

# APPLYING PARTICIPATORY APPROACHES IN THE EVALUATION OF SURVEILLANCE SYSTEMS: A PILOT STUDY ON SWINE FEVERS IN CORSICA

C. CALBA\*, N. ANTOINE-MOUSSIAUX, F. CHARRIER, P. HENDRIKX, C.  
SAEGERMAN, M. PEYRE AND F.L. GOUTARD

## SUMMARY

Regular and relevant evaluations of surveillance systems are critical to improve their performance and limit their costs. Due to the complexity of these systems, and to the context variability in which they are implemented, there is a need to develop flexible evaluation tools. In this frame, participatory tools were developed and implemented to assess the acceptability of the swine fevers surveillance system in Corsica (France). Individual interviews and focus groups were implemented with representatives at every level of the system. Diagraming and scoring tools were used to assess all the elements behind the acceptability definition. Results highlighted a medium acceptability of the system for farmers and hunters; and a good one for the other representatives (e.g. private veterinarian, local laboratory). The data collected using such an approach allowed provision of relevant recommendations based on the Corsican context that can be implemented to improve the current surveillance system.

## INTRODUCTION

Even though the need for effective surveillance systems has long been recognized, in most countries investments are decreasing due to budget constraints, leading to an increase in international pressure to improve the efficiency of these systems (Drewe et al., 2012). Therefore, regular and relevant evaluations of these systems are critical to improve their performance and limit their costs (Shahab, 2009). According to the World Health Organisation (WHO), evaluation refers to ‘the systematic and objective assessment of the relevance, adequacy, progress, efficiency, effectiveness and impact of a course of actions, in relation to objectives and taking into account the resources and facilities that have been deployed’ (WHO, undated). Applied to surveillance, this includes the assessment of a series of evaluation attributes such as sensitivity, acceptability and timeliness, using qualitative, semi-quantitative or quantitative methods and tools (Drewe et al., 2012).

The complexity of surveillance systems, and the context variability in which they are implemented, entail the need for flexible evaluation tools, able to take into account every stakeholders’ opinions. This could be achieved by using flexible and adaptable methods based on participatory approaches within the evaluation process. Participatory approaches refer to a

---

\* Clémentine Calba, Centre de Coopération International pour la Recherche Agronomique et le Développement (CIRAD), Campus International de Baillarguet, TA C 22/E, 34398 Montpellier Cedex 5, France. Email: clementine.calba@cirad.fr

range of methods and tools that enable stakeholders, depending on their degree of participation in the process, to play an active role in the definition and in the analysis of the problems they may encounter, and in their solution (Johnson et al., 2004; Peyre et al., 2014; Pretty, 1995; Pretty et al., 1995). By taking into consideration stakeholders' perception, needs and expectations, these approaches could lead to a better understanding of the system (Hoischen-Taubner et al., 2014).

Participatory tools were developed and applied during a pilot study designed to evaluate some of the attributes of the surveillance system of Classical Swine Fever (CSF) and African Swine Fever (ASF) in Corsica (France). This system is coordinated by the General Directorate of Food (DGAL) under the supervision of the French Ministry of Agriculture, Agribusiness and Forest (MAAF). Originally the system was designed to detect CSF, and indirectly ASF. However due to the increasing occurrence of ASF in Eastern Europe these last years (Costard et al., 2013; Sánchez-Vizcaíno et al., 2013; Torre et al., 2013), and its endemic situation in Northern Sardinia (European Commission, 2011; Mur et al., 2014), in conjunction with the increase risk of its introduction, spread and maintenance in Corsica, the current system mainly targets ASF (Desvaux et al., 2014). The objective of this surveillance system is to early detect both diseases using (i) post-mortem surveillance in slaughterhouses (active surveillance), and (ii) the mandatory notification of suspected cases by farmers and private veterinarians (passive surveillance).

In Corsica, pig breeding is mainly based on traditional forest-pastoral system (outdoor free-range breeding), which mobilizes resources and involves transhumance summer practices (Casabianca et al., 1989). Also, there are a reduced number of rural private veterinarians in the island (personal communication). It is thus impossible to regularly assess the health of every animal, meaning that the system relies on stakeholders' willingness to report suspicions (Sawford, 2011). The decision to report a suspected event is a critical function of an emerging infectious disease surveillance system (Tsai et al., 2009). In order to limit the under-reporting of suspected cases and to identify the best ways to improve the current surveillance system, it is crucial to assess stakeholders' willingness to participate in this system (Bronner et al., 2014). The acceptability of the surveillance system reveals important perception factors and sociological aspects due to the fact that reporting an outbreak may be conflicting economic, cultural, and/or political incentives (Tsai et al., 2009; Valeeva and Backus, 2007). This evaluation attribute has been defined as the 'willingness of persons and organisations to participate in the surveillance system' (Drewe et al., 2012), and refers to the degree to which each of these users is involved in the surveillance (Hoinville et al., 2013). Even though it has been listed by the Centre for Diseases Control and prevention (CDC) as one of the most important factor for the quality of surveillance (German et al., 2001), having indirect impact on the quality of other evaluation attributes such as sensitivity or timeliness (Peyre et al., 2014), there are still issues related to the way to evaluate it (Auer et al., 2011).

These are the reasons why acceptability of the swine fevers surveillance in Corsica appeared to be a relevant case study for the implementation of participatory methods and tools in an evaluation frame.

## MATERIALS AND METHODS

### Targeted population

The objective of the field interviews was to meet representatives at every level of the surveillance system. Farmers and hunters, who are in the front line of the passive surveillance, represent level 1. Private veterinarians, the GDS animal health groupings (*Groupements de Défense Sanitaire*, association of farmers addressing health issues, recognized in an official capacity under French law (Bronner et al., 2014)), local laboratories, or wildlife organization (for example hunters' federations), that are contacted in case of suspicion on a farm, or in the wild animal population by farmers or hunters, represent level 2. Then the Veterinary Services, at local, regional, and national levels, to whom any suspicion has to be declared and who are in charge of implementing sanitary politics represent level 3.

Participants were selected according to their role in the surveillance system and to their availability, and were interviewed through focus groups or individual interviews. Focus groups are designed to expose a group of people to some common stimulus (Pahl-Wostl, 2002). They are particularly important to assess complex issues through the discussions and the social processes analyses (Pahl-Wostl, 2002). The objective was to implement focus groups with (i) ten farmers (two groups of five participants), (ii) five hunters (one group) for level 1; (iii) five private veterinarians (one group), and (iv) three GDS technicians (one group) for level 2. For other stakeholders, the objective was to implement individual interviews with one representative from each local laboratories (two in Corsica), and one representative of wildlife organization for level 2; two representatives of Veterinary Services at local level, and one at regional level for level 3.

This work was implemented between April and June 2014. Interviews were conducted by a team of two to three evaluators: one was in charge of leading the discussion, and the other(s) one(s) in charge of observing participants' behaviour and taking notes. All of the interviews were recorded with the participants consent and were subsequently transcribed to text format.

### Evaluation process

Acceptability is relevant to different aspects of surveillance system (Auer et al., 2011). It first refers to the acceptance by the actors of the system objective and to the way it is operating. The acceptance of the way the system is operating refers to (i) the role of each actor and the representation of its own utility, (ii) the consequences of the flow of information for each actor, (iii) the perception by each actor of its own role relative to other actors', and (iv) the relations between stakeholders. Another essential element of acceptability is the trust, devoted to the system as a whole but also devoted to each other stakeholders involved in it.

These elements were measured using a combination of participatory diagramming and scoring tools, which were developed and adapted to this specific context.

(1) Relational diagrams, developed to identify professional networks and interactions between stakeholders. Participants' status or organization was placed in the middle of a flip chart. Then facilitators asked them to list the stakeholders they have interactions with, and to describe these interactions (i.e. frequency and reciprocity).

(2) Flow diagrams, developed to assess participants' knowledge about the flow of information following swine disease suspicion and to identify the different pathways where

this information can circulate. The implementation of these diagrams started with a representation of stakeholders from level 1 (i.e. farmers or hunters), asking the participants how the information usually flows within the system. Once the diagram was considered completed by the participants, proportional piling (Catley and Admassu, 2003; Catley et al., 2012; Jost et al., 2007) was performed to quantify the level of trust they had in the system, and on the other stakeholders involved. Next facilitators asked the participants to divide 100 counters into two parts, one representing their confidence in the system and the other the non-confidence. The counters allocated to confidence were then used to specify confidence level with the actors and organizations represented on the diagram.

(3) Impact diagrams, to assess both positive and negative impacts of a specific event and to document the consequences as experienced directly and indirectly by project beneficiaries (Kariuki and Njuki, 2013). In this study, the specific event was an ASF suspicion in Corsica. Facilitators asked the participants to list and explain the positive and negative impacts of a suspicion in their own work, organization and relations. Proportional piling was then implemented on the diagram by first dividing the 100 counters over positive and negative impacts according to their weights, and then by splitting the counters across the identified impacts to assess their probability of occurrence.

### Data analysis

Each element of acceptability was assessed through the analysis of the diagrams and discussions as stated in Table 1. The acceptability of the surveillance system objective was assessed using the qualitative data collected during the elaboration of the impact diagrams (i.e. discussions). The acceptability of the operation of the system was done using all three diagrams (relation diagrams, flow diagrams, and impact diagrams) and using the qualitative data collected during their drawing. The trust allocated to the system as a whole, and to other stakeholders' was analysed on the basis of the proportional piling implemented on flow diagrams, and by analysing the qualitative data collected during its implementation.

## RESULTS

Focus groups and individual interviews of representatives from each level of the swine fevers surveillance system in Corsica were implemented in the field. The analysis of diagrams, proportional piling and the data generated through the discussions during these interviews allowed to assess the acceptability's elements previously identified. Nonetheless, the 'perception by each actor of its own role relative to other actors' could not be assessed using the collected data, and thus it has been left out from the present analysis.

### Interviews

A total of 16 actors were interviewed, of which 3 were women and 13 were men. Three focus groups were held: one with 3 farmers, one with 3 representatives from the GDS (including one woman), and another one with 2 representatives of the Veterinary Services at regional level (including one woman). Eight individual interviews were implemented: 2 farmers/hunters, 3 hunters, one private veterinarian, one representative from the local laboratory, and one representative of the Veterinary Services at local level (woman). Focus groups lasted between 2 and 3 hours; individual interviews an average 2 hours.

Table 1. Participatory methods and tools used to assess acceptability's elements

Acceptability's elements	Associated questions	Associated participatory methods and tools
<b>Objective</b>	Are stakeholders <i>satisfied</i> by the objective of the system?	Impact diagram
<b>Operation</b>	-	-
Role of each actor and representation of its own utility	Are stakeholders <i>satisfied</i> with their duty?	Flow diagram
Consequences of information flow	Are stakeholders <i>satisfied</i> with the consequences of information flow?	Impact diagram associated with proportional piling
Perception by each actor of its own role relative to other actors'	How do stakeholders perceive their own role in the system in comparison with other stakeholders' role?	Flow diagram
Relations between stakeholders	Are stakeholders <i>satisfied</i> with the relations they have with other stakeholders?	Relational diagram
<b>Trust</b>	Do stakeholders know about the system?	-
In the system	Do stakeholders trust the system to fulfil its surveillance objective(s)?	Flow diagram associated with proportional piling
In the other stakeholders involved in the system	Do stakeholders trust the other stakeholders to fulfil their role in the system?	Flow diagram associated with proportional piling

Acceptability of the objective of the surveillance system:

The objective of the swine fevers surveillance system in Corsica was only known for level 1 by farmers (and farmers/hunters), which represented 5 out of the total 8 participants interviewed. All participants from levels 2 and 3 knew about the objective. Participants of all levels agreed on a need for early detection for these specific diseases. Nonetheless, they highlighted the fact that according to them post-mortem surveillance at slaughterhouses and passive surveillance would not be enough to reach the objective of early detection. Furthermore, they stated that once the disease is detected in pigs, it is already too late. Consequently, to avoid the introduction of the diseases, ports surveillance and awareness campaigns for tourists should be strengthened.

Acceptability of the operation of the surveillance system

Level 1: Most participants from the first level (6/8) were clear about their role in the system and they accepted it, including the reporting of any suspicion. Nonetheless, 2 hunters

did not have a clear understanding of their role in the system: they were not aware of ASF threats and of what to do in case of suspicion.

Issues on the constraints linked to the reporting were highlighted and differed between farmers and hunters. The 3 hunters did not identify any consequences following a suspicion due to the fact that they never experienced an ASF epidemic. For all farmers, the consequences of a suspicion were not well accepted because of regulatory restrictions to be implemented on the farm (i.e. animals have to be penned), leading to an increase of feed costs. In addition, even if ASF is a non-zoonotic disease, consumer confidence in the product could be affected, causing damages on the entire sector. However, they anticipated that in case of suspicion in Corsica, farmers would come together to face the problem; which would perhaps enhance collective efforts and contribute in improving the organisation of the sector.

Participants were not satisfied with the relations they have with other stakeholders. All farmers felt isolated and ‘completely abandoned’ by animal health services (either by private veterinarians, GDS and Veterinary Services) (Fig. 1). Indeed, only 3 out of the 6 farmers interviewed acknowledged being regularly in contact with a private veterinarian, including one having a personal relationship with his private veterinarian. They commented more than once that ‘relations with vet correspond to the minimum requirement’<sup>1</sup>, and found it regrettable that ‘90% of the information are going through farmers’<sup>1</sup>. Most of the hunters (4 out of the 5 interviewees, including 2 farmers/hunters) had a very poor network having relations only among hunters.

Level 2: Participants from level 2 were satisfied about their role, except for a few points. The private veterinarian highlighted the fact that in case of suspicion ‘it is impossible to comply with safety standards imposed by emergency plans’<sup>2</sup>. The local laboratory stated that ‘the perception of each other’s roles in the system is not clear’<sup>3</sup>. GDS technicians told about the difficulties of being a moderator between Veterinary Services and farmers.

Regarding the consequences of the information flow, they highlighted that an ASF suspicion would cause an increase and disorganization of their workload, leading to a decrease in the surveillance of other diseases, even if it could spur an increase of contacts and collaborations.

They were satisfied about the relations they have with other stakeholders. Nonetheless both the private veterinarian and the GDS technicians complained about the relations with the Veterinary Services at local level. Given that they are not always well given the needed information from the Veterinary Services. However they highlighted that it was mostly due to human constraints. Although they are aware about the potential important role of wildlife in the spread of the disease, they complained about the lack of collaboration between wildlife and animal health.

Level 3: Veterinary Services were satisfied about their role in the system and about the consequences of the flow of information. They stated that a suspicion ‘could bring feedback, this would allow testing the system and to raise stakeholders’ awareness’<sup>4</sup>; and could increase contacts and collaborations between organizations. As they represent the French State in the

---

<sup>1</sup> Focus group with farmers, 28<sup>th</sup> May 2014

<sup>2</sup> Individual interview with a private veterinarian, 6<sup>th</sup> June 2014

<sup>3</sup> Individual interview with a local laboratory, 3<sup>th</sup> June 2014

<sup>4</sup> Individual interview with Veterinary Services at the local level, 12<sup>th</sup> June 2014

region, they stated the hypothesis that a crisis in Corsica would increase consideration from superior authorities in Paris, who would perhaps allocate them more resources. Nonetheless, they stated that a suspicion would also cause an increase and disorganisation of their workload. They were satisfied about their relations with the other stakeholders involved in the system, even if there was some lack of direct contacts with level 1.

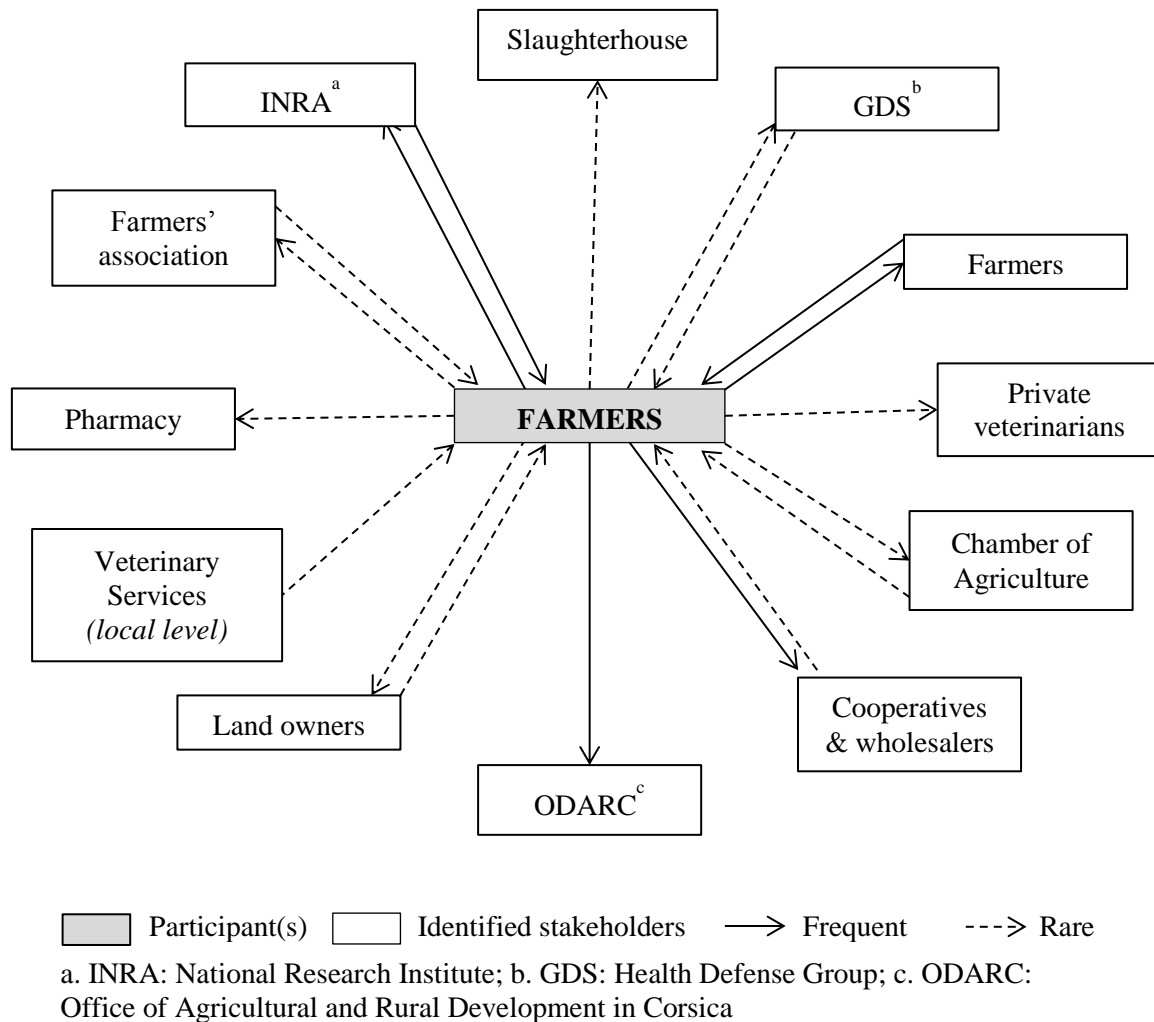


Figure 1. Relational diagram resulting from a focus group implemented with three farmers

Trust devoted to the surveillance system and to other stakeholders

For level 1, the trust allocated to the system was low and ranged from 15% to 56%. One hunter stated that ‘they will listen in case of problem, but I am not sure there will be action’<sup>5</sup>. The two other hunters did not know about the organization and the operation of the system, thus they could not draw the flow diagram. The other participants showed hesitation in drawing the surveillance system scheme. The time taken to do the exercise and the associated discussions showed that these actors did not know the system well outside their farm environment. Four farmers did not completely trust other farmers because ‘some of them will

<sup>5</sup> Individual interview with a hunter, 4th June 2014

hide it, at least initially'<sup>6</sup>; and did not trust Veterinary Services at the local level because of budget constraints, and at the national level because 'for them Corsica is just a drop of water regarding the whole French territory'<sup>6</sup>. Two farmers/hunters did not completely trust hunters either because of their lack of awareness, and did not trust wildlife organisations because the relations between them are minimal.

For level 2, the trust devoted to the system as a whole was about 37%. All participants agreed that there were problems with the local laboratories due to budget and human constraints, and to the difficulties to send some samples to mainland France. GDS representatives stated that they did not trust all private veterinarians because 'they are not interested in the pig sector'<sup>7</sup>; even the private veterinarian highlighted that most of them never saw clinical signs of the disease, and might thus miss a suspicious case. They agreed that 'the critical point is the farmers'<sup>7</sup>, because 'they will call at the last moment [*in case of suspicion*], they will even tend to hide it'<sup>7</sup>.

For level 3, the trust devoted to the system as a whole was about 40%. Here again, local laboratories were identified as a critical point in the system, because of the same reasons stated by level 2. There was a lack of trust regarding farmers, especially due to the specificities of the dominant farming system (free-ranging). Indeed, farmers do not see their animals every day and can therefore take some time to notice that some animals are missing.

## DISCUSSION

### Acceptability of the swine fevers surveillance system in Corsica

Results from focus groups and individual interviews showed variations in the acceptability of the system between the different levels.

The acceptability was medium for level 1. Most of their relations were only shared with stakeholders of the same level. There were lacks of interactions with levels 2 and 3. Farmers felt isolated and abandoned by animal health services. This is due to the fact that GDS lacks human resources to be able to visit every farm during the year. Also, most of the private veterinarians in Corsica do not work with pigs. Their services are thus limited and expensive. Moreover farmers were afraid of ASF. They were aware of the presence of the disease in Sardinia, and the complexity of dealing with this sort of infectious disease without any preventive means. They felt helpless regarding the protection of their animals, even if they provide or receive the information related to a suspicion. Hunters did not know about the surveillance system and about the disease. Even though Veterinary Services implemented awareness campaigns in early 2014, in collaboration with hunters' federations, their knowledge regarding their role in the system as well as the importance of wildlife in diseases transmission was limited. This limited knowledge might result from limitation in the campaign or because the hunters involved in this pilot study did not take part in the campaigns. Only one hunter spoke about these campaigns, explaining that they raised more fear about the disease instead of giving knowledge and recommendations on the behaviour to adopt in case of disease suspicion. This hunter had more relations with hunters' federation than the other interviewees, highlighting the needs to strengthen the interactions between hunters and wildlife organizations.

---

<sup>6</sup> Focus group with farmers, 28<sup>th</sup> May 2014

<sup>7</sup> Focus group with GDS representatives, 23<sup>th</sup> May 2014



The acceptability was good for levels 2 and 3. The main problem identified was related to the limited trust given to the system, and more specifically to the low trust given to level 1 and to local laboratories. This correlates with the finding that farmers felt isolated and left alone by animal health services who rely on them to report these diseases.

All participants knew about the early detection objective of the surveillance system and were satisfied with it. Nevertheless, they all agreed that the ways of achieving that aim were not consistent with the objective in mind. Stakeholders expect the Veterinary Services at national level to develop surveillance at ports and to implement awareness campaigns, especially for tourists coming from Sardinia.

### Feedback on the method

The visualization tools helped the stakeholders to discuss their perception of the surveillance system. They allowed collection of more information related to the context in which surveillance is implemented, and related to the environment in which stakeholders operate. Limitations of the current system were highlighted thanks to the involvement of representative from all levels. Also, several solutions for its improvement emerged during the discussions. In order for these solutions to be acceptable for all the levels it would be necessary to organize a feedback meeting gathering all participants involved.

Only few participants were involved in this study, and thus some points of view may be missing. Nonetheless, qualitative approaches rely on 'purposive sampling' to maximize the diversity of the data collected (i.e. perceptions and point of views) (Bronner et al., 2014). The quality of the sample is thus considered as more important than the sample size in such approaches (Côte and Turgeon, 2002). Participants were selected in order to reach this diversity, and to reach the theoretical saturation of the data (Côte and Turgeon, 2002). Indeed, saturation has become the gold standard for health science research (Guest et al., 2006). It refers to the point at which no new information is observed in the data (Guest et al., 2006). This standard for qualitative research has not been reached during this pilot study because of time constraints, and due to the lack of availability of some stakeholders. Some stakeholders, especially private veterinarians, did not have time to join these meetings. Moreover, participants from all levels were selected according to their availability, but also to their willingness to be part of the study. This means that mostly people with an interest related to animal health were involved. As this was a pilot study, biases on the way to formulate the questions and to guide stakeholders may have also occurred.

## CONCLUSION

Although acceptability represents an important concern in the evaluation process, limitations exist regarding how this attribute should be considered and evaluated (Auer et al., 2011). The participatory approaches developed in this study allowed to assess all the elements behind the acceptability definition. Indeed this study confirmed previous work which showed that participatory methods and tools play an important role in helping researchers and decision makers to reconnect with farmers, and to gain a better understanding of diseases from a local perspective (Catley et al., 2012). Since the information from all levels is critical for effective disease surveillance (Tsai et al., 2009), the data collected using such an approach allowed to provide relevant recommendations based on the Corsican context that can be implemented to improve the current surveillance system.

## ACKNOWLEDGEMENTS

This work was performed under the framework of RISKSUR project funded by the European Union Seventh Framework Programme (FP7 / 2007-2013) under grant agreement n°310806. We thank Dr Casabianca (LRDE research unit Director, INRA Corte), Oscar Maestrini (INRA Corte), and all participants for their implication in this work. We are grateful to Juana Bianchini for reviewing the English.

## REFERENCES

- Auer, A.M., Dobmeier, T.M., Haglund, B.J. and Tillgren, P. (2011). The relevance of WHO injury surveillance guidelines for evaluation: learning from the Aboriginal Community-Centered Injury Surveillance System (ACCISS) and two institution-based systems. *BMC Public Health* 11, 744
- Bronner, A., Hénaux, V., Fortané, N., Hendriks, P. and Calavas, D. (2014). Why do farmers and veterinarians not report all bovine abortions, as requested by the clinical brucellosis surveillance system in France? *BMC Vet. Res.* 10, 93
- Casabianca, F., Picard, P., Sapin, J., Gauthier, J. and Vallée, M., (1989). Contribution à l'épidémiologie des maladies virales en élevage porcin extensif. Application à la lutte contre le maladie d'Aujeszky en Région Corse. *Journées Recherches Porcines En France* 21, 153-160
- Catley, A. and Admassu, B. (2003). Using participatory epidemiology to assess the impact of livestock diseases. In *FAO-OIE-AU/IBAR-IAEA Consultative Group Meeting on Contagious Bovine Pleuropneumonia in Africa* (Rome, Italy)
- Catley, A., Alders, R.G. and Wood, J.L. (2012). Participatory epidemiology: approaches, methods, experiences. *Vet. J.* 191, 151-160
- Costard, S., Mur, L., Lubroth, J., Sanchez-Vizcaino, J. and Pfeiffer, D. (2013). Epidemiology of African swine fever virus. *Virus Res.* 173, 191-197
- Côte, L. and Turgeon, J. (2002). Comment lire de façon critique les articles de recherche qualitative en médecine. *Pédagogie médicale* 3, 81-90
- Desvaux, S. Le Potier, M.F., Bourry, O., Hutet, E., Rose, N., Anjoubault, G., Havet, P., Clément, T. and Marcé, C. (2014). Peste porcine africaine : étude sérologique dans les abattoirs en Corse durant l'hiver 2014. *Bulletin Epidemiologique* 63, 19
- Drewe, J., Hoinville, L., Cook, A., Floyd, T. and Stärk, K. (2012). Evaluation of animal and public health surveillance systems: a systematic review. *Epidemiol. Infect.* 140, 575-590
- European Commission (2011). Commission Implementing Decision of 15 December 2011 amending Decision 2005/363/ EC concerning animal health protection measures against African swine fever in Sardinia (Italy)
- German, R.R., Lee, L., Horan, J., Milstein, R., Pertowski, C. and Waller, M. (2001). Updated guidelines for evaluating public health surveillance systems. In *MMWR Recommendations and Reports* (Center for Disease Control and Prevention (CDC)), 1-35

- Guest, G., Bunce, A. and Johnson, L. (2006). How many interviews are enough? An experiment with data saturation and variability. *Field methods* 18, 59-82
- Hoinville, L., Alban, L., Drewe, J., Gibbens, J., Gustafson, L., Häslner, B., Saegerman, C., Salman, M. and Stärk, K. (2013). Proposed terms and concepts for describing and evaluating animal-health surveillance systems. *Prev. Vet. Med.* 112, 1-12
- Hoischen-Taubner, S., Bielecke, A. and Sundrum, A. (2014). Different perspectives on animal health and implications for communication between stakeholders. In: *The 11th European IFSA Symposium, Berlin*
- Johnson, N., Lilja, N., Ashby, J.A. and Garcia, J.A. (2004). The practice of participatory research and gender analysis in natural resource management. In: *Natural Resources Forum*, 189-200
- Jost, C., Mariner, J., Roeder, P., Sawitri, E. and Macgregor-Skinner, G. (2007). Participatory epidemiology in disease surveillance and research. *Rev. Off. Int. Epizoot.* 26, 537-549
- Kariuki, J. and Njuki, J. (2013). Using participatory impact diagrams to evaluate a community development project in Kenya. *Dev Pract* 23, 90-106
- Mur, L., Atzeni, M., Martínez-López, B., Feliziani, F., Rolesu, S. and Sanchez-Vizcaino, J. (2014). Thirty-Five-Year Presence of African Swine Fever in Sardinia: History, Evolution and Risk Factors for Disease Maintenance. *Transbound Emerg Dis*, 1-13
- Pahl-Wostl, C. (2002). Participative and stakeholder-based policy design, evaluation and modeling processes. *Integrated assessment* 3, 3-14
- Peyre, M., Hoinville, L., Haesler, B., Lindberg, A., Bisdorff, B., Dorea, F., Wahlström, H., Frössling, J., Calba, C., Grosbois, V. and Goutard, F. (2014). Network analysis of surveillance system evaluation attributes: a way towards improvement of the evaluation process. In *International Conference on Animal Health Surveillance (ICAHS)* (La havane, Cuba)
- Pretty, J.N. (1995). Participatory learning for sustainable agriculture. *World development* 23, 1247-1263
- Pretty, J.N., Guijt, I., Thompson, J. and Scoones, I. (1995). *Participatory learning and action: A trainer's guide*. London: IIED, 270 p
- Sánchez-Vizcaíno, J.M., Mur, L. and Martínez-López, B. (2013). African swine fever (ASF): Five years around Europe. *Vet. Microbiol.* 165, 45-50
- Sawford, K.E. (2011). *Animal health surveillance for early detection of emerging infectious disease risks*. University of Calgary, Calgary, Alberta
- Shahab, S. (2009). Finding value in the evaluation of public health syndromic surveillance systems from a policy perspective. K. u. Search Canada, Alberta Health Services, 24 p
- Torre, A.D.L., Bosch, J., Iglesias, I., Muñoz, M., Mur, L., Martínez-López, B., Martínez, M. and Sánchez-Vizcaíno, J. (2013). Assessing the Risk of African Swine Fever Introduction into the European Union by Wild Boar. *Transbound Emerg Dis*, 1-8

Tsai, P., Scott, K.A., Pappaioanou, M., Gonzalez, M.C. and Keusch, G.T. (2009). Sustaining global surveillance and response to emerging zoonotic diseases. National Academies Press, Washington, 338 p

Valeeva, N. and Backus, G. (2007). Incentive Systems under ex post Moral Hazard to Control Outbreaks of Classical Swine Fever in the Netherlands. In: American Agricultural Economics Association, Portland, USA, 18 p

World Health Organisation (WHO). Health systems strengthening – Glossary ([http://www.who.int/healthsystems/hss\\_glossary/en/index4.html](http://www.who.int/healthsystems/hss_glossary/en/index4.html)). Accessed 15 December 2014