Operational design and field implementation of a syndromic surveillance of cattle mortality: preliminary lessons from the OMAR pilot experience in France

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Abstract
OMAR is the French syndromic surveillance system of cattle mortality. Its aim is to identify as early as possible, unexpected significant excesses of deaths in the cattle population related to emerging diseases, epidemiological change of enzootic diseases or other health-related events that were not identified by the traditional surveillance systems. Launched in 2009 by the French Ministry of Agriculture, a 3-year pilot phase began in January 2013 in five départements (French administrative unit). OMAR is currently under national operational deployment within the framework of the French platform for epidemiological surveillance in animal health, even if a part of the system still needs to be evaluated. The test phase highlighted organisational and regulatory difficulties which are encountered when implementing new surveillance system. Human resources for the national and local animations of such a system should be subject to a particular focus. Besides, OMAR provided the opportunity to get the animal health actors to work together around the cattle mortality problem. The tools of the syndromic surveillance system revealed to be very useful and stimulating for the animal health actors.

Introduction
In the last decade, a substantial number of methodological developments involved syndromic surveillance (SyS) [1-3]. This nonspecific surveillance is developed in public and veterinary health as a more cost-effective and earlier surveillance than traditional systems (passive and active surveillances). Despite the high number of feasibility studies [4-8], few SyS systems are operational in animal health [9, 10] and feedback on the field implementation of these SyS systems are scarce although it is of high interest [11]. The few existing guidelines for SyS systems [12-16] do not address the organisational aspect between stakeholders, the importance of the animation of the SyS system to ensure its usefulness and an evaluation of the human resources needed.

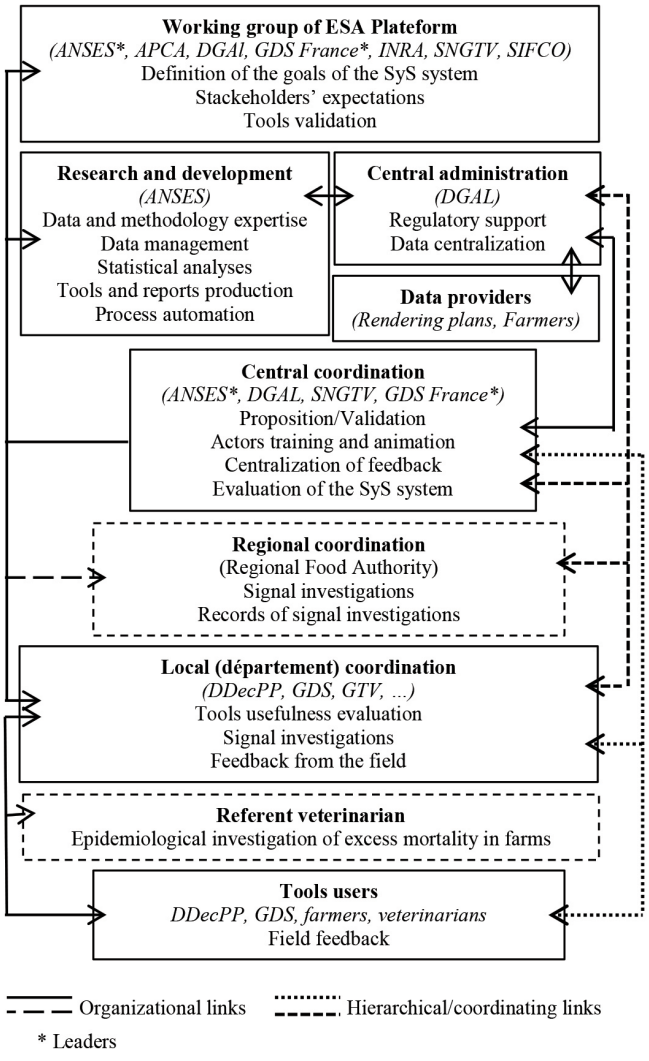
In France, a SyS system of cattle mortality – OMAR – is under operational deployment. It is designed with particular attention to its field use: it is based on the current animal health organisation in France and takes into account the expectations of the animal health actors, their human resources and expertise levels. In this report, we detail the operational design of OMAR and the difficulties and success encountered during its pilot phase.

Context and organisational aspect of Omar pilot phase
OMAR is a SyS system being launched in 2009 by the Directorate General for Food (DGAL), together with the French Agency for Food, Environmental and Occupational Health and Safety (ANSES) and the National Institute for Agronomic Research (INRA). Its aim is to identify as early as possible, unexpected significant excesses of deaths in the cattle population related to emerging diseases, change in the epidemiology of enzootic diseases or other health-related events that were not identified by the traditional surveillance systems. OMAR uses information on cattle demography and mortality routinely collected in the French National Cattle Register (BDNI) and Fallen Stock Data Interchange (FSDI). A feasibility assessment confirmed the adequacy of the data sources for the modelling of cattle mortality and the interest of mortality as an unspecific surveillance indicator [17]. Following these promising results, the objectives and operational design of OMAR were discussed within a collaborative, multi-stakeholder, working group of the French platform for epidemiological surveillance in animal health (ESA Platform), including the animal health and animal welfare departments of DGAL, ANSES, the National Federation of Farmers' Animal Health Services (GDS France), the National Technical Grouping of Vets Association (SNGTV), the professional union of French rendering plans (SIFCO), the French Chamber of Agriculture (APCA) and INRA (Figure 1).

In January 2013, a three-year pilot phase was initiated in five voluntary départements to test the system and design the national organisation. Selected départements demonstrated common motivation of the local administrative animal health unit (DDecPP), Farmers' Animal Health Services (GDS) and technical grouping of vets association (GTV). In each département, these three main local animal health

actors constitute the local group and are free to include other actors. A local coordinator is designed in each group to participate to the working group of the ESA Platform and interact with the animation cell (AC) of OMAR. Local groups test the SyS system tools and locally promote OMAR amongst vets and farmers. The AC includes a representative of each stakeholder. The AC coordinates the SyS system, manages the local coordinators and makes organisational and methodological proposals that are discuss within the working group. Additional hierarchical or coordinating links between the groups consolidate the organisation and ensure the coordination of the animal health actors (Figure 1).

Figure 1. Operational design of the OMAR pilot phase. Plain line boxes are current levels and dashed line boxes levels that should be added for a national deployment.



OMAR tools

OMAR provides mortality standards and real time surveillance tools to compare and monitor cattle mortality over time at individual (farms) and collective (farm groups into specific spatial units) scales, using stratification by age group and farm production type. Two annual mortality standards (mortality rate and standardised mortality ratio) are calculated from the BDNI for the six age groups and the nine farm production types, for each département and at the national level (Table1). Three tools are based on these standards and are annually made available to the actors:

- The individual mortality report compares, for each farm, its mortality level for each age group in the past four production periods to that of similar farms (same production type) located in the *département* (or at national level if the number of farms is under 30 in the *département*);
- The *département*-scale mortality report compares, in the past four production periods, the mortality level of each *département* to the national one; details per age group and farm production type are given;
- The *département*-scale farm classification is a spreadsheet document concerning the last production period. It sorts the farms of one *département* by mortality rate, according to various filters (production type, farm size, age group…).

A fourth tool is the collective alert. It corresponds to the automated acquisition, spatio-temporal aggregation, and time analysis of the FSDI data and the automated generation and transmission of alarm reports. Alarm reports include various indicators (level, type of alarm, number of deaths) that help interpreting the excess mortality.

All the tools and their instruction guides are made available to local groups using a secured ftp site and emails.

Table1. Age groups and farm production types in OMAR

Variable	**Definition**
Age groups (days)	0-7, 8-21, 21-183, 184-731, ≥ 732
Farm production types	beef breeder herd beef breeder-fattener herd dairy breeder herd dairy breeder-fattener herd mixed breeder herd mixed breeder-fattener herd small herd, fattener herd, other

Results after the first two years of operational test

After defining the needs and expectations of field actors, the OMAR operational test of the organisation and tools began in September 2014. The aim of this ongoing test phase is to validate the accuracy and usefulness of the mortality standards, the design of the tools and the local and central organisations in order to propose an operational and economic model for a national SyS system. The test has been led with no specific budget or staff; each partner organisation has participated voluntary, by involving its own staff and resources.

Operational design:

A memorandum published by DGAL defines the general rules applying to the project (information flow, data protection...).

The local groups implement collective actions, in compliance of these general rules, using the OMAR tools. Nevertheless, despite a strong motivation, the actors' feedbacks highlighted that the tools were underused due to insufficient local human resources, heavy workloads and urgent issues, like the unexpected occurrence of Bluetongue disease in 2015. Similar observation was made by the central coordination. The production of the tools is extremely time-consuming as well as the central animation, which should be further reinforced to help the local groups with the animation and tool use. These reports occurred before the collective alert system was implemented in the field. Because of the limited human and financial resources to monitor and investigate the signals and a regulatory issue about the epidemiological investigations in farm, the implementation of this tool was delayed. One solution, to be assessed, is the inclusion of the regional level between central and local coordination to mutualise human resources and provide technical and expertise supports to local actors. Nevertheless, the pilot phase indicated the need to keep the local level to maintain stimulation and field expertise.

Tools evaluation:

The first three tools have been tested for two years in their current design. After time for appropriation, tools have proven to be accurate, ergonomic and very useful and stimulating for all the animal health actors. OMAR tools help GDS implement actions for raising awareness about cattle mortality (especially for young animals) and support the communication between vets and farmers about sanitary disorders and preventive actions. Indicators provided by OMAR are useful for local veterinary authorities to identify the farms that require inspection and implement animal welfare and protection actions. OMAR tools also provide mortality data when legal proceedings are required. The first developments of the collective alert tool showed promising results and its weekly surveillance of the intermediate spatial units, issue from the aggregation of the smallest administrative units, seemed well adapted to the organisation of the animal health actors.

Discussion

The innovation is that OMAR, in its current operational design, is constructed with and for all the stakeholders from local animal health actors to central administration. A large place is made in the system to field actors that play a crucial role in animal health surveillance and have a valuable expertise to ensure the long-term sustainability and cost-effectiveness of the system. OMAR tools meet the stakeholders' expectations about support for collective and individual preventive actions related to cattle mortality. In that way, OMAR should assist with the reduction of the avoidable mortality, which creates some noise in the mortality indicator. Accordingly, one of the difficulties encountered with the SyS system is their inherent low specificity and high sensitivity leading to potential high level of false alarms. This is especially true when the indicator is strongly noised, which is the case of cattle mortality at small spatio-temporal scale.

The pilot phase was limited to a small number of *départements* in which the motivation of stakeholders was high. This ensured the best conditions to test the system. After the 3-years pilot phase, OMAR operational design is under validation but the roles of the government and the professionals remain to clarify. Besides, the economical scheme still need to be drawn up, including technical means for a national implementation and funding for the epidemiological investigations linked to the collective alert tool. Nevertheless, a national deployment of two of the tools is scheduled in 2017. The importance of the animation was evidenced along the pilot phase; therefore tools will be accompanied by practical guides with cases studies and communication supports. The *département*-scale mortality reports will be made available for all animal health actors while the *département*-scale farm classification that required strong expertise, will be restricted to local administrative animal health units to help them in their animal protection and welfare controls.

The OMAR pilot experience showed the difficulty to design an operational SyS system with limited dedicated human and financial resources, and incomplete regulatory support. In the OMAR case, the motivation of the field actors initially balanced the limited resources but the system has reached its limits. The limited number of operational SyS systems in animal health may be related to the difficulty to convince fund providers to finance field evaluation of such systems whose benefits are still in doubt, also in human health [18].

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