

Implementation of an integrated information system for the management of swine vesicular disease surveillance activities in Italy

Silvia Bellini⁽¹⁾, Nicola Ferrarini⁽²⁾ & Ugo Santucci⁽²⁾

Summary

In Europe in the last decade, swine vesicular disease (SVD) outbreaks have been steadily reported in Italy where surveillance and eradication activities are in place. To collect and analyse data gathered during SVD surveillance activities, the Italian reference centre for vesicular diseases (CERVES) has implemented an integrated information system for the management of the national surveillance plan. The system was developed using Web-based technology and open source software. It was designed to gather, integrate and manage data generated by the activities of the Veterinary Services, the laboratory information system, herd and animal registers and the relevant technical and scientific information. A geographic information system provides an interface for the system, which facilitates the planning, implementation and evaluation of disease control actions. Access to the system is feasible through a second level domain.

Keywords

Eradication, Geographic information system, Italy, Surveillance, Swine vesicular disease, Web technology.

Realizzazione di un sistema informativo integrato per la gestione delle attività di sorveglianza per la malattia vescicolare del suino in Italia

Riassunto

In Europa negli ultimi dieci anni la malattia vescicolare del suino (MVS) è stata persistentemente segnalata in Italia, per tale motivo sul territorio nazionale è in corso un piano di sorveglianza che ha come obiettivo finale l'eradicazione della malattia. Per gestire le principali attività previste dal piano, il Centro di riferimento per le Malattie Vescicolari (CERVES) ha realizzato un sistema informativo integrato. Il sistema è stato sviluppato utilizzando tecnologia Web e software open-source, è stato progettato per raccogliere, integrare e gestire i dati generati da: le attività svolte dai Servizi Veterinari, i sistemi informativi dei laboratori, l'anagrafe nazionale zootecnica, informazioni tecniche e scientifiche. Il GIS costituisce un' interfaccia del sistema e facilita le attività di programmazione, realizzazione e di verifica delle misure intraprese per il controllo della malattia. Si accede al sistema attraverso un dominio di secondo livello.

(1) Centro Nazionale di Riferenza per le Malattie Vescicolari (CERVES), Istituto Zooprofilattico Sperimentale della Lombardia ed Emilia Romagna, Via A. Bianchi 9, 25124 Brescia, Italy
sbellini@bs.izs.it

(2) Centro Nazionale di Riferenza per le Malattie Vescicolari (CERVES), Istituto Zooprofilattico Sperimentale della Lombardia ed Emilia Romagna, Via A. Bianchi 9, 25124 Brescia, Italy

Parole chiave

Eradicazione, Italia, Malattia vescicolare del suino, Sistema informativo geografico, Sorveglianza, Tecnologia Web.

Introduction

Swine vesicular disease (SVD) was first reported in Italy in 1966, when it was clinically identified as foot and mouth disease (FMD). In spite of the clinical signs, it differed from FMD and the pathogen was classified as an enterovirus within the family *Picornaviridae*. SVD was included in the former disease list A of the World Organisation for Animal Health (OIE: Office International des Épizooties) due to the similarity of its lesions with those of FMD; however SVD is often mild in nature and may infect pigs without clinical signs.

Surveillance and eradication activities against SVD have been implemented in Italy for the past ten years. The aim of the surveillance is to achieve eradication based on a SVD health certification scheme for each region in Italy. The central-northern areas of the country have been recognised as SVD-free and have maintained this status since 1997, while other regions, mainly in the south, have never been able to attain disease-free status. The plan is updated annually according to the epidemiological situation and has been approved by the European Union. Requirements for routine surveillance were established for Italy by Commission Decision 2005/779/EC 'concerning animal health protection measures against swine vesicular disease in Italy' (3).

Under the aegis of the Ministry of Health, the Italian reference centre for vesicular disease (CERVES) has collected and analysed data gathered during SVD surveillance activities. In addition the centre has implemented an integrated information system for the management of the national surveillance plan to improve the timing of response and decision-making capacity of the veterinary services.

Data integration, analysis and mapping provide a better understanding of the

distribution and evolution of a disease, and facilitate the definition of appropriate control strategies (1, 2, 4). Consequently, a Web-enabled geographical information system (GIS) has been added to the programme, to analyse epidemiological data and to present results in a user-friendly format.

Materials and methods

Data collection and data flow

Regional veterinary laboratories perform periodic serological testing and the results are entered into the database of the system through a Web interfaced file that can be uploaded.

CERVES provides the results of the virological tests and confirms positive serological results found at a regional level. Every night, a batch procedure updates the information in the database.

Data on herds and animal registers are provided by the national data bank (BDN: *banca dati nazionale*), as follows:

- aggregated data are updated each month in a standard format and are transferred using ftp technology; uploading is preceded by semi-automatic validation of the data
- data on specific farms is acquired real-time, directly from the BDN using Webs technology.

The notification of SVD outbreaks and related legal provisions are recorded in the system database by the Veterinary Services General Directorate through a Web interfaced file.

Access to the system

The system is accessible through a second level domain (www.cerves.it). The SVD management system includes sectors that are freely accessible to the public, with a restricted section accessible to the Veterinary Services General Directorate, to official laboratory veterinarians and to the regional veterinary services. The restricted area is accessible with a username and password and users can access only data that is relevant to the geographic area they are responsible for. CERVES and the Veterinary Services General Directorate have access to the entire system.

Structure

The system is Web-based and was implemented to manage the surveillance activities of the Italian SVD eradication plan. It gathers, analyses and monitors data generated by Veterinary Services activities, the laboratory information system, herd and animal registers (BDN) and technical and scientific documents. The structure of the system is presented in Figure 1.

Development

The system was developed using Web-based technology (Hypertext Preprocessor) and open-source software (MySQL). GIS was developed by using traditional methodological tools (JavaScript, application programming interface [Api], Google® Maps).

Geographic information system

To analyse surveillance data and display the outcomes of the activities performed, a Web-based GIS was added to the system and data from different sources integrated (laboratory information system and herd animal registers). The GIS allows proximity analysis and enables the automatic extraction of farms in a given

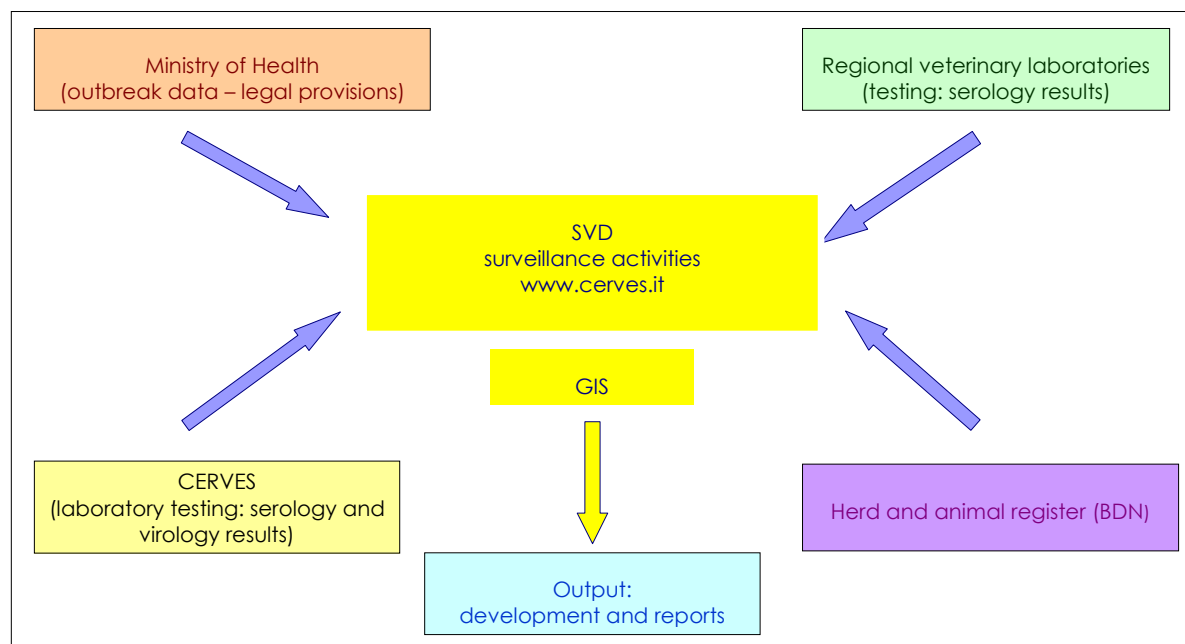
area or the results of the surveillance actions performed in that area. The area can be selected by a given radius from an index farm (1, 3 and 10 km) or through administrative boundaries (region, province, municipality).

The system was implemented to manage surveillance activities for vesicular diseases (FMD and SVD) but it is currently operating and running data on SVD surveillance activities.

Results

Outputs of the system are shown in Figure 2, namely:

- informative pages describing the disease
- SVD surveillance activities with the complete archives of the results of laboratory tests performed in the past five years; queries may either be focused on single farms or on output aggregated according to the principal requirements of the surveillance guidelines; data selected from queries can be downloaded locally to perform additional analyses; access to this section is for authorised users only (Fig. 3)



SVD swine vesicular disease
 GIS geographic information system
 CERVES *Centro Nazionale di Riferenza per le Malattie Vesicolari* (Italian reference centre for vesicular disease)
 BDN *banca dati nazionale* (national data bank)

Figure 1
 Swine vesicular disease system: data collection and flow

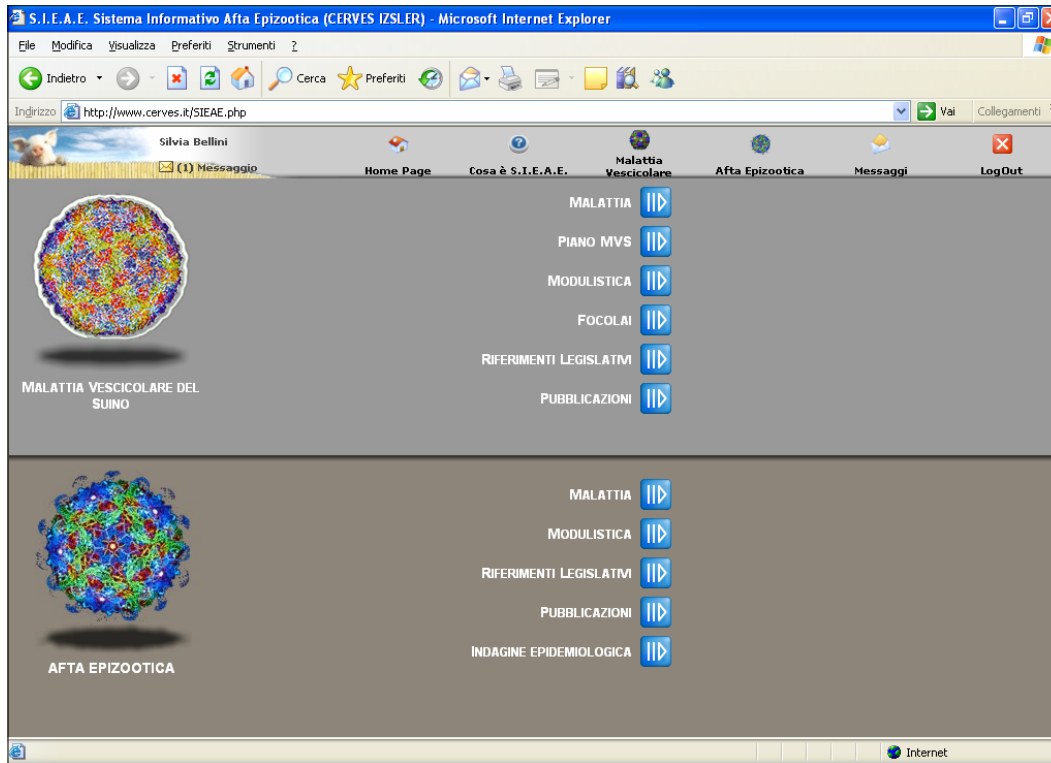


Figure 2
Vesicular disease surveillance activities management system

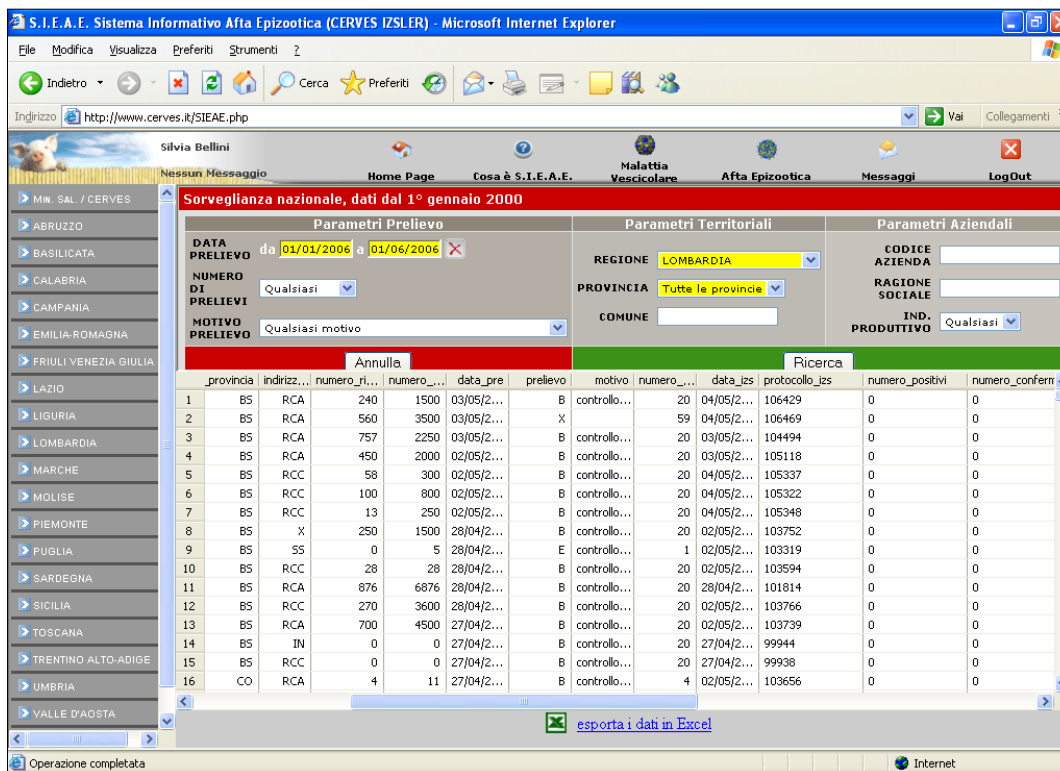


Figure 3
Output of a query on surveillance activities meeting different selection criteria

- relevant forms for the management of surveillance activities
- national and European Union legal provisions on the disease
- SVD outbreaks (detailed information on the farms is for authorised users only)
- scientific publications.

Raw and processed data on activities are displayed by maps, in both tabular and graphic formats.

Spatial information interacts with alphanumeric data related to each farm (Figs 4 and 5).

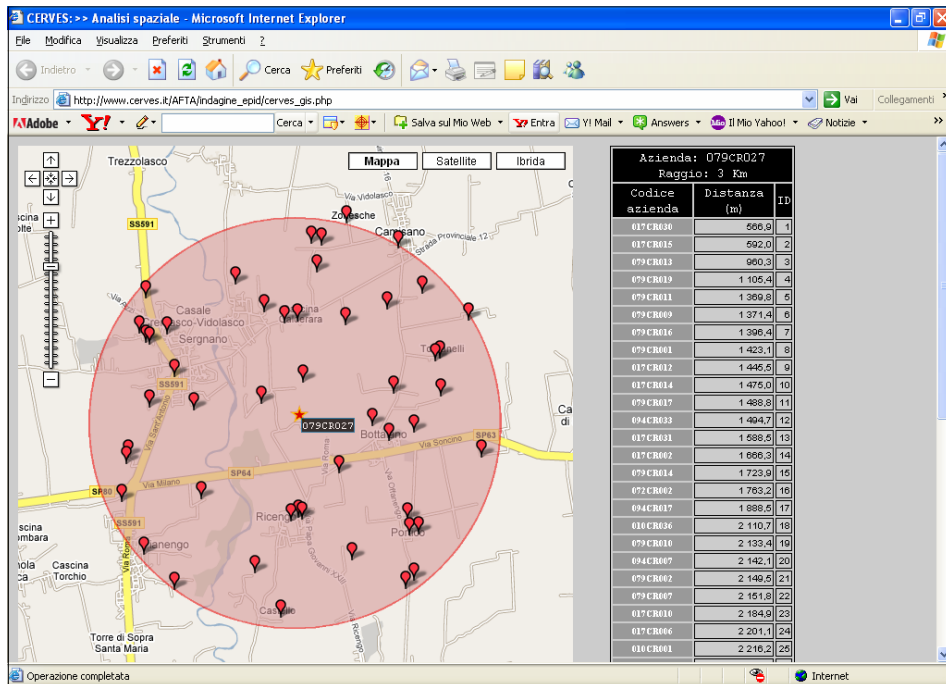


Figure 4 Geographic information system: selection result

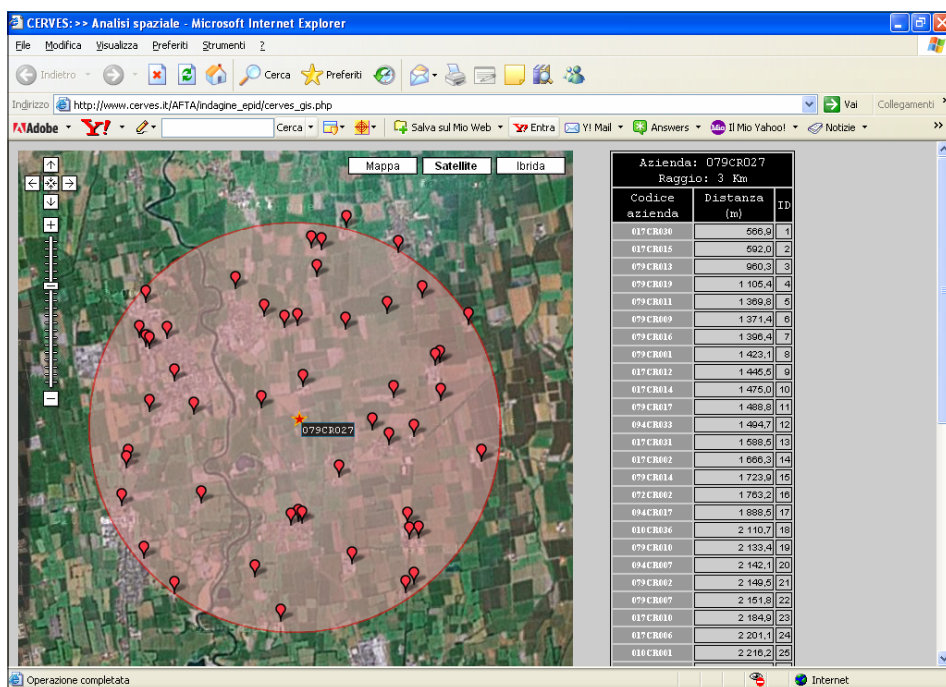


Figure 5 Geographic information system: the result of the selection is displayed on an ortho-photo image

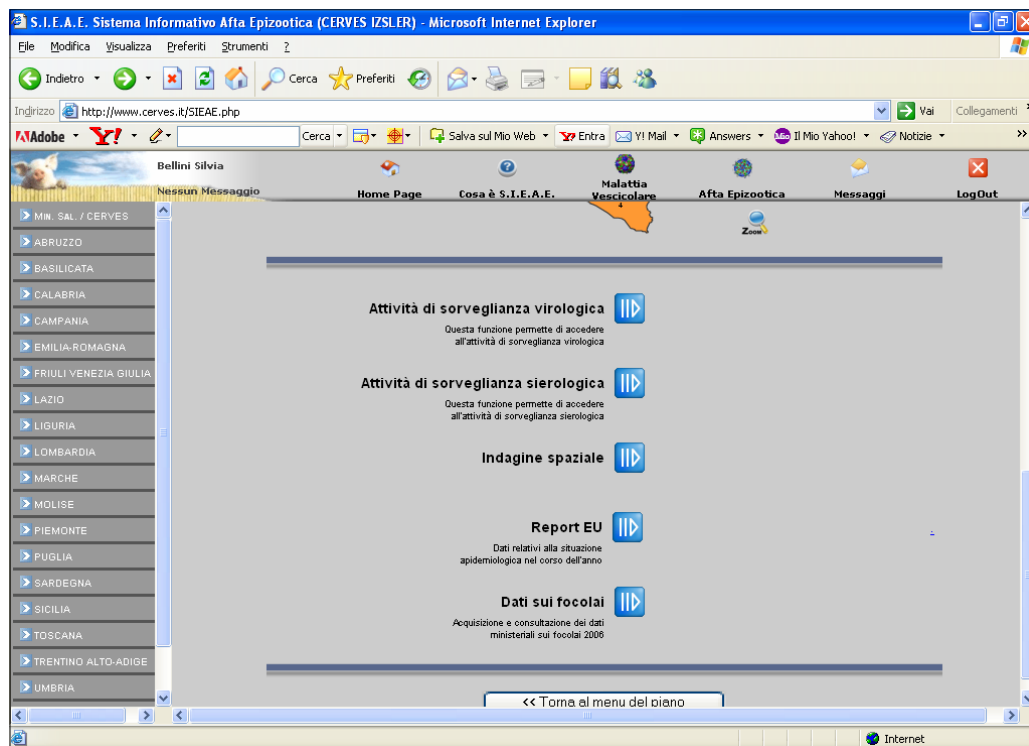


Figure 6 Report section of the system, showing different types of reports

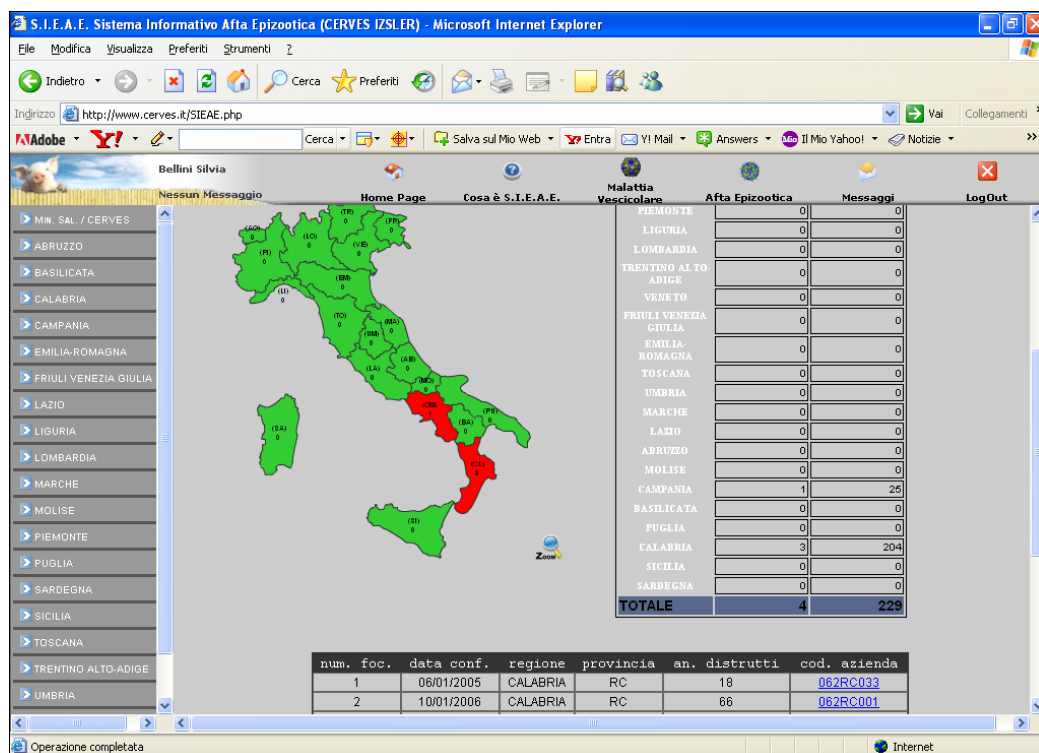


Figure 7 Reports section, showing the different report formats

Reports required for the evaluation of the plan are supplied to the competent authorities, in accordance with the Italian Ministry of Health and European Union requirements (Figs 6 and 7).

Discussion

Data generated by the system is used to provide the information necessary for the implementation of the SVD surveillance plan. The system aims to deliver timely and accurate analyses, providing the institutions involved with the information they require to manage and implement national surveillance. Feedback of information to the administrations concerned (European Union, Veterinary Services General Directorate, CERVES, official laboratory veterinarians and regional veterinary service veterinarians) is transmitted using the Internet.

Web-enabled GIS has been added to analyse epidemiological data and to present the results in a user-friendly format. The use of GIS is well established in veterinary science for surveillance and emergency response and it facilitates the planning, implementation and evaluation processes of disease control programmes. The availability of spatial data describing the location and ownership of premises, together with details on susceptible species, are essential elements to ensure an effective response to emergency situations. Furthermore, GIS displays results in a user-friendly format which further facilitates surveillance and eradication activities.

During 2006 and the first four months of 2007, the restricted sector of the system was accessed by 3 284 users.

References

1. Bellini S., Colangeli P., Isocrono E., Giovannini A., Di Francesco C. & Caporale V. 1999. Implementation of a telematic system for the management of epidemic emergencies. towards the millennium of cybermedicine – MEDNET '99 (T.N. Arvanitis, G. Eysenbach & J. Woodall, eds). *Of J Med Internet Res (Suppl.)*, **1**, 21 - 22.
2. Bellini S., Di Francesco C., Giovannini A., Colangeli P., Calistri P., Petrella D. & Caporale V. 2000. Implementation of a system for the management of epidemic emergencies at regional level. *Rev Sci Tech*, **19** (3), 841-847.
3. European Commission (EC) 2005. Decision 2005/779/EC of 8 November 2005 concerning animal health protection measures against swine vesicular disease in Italy. *Off J*, **L 293**, 09/11/2005, 28-32.
4. Murray G. & McCutcheon S. 1999. Model framework and principles of emergency management *In* Management of animal health emergencies (J.G. Murray & P.M. Thornber, eds). *Rev Sci Tech*, **18** (1), 15-20.