning-center.fao.org/mod/page/view.php?id=13158)

Dr Michel Dione of the *International Livestock Research Institute* (ILRI) explained that smallholder production is characterised by low productivity, informal trade, informal slaughter, informal product processing and informal disposal of waste, citing the example of Uganda's smallholder pig sector. Based on these studies in Uganda (table 1 below), he showed results from simulations that show the impact of outbreaks on different actors. It depicts that benefits accrue for farmers when biosecurity and business hub interventions are implemented together. However, farmers are the greatest losers in case of biosecurity breaches, i.e. disease outbreaks and this therefore justifies the need to support them to implement biosecurity (better) as a cushion. Other findings were that farmers change their behaviour and practices but consider it difficult to implement biosecurity measures due to lack of capacity. He recommended that capacity building efforts should consider integrated biosecurity protocols, including parasitic and other priority pig disease, animal wealth and herd health practices (feeding, breeding and other health preventive). ILRI also piloted the adoption of mobile-based interactive advisory services to support extension, but did not get an investor to run the service.

Table 1: *Average annual % change of value chain actors' cumulative profit relative to baseline*

Scenario	**Pig value chain actors**				
	Producers	Butchers	Traders	Collectors	Wholesalers
ASF biosecurity *versus* baseline	-6.2	8.1	10.3	8.6	8.0
Pig business hub *versus* baseline	11.3	5.3	8.8	7.3	4.0
Combined ASF biosecurity - pig business hub	6.5	13.1	21.2	17.4	10.4

Dr Casimir Marcel Ndongo, ASF Technical Specialist of the NSAH (FAO) presented experiences with feed and swill feeding in Central Africa, where pig production is often categorised as a secondary activity. He mentioned that most producers have moved from free-range to smallholder production systems, though still with limited investment, sometimes characterised by multi-species integrated production. According to his presentation, feeding accounts for about 60 – 75% of the cost of production, causes 90% of the contacts between the pigs and the farmer, and causes 75% contacts by the farmer, outside of his/her farm. He described various feeding practices with crop residues and mostly swill as the feed options. The other alternative is kitchen waste. Among the risks he mentioned was exposure of crop residues to wild boars in the field, or feed contamination during transportation. The current and only practical solution available to farmers is heat treatment prior to feeding, quoting WOAH standards, Code article 15.1.22, a FAO paper (2017) and Nuanualsuwan *et al.* (2022), with varying recommendations, sometimes contradicting, such as :

- 10 minutes at boiling point (Nuanualsuwan *et al.*, 2022)
- 30 minutes at 70°C (Beltran-Alcrudo D *et al*, FAO, 2017)
- 60 minutes at 90°C (WOAH Code, 2022)

Dr Djassi Edoukou, an independent ASF consultant (FAO and WOAH), based in Abidjan, presented on movement control of people (traders, animal health service providers) and animals (pigs, rodents, birds), on-farm quarantine, introduction of new animals, all-in / all-out, renting of boars and related risk factors. He reiterated the fact that transport plays a key role in ASFV transmission. One of the key

-textbook- measures is to restrict movement of pigs, especially during outbreaks or in affected areas, though this is difficult to implement. In addition, the lack of incentives *(the carrot)* to compensate for any losses poses a challenge to compliance. Enforcement *(the stick)* is limited by the number of staff within the Veterinary Services and other law enforcement authorities. Other challenges are the lack of cooperation and adherence to rules, businesspeople wanting to make a quick profit from sick animals, deterrence of farmers fearing marginalisation by reporting, the practice of renting or exchange of boars, limited means to feed animals, weak motivation to implement strict biosafety and -overall- porous land borders. The all-in all-out management system is implemented in some farms, which would also have isolation space for new animals.

In the discussion session, labelled "what are the incentives for reporting and the benefits of applying strict biosecurity?" it was again emphasised that compensation has largely proven unsustainable. The question then is : what other incentives can be promoted to encourage reporting? For example, can farmers can be supported with disinfection and disposal of carcasses, even where compensation is not possible? Based on the Nigerian experience with avian influenza, it was suggested to work with market operators to support surveillance and provide a competitive package scheme to cushion the losses and encourage livestock insurance. It was also acknowledged that it would remain a challenge to improve compliance of marketers or traders as any movement restrictions would immediately affect their business. In an effort to improve reporting, it was also suggested to use social media groups as a communication platform with farmers, in order to support extension and information exchange including receiving rumour reports. The Vietnam model, presented at the meeting by FAO, was also seen as a valuable inspiration for some innovative biosecurity measures which could be contextualized by countries in Africa. Cote d'Ivoire shared its experience in providing training following an outbreak that led to the slaughter of about 31,000 pigs. Farmers were trained to organise fencing and were supported with restocking, starting with 100 pigs. Those who abided by the biosecurity measures, grew their farms and became specialists. They now participate in reporting and alert authorities in case the spot scavenging or free-range pigs.

Session 3c: Biosecurity in Backyard, free-range, scavenging and extensive production systems (sector 3)

The session started with a pre-recorded presentation on Community-contracting and self-regulation at community-level by Dr Erika Chenais of the Swedish National Veterinary Institute. Her presentation covered a participatory study conducted in six villages in the Gulu region of Uganda on co-created community contracts. In the first community meeting they discussed biosecurity measures and they agreed which measures they would implement in each village. This was documented in a community contract. The level of implementation of each measure was then reviewed village by village. In assessing such contracts, it is important to consider the feasibility of implementation of some of the measures, costs associated with them and social norms or taboos. She attributed the training provided in the first meeting to have helped in the adoption of basic measures. She concluded that community-based or driven approaches stimulate change. Contracts go beyond the paper they are written on, instil aspirations for change and contribute to positive ''peer pressure'' in realising some of the measures.

A presentation on the FAO *Progressive Management Pathway* for *Terrestrial Animal Biosecurity* (PMP-TAB) towards sustainable and resilient livestock production systems was made by Dr Andriy Rozstalnyy

(FAO, and Member of the GF-TADs ASF Working Group). The PMP – TAB is a process intended to support countries improve their national biosecurity systems from the production site to the point of slaughter. It is not a disease specific pathway, but a process for inclusive collaboration, with steps of assessment of current biosecurity practices, relevant biological risks and analysis that lead to the development of initiatives that can be implemented. Limited pilot approaches can later lead to upscaling geographically or to other sectors, resulting in demonstrated commitment for continued biosecurity support by stakeholders. PMP-TAB represents an important connection to the food safety and environmental sectors. At each step there should be economic and business incentives. The core components are knowledge and information sharing for evolving situations, enabling environment, infrastructure and the capacity to influence desired practices.

FAO established a *Community of Practice* (CoP) for Terrestrial Animal Biosecurity, through its *Virtual Learning Centres* (VLC). Interested individuals can join the CoP at https://virtual-learning-center.fao.org/mod/page/view.php?id=8724&forceview=1 or contact PMP-TAB@fao.org by email.

On behalf of the *International Livestock Research Institute* (ILRI) in Nairobi, Dr Edward Okoth, in his presentation about scavenging for food and use of food waste, stated that free-ranging pigs increase interactions and risk of spread of ASFV. Confinement is therefore logically recommended. Other measures include controlled access to pig houses and addressing pig welfare concerns. Feeding swill and food waste has contributed to transmission dynamics of the disease, citing cases of Europe, near Lisbon airport in 1957, in the former Soviet Republic of Georgia in 2007 and infected pig meat from ships in the Black Sea Port of Poti. The virus can survive in many environments and pork products remain a risk for spread. In efforts to control ASF, one needs to remember that farmers, who are rational beings, will always act where benefits demonstrate advantage to their production and productivity. In doing so and getting there, they will need support to implement the changes. These may include training, information and access to technologies.

The discussion session focused on whether community-based self-governance is the solution. The meeting agreed that community intervention is a fundamental component and is key in biosecurity issues. However, one needs to understand how communities behave and respond, what is feasible and what interventions can upscale compliance. Communities may also require support, monitoring, and supervision to feel, touch and see the results and -in the end- accept them. “Difficult” measures like animal movement should be handled collaboratively with veterinary services and relevant authorities. The community should be considered as part of the private sector, therefore should consider *Public-Private-Community-Partnerships* (PPCP) using local resources e.g. crop residues/waste as feed. Solutions should consider integrated holistic approaches, not necessarily specific disease focused. Strategies will need to be adapted to ensure real and genuine contact between *authority* and *community*, so that the proposed solutions contribute to results and improve interactions. The approach to reach out to communities needs to involve other relevant disciplines. There is a need to collaborate with social anthropologists to understand how our collective actions affect community behaviour and then focus on enforcement of appropriate legislation. Furthermore, one needs to consider risk-based approaches that promote and privilege business continuity, food security and nutritional security. The meeting was reminded that mobilising communities comes at a cost and that Veterinary Services or other disciplines or authorities may not have sufficient resources. In some cases, it makes economic and business sense for private investors from sector 1 to get involved in addressing the challenges of sector 3 (and 2).

The meeting concluded that well-supervised and result-oriented community-based self-governance is fundamental in the control of swine diseases, including ASF. While there is no one-fits-all solution

available, the meeting encouraged the promotion of community-based approaches and grassroot support, from a multidisciplinary angle, with social science and economic analysis looking into the drivers of change.

Session 4. Surveillance (topic 3)

Field surveillance

The presentation on "Purposes of surveillance: disease control or disease intelligence?" was delivered by Dr Misheck Mulumba, Director of the *Onderstepoort Veterinary Research Institute* (OVRI, formerly OVI) in Pretoria, South Africa. He emphasised that any surveillance is done with a view of taking action, premised on a set of objectives i.e. to determine the level of disease in a population, declare its freedom or determine the presence of emerging disease. Relevant disease intelligence can be collected, robustly analysed, and expertly communicated to scientists and stakeholders. Infectious disease intelligence is a new concept that attempts to address concerns related to new and emerging diseases and enhance national emergency preparedness to minimize economic losses and even loss of life.

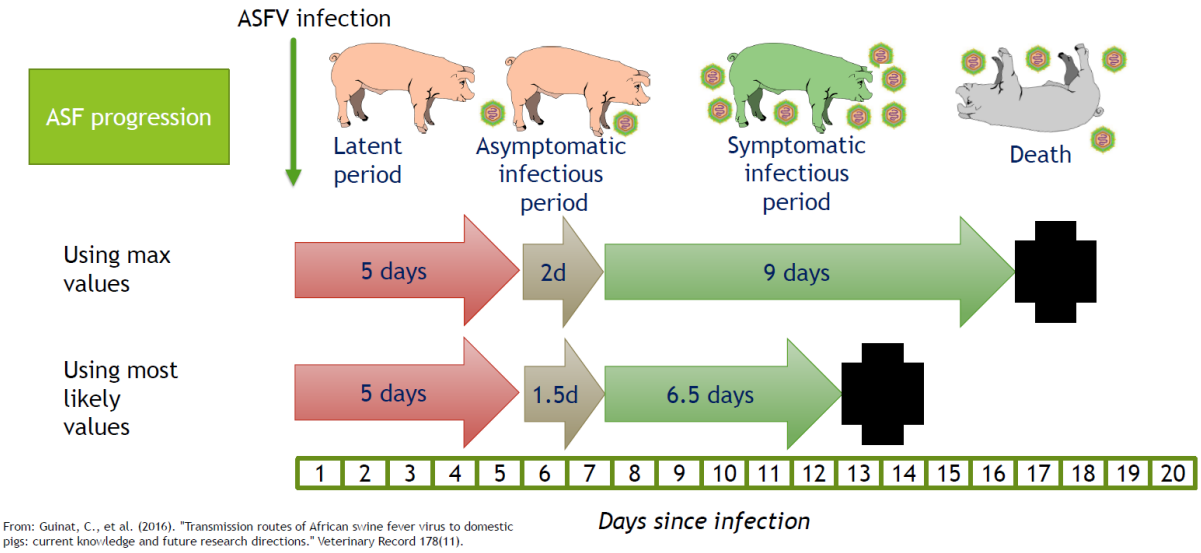
On behalf of the *International Livestock Research Institute* (ILRI) in Dakar, Dr Michel Dione presented the challenges in active and passive surveillance, or for syndromic surveillance in the pig-sector and how to improve the systems (including abattoir and market surveillance). In his presentation he mentioned that clinical disease doesn't present any pathognomonic signs, and that ASF can therefore be only confirmed through laboratory diagnosis. Lateral flow assays have been developed for farm testing *(point-of-care* tests, PoC) but the question remains whether they are sufficient. Reporting studies show low compliance attributed to fear of business losses (i.e. protection of business source by value chain actors) and lack of knowledge on how to recognise ASF. There is a need to build capacity of veterinary staff in the public and the private sector, including laboratory staff, promote access to cost effective lateral flow tests, set up reliable surveillance systems at markets and slaughterhouses, develop alternative ways for disease reporting by increasing community involvement with self-regulation systems and the use of *Information and Communication Technologies* (ICT) for channelling information.

The topic about on-farm surveillance was presented (online) by Prof. Dirk Pfeiffer, from the *Centre for Applied One Health Research and Policy Advice* (OHRP), City University of Hong Kong. He noted that reporting by farmers is a key component of the surveillance system.

Based on transmission dynamics reports, the spread of ASFV by pig-to-pig transmission can be slower than for other diseases, and clinical diagnosis has poor sensitivity given the long latent period, part of which the animal is infectious. This is further complicated by delayed or reporting avoidance by farmers.

It is generally accepted that the r_0 value (basic reproduction number) for ASFV is 4, which is comparable to COVID-19 in man.

He mentioned that FAO has produced a lot of documentation on ASF risk management guidelines for smallholder farms in Asia (ASF publications, fao.org) as well as the OIE (now WOAH) Manual for assessing cross-border African swine fever risk. He emphasised that surveillance programmes should have clear objectives directed towards informing action, should be risk-based, needs support of farmers and clarity on the role of on-farm molecular surveillance. Molecular diagnostics on-farm can be used for early detection of the disease within five days at individual animal level.



From: Guinat, C., et al. (2016). "Transmission routes of African swine fever virus to domestic pigs: current knowledge and future research directions." Veterinary Record 178(11).

ASF progression following infection (assumptions are that this is a case of Georgia 2007/1 and that the infected animal which is introduced into a herd is infectious immediately after introduction).

Prof. Pfeiffer cautioned that new strains of ASFV could be introduced due to illegal use of vaccines. Overall, technologies should be taken up based on evidence and not out of frustration so that results can support advocacy and buy-in by farmers who we need on our side to promote animal health and welfare.

Dr Gerald Misinzo, of *Sokoine University of Agriculture* (SUA), Tanzania, made a presentation titled "Understanding cross-border movements and spatial and temporal transmission of ASFV through molecular techniques". He reiterated that molecular techniques are useful for early detection of the virus at source. Mobile kits that can enable affordable complete genome sequencing (e.g. using Oxford nanopore), combined with syndromic surveillance using mobile apps, can allow for early detection at source and genotyping of ASFV. Genotype II may be amplified using LILO primers, but this is not applicable to other genotypes in the region; and work is in progress to develop the protocol for the rest. Meanwhile, SUA have established the complete genome sequencing for genotype XV (Tanzania and Malawi).

He explained that molecular sequencing has helped in understanding the geographic origin or source of infections, based on identity and genotype transmission dynamics. He stressed the 'power' of genomic surveillance in understanding transmission dynamics and spread of the disease across Africa, for example how genotype II spread in Tanzania and was introduced in Rwanda in 2021. The likelihood of genotype II gradually spreading northwards into Burundi, the Democratic Republic of Congo, Kenya and Uganda, is considerable. Using the information available, how then do we prevent the further spread and dominance of genotype II in the region? One of the important points is to understand if genotype II can enter the sylvatic cycle (ticks and wildlife).

The topic on wildlife surveillance was presented by Dr Ferran Jori from the *Coopération Internationale en Recherche Agronomique pour le Développement,* CIRAD in France, or French Agricultural Research Centre for International Development, who focused on ASF surveillance in African wild suids. He noted that very few countries are conducting ASF surveillance in wildlife. There is scarce knowledge on the role of African wild pigs in the epidemiology of ASF. With the exception of warthogs (80-100% prevalence), there is very little that is known about role of the other species (bushpig, red river hog, giant forest hog). Warthogs are asymptomatic ASFV hosts (i.e. do not develop clinical signs of ASF) and

serve as reservoirs. Young wild suids develop viraemia, produce very little virus, in insignificant amounts, unable to cause infection in other warthogs, but can infect ticks. Transmission through soft ticks is essential and horizontal transmission (between warthogs) has never been demonstrated.

Disease spread to domestic pigs is a consequence of sharing the same environment with warthogs (through ticks of the *Ornithodoros* spp). Indeed, warthogs may be the main reservoir, but are unable to transmit virus directly to pigs. Soft ticks have been documented as present only in eastern and southern Africa.

In South Africa, the dynamics within the sylvatic cycle have been changing and need to be monitored with time. The patterns seen in wild suids include high infection rates in warthogs (80 – 100%), fair proportion of burrows infested with soft ticks (44 – 65%) with low rates of infected ticks (0 – 3%). In areas where a sylvatic cycle occurs, there is also a diversity of ASF genotypes. There have been exceptions though, with high infection rates of warthogs in the absence of tick-infested burrows and vice versa : low infection rates of warthogs in the presence of tick-infested burrows.

Dr Jori noted that although the sylvatic cycle plays a minor role in ASFV transmission in pigs, it should not be neglected, but instead monitored as it maintains the virus in the environment, could be a source of early spillover, including a potential source of new strains. It is anticipated that with future population growth, food needs, there is likelihood for increased contacts between wild and domestic suids. For purposes of detection, serology only works in warthogs and bushpigs and doesn't work in other species. However, virus detection by PCR can be done in all species.

Country presentations on field surveillance were made by Drs Leana Janse – Van Rensburg from South Africa and Ayuba Sini Ibrahim from Nigeria.

In South Africa, surveillance is based largely on passive surveillance, and active surveillance in compartments, previous national pig surveys with ASF serology (2009, 2013) and surveillance in abattoirs. Veterinarians have been trained on sample collection and on observing strict biosecurity. The challenge with serology is that it reflects previous exposure and not necessarily a present outbreak, hence the use of PCR tests.

The surveillance system in Nigeria takes place at community, state and federal / national level with the support of laboratory and epidemiology experts, based at federal and state (36) levels. Reporting is based on an electronic system called the *Nigeria Animal Disease Information System* (NADIS), that has helped with information transfer to the National Centre. The current challenges include inadequate funding of disease surveillance, weak private sector involvement and collaboration, poor cross-border collaboration (inter and intra), inadequate human resources due to staff attrition, retirements and deaths, reliance on inadequate disease reports (mainly from clinical cases and postmortem signs rather than laboratory confirmation), under-reporting and insufficient laboratory inputs for diagnosis. Disease confirmation can only be done at central level *(National Veterinary Research Institute,* NVRI).

The discussion session focused on indirect surveillance approaches (i.e. by *proxy)* with possible consideration of sentinel animals, carcass price monitoring, marketing volumes, environmental sampling or opportunistic sampling of wildlife. The high costs and non-repeatability of surveillance due to wildlife movement was raised. To lower these costs, it was suggested to look at game farms which are localised/fenced to inform surveillance. The discussion emphasised that the purpose for surveillance must be well defined before engaging in surveillance. Important questions to be answered first are : what is the policy and purpose for these surveillance aspects ? E.g. once one understands the disease situation, one can use the data for modelling to predict disease events. The surveillance will be unique for each country and there is need to better define the outcome of surveillance in each

context. For example, establishing the extent of the sylvatic cycle in a country, such as South Africa, informed their surveillance plan.

Members also agreed that early warning systems should be utilised more, rather than the over-investment in low-risk surveillance areas.

"If surveillance systems can't predict an outbreak, we are in danger of failing".

The most important cycle is the domestic cycle, but collaboration with other sectors remains very important to pick-up issues, such as in the environment, in wildlife, from producers to gather syndromic disease information, live pig and pork market prices, carcass price monitoring and carcass sampling, bush meat sampling, alternative / indirect surveillance methods and collaborating with other relevant stakeholders, including the private sector and at borders when and where there are risks emanating from neighbouring countries.

The top priority for the region however, with specific mention of South(ern) Africa and Cote d'Ivoire, West Africa, remains domestic pig surveillance, due to current outbreak patterns, resource constraints and challenges with getting representative samples. This priority is also informed by the asymptomatic nature of disease in wildlife. Nonetheless, investigating the serological status of wild pigs, i.e. warthogs, in an area is the quickest way to determine the absence or presence of disease.

The issue of under-reporting was raised and it was argued that improving surveillance and diagnostic capabilities could partly address reporting issues. Community level surveillance including at markets, transportation and along the value chain is critical.

Diagnostics

The presentation on new diagnostics considered for the Terrestrial Manual, Guidelines on ASF diagnostics and pen-side tests was made by Dr Livio Heath, Designated Expert of the WOAH Reference Laboratory for ASF at the *Onderstepoort Veterinary Research Institute* (OVRI, formerly OVI) in Pretoria, South Africa. He updated the meeting on the ongoing review of the WOAH Terrestrial Manual.

The WOAH ASF *Reference Laboratory Network* (RLN) has been reviewing available data on commercially available tests to provide guidance on the best selection of pen-side or point-of-care (PoC) tests. He clarified that the aim is not to avail tests to farmers, but to avail them to veterinarians to support decisions for laboratory diagnosis. The 2022 ASF *Point of Care* (PoC) Test Guide (WOAH) is available in English and Spanish. PoC tests cannot be used to confirm ASFV due to their lower sensitivity, generating false negatives. Pen-side tests should therefore not be seen as a substitute to laboratory diagnostics. For some countries, a combination of tests may be employed depending on application and available resources. The essence of pen-side tests is to allow immediate action in case of (truly) positive cases. However, if outcomes are negative, one still needs to proceed to laboratory confirmation. Further complicating matters, reports have emerged of atypical low-pathogenic and/or chronic cases in Asia, that could be linked to the use of unlicensed vaccines in China, manufactured based on numerous mutations, deletions and insertions of the genome.

He informed the meeting that the WOAH ASF *Reference Laboratory Network* (RLN) has clear terms of reference, with criteria for membership outlined. Among the activities are the provision of support to training on diagnostic capacity in low- and middle-income countries. The emphasis of the network is to promote collaboration at all levels including diagnosis between international reference laboratories and national reference laboratories, since rapid and accurate diagnosis remains a critical component

for ASF control. One such initiative is the upcoming benchtop training on advanced diagnosis and sequencing of ASF virus at OVRI which will benefit national reference laboratories in Botswana, Benin, Mali, Morocco, Nigeria, Senegal, and Tanzania (August – September 2023).

Prof. Emmanuel Couacy-Hymann, the President of the WOAH Biological Standards Commission and Head of Virology at the *Centre National de Recherche Agronomique* (CNRA) or National Agricultural Research Centre in Abidjan, Cote d'Ivoire, provided updates to changes to the ASF Chapter of the WOAH Terrestrial Manual. He informed the meeting that the chapter on ASF is updated approximately every 4 years, based on new scientific findings and evolutions, through the WOAH standard setting process. The WOAH Observatory was established in 2018 to monitor implementation of standards and its first annual report (2022) is available here: https://rr-africa.woah.org/wp-content/uploads/2023/01/annual-report-observatory-2022.pdf.

Country presentation on diagnostics were made by Drs Roger Mponda Madiamba for the Democratic Republic of Congo (DRC) and Samuel Kahariri for Kenya.

In the DRC, there are three national laboratory facilities, located in Kinshasa (west), Goma (east) and Lubumbashi (south), but by 2022 only the central laboratory in Kinshasa had the capabilities to diagnose ASFV. Positive diagnostic reports with associated mortalities were filed during outbreaks in 2022, with 17 out of 26 provinces affected. In terms of information sharing and reporting, several tools are used : Ema-i/FAO/RDC, Empres-I (FAO), KoboCollect, $DHIS_2$ (WHO), ARIS 3.0 (AU) and WAHIS (WOAH).

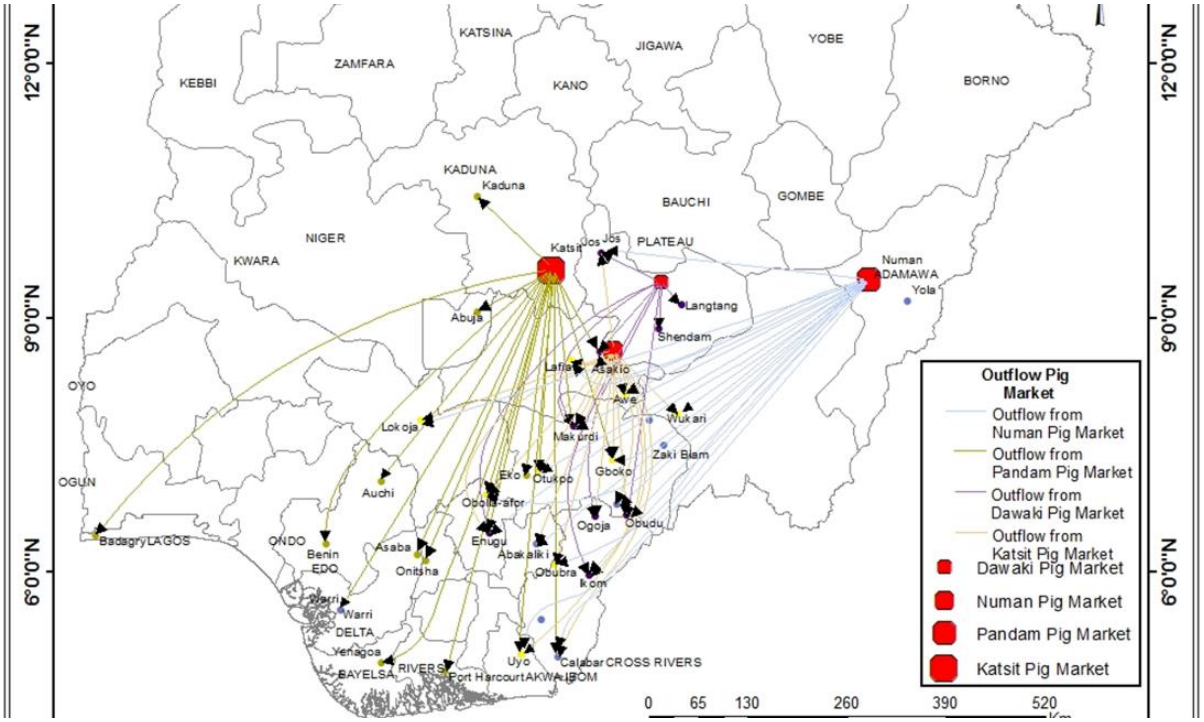
In Kenya, surveillance is done with the help of electronic means using the *Kenya Animal Bio-Surveillance System* (KABS), while only 2 of 47 counties are implementing community syndromic reporting. The National Veterinary Laboratory (Kabete) has the necessary capacity for PCR. Regional laboratories are sparsely distributed and only two have the capacity for ELISA testing. The veterinary services have no access to pen-side test (PoC) kits for screening. There is limited capacity by field staff when it comes to sampling pigs and this affects the number and quality of samples submitted to the laboratories. All laboratories struggle with limited reagents and supplies which are complicated by cumbersome procurement procedures. The country lacks a BSL – 3 facility and relies on ILRI for virus isolation and culture. The circulation of genotypes IX and X has been confirmed in Kenya.

Dr. Charles Euloge Lamien presented *research and development* (R&D) and capacity building activities of the Joint FAO/IAEA Centre of Nuclear Techniques in Food and Agriculture, in Vienna, Austria, in terms of ASF diagnosis and surveillance through its Veterinary Diagnostic Laboratory (VETLAB) Network. He informed the meeting that their activities are mostly focusing on research and innovation in terms of nuclear and molecular technologies. Capacity building is conducted mainly through the VETLAB Network in order to facilitate knowledge, information and experience exchange and group trainings, sometimes in collaboration with WOAH Reference Laboratories.

Among the developments of the network is a bulletin and platform for information sharing. The institute organises proficiency testing, mostly for *peste des petits ruminants* (PPR), but also for *lumpy skin disease* (LSD) and ASF. They have been undertaking field missions to support the setup of technology for diagnostic methods, conducting R&D on diagnostic methods, whole genome sequencing and molecular characterisation of ASFV. He shared some of their publications which include documentation of genotype XXIII in Ethiopia, co-circulating strains of ASFV in the DRC, the circulation of genotype I in West Africa until 2019, followed by the detection of a more virulent genotype II in 2020 in Burkina Faso. He mentioned that most VETLAB partner labs are now able to detect ASFV and are keeping in touch with the IAEA's *Animal Production and Health Laboratory* (APHL),

as well as FAO and WOAH Reference Centres and Laboratories for confirmation and further characterisation.

He mentioned that the Joint Division has provided prompt support with *Standard Operating Procedures* (SoPs) and access to appropriate control samples, which is critical, whereas a few more laboratories have been provided with reagents on request.



Important national live pig markets, in red, targeted by the surveillance system in Nigeria.

The selected national reference laboratories' presentations were delivered by Dr Pam Luka for NVRI-Vom, Nigeria and Dr Mame Nahé Diouf for LNERV – ISRA, Dakar-Hann, Senegal.

In Senegal, ASF is included among the 21 priority diseases but without disposing of a national strategy, contrary to Nigeria, which has adopted a national strategy to guide ASF control. Both national laboratories participate in research and development, though with limited capacity for diagnostics. Both reported emergence of new variants like genotype I (2016 – 2018) and the presence of the more virulent genotype II. Surveillance is done in live pig markets which are considered hotspots, as shown on the map 3 above, for Nigeria.

The largest live pig markets are found in Nigeria, West Africa, with a throughput of about 5,000 pigs on a daily basis. Four of these major markets exhibit low levels of hygiene and allow different interactions to occur on the sidelines, including slaughter.

Both laboratories have the capacity to conduct serology, ELISA tests and molecular diagnosis, using conventional and real time PCR. Their common concerns are the low submission rate of samples sent to the laboratories for confirmation, despite sometimes strong suspicion of ASF outbreaks, and the need for staff capacity building.

An example of an ASF twinning programme was presented by Dr Theophilus Odoom, Head of the Accra Veterinary Laboratory (AVL) in Ghana. He first shared the experiences from an already completed

twinning programme, which objectives were to enhance diagnosis for *avian influenza* (AI) and *Newcastle disease* (ND) in Ghana, a twinning with the National Centre for Foreign Animal Disease Laboratory (NCFAD), in Winnipeg, Canada as the parent laboratory. The project improved diagnostic capacities well beyond the target diseases AI and ND, and the AVL is now in a better position to support other laboratories, including for COVID testing during the pandemic. The aim of the new twinning agreement with the OVRI in South Africa is to improve diagnostic capacity for ASF. Key objectives have been identified and a workplan developed. These key areas will include capacity improvement for virus isolation and the *heamadsorption test* (HAD), ELISA for antigen detection, and sequencing.

The discussion session focused on the topic of "adoption of molecular techniques so as to build capacity to differentiate wild from vaccine strains in the future, asymptomatic virus strains, differential diagnoses for ASF, and linking syndromic surveillance outcomes to diagnostic protocols".

For a start, and in general terms, the challenge of not having a continuous supply of reagents was recognised as an important limitation for countries to diagnose and control ASFV.

Currently there are no laboratories in Africa that have the capacity to detect vaccine strains or similar natural variants using routine molecular techniques, though OVRI is working on having the capacity in the next 4-6 months. The meeting proposed to build regional laboratory capacity to implement molecular tests for the detection of vaccine strains, focusing on the vaccine that are being assessed in Asia. There is need for differential techniques to help confirm and characterize viral variants, including access to next generation sequencing technologies.

The IAEA representative suggested that it can support laboratories - upon request - with assays that can test against multiple diseases e.g. ASF, *classical swine fever* (CSF), *Erysipelas* and *Salmonella*. The assays should be of interest to CVOs, who want to know what disease is affecting animals and why the mortalities occur. Therefore, an integrated approach (beyond one disease) using multiplex tests, combined with a syndromic approach, may be prove useful.

There was a suggestion for labs to always use primers for ASF and CSF, based on the situation encountered in Madagascar after discovering ASF few months after checking CSF. The proposal went further for the need to adopt molecular techniques and nanopore sequencing.

As an action, the meeting agreed to prioritise capacity-building on molecular techniques with the support of Reference Laboratories. Additionally, metagenomics and genome-sequencing -though expensive- can be used for differentiating between wild and (future) vaccine strains; this is important and will require validation through the WOAH Biological Standards Commission and its Terrestrial Manual.

It was argued that central or national (reference) laboratories should develop the capacity to train regional (sub-national) laboratories and deploy reagents, herein, in order to support sampling and diagnoses, using portable devices in remote sites. The pen-side tests – it was reiterated - are useful but generate false negative results.

ILRI mentioned that they – as many others - are conducting research to develop a DIVA enabled vaccine, based on live attenuated strains. It is therefore important that DIVA *tests* are developed alongside these vaccines and ensure that no commercial vaccine is released without such tests. Indeed, whereas – officially - no vaccine is currently circulating in Africa, the meeting couldn't ignore or rule out any future informal entry of vaccine into Africa. It was therefore suggested that countries need to be proactive and develop regulations for vaccine registration and licensing (and therefore : law enforcement in cases of violation).

Session 5. Final deliberations, action points, next meeting

In the end, the meeting (through two rounds of presentations, one behind closed doors, one open, plenary) agreed on a number of action points, eventually to be circulated to all Member Countries.

Conclusions and action points:

As a way forward, it was agreed that:

Biosecurity

1. Members to conduct awareness raising and training for stakeholders along the value chain on biosecurity for ASF, with the support of FAO, WOAH, AU and development partners;
2. Member countries to improve on the enforcement of existing regulations to apply biosecurity and surveillance activities for ASF, such as working with relevant governmental authorities and the private sector;
3. Members to explore compartmentalisation as a means to providing business continuity for commercial farms (sector 1), leveraging private-public partnerships to provide the necessary support;
4. Members to consider biosecurity through an integrated approach addressing not just ASF but other priority swine diseases (e.g. porcine cysticercosis) to optimize the use of limited resources;
5. Members to consider FAO and WOAH guidelines regarding animal feed production and supply chain, and inactivation of ASFV in swill to limit and prevent the spread of the virus;
6. FAO and WOAH to update guidelines and standards on animal feed production and processing (including swill) based on the latest scientific evidence;
7. Member countries to exchange information and collaborate with other countries (cross-border collaboration) in the application of biosecurity and surveillance in resource-limited settings with the support of FAO, WOAH, AU-IBAR and development partners;
8. FAO to invite SGE Members and other stakeholders to participate in the *Community of Practice* (CoP) for the *Progressive Management Pathway* (PMP) for *Terrestrial Animal Biosecurity* (TAB).

Surveillance

9. Member countries to prioritize the use of participatory approaches and community-based self-governance or self-regulation practices to incentivize the adoption of good biosecurity practices and surveillance to control the spread of ASF in resource-limited settings;
10. FAO, WOAH, AU-IBAR and development partners to strengthen the use of social sciences and economic analyses to support members implement technically sound and feasible ASF control programmes;

11. Member countries to improve capacity for ASF diagnostics, including genomic sequencing and the use of *Point of Care* (PoC) tests in the field for rapid ASF testing and participation in Reference Lab networks, including through WOAH twinning programmes;
12. FAO/IAEA and WOAH Reference Laboratories and networks involving ASF, to provide guidance and facilitate access to diagnostic methods for ASF;
13. Member countries are reminded of their obligation to report the occurrence (absence, presence) of ASF through WAHIS, including submission of data on wildlife;
14. Given the resource constraints in conducting surveillance in domestic pigs, members to consider the use of proxy surveillance approaches to indirectly gather additional information on the ASF situation;

Governance

15. AU-IBAR to initiate procedure for endorsement of the regional *African swine fever* (ASF) control strategy.

Recommendations to amendments of the terms of reference (ToR)

Membership:

The meeting agreed on several recommendations to amend the *terms of reference* (ToR), which include the co-opting of both Cabo Verde and Mali to be SGE Members (this requires the validation by the RSC). The participation of one of the Members-Laboratories, i.e. LANAVET, Cameroon, will be re-considered, based on its response and involvement in future meetings.

The principle of embedding a session on “vaccines and vaccination” into the (next) session (n° 5) on “outbreak management” was also approved and requires no validation by the RSC.

Next SGE meeting:

- The format of the next meeting, whether face to face, online or hybrid could not be discussed because funding sources still need to be identified.
- A proposal was put forward for any Member willing to host the meeting (if face to face) to provide feedback alongside the action points.

The next meeting will be communicated as soon as funding is available. Schedule and venue will be communicated by the organising team (WOAH, FAO, AU-IBAR) in due course. The agenda of the next meeting will be **outbreak management, including vaccines and vaccination.**

Closing session

The closing remarks which were moderated by WOAH Regional Representative Karim Tounkara, were delivered by Dr Roland Xolani Dlamini, WOAH Delegate and Director of Veterinary Services, Eswatini, Dr. Vessaly Kallo, WOAH Delegate and Director of Veterinary Services, Cote d'Ivoire, and Dr. Andriy Rozstalnyy, on behalf of the GF-TADs ASF Global Working Group and FAO. They appreciated all country representatives, experts, researchers, pork industry players who participated in the meeting, in person or online. They recognized the efforts of FAO and WOAH team for the organisation, as well as the host country delegation. The services of the interpreters and technician were acknowledged for contributing to the successful event. Roland Dlamini specifically expressed gratitude to scientists working on ASF for dedication and time spent preparing. He challenged everyone to consider how the knowledge and information gained shall be used. He urged members to commit to the action points and stir progress in ASF control and wished everyone success in their efforts to control ASF and other priority swine diseases. Dr. Vessaly Kallo on behalf of the Minister for Animal and Fisheries Resources of appreciated the choice of Cote d'Ivoire to host, since ASF poses a big challenge to their economy. He reminded the meeting that poultry and pig value chains are the most important in their country. Therefore, ASF control conversation was key in helping them advance in the control of this disease. Acting on behalf of the Minister, he officially declared the meeting closed.

The present report has been added to the dedicated SGE page that has been opened of the GF-TADs for Africa website in order to facilitate the sharing of information amongst members of the SGE (click the link) : African Swine Fever - Standing Group of Experts (SGE) - Africa

Annex 1. List of participants

Rank	First name(s)	SURNAME	Position	Department / Division	Institution	City, town	Country	Attendance
1	Edward Okoth	ABWORO	Senior Scientist - Epidemiologist	Animal Health and Human Health	International Livestock Research Institute	Nairobi	Kenya	
2	Patrick	BASTIAENSEN	Programme Officer	Sub-Regional Representation for Eastern Africa	World Organisation for Animal Health	Nairobi	Kenya	
3	Komla Batasse	BATAWUI	Conseiller spécial du Ministre	Ministry of Agriculture, Livestock and Rural Development		Lomé	Togo	
4	Jean De Dieu	BAZIKI	Laboratory Scientist	AU-PANVAC	African Union Commission	Debre-Zeit	Ethiopia	
5	Magnimwe	BELEYI	Director of Livestock Services	Ministry of Agriculture, Livestock and Rural Development		Lomé	Togo	
6	Viola Jelagat	CHEMIS	Regional Programmes Coordinator	Regional Activities Department	World Organisation for Animal Health	Nairobi	Kenya	
7	Charmaine W.	CHNG	Deputy Head	Science Department	World Organisation for Animal Health	Paris	France	
8	Monteiro Évora	CONCEICAO	Point Focal National pour la Surveillance Epidémiologique des Animaux	Department of Veterinary Services and Sanitary Inspection	Ministry of Agriculture and the Environment	Praia	Cabo Verde	(online)
9	Emmanuel	COUACY-HYMANN	President of the WOAH Biological Standards Commission	Head of LIRED, Livestock	CNRA	Abidjan	Cote d'Ivoire	
10	Drissa	COULIBALY	Directeur National des Services Vétérinaires	National Directorate of Veterinary Services	Ministry of Rural Development	Bamako	Mali	
11	Laibané Dieudonné	DAHOUROU	Technical Assistant, P3V project	Regional Representative office for Africa	World Organisation for Animal Health	Dakar	Senegal	(online)
12	Jeroen	DEWULF	Professor	Full professor	Ghent University	Ghent	Belgium	
13	Michel Mainack	DIONE	Senior Scientist - Animal Health	Animal Health and Human Health	ILRI	Dakar	Senegal	
14	Mame Nahe	DIOUF	Director	National Laboratory for Livestock and Veterinary Research (LNERV)	Senegalese Institute of Agricultural Research (ISRA)	Dakar	Senegal	
15	Xolani Roland	DLAMINI	Director	Veterinary and Livestock Services	Ministry of Agriculture	Mbabane	Eswatini	
16	Djassi Georges	EDOUKOU		Independent consultant		Abidjan	Cote d'Ivoire	
17	Peter	EVANS	Head	Consumer Assurance and Veterinary Liaison	South African Pork Producer Organization	Pretoria	South Africa	

18	Jean-Marc	FEUSSOM KAMENI	Deputy Director of Preventive medicine and Epidemio-surveillance	Directorate of Veterinary Services	Ministère de l'Elevage, des Pêches et des Industries Animales	Yaounde	Cameroon	
19	Caroline	GIBBS	State veterinarian	Directorate Animal Health	Department of Agriculture, Land Reform and Rural Development	Pretoria	South Africa	(online)
20	Garga	GONNE	Director	Directorate of Veterinary Services	MINEPIA	Yaounde	Cameroon	
21	Livio	HEATH	Research Team Manager	Transboundary Animal Diseases	ARC - Onderstepoort Veterinary Institute (OVI)	Pretoria	South Africa	
22	Ayuba Sini	IBRAHIM	Deputy Director	Federal Department of Veterinary and Pest Control Services	Federal Ministry of Agriculture and Rural Development	Abuja	Nigeria	
23	Leana	JANSE VAN RENSBURG	State veterinarian	Western Cape Veterinary Services		George	South Africa	
24	Ferran	JORI	Senior researcher	UMR ASTRE, *Coopération Internationale*	*en Recherche Agronomique pour le Développement* (CIRAD)	Montpellier	France	
25	Samuel M	KAHARIRI	National Epidemiologist	Veterinary Epidemiology and Economics Section	State Department for Livestock	Nairobi	Kenya	
26	Vessaly	KALLO	Director	Directorate of Veterinary Services	Ministry of Animal and Fisheries Resources	Abidjan	Cote d'Ivoire	
27	Fredrick	KIVARIA	Regional Epidemiologist	ECTAD	Food and Agriculture Organization of the United Nations (FAO)	Nairobi	Kenya	
28	Charles Euloge	LAMIEN	Technical Officer	Joint FAO/IAEA Center	International Atomic Energy Agency	Vienna	Austria	
29	Pam	LUKA	Chief Veterinary Research Officer	Biotechnology Centre	National Veterinary Research Institute (NVRI)	Jos	Nigeria	
30	Paul Johnson	LUMU	Senior Veterinary Officer Epidemiology, disease surveillance and investigation	Animal Health	Ministry of Agriculture Animal industry and Fisheries (MAAIF)	Kampala	Uganda	
31	Roger Mponda	MADIAMBA	Head of the animal health division	Directorate of Veterinary Services	Ministry of Fisheries and Livestock	Kinshasa	Congo (Dem. Rep.)	
32	Nguyen Thi Tuyet	MINH	National Livestock Production Management and Biosecurity Advisor	ECTAD Vietnam	Food and Agriculture Organization of the United Nations (FAO)	Hanoi	Vietnam	(online)
33	Gerald	MISINZO	Professor	SACIDS Foundation for One Health	Sokoine University of Agriculture	Morogoro	Tanzania	
34	Serge	MPOUAM	Programme Officer Rabies and TADs for Central Africa	Regional Representation for Africa	World Organisation For Animal Health	Bamako	Mali	(online)
35	Misheck	MULUMBA	FAO ASF Reference Centre	WOAH Collaborating Centre	ARC - Onderstepoort Veterinary Institute (OVI)	Pretoria	South Africa	

36	Patrick Maswangi	MUSANZI	Principal Epidemiologist		Ministry of Fisheries and Livestock	Kinshasa	Congo (Dem. Rep.)	
37	Marcel Casimir	NDONGO	ASF Technical Specialist	NSAH	Food and Agriculture Organization of the United Nations (FAO)	Yaounde	Cameroon	
38	Theophilus	ODOOM	Head	Accra Veterinary Laboratory	Veterinary Services Directorate	Accra	Ghana	
39	Yooni	OH	Animal Production and Health Officer	ECTAD RAP	Food and Agriculture Organization of the United Nations (FAO)	Bangkok	Thailand	(online)
40	Douyeri Thierry	OUATTARA	Head of the Department of Surveillance and Response	Directorate of Veterinary Services	Ministry of Animal and Fisheries Resources	Abidjan	Cote d'Ivoire	
41	Pawin	PADUNGTOD	Senior Technical Coordinator	ECTAD Vietnam	Food and Agriculture Organization of the United Nations (FAO)	Hanoi	Vietnam	(online)
42	Mary Louise	PENRITH	Extraordinary Professor	Department of Veterinary Tropical Diseases, Faculty of Veterinary Science	University of Pretoria (UP)	Pretoria	South Africa	
43	Dirk	PFEIFFER	Chow Tak Fung Chair Professor of One Health (CityU)	Professor of Veterinary Epidemiology (RVC)	Centre for Applied One Health Research and Policy Advice, City University of Hong Kong	Hong Kong	Hong Kong SAR	(online)
44	Andriy	ROZSTALNYY	Animal Health Officer	Animal Production and Health Division	Food and Agriculture Organization of the United Nations (FAO UN)	Rome	Italy	
45	Abdramane	SANOGO	Accountant	Regional Representation for Africa	World Organisation for Animal Health	Bamako	Mali	
46	Karim	TOUNKARA	Regional Representative	Regional Representation for Africa	World Organisation for Animal Health	Bamako	Mali	
47	Wamalwa Kinyanjui	WAFULA	Animal Health Expert	IGAD Center for Pastoral Areas and Livestock Development (ICPALD)	Inter-Governmental Authority on Development (IGAD)	Nairobi	Kenya	(online)
48	Samuel	WAKHUSAMA	Sub-Regional Representative	Sub-Regional Representation for Eastern Africa	World Organisation for Animal Health	Nairobi	Kenya	

Annex 2. Resources : international reference laboratories (WOAH) for African swine fever

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Annex 3. Resources : international reference centres (FAO) for African swine fever

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Annex 4. Resources : selected national reference laboratories for African swine fever (SGE Members)

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Annex 5. Resources : latest immediate notifications submitted to WAHIS (since 2018, in reverse chronological order) as of 18 August

18/08/2023 Cote d'Ivoire

02/08/2023 South Africa

04/11/2022 Zambia

12/08/2022 South Africa

31/03/2022 Zambia

17/05/2021 Côte d'Ivoire

25/02/2021 South Africa

03/02/2021 Tanzania

21/01/2021 South Africa

05/08/2020 Zambia

17/06/2020 Nigeria

12/05/2020 Namibia

11/05/2020 South Africa

12/02/2020 Sierra Leone

02/10/2019 Kenya

01/10/2019 Cote D'Ivoire

11/09/2019 South Africa

23/08/2019 Zimbabwe

18/04/2019 South Africa

09/04/2019 South Africa

14/02/2019 Zimbabwe

14/09/2018 Chad

30/05/2018 South Africa

This event was organised under the auspices of

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