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Evaluation of the Indonesian Animal Brucellosis Surveillance System in 2016 using the Outild'analyse des systèmes de surveillance (OASIS) Method

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Abstract

Surveillance system evaluation is essential for the system improvement. The Indonesia government is conducting the animal brucellosis surveillance to determine herd prevalence and detect infected animals in the herd. This study was conducted to evaluate this brucellosis surveillance system using the Outild'analyse des systèmes de surveillance (OASIS) tool. The questionnaire, developed based on the OASIS tool, was sent to officers in charge of the surveillance system at national, regional and local levels. After collection of information, a consensus panel meeting was conducted to validate and summarize the responses. The OASIS tool assessed the level of satisfaction, critical points and attributes of the surveillance system. There were 37 respondents, including 27 provincial, eight regional and two national officers. The respondents were most satisfied with the information dissemination component of the system. They were also satisfied with the utility of the system, laboratory capacity, surveillance tool, data analysis and communication. In contrast, attention was needed for field institutional organization, surveillance procedures and evaluation, sampling points, and representativeness. Corrective actions can be taken and prioritized based on the evaluation findings, focusing at specific elements which did not meet the officers' expectation.

Keywords: brucellosis, OASIS, surveillance evaluation, Indonesia

Introduction

Animal health surveillance system, which consists of activities that generate information on health or disease status in animal population, is essential for providing evidences of disease absence or describing the occurrence of a particular disease.[1,2] Surveillance system evaluation is also crucial to ensure appropriate resource allocation, providing meaningful information and improvement of surveillance component that are deficient.[3,4] A surveillance system can be evaluated using a qualitative, semi-quantitative or quantitative approach.[5]

The Outild'analyse des systèmes de surveillance (OASIS) method[6] is a semi-quantitative approach

used in animal diseases surveillance evaluation. The tool assesses the characteristics of 10 components in the surveillance system: objective, central organizational aspects, field institutional aspects, laboratories, surveillance tools, surveillance procedures, data management, training, communication and evaluation. The tool consists of scoring criteria and supplementary materials such as a questionnaire and scoring guidance.[7,8] The tool analyzes information in the questionnaire and provides three different outputs: surveillance system component, critical points and attributes.

Brucellosis adversely affects to small-scale cattle farm in Indonesia. Different levels of prevalence were identified in 20 out of 34 provinces. The Indonesia government implemented surveillance to determine brucellosis prevalence at farm level and detect infected animals in the farm.[9] The government at the national (Directorate of Animal Health, DAH), regional (Disease Investigation Center, DIC) and local (Provincial and District Veterinary Services) levels had responsibilities for specific activities.

Regional and local levels were responsible for conducting active and passive surveillance by reporting brucellosis syndromes such as abortion in the third trimester of pregnancy or swollen joints in cattle, and collecting blood samples for laboratory confirmation. The active surveillance had been conducted by sample collection in cattle farms. DAH was responsible for developing policies, guidelines, and managing the surveillance system. Monitoring for disease signs and syndromes, data reporting and laboratory testing were the main activities of the surveillance. Surveillance data were managed in two databases, the Integrated National Animal Health Information System (iSIKHNAS) which managed syndromic surveillance data, and the Laboratory Information System (InfoLAB) which managed laboratory results (Figure 1).

In the past few years, the Indonesia government had promoted cattle raising in small-scale farms to secure meat either supply or self-sufficiency in Indonesia. Brucellosis could be a threat to the success of the program due to chronic production losses of infected animals, in addition to zoonotic potential. Thus, this study was conducted to evaluate the current brucellosis surveillance system by assessing the opinion of stakeholders using the OASIS tool in order to provide recommendations for prevention and control of the disease.

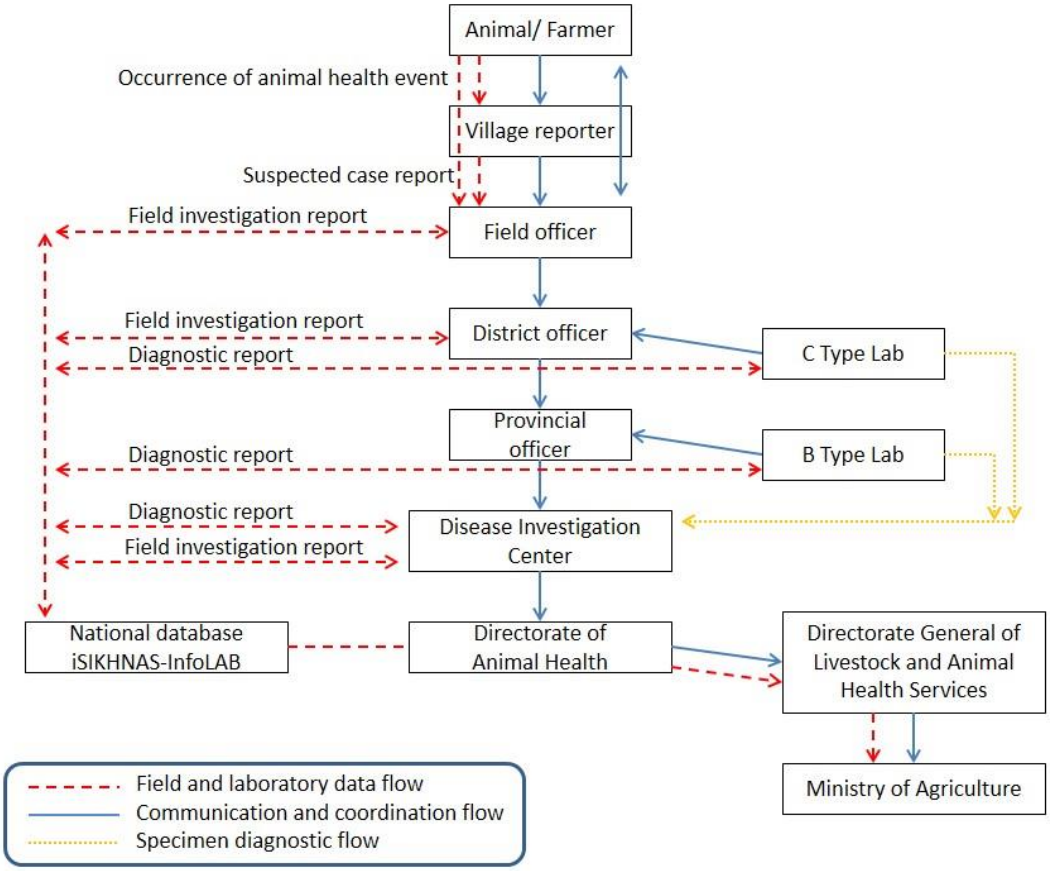


Figure 1. Structure of animal health surveillance system in Indonesia

Methods

Evaluation Process

The study was conducted between September 2015 and February 2016. The evaluation process, from preparation to reporting, involved several officers in charge of the surveillance system at different levels. We reviewed and modified the OASIS tool and questionnaire for brucellosis according to different (provincial, regional and national) levels of the government staff. We followed the OASIS tool to group surveillance components for evaluation into 10 components, comprising objective, central organizational aspects, field institutional aspects, laboratories, surveillance tools, surveillance procedures, data management, training, communication and evaluation. Total 78 criteria included in evaluation of each component (Table 1). The questionnaire was pre-tested with national and regional staff before deploying.

Table 1. Criteria for scoring of each component of the animal brucellosis surveillance system in Indonesia

Surveillance component	Scoring criteria
1: Objectives and context of surveillance	1) Relevance of surveillance objectives, 2) Level of detail, accuracy and formalization of objectives, 3) Taking partners' expectations into account, 4) Coherence of the diseases under surveillance with the sanitary situation (existing/exotic diseases or threats)
2: central organizational	1) Existence of an operational management structure (central unit), 2) Existence of an operational steering structure that is representative of the partners (steering committee), 3) Existence of a scientific and technical committee for the system, 4) Organization and operations of the system laid down in regulations, a charter, or a convention established between the partners, 5) Frequency of meetings of the central coordinating body, 6) Supervision of intermediary units by the central level, 7) Adequacy of the central level's material and financial resources
3: Field institutional organization	1) Existence of formal intermediary units covering the entire territory, 2) Active role of intermediary units in the functioning of the system (validation, management, feedback), 3) Implementation of supervision by the intermediary level, 4) Harmonization of intermediary units' activities, 5) Adequacy of material and financial resources of intermediary units, 6) Existence of coordination meetings at the intermediate level, 7) Exhaustiveness or representativeness of the field agents' coverage of the target population, 8) Adequacy of material and financial resources at the field level
4: Laboratory	1) Effective integration of laboratories in the surveillance system, 2) Adequacy of human, material, and financial resources for diagnostic needs, 3) Application of Quality Assurance for the tests undertaken, 4) Quality of the standardization of work between different laboratories, 5) Proportion of tests submitted to inter-laboratory trials, 6) Existence of an investigation team to support field agents, 7) Relevance of diagnostic techniques, 8) Sensitivity of diagnostic techniques, 9) Specificity of diagnostic techniques, 10) Control of laboratory reagents, 11) Technical level of data management at the laboratory, 12) Analysis deadlines at the laboratory (formalization, standardization, verification, transfer of results to the central unit), 13) Quality of results delivered
5: Surveillance tools	1) Existence of a formalized surveillance protocol for each disease or threat under surveillance, 2) Standardization of data collected, 3) Relevance of measurement tools (excluding laboratory tools), 4) Sensitivity of the case or threat definition, 5) Specificity of the case or threat definition, 6) Simplicity of the case or threat definition, 7) Quality of the filling out of investigation forms, 8) Relevance of collected samples, 9) Standardization of collected samples, 10) Quality of samples collected, 11) Respect of the interval between the detection of a case or threat and the delivery of results, 12) Simplicity of the notification procedure, 13) Simplicity of the data collection procedure, 14) Acceptability of the consequences of a suspicion or case for the source or collector of data
6: Surveillance procedures	1) Appropriateness of surveillance procedures with the system's objectives, 2) Existence of passive (event-based) surveillance whose results are exhaustive or representative, 3) Existence of awareness building programs for data sources in a passive (event-based) network, 4) Relevance and suitability of active (planned) surveillance protocols, 5) Surveillance of susceptible wild animals, 6) Vector surveillance and control, 7) Representativeness of the populations targeted by sampling in active (planned) surveillance, 8) Precision of sample under active (planned) surveillance, 9) Level of satisfaction of active (planned) surveillance completeness rate
7: Data management	1) Adequacy of the data management system for the needs of the system (relational database, etc.), 2) Data input interval in accordance with the objectives and use of system results, 3) Designated staff available and trained in data entry, management and analysis, 4) Adequacy of material and financial resources for data management and analysis, 5) Data verification and validation procedures formalized and operational, 6) Complete descriptive processing of data, 7) Exploitation of data fits the needs of the system (if possible regular and multi-disciplinary)
8: Training	1) Adequate skill level in epidemiology of members of the central unit, 2) Initial training implemented for all field agents when joining the system, 3) Objectives and contents of initial training of system field actors adequate for operational surveillance needs, 4) Regular advanced training 5) Adequacy of material and financial resources for training
9: Communication	1) Regular release of reports and scientific articles on surveillance results, 2) Return of individual test results to field actors, 3) Regular dissemination of a relevant information bulletin, 4) Systematic return of reports on results to field actors (outside of a bulletin), 5) Presence of a communications system organized transversally and vertically between field actors (mail, web, telephone), 6) Solid external communication policy, 7) Adequacy of material and financial resources for communication
10: Evaluation	1) System of performance indicators developed and validated by the directors of the network, 2) Performance indicators regularly measured, interpreted, and disseminated, 3) External evaluations carried out, 4) Implementation of corrective measures

Evaluation involved officers in-charge of the surveillance system at all levels. The questionnaires were sent by email to officers, including one officer each from 34 provinces and eight DICs, and two officers from national surveillance section (Table 2).

The Scoring Criteria

The OASIS scoring guideline was used to evaluate 78 criteria. The scores ranged 0-3 (with description guideline), reflecting the level of compliance of the component under examination. If the specified criterion was not relevant for the system, it would be classified as "not applicable" (NA) without any scoring and not considered in the analysis. The respondents could also provide additional comments, explaining their reasons for the particular scoring. An example of one of the scoring criteria for surveillance procedures is illustrated in table 3.

Finalizing the Scores

All data and information were reviewed and validated. A panel of respondents (2 from national, 8 from regional and 2 from provincial) met to produce a summary of satisfactory levels of each criterion, finalized the scores and provided their justification. The satisfactory level was automatically created and generated by the OASIS tool using a specific combination of the scoring criteria. The OASIS tool generated three outputs of the evaluation: 10 components (as described above), seven critical points (Objectives, coordination, surveillance tool, sampling, data collection, data analysis and information dissemination), and 10 attributes of the surveillance system (utility, flexibility, acceptability, simplicity, reliability, stability, representativeness, sensitivity, specificity, and timeliness).

Table 2. Summary of the animal brucellosis surveillance system evaluation process in Indonesia

Pre-action	
1. Desk review	Reviewing OASIS tool to be fit in Indonesia context
2. Tool pre-test	- Assigning 1 national officer and 2 regional officers to finalize OASIS tool - Selecting the questions from OASIS questionnaire according to its level (national, regional, local)
3. Respondent selection	Selecting person in-charge on surveillance system in national (2 persons), regional (8 persons), provincial (34 persons) levels
Action	
4. Send the questionnaire	Sending the questionnaires (with selected questions according to its level), by email to selected respondents
5. Complete the questionnaire	- Each question was scored by respondents: 0-3 or not applicable, according to the degree of adequacy and made additional comments. - Sent a reminder message to respondents
Post-action	
6. Questionnaire compilation	All scores compiled and adapted to the respondents comments and other documents.
7. Rating scoring criteria	- Final score was given based on consensus, put in the scoring tool– and automatically generated 3 outputs (pie chart, histogram, radar chart) - The percentage number in 3 outputs defined in 4 levels of satisfaction: ≥ 90 as highly satisfactory, <90-80 as satisfactory, <80-70 as less satisfactory, and <70 as unsatisfactory.
8. Summarizing	All findings were summarized as a final report.

Table 3. Example of guideline for scoring of one criteria (surveillance procedures: relevance and suitability of active (planned) surveillance protocols) for animal brucellosis surveillance in Indonesia

Component 6: Surveillance procedures	
6.4 Relevance and suitability of active (planned) surveillance protocols To score, choose from the following options:	
Score of 3	The objectives of the system require active surveillance and the active surveillance protocol procedures in place respond perfectly to the objectives.
Score of 2	The objectives of the system require active surveillance but the active surveillance protocols in place need to be modified slightly to better respond to these objectives.
Score of 1	The objectives of the system require active surveillance but some active surveillance procedures needed to respond to these objectives are missing or the procedures in place require important modifications.
Score of 0	No active surveillance protocol is in place although the objectives of the surveillance clearly require an active surveillance protocol.
Not applicable	No active surveillance protocol is in place and the objectives of the surveillance do not require an active surveillance protocol.

The panel categorized the satisfactory level that was generated by OASIS tools into four levels of satisfaction: 90 and above as highly satisfactory, under 90-80 as satisfactory, under 80-70 as less satisfactory, and under 70 as unsatisfactory.

Results

All selected persons in charge for the surveillance system at the national (2 persons) and regional (8 persons) level, and 27 out of 34 provincial staff responded the questionnaire. After reviewing and validating the result of all questionnaires, the levels of satisfaction were summarized by outputs.

Outputs

Output 1: Surveillance system components

From 10 components, three components were rated as satisfactory, including communication 85.7% (18/21), laboratory 84.6% (33/39) and surveillance tool 81.0% (34/42). Four components were rated as less satisfactory, including data management 76.2% (16/21), objectives of surveillance 75.0% (9/12), training 73.3% (11/15) and central institutional organization 71.4% (15/21). Three components were rated as unsatisfactory, including field institutional organization 62.5% (15/24), surveillance procedures 51.9% (14/27) and evaluation 58.3% (7/12) (Figure 2).

Component	Chart	Percent
1. Objectives and context of surveillance		75
2. Central institutional organization		71
3. Field institutional organization		63
4. Laboratory		85
5. Surveillance tools		81
6. Surveillance procedures		52
7. Data management		76
8. Training		73
9. Communication		86
10. Evaluation		58

Figure 2. Satisfaction levels of the structures and procedures of the animal brucellosis surveillance system in Indonesia

Output 2: Surveillance system critical points

Amongst a total of seven critical points, information dissemination (90.0%, 9/10) was rated as highly satisfactory. Surveillance tool (85.0%, 17/20) and data analysis (80.0%, 8/10) were rated as satisfactory. Objectives (73.3%, 11/15), coordination (73.3%, 11/15), and data collection (70.0%, 7/10) were rated as less satisfactory while sampling (60.0%, 12/20) was rated as unsatisfactory (Figure 3).

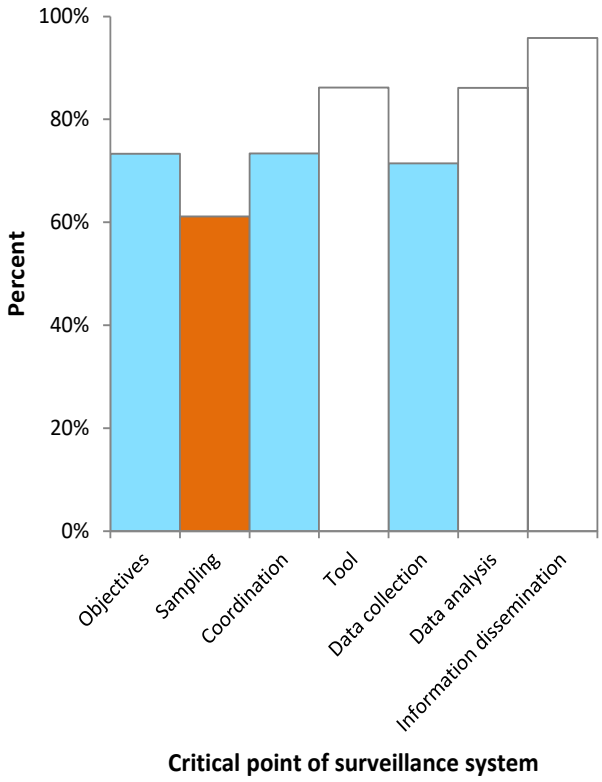


Figure 3. Satisfaction levels of the animal brucellosis surveillance system critical points in Indonesia

Output 3: Surveillance system attributes

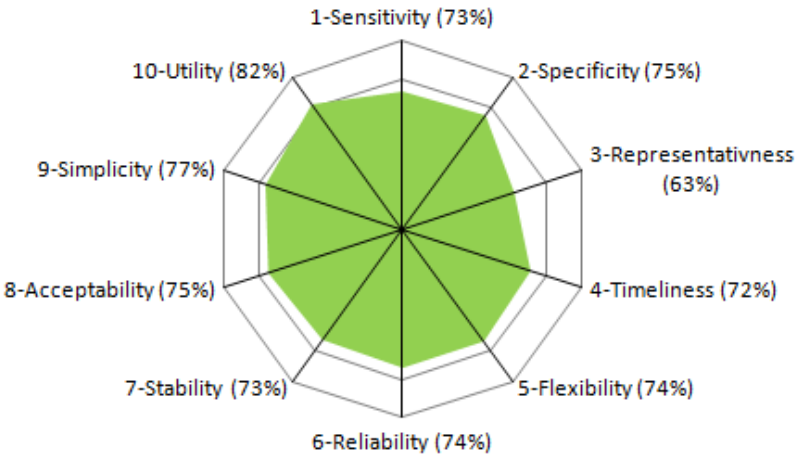
Out of total 10 attributes, utility (82.3%, 79/96) was rated as satisfactory. Eight attributes were rated as less satisfactory, including simplicity 76.7% (46/60), specificity 75.0% (27/36), acceptability 75.2% (115/153), flexibility 73.6% (64/87), reliability 73.7% (294/399), stability 72.6% (135/186), sensitivity 73.3% (121/165) and timeliness 71.6% (58/81) while representativeness (62.5%, 30/48) was rated as unsatisfactory (Figure 4).

Strengths of the Brucellosis Surveillance System

Organizational structure

There were effective functional scientific and technical committees for brucellosis at all levels.

Formal intermediary units (Provincial and district levels) existed with their active roles covering the entire country.



Note: outer and inner lines represent 100% and 80% respectively.

Figure 4. Satisfaction levels of different attributes of animal brucellosis surveillance system in Indonesia

Number of staff at the national level were competent in epidemiology with, at the minimum, a master level in epidemiology or over five years of professional experience in field epidemiology.

Surveillance protocol

The protocol to address the objectives of the brucellosis surveillance system, which required active surveillance, had been in place.

The case definition was simple and sensitive for detection of brucellosis and to guarantee that all manifestations of brucellosis would be picked up.

Sample collection and diagnosis

The collected samples were suitable for testing upon arrival at the diagnostic laboratory.

Laboratories had a clear position in the system that provided the staff significant roles in operation and organization of epidemiological surveillance.

The diagnostic method had a high sensitivity with regular inter-laboratory trials.

Information dissemination

The maximum interval between analysis of samples and transfer of laboratory results to the central unit was defined and verified using the computerized information management system at the laboratory (InfoLAB).

A database existed at the national level (iSIKHNAS), integrating all of the data of the surveillance system, and it was compatible with the size of the surveillance system.

Reports and scientific articles of brucellosis were released regularly. The communication system was used effectively by the large majority of the surveillance stakeholders.

Challenges Identified

Limited resources and workload

At the national level, there was insufficient operational management such as data management, processing, interpretation and validation of iSIKHNAS due to limited number of staff, workload on administrative tasks and maintenance activities.

At the regional level, there was over-workload, delay of diagnosis and materials procurement to perform laboratory diagnosis.

At the local level, limited availability of financial resources and workload to implement iSIKHNAS were the main challenges.

Representativeness

Due to wide geographical area of Indonesia, the submitted samples in active surveillance system did not cover appropriate target population, leading to lack of representativeness of the surveillance result.

Results from the syndromic surveillance were not reported consistently by local officers.

Surveillance protocol and data collection

Changing of the active surveillance protocol caused confusion of local staff.

Data collection form and instruction were not well standardized and not consistently used by local staff.

Utilization of information

The system needed to regularly explore surveillance data and include a multi-disciplinary team due to zoonosis potential.

Discussion

The laboratory was one of the strongest components in the surveillance system. There were well-qualified laboratory personnel who were essential for the surveillance system. The laboratory staff need to understand the limitations and applicability of diagnostic tests[10]. DICs were the main unit responsible for animal laboratory tasks in Indonesia. However, their workload could be overwhelmed by other responsibilities, including conducting disease investigation. The variety of active surveillance protocols needed to be standardized. Frequent changes of the protocols could lead to non-compliance. The communication was the strength of the system since regular reports were produced to engage users in this study. The comprehensive report could improve the acceptability, representativeness, quality and usefulness of the surveillance to stakeholders[11].

System utility was perceived to be satisfactory at all administrative levels. It reflected contribution of the system to improve understanding of the disease distribution[12], prevention and control[2]. The system equipped with a relational database (iSIKHNAS) that provided latest information for stakeholders to understand current disease distribution. The system could be improved by conducting data exploration using a multi-disciplinary approach. In addition, iSIKHNAS had been developed as real-time syndromic surveillance database. It was designed as all data were stored and managed primarily at a central location and integrated within the same framework[10]. The reporting of brucellosis syndrome tended to be under representative. The possible reason was that iSIKHNAS reporters had to be familiar with the procedures to use mobile phone for reporting with standardized codes. To address this constraint, training could be targeted at different audiences to improve users' knowledge and awareness, and also to emphasize the reporting procedures.

There were challenges identified in this study. At the national level, composition of staff and time allocation to manage the system were inadequate. DAH was responsible for the management of brucellosis as well as all other animal diseases at the national level. The workload for their staff was one of the major challenges for the brucellosis control and prevention program. This constraint might also affect the quality of other surveillance components. Similar to the regional and local levels, lack of representativeness of field samples could be due to lack of resources allocated to cover surveillance area. It was in line with AIP-EID[10] findings in inadequate operational budget at field level. The national decentralization policy provided the local administrative level to manage their resources allocation[13,14]. Distribution of responsibilities among stakeholders and program prioritization are the best ways to allocate limited resources and avoid overlapping of roles. Thus, to address this constraint, DAH had to prioritize animal diseases and activities as well as effectively coordinate with the local government.

Salman et al[2] stated that basic requirement of evaluation was to use an objective, transparent and systematic approach. The OASIS tool has been developed to evaluate surveillance systems by providing standardized and clear guidelines. It can be used by external evaluators or through self-assessment. The subjectivity issue by respondents could be reduced through the use of questionnaires to allow probing and confirmation of information, collecting comments associated with each scored criterion and producing of a consensus score for each evaluation criterion amongst actors. The OASIS tool can also be applied to evaluate other animal diseases with some modification to make it suitable for characteristics and objectives of the surveillance system.

The study was the first brucellosis surveillance system evaluation using the OASIS tool that provided a basis for improvement of system. Strengths and constraints were identified for improvement of the system. Involving wider stakeholders (e.g. public health sector, farmer, district office and different levels of animal health laboratory) in future evaluation would facilitate clearer picture of the brucellosis surveillance system. Evaluation measures should be conducted regularly to ensure that the quality and performance of the surveillance system is appropriate for the objectives the system.

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