Food and Agriculture Organization of the United Nations

AFRICA SUSTAINABLE LIVESTOCK 2050

Zoonotic diseases spotlight

BURKINA FASO

The case for an expert elicitation protocol on zoonoses

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The case for an expert elicitation protocol in Burkina Faso

1. Introduction

In rapidly changing societies such as Burkina Faso, it is imperative that decision makers at all levels appreciate the current and future impact of the livestock sector on public health, the environment and livelihoods. This allows decision makers to take actions now that will ensure sustainable development of the livestock sector in the coming decades – a development that benefits producers, consumers and society in general – with limited negative effects on public health and the environment.

Good quality data are essential for formulating policies and programmes that support sustainable development of the livestock sector. However, livestock stakeholders, particularly the Ministries in charge of animal and public health, often face what is referred to as "the zoonotic disease and antimicrobial resistance (AMR) information trap". As there is little robust evidence to quantify the negative impacts of zoonotic disease and AMR on society, stakeholders find it hard to sufficiently demonstrate the returns of programmes and investments that tackle zoonoses and AMR. This in turn makes it difficult to secure resources to tackle zoonotic disease and AMR, and create the necessary partnerships between the government and the governed to address issues that cross all sectors of society.

This brief provides a snapshot of the information system on zoonotic diseases and AMR in Burkina Faso. It then makes the case for implementing an expert elicitation protocol to assemble data on the impact of zoonoses and AMR on society. Results from implementing such a protocol can contribute to break the "zoonotic disease and AMR information trap", thereby allowing Burkina to enter into a virtuous circle of information gathering, knowledge generation and policy reforms, which is essential to address current and emerging zoonotic and AMR issues successfully.

2. Zoonoses and antimicrobial resistance in Burkina Faso: the evidence for decision-making

Zoonotic diseases and livestock-driven AMR negatively impact society, for example through reducing the quantity and value of the produce from livestock; worsening the trade balance; decreasing labour productivity; and making households and the government use resources to treat sick animals and humans rather than for productive purposes. When zoonoses become pandemics, their impact on society escalates and can be devastating, as the experiences of highly pathogenic avian influenza in Asia and the Ebola virus epidemic in West Africa show. AMR is an emerging global threat and its toll on human society is on the increase. For example, the World Health Organization (WHO) reports that, among new cases of tuberculosis in 2014, an estimated 3.3 percent were multi-drug resistant (WHO, 2016).

Beyond the availability of human and financial resources, the capacity of livestock stakeholders (starting with the government) to manage and contain zoonotic diseases and livestock driven AMR depends on access to good quality data and information. These allow assessment of the current and potential effects of zoonotic diseases and AMR on society, and grant the ability to measure the returns on investments for their containment and management. Good quality data and information should be available on:

- The incidence and prevalence of zoonotic diseases by livestock production system (e.g. intensive vs. semi-intensive vs. extensive).
- The use of antibiotics in livestock, disaggregated by animal species and production system.

- The incidence and prevalence of zoonotic diseases in humans, by category of people (e.g. farmers vs. market operators vs. consumers).
- The use of antibiotics and antimicrobial resistance in humans, by category of people.
- The reduction in the quantity and value of livestock production due to zoonoses, for example because of death and morbidity in animals; the reduction in labour productivity (zoonotic diseases can affect labourers in any sector of the economy); and the value of private and public resources used to deal with zoonoses, preventing their allocation for more productive purposes.
- The causes of zoonotic disease emergence and spread, which include inadequate vaccination coverage, inefficient biosecurity and biosafety measures, and lack of advocacy. Causes of AMR, for example for non-therapeutic usage in animals. These causes should be the target and focus of policy actions as investing resources to measure zoonoses and AMR, without information on their root causes, is of little help for decision makers.
- The feasibility – in terms of financial resources and technical competencies – of possible interventions to tackle the root causes of the emergence and spread of zoonoses and of livestock-driven AMR. This information helps identify actionable interventions and estimate their different returns, i.e. to allocate available resources to maximise the benefits for society.

In Burkina Faso stakeholders have identified, through a participatory process[1], a multitude of zoonotic diseases that affect the country. These diseases are anthrax, bovine tuberculosis (bTB) and brucellosis from ruminants; highly pathogenic avian influenza (HPAI), salmonellosis and *E. coli* (gastroenteritis) from monogastric livestock; and Ebola and rabies from other domesticated and wild animals. The government is in charge of designing policies and programmes to deal with zoonotic diseases and AMR. These should be based on good evidence and data, comprising information on:

- Incidence and prevalence in livestock, disaggregated by production system.
- Economic losses in livestock systems from value of animals lost, reduced animal productivity and farm income stream, trade implications and foreign exchange, and others.
- Incidence and prevalence in human beings.
- Economic losses associated with human infections such as reduced number of working days due to morbidity, private and public expenditure to treat diseases, and affect on tourism.
- Determinants/hazards that favour the emergence and spread of zoonotic diseases in animals and their transmission to humans, such as poor husbandry and value chain practices, and inefficient biosecurity and biosafety measures.

Currently, the necessary evidence to design effective policies and investments to tackle zoonotic diseases is lacking, and tends to focus more on emerging rather than endemic diseases. For example, the public data reporting mechanism for zoonoses in animals (annex 1) does not include information on the use of antibiotics in animals.

Furthermore, when diseases are included in the reporting mechanism, the quality of the data can be contentious, and there are concerns the figures are not representative due to under-reporting. For example, different reports and surveys on the HPAI outbreak in Burkina Faso in 2015 do not agree on the figures.

Data for the socio-economic consequences of zoonotic diseases in livestock systems are not readily available, even when data on disease prevalence are available. For example, the

[1] Launch workshop on May 26, 2017 and technical thematic workshops on June 21-22 and July 12, 2017.

countrywide impact of brucellosis on milk production, disaggregated by production system, is not known.

The public data reporting mechanism for zoonoses in humans (annex 1) does not include data on AMR in humans. Information on several zoonoses are not included either. For example, HPAI, brucellosis, cysticercosis, botulism, *Escherichia coli*, campylobacteriosis and swine influenza are not regularly reported in humans. Furthermore, data for the socio-economic consequences of zoonoses are not available, such as expenditures on bovine TB or brucellosis treatment at household and national levels.

Finally, with the currently available information, it is challenging for the government to design policies and investments that will effectively tackle zoonoses. Even when data on the prevalence and incidence of zoonotic diseases were available, including both in animals and humans, there is not an integrated information system in place that can estimate their impact on society, such as on livestock production and labour productivity. For example, data are not easily available to assess the quantity and value of milk production lost due to brucellosis, or on the financial resources households and the government allocate to deal with anthrax.

Given the current information system and its functioning, the ministries in charge of livestock and public health are not in a position to generate accurate estimates of the incidence and prevalence of zoonoses and livestock-driven AMR; demonstrate the returns of programmes and investments for their management and control; and create that necessary partnership between the government and citizens to address issues that interweave public and private dimensions. The government, therefore, faces what is here defined as the "antimicrobial and AMR information trap".

3. An expert elicitation protocol for assembling information on zoonoses and AMR

When there is insufficient or unreliable data, or when data is either too costly or physically impossible to gather, expert elicitations are a promising tool to obtain good quality information. They are a scientific consensus methodology to get experts' judgments on the distribution of the variables and parameters of interest, including those whose value is either unknown or uncertain. An important feature of expert elicitation is that experts not only provide information on the unmeasured, but can also suggest values that differ from those in the scientific literature or from official statistics (the official knowns), because for example they believe some causal linkages are underestimated or some issues underreported. The public sector, but more frequently private parties, has used expert elicitations for a multitude of purposes, such as to investigate the nature and extent of climate change; the cost and performance of alternative energy technologies; and the health impact of air pollution (Morgan, 2014). The World Health Organization has used an expert elicitation to estimate the global burden of foodborne diseases (WHO, 2015).

The Africa Sustainable Livestock 2050 Initiative (ASL2050), under the guidance of a National Steering Committee comprising representatives of the *Ministère des Ressources Animales et Halieutiques* (MRAH), *Ministère de l'Environnement de l'Economie Verte et du Changement Climatique* and *Ministère de la Santé*, has developed an expert elicitation protocol to assemble quantitative information on zoonoses and AMR in Burkina Faso. As the livestock sector in Burkina Faso is heterogeneous, it was agreed to start designing and testing the protocol for two different livestock types, four zoonoses and AMR.

The two livestock types are cattle and poultry; while the four zoonoses are bovine tuberculosis and brucellosis for cattle, and salmonellosis and highly pathogenic avian influenza (HPAI) for poultry (see Box 1 and Box 2). These were selected because of their relevance not only for

Burkina Faso but also for other ASL2050 countries implementing the protocol, including Egypt, Ethiopia, Kenya, Nigeria and Uganda, which in the medium-term will facilitate cross-learning.

Box 1. Cattle production systems, bovine tuberculosis and brucellosis

Cattle is one of the main agricultural industries in Burkina Faso. It represents 36–40 percent of the agricultural value added, with the country producing over 30 million tons of beef meat and 264 million tons of milk per year approximately valued at USD 22 million and USD 120 million respectively. Per capita consumption is approximately 6kg of beef meat and 17–18 litres of milk per year. The sector largely relies upon local breeds, with at least 0.5 million households keeping cattle in extensive systems. Stakeholders have identified two bovine production systems and four sub-systems in Burkina Faso including: extensive system (96–98 percent: pastoral, agro pastoral) and intensive system (2–4 percent: semi-intensive and intensive).

Brucellosis is a highly infectious, chronic disease in livestock and humans caused by *Brucella* bacteria. The major clinical signs in cattle are repetitive abortions, and the main symptoms in humans are a profuse undulant fever with muscle and bone pain. The disease can be detected through cell staining, serological tests or bacterial culture. Brucellosis transmission from cattle to humans is usually from ingesting unpasteurised dairy products or raw meat, and direct contact with infected blood or other secretions. Animal to animal transmission is usually from direct contact with infected bodily secretions. The economic consequences of brucellosis are a significant reduction in livestock productivity due to decreased milk production because of appetite loss, loss of young, as well as the impact of severe trade restrictions imposed on affected farms and countries.

Bovine tuberculosis (bTB) is a chronic infectious disease in animals and humans caused by *Mycobacterium bovis (M. bovis*) of the *M. tuberculosis* complex. It is widely distributed throughout the developing world. In humans, tuberculosis caused by *M. tuberculosis* as well as by *M. bovis* has become increasingly important due to its association with HIV/AIDS. Symptoms in humans include fever, weight loss, night sweats, and in the most common form of pulmonary tuberculosis, coughing and blood-stained sputum. In animals the clinical signs are coughing, dyspnea, gastrointestinal problems, bone deformation, and emaciation. Diagnostic methods include direct staining of tissue, sputum or other secretions, bacterial culturing, or DNA amplification by PCR. The intradermal tuberculin test is the main diagnostic tool used in control programmes of bovine TB. The principal route of human infection with *M. bovis* is by ingestion of contaminated products such as infected milk. The economic impacts of bTB in humans result from treatment costs while in livestock economic impacts are related to production losses, e.g. reduced milk yield, weight loss, impaired draught power; and the cost of surveillance and control programs, e.g. complete or partial condemnation of carcasses, animal culls, and trade restrictions.

Box 2. Poultry production systems, salmonellosis and highly pathogenic avian influenza

Poultry is one of the main agricultural industries in Burkina Faso. It represents 6 percent of agricultural value added, with the country producing over 140 000 tons of meat and 6 000 tons of eggs per year, valued at USD 80 million in 2009 and more than USD 140 million in 2011. According to the CAPES (CAPES, 2007), poultry meat (all systems included) contributes 16.47 percent of the meat consumed in Burkina Faso. Per capita consumption is approximately 8kg of poultry meat and 1kg of eggs per year. The poultry sector comprises large backyard/extensive producers (about 1 million producers) and intensive integrated, specialized producers (328 operators). Stakeholders have identified two poultry production systems and four sub-systems in Burkina Faso: extensive system (98 percent: liberty and semi-liberty) and intensive system (2 percent: semi-intensive and intensive).

Avian influenza viruses are highly contagious, extremely variable viruses that are widespread in water birds. Wild birds in aquatic habitats are thought to be their natural reservoir hosts, but domesticated poultry are readily infected. Highly pathogenic avian influenza (HPAI) viruses, by definition, cause severe illness in chickens and turkeys, killing up to 100% of the flock. Common clinical signs can range from decreased feed and water intake, to other nonspecific systemic, respiratory and/or neurological signs including depression, edema and cyanosis of the unfeathered skin, diarrhea, ecchymoses on the shanks and feet, and coughing, but no signs are pathognomonic. Sometimes the first sign of infection is sudden death. Human infections with HPAI virus are rare, usually occurring after prolonged close contact with infected poultry, but can result in severe illness, pneumonia, respiratory failure and death. A combination of virus isolation, serological tests, and direct antigen detection is used to diagnose HPAI infection in flocks. HPAI can spread rapidly between flocks, devastating the sector and resulting in severe trade restrictions.

Salmonellosis is a foodborne zoonotic disease caused by *Salmonella* bacteria. It is transmitted both from animals to humans and vice versa. The symptoms in humans include acute abdominal pain, diarrhoea, nausea, fever, and sometimes vomiting. When present, clinical signs in animals are similar – diarrhoea, fever and vomiting – but infection in animals is often asymptomatic. Diagnosis is based on clinical signs and isolation of the pathogen from the faeces, blood or tissues of affected animals or humans. Transmission from animals to humans is usually through contaminated food products of animal origin such as meat and eggs, or contaminated plant material such as lettuce. The socioeconomic impacts both in livestock (mainly in young stock) and in humans arise from losses in productivity due to sickness. Other economic impacts include public sector costs resulting from the investigation of cases, and healthcare costs.

The ASL2050 Expert Elicitation Protocol comprises five sections: bovine tuberculosis, brucellosis, highly pathogenic avian influenza, salmonellosis and AMR. Each zoonotic disease section includes questions for animals and humans as follows:

For cattle and poultry, questions are asked for each zoonosis on the:

- number of animal cases;
- number of animal deaths;
- number of salvage slaughtered;
- number of animal culls;
- percentage of underreporting in number of cases in animals;
- percentage of underreporting in number of deaths in animals.

An important feature is that questions are asked by the different cattle and poultry production systems, as defined by stakeholders, including intensive, semi-intensive and extensive for dairy; intensive, semi-intensive, extensive and feedlots for beef; and intensive (broilers and layers), semi-intensive and free range for poultry. Getting information by production system helps illuminate where major issues reside, i.e. where to focus policy attention.

For human beings, questions are asked for each zoonosis on the:

- number of human cases;
- number of human deaths;
- number of working days lost per household per case;
- average age of person affected;
- percentage of females affected out of total number of cases;
- household expenditure per case;

- government expenditure per case;
- percentage of underreporting in number of cases in humans;
- percentage of underreporting in number of deaths in humans.

Questions are asked by category of people: livestock keepers; middlemen i.e. all intermediaries working along the value chain, such as traders or labourers in processing plants; and consumers. Again, information by category of people helps narrow down the policy focus.

Finally, the Expert Elicitation Protocol includes a section on livestock-driven AMR. Questions are asked on the:

- proportion of cattle and poultry farms using antibiotics, by production system;
- trends on use of antibiotics in cattle and poultry farms, by production system;
- trends in antimicrobial resistance in humans;
- expert's concerns on antimicrobial resistance in humans.

While asking questions is straightforward, the successful implementation of an expert elicitation depends on a number of factors. Important ones are the selection of experts; the introduction of the purpose of the protocol to the experts, who should well understand they are supposed to provide their opinion and not to report the dominant narrative or official statistics, unless of course they conform to their personal view; and the way questions are formulated. In addition, it is important to interpret results from protocol implementation keeping in mind official statistics and available scientific evidence, and in consultation with stakeholders. Indeed, it is only when done well that expert elicitations provide a valuable contribution to informed decision-making.

4. Conclusions

Livestock stakeholders in Burkina Faso, including the government, find it challenging to design and implement zoonotic disease and AMR-related policies because of gaps in available evidence. There is neither systematic information on the incidence and prevalence of zoonotic diseases in animals and humans, nor on the use of antibiotics in animals and on antimicrobial resistance in humans. Additionally, there is no dataset to quantify the returns on investments for containing and managing zoonoses and AMR, such as increases in animal and labour productivity.

The ministries in charge of animal and public health face what has been referred here to as "the zoonotic disease and AMR information trap": they do not have information on zoonoses and AMR to make the case for getting resources for their control and management and to engage stakeholders in this endeavour. However, given the anticipated growth of livestock in Burkina Faso – and the expected novel interactions between animals, humans and wild animals – the importance of assembling information on zoonotic diseases and AMR to start designing effective policies and programmes cannot be overstated. The government should prepare now to deal with emerging public health challenges to ensure that possible outbreak and spread of zoonotic diseases and AMR do not cripple the development of the entire country, as the avian influenza and Ebola crises serve to warn us. The implementation of an expert elicitation protocol on zoonoses and AMR, if well done, represents a first step in this direction.

January 2018. The production of this document has been coordinated by Antonio Mele (FAO) and Drissa Siri (FAO) under the guidance of the Members of the ASL2050 Burkina Faso Steering Committee and in consultation with national livestock stakeholders.

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Morgan, M.G. 2014. Use (and abuse) of expert elicitation in support of decision making for public policy. *Proceedings of the National Academy of Sciences*, 111(20): 7176–7184. https://doi.org/10.1073/pnas.1319946111

WHO. 2015. WHO estimates of the global burden of foodborne diseases. Geneva.

WHO. 2016. Multi-drug resistant tuberculosis, 2016 Update. Geneva.

Appendix 1. Content of reporting forms on animal diseases and human diseases

<u>**Reporting templates for animals (Ministère des Ressources Animales et Halieutiques)**</u>

- **RESEAU DE SURVEILLANCE EPIDEMIOLOGIQUE DES MALADIES ANIMALES DU BURKINA FASO**
- **
- SURVEILLANCE EPIDEMIOLOGIQUE DES MALADIES ANIMALES PRIORITAIRES
-
-
- **Période :** **Nom et Prénom de l'agent :** **Tel :**
-
- **Région:** **Province:** **Département** : **Poste de surveillance de :**
-

Maladies suspectées	Espèces affectées	Localisation du foyer			Dates		Effectif			Mesures prises			
		Village/ localité	Long. foyer	Lat. foyer	Début	Constat	Exposés	Morbi dité	Mortal ité	Abattus	Détruits	Vacci nés	Autre s

Reporting templates for humans (Ministère des la Santé)

TLOH N° ______du /____/ /____/ au /___/____/______/

Maladies sous surveillance	Nombre de cas	Nombre de décès
Méningite		
Rougeole		
Diarrhée sanguinolente		
Ictère fébrile		
Choléra		
Tétanos néonatal (TNN)		
Paralysie flasque aigüe (PFA)		
Paludisme simple		
Paludisme grave		
Syndromes grippaux (SG)		
Infections respiratoires aigües sévères (IRAS)		
Dengue		
Autres MPE : (MVE, Fièvre Lassa, FVR, Fièvre, Zika, Charbon…)…………………………………..		
Ver de Guinée	Notifié	Isolé
Décès maternel et néonatal	En institution	En communauté
Décès maternel		
Décès néonatal		

NB: Fiche pour archivage au CSPS/unités de soins du CM/CMA/Services du CHR/Services du CHU

Observations: ---

Nom et signature du responsable

Appendix 2. CDC list of priority zoonotic diseases for Burkina Faso

N°	DISEASES	ANIMAL HEALTH	HUMAN HEALTH
	Bacteria		
1	Bovine tuberculosis	X	X
2	Brucellosis	X	
3	Anthrax	X	X
4	Buruli ulcer	X	X
5	Q fever	X	
6	Plague	X	X
7	Botulism	X	
8	Leptospirosis	X	
9	Listeriosis	X	
10	Shigellosis	X	X
11	Campylobacteriosis	X	
12	*Escherichia coli*	X	
13	Tetanus (neonatal)		X
14	Tularemia	X	
15	Lyme Disease	X	
	Viruses		
16	Rabies	X	X
17	Highly pathogenic avian influenza	X	
18	Rift Valley Fever	X	X
19	Lassa Fever	X	X
20	Ebola	X	X
21	Marburg Hemorrhagic Fever	X	
22	Swine influenza	X	
23	MERS-CoV	X	
24	Nipah/Hendra Virus	X	
25	Crimean-Congo Hemorrhagic Fever	X	
26	SARS		X
27	Dengue	X	X
28	Chickungunya	X	
29	Yellow Fever	X	X
30	West Nile Virus	X	
31	Zika virus		X
	Parasites		
32	Cysticercosis	X	
33	Toxoplasmosis	X	
34	Leishmaniasis	X	X
35	Trichinellosis	X	
36	Echinococcosis	X	
37	Schistosomiasis	X	X
38	Rickettsioses/Spotted Fever	X	
39	Dracunculiasis		X
40	Lymphatic filariasis		X
41	Malaria		X
42	Trypanosomiasis	X	X

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