

# ECONOMIC AND SOCIAL JUSTIFICATION OF INVESTMENT IN ANIMAL HEALTH AND ZOONOSES

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**Summary:** A number of key points have emerged from a review of available economic studies and an analysis of the responses to the questionnaire sent to the OIE Member Countries:

- They reveal the limitations of analyses confined to direct or short-term effects, effectively ignoring the complex socioeconomic impacts of animal diseases, especially where they become globalised or affect public health. When they are analysed/calculated, indirect effects tend to be far greater than direct effects because they include (and sometimes combine) 'ripple' effects upstream and downstream of the affected commodity chain or chains, 'spillover' effects onto other sectors of the economy (such as tourism), 'long-term' effects (herd structure in species with a long reproduction cycle or endemic status of a disease), and 'remote' effects (on international markets in the products directly affected, as well as in substitution products). This would suggest that most of the figures cited in literature are much lower than in reality, and that the real effects are themselves severely underestimated.
- They reconfirm increasingly frequent reports of major animal health crises, always with very serious effects on all the various social and professional categories, rich countries as well as poor, extending to all economies in the case of a panzootic, or to the entire population in the much-feared case of a pandemic.
- They demonstrate the mutual interest for a country, a region, or the community as a whole, to invest in animal health programmes, in order to secure livestock capital and producers' welfare, to preserve, restore or create access to lucrative international markets and to safeguard consumer health.
- They confirm the economic and social benefit of taking action upstream of crises by investing in surveillance, early detection and rapid response actions, which are much more effective and a lot less expensive than those needed to manage a crisis.

In this context, the economic principles of public good and externality justify treating the OIE's key missions as 'global public goods', whether this involves ensuring the transparency of the world disease status and of scientific information, food safety and international trade, or promoting Veterinary Services and supporting developing countries. Moreover, the latter two missions tie in well with the (recent) commitment by donors to build the capacities of the official Veterinary Services of any developing or transition countries that so request, in accordance with OIE recommendations, standards and guidelines.

Recent animal health crises, especially the current avian influenza epizootic, have helped to bring home to the international community the enormous risks of a weak and incomplete global system, and the importance of basing investment on the solidarity principle advocated by the OIE, to be implemented at three geographical levels (national, regional and international), so as to achieve a more effective and balanced global system. This would reduce current disparities in the capacities of countries to prevent major worldwide crises and would guarantee the integrity of the global system of veterinary governance. The health and safety of our entire planet depends upon it.

**Key words:** funding – public good – pandemic – socioeconomic impact – animal disease – veterinary service – economics – public health – zoonosis

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The points of view expressed in this report are those of the author and not the official position of the World Bank.

## Introduction

A number of health crises in recent years have highlighted the global importance of a growing number of emerging and re-emerging animal diseases, in particular zoonoses, and have prompted the international community to recognise that it is a 'global public good' to control these diseases. Well-known examples include the crises of foot and mouth disease (FMD), bovine spongiform encephalopathy (BSE) and, more recently, highly pathogenic avian influenza. These events have contributed to renewed interest in better control of such diseases, in particular by building the capacity of the Veterinary Services in the area of early detection and rapid response to reduce the economic and social impact of crises, and more generally in putting the case for further investment in animal health and zoonoses.

In order to assess the outcome of an investment programme aimed at improving the animal health and zoonosis situation, countries must not only carry out an economic analysis, they must also ascertain to what extent the programme would affect the various stakeholders, based on information on the social structure of the sector.

In 2004, when the OIE Delegates proposed this Technical Item, a number of health crises had recently occurred (BSE, FMD and Rift Valley fever), but the current avian influenza epizootic, probably the most heavily publicised and global of them all, had only just begun. Today, at a time where this epizootic has crossed three continents, the subject is even more topical and, the more pressing the problem, the easier it is to justify the investment.

The bibliographic review carried out prior to drafting the questionnaire sent to the OIE Member Countries revealed the limitations of available economic and social analyses on the subject. Such analyses tend to be difficult to extrapolate and, more often than not, contain serious omissions. Nevertheless, they do prove useful, not so much for convincing policy makers to invest, as for aiding in the choice of control strategies and in preparing investment projects.

## A. Background

### A.1. Trend in animal diseases and zoonoses

Many of the major diseases, such as rabies or anthrax, have been known since ancient times. Some authors ascribe one of the Egyptian plagues described in the Old Testament to an epizootic of Rift Valley fever. The cultural taboos and religious constraints concerning the consumption of certain animal products originate more often than not from the desire to protect consumers against foodborne zoonoses.

However, very little data exist on the economic and social impacts of the major epizootics of times past, with the possible exception of rinderpest. The first outbreak of rinderpest recorded in East Africa in 1887 was said to have decimated 90% of Ethiopia's cattle population and more than 10 million large ruminants throughout the continent, and led to widespread famine. The animal health crises caused by rinderpest, first in Europe and then in Africa, encouraged the development of public veterinary services. After being eradicated from Europe in the late 19th century, rinderpest was reintroduced into Belgium in 1922 from zebu imported from India. This incident was directly responsible for the creation of the OIE [11].

The mid-19th century saw an explosion of major epizootics such as FMD, contagious bovine pleuropneumonia, and classical swine fever, which lasted up to the 20th century. More recently, authors have referred to a new era of emerging and re-emerging diseases, which originate mainly from animals and most of which have zoonotic potential [6]. The recent epidemics of West Nile virus and avian influenza, or the contemporary upsurge in rabies in Eastern Europe and Asia, testify to the vigour of emerging diseases worldwide. They pose an ever greater threat to public health and a new disease of animal origin emerges virtually every year, putting the world's population at risk: Nipah virus, BSE, severe acute respiratory syndrome (SARS), highly pathogenic avian influenza. The 20th century witnessed three influenza pandemics of probable animal origin in 1918, 1957 (pigs) and 1968 (poultry). And now, in the early 21st century, a new pandemic is brewing...

The growth in these diseases can be attributed to the combined effect of genetic mixing and the spread of emerging pathogens throughout the world, as well as to an increase in contacts between humans and animals, which have come about as a result of the continually changing demographic, commercial and production context.

In the first place, the characteristics of the human population are changing radically:

- From a purely quantitative standpoint, the world's population quadrupled in the last century, is growing by a further 90 million people every year and is set to reach a total of 9 billion by the 2050.
- Humans are increasingly susceptible to pathogens, having been weakened either by development (an ageing and overmedicalised population in the North), or by under-development (undernutrition, malnutrition, immunodeficiency).
- The human population is increasingly mobile, with the average person's spatial mobility having multiplied by a factor of more than 1,000 since 1800. Nowadays, around 700 million people travel abroad, a figure that is set to rise to 1 billion by the year 2010. People are travelling faster all the time, and visit a great many cultures and destinations that would have been inaccessible only a short time ago.

The population explosion has been accompanied by an extraordinary increase in demand for animal products, with a projected annual increase in demand for poultry meat of 3.9% by the year 2020, and a rise of between 2% and 3% for other animal products. In total, world meat consumption is set to increase by 2% per year by 2015. This rise in demand for animal products would be met almost exclusively by stepping up production in the developing countries, dubbed the "food revolution" [3].

The growing demand for animal products encourages the intensification of production methods and a geographically denser network of farms, chiefly for poultry and pigs. Such demand has also led to the creation of more genetically uniform domestic livestock populations, which are more vulnerable to pathogens. It also promotes trade in animals and animal products, which is becoming more large-scale, complex and global. The estimated volume of world beef, pork and poultry meat exports in 2004 was 17.7 million tonnes, a 5% rise on the previous year. The steep drop in the unit cost of ocean freight (of nearly 70%) and air freight (3% to 4%) over the past two decades [11] is a good indicator of trade globalisation.

Nowadays, people, animals and animal products can travel around the globe faster than the incubation period of most known pathogens [6]. Pathogens are globalising... and the great majority of diseases can now be considered to have become transboundary diseases.

## **A.2. Economic and social impacts of animal diseases**

The impacts of animal diseases can be complex, and usually go well beyond the immediate impacts on the affected producers. They take a number of different forms:

- losses of livestock productivity (production losses, treatment costs, market disruption);
- revenue losses for activities using animal resources (agriculture, energy, transport, tourism);
- public welfare (morbidity or even mortality, compromised food safety and quality);
- costs of prevention or control (production costs, public expenditure);
- suboptimal use of production potential (animal species, genetics, and livestock practices).

In some cases, the induced effects are so complex that it is no longer possible to make an accurate assessment of the economic and social effects.

Another possible method is to categorise the types of impact according to their effects: 'direct' effects, 'ripple' effects (impact on the commodity chain upstream and downstream), 'spillover' effect (impact on other chains), 'long-term' effect or 'remote' effect.

### **A.2.1. Direct effects of animal diseases**

The most direct economic impact is loss of production and/or productivity and the livestock producer's resulting drop in income.

If the farm has a diversified economy, or if there are other income opportunities, the effects will be minimised. If, however, the farm's economy relies on one or more vulnerable products, the effects could be severe and local food security jeopardised.

The economic impact will also depend on the livestock producer's adaptation strategies and on possible market adjustments. In general, a livestock producer's loss of welfare will be not

be as great as the loss sustained on the product, except where the livestock producer has few alternatives, or is entirely dependant on the affected product, which is quite a common scenario in developing countries.

Direct losses can stem either from the disease itself (and can be distressingly heavy, where the mortality rate is between about 50% and 100%), or from animal health measures (stamping-out policies).

In Vietnam, the country to have been hardest hit by avian influenza, nearly 44 million birds, that is to say, 17% of the country's poultry population, have had to be destroyed, at an estimated cost of 120 million USD<sup>1</sup> (equivalent to 0.3% of GDP). Although the smallest producers are the ones who have lost the least in absolute terms, in relative terms they have lost the most, with losses due to an outbreak costing the equivalent of fifty or more times their daily income (of 2 USD per day or less). [11]

Abortions caused by Rift Valley fever in animals not only have an impact on births but, because of the lost of one lactation, they also reduce the amount of milk for human consumption in the year following an outbreak. [11]

FMD leads to considerable loss in milk production in dairy cattle. In Kenya, milk production losses in the early 1980s were estimated to have accounted for 30% of the total losses caused by FMD [11].

In all cases the direct costs of animal diseases are directly related to the rapid containment of outbreaks: case studies have revealed that early detection of outbreaks and the implementation of appropriate measures are crucial to limiting direct losses to the minimum. Conversely, inappropriate control and eradication measures are at the root of such endemic situations, which are much more difficult, and infinitely more costly, to keep under control or eradicate.

### A.2.2. Ripple effects of animal diseases

The livestock sector plays a significant role in the economic development of numerous countries; the production of meat and other products of animal origin create income, jobs and foreign exchange earnings for all stakeholders in the livestock commodity chains. Consequently, an epizootic can have ripple effects both upstream of the chain (inputs, genetic heritage) and downstream (slaughterhouses, meat cutting, processing, marketing), affecting jobs, incomes for stakeholders in the chain, prices, or market access.

An FAO<sup>2</sup> survey on avian influenza has revealed that, in the hardest hit regions of Indonesia, 20% of the permanent workforce of industrial and commercial farms lost their jobs. Likewise, the introduction of bovine contagious pleuropneumonia into Botswana led, in the most affected province, to the destruction of more than 300,000 animals and the immediate closure of the export slaughterhouse, which had 200 employees. On account of the catalyst role of livestock production on the province's entire economy, the costs of the indirect effects of these measures were later estimated to be seven times greater than the costs of direct losses [11].

The FAO and OIE estimate that between one third and one half of the population in the most affected areas of South-East Asia earn at least part of their income from poultry farming.

In Vietnam, poultry farming accounts for 6% to 7% of household incomes for 60% of the poorest section of the population, which is therefore particularly exposed to revenue losses caused by avian influenza.

In France, Europe's leading poultry producer, the livestock producers hit by the crisis reportedly lost 40% of their income in the space of three months (January to March 2006). The poultry feed sector in Europe, which accounts for a turnover of 42 billion USD, has been hit by the avian influenza crisis, with a 40% reduction in demand for poultry feed in some European Union countries [10].

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1 USD: US dollar

2 FAO: Food and Agriculture Organization of the United Nations

Combined with the effects of production losses, balances/imbalances between supply and demand lead to price variations. Depending on the market, prices can suddenly rise (consumer product in a domestic market) or else collapse (products authorised for sale to domestic consumers but banned for export, products that have become too hazardous for human consumption, or perceived as such). In Brazil, where 30% of production is for export, the price of a day-old chick—an early indicator of a possible change in production—is reported to have fallen by 50%. And even if the country is not infected, market uncertainties and price drops have prompted larger producers to cut their production by 15% this year [10].

The loss of access—or opportunities for access—to regional and international markets tends to have much more important economic implications than production losses alone. In the 1997-1998 period, outbreaks of Rift Valley fever in East Africa severely affected the pastoral economies of Somalia, with a fall of more than 75% in exports (which generate more than 90% of foreign exchange earnings of Somaliland) after Saudi Arabia declared an embargo on all animal products from the Horn of Africa [11].

Conversely, the eradication of certain major diseases to gain access to “high value” export markets can bring considerable benefits.

Uruguay is a good example of a country that has gained access to a lucrative market after eradicating FMD. Its beef exports increased by more than 100% in volume and by 52% in value after the OIE declared Uruguay to be officially FMD-free without vaccination in 1996. Access to the American market (which pays more than double the prices paid on the domestic market) provides Uruguay with additional income of around 20 million USD per year. According to a medium-term analysis, access to “Pacific Rim” markets would generate supplementary revenue of 90 million USD per year. In comparison, prior to eradication, the country spent (only) between 8 and 9 million USD per year on vaccination against FMD [11]. This would mean that FMD control would cost less than 10% of the revenues generated by exports alone.

#### **A.2.3. Spillover effects of animal diseases**

Animal diseases can have major effects on food availability and quality for poor communities. Although agriculture has always been acknowledged to play a major role in job and revenue creation in other sectors, the recent epizootics have brought to the fore just how close this relationship of interdependence actually is. Zoonoses affect human health and, in the case of a pandemic, the workforce of the countries. Finally, tourism and environment are sectors frequently affected.

For pastoral societies, livestock production contributes directly and indirectly to food security and to nutrition as a source of first-class protein, vitamins and trace elements, to traction, to fertilising soil and to trade in products. Certain diseases can have major repercussions on available food resources and on the nutrition of poor communities which have no readily-available alternative products, potentially leading to famine (rinderpest for example).

Poultry meat is the foremost animal protein in Africa (where there is very little to be had) and an essential source of supplementary income for the sustenance (and survival) of millions of smallholders. The high mortality rates from highly pathogenic avian influenza and poultry stamping-out measures will therefore have adverse effects on the food resources of the entire population, as well as on the incomes of rural communities [2]<sup>1</sup>.

Furthermore, developing or transition countries, which tend to have inefficient public health systems, are particularly exposed to the risk of zoonoses. In 1977-1978 a major epidemic of Rift Valley fever in Egypt was responsible for 200,000 human cases and 600 deaths. Twenty years later, a new epidemic of Rift Valley fever has affected more than 500,000 people in East Africa, and 500 people are said to have succumbed to the haemorrhagic form of the disease. However, zoonoses also affect industrialised countries with high health standards, as in the case of the BSE crisis in Europe. Foodborne diseases (of which more than 200 are listed) are a major source of acute gastroenteritis (which is reported to cost the Netherlands 27 million USD per year) and a major cause of morbidity, with child deaths, in the third world.

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<sup>1</sup> Everywhere else in the world, trade globalisation reduces the local effect of disease on available food resources.

In the particular case of a pandemic [1], a large proportion of the economic losses are caused by higher morbidity and mortality rates in the human population and by its repercussions on the world economy. The latest estimates suggest that “Spanish” flu could have been responsible for the deaths of 50 million people, that is to say, 2.5% of the population of the time. The most obvious economic losses are a shrinking and less productive workforce, and, according to the experts, in the event of a pandemic, the losses could be ten times greater than all the other losses combined<sup>1</sup>. Another type of economic impact relates to individual strategies for preventing contamination —or for surviving possible contamination. The example of SARS is a good illustration of a sharp fall in demand for the service sectors (tourism, public transport, retail trade, hotels and restaurants) engendered by the cumulative efforts of individuals to avoid any form of close contact. Based on the experience of SARS in Southeast Asia, the World Bank estimates that an avian influenza pandemic could lead to a 2% drop in the world GDP and cost the world economy 800 billion USD in the space of one year. The losses in developing countries without effective health systems are difficult to quantify and would doubtless be significantly greater because of much higher mortality rates.

The impact of animal diseases on the tourism and leisure sectors can also be considerable. For instance, in the United Kingdom, the adverse impact of FMD on these two sectors totalled 49 billion USD because of bans on access to rural areas, representing more than half the total cost of the disease [4].

The effects on the environment must also be taken into account where wildlife is threatened, or where the control measures themselves have adverse environmental effects (use of pesticides to control vectors; contaminated waste; etc.).

#### **A.2.4. Long-term effects of animal diseases**

It is difficult to quantify the cost of public loss of confidence in a country’s livestock industries or of an importing country’s loss of confidence in the Veterinary Services of the exporting country.

Consumers’ obsessive fear of BSE (which was fuelled by the media but which a good communication strategy could have avoided) has had disproportionately heavy social repercussions in a Europe still affected by long-term economic repercussions. The —largely unfounded— perception of a food risk from avian influenza, coupled with a lack of confidence in public health services, has led to a 70% fall in the consumption of poultry meat and eggs in Italy. Where importing countries lose confidence, it can trigger a lasting embargo and very serious economic and social repercussions (as with the Arabian Peninsula’s embargo on the Horn of Africa, affected by Rift Valley fever).

Furthermore, animal diseases can have indirect long-term impacts, with delayed effects on productivity. This happens, for instance, when there is a reduction in the fertility rates of species with a long reproductive cycle, where the results are felt for the next 10 to 20 years.

Lastly, the long-term costs of a slow response are rarely taken into account. Economic analyses have focused mainly on the effects of outbreaks and few have taken into account the long-term effects of an endemic situation (characterised by outbreaks that are less virulent but which recur over several years). This is the case with classical swine fever in Haiti, where recurrent outbreaks are reported to have reduced the offtake rate by 10%, which for pig producers would mean a loss in income of 2.7 million USD per year [11].

With major crisis, long-term impacts would make themselves felt, since the additional costs of financing prevention and control measures would lead to an equivalent reduction in savings and investments.

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<sup>1</sup> Remember that in the case of contagious bovine pleuropneumonia in Botswana, the indirect losses were seven times greater than the direct losses.

#### **A.2.5. Remote effects of animal diseases**

Assessing the global impact of an animal disease on international markets would require an analytical framework that links markets in spatial terms and by product. For example, the analysis of the global impact of the avian influenza crisis in Europe has been complicated by the recent outbreaks of FMD in Brazil, one of the world's largest exporter of beef and poultry meat. The combination of these two events is expected to push up the prices of all types of meat, as happened in 2004 with BSE and North American beef. The European Union, a net importer of beef, especially from Brazil, will see the price of beef increase on its domestic markets because of the embargo imposed on Brazilian beef on account of FMD.

An important consideration is that crises can combine a number of different impacts, especially where they are magnified by the effects of globalisation. The following example therefore combines the ripple, spillover and remote effects: in the United States of America, where 62% of oilseed and cereal production is destined for animal feed, an epizootic that would reduce livestock production by 10% would immediately result in the loss of 418,000 jobs, a surplus of 18.4 million tonnes of cereal and oilseed crops, a 10% drop in global market prices, and crises in other producer countries [8]. The highly pathogenic avian influenza is the perfect example of an animal disease with the capacity to generate all the impacts described in this paper.

#### **A.3. Importance of countries' capacity to prevent and eradicate animal diseases – 'Global public good' concept**

A great many developing countries, and some industrialised, countries, do not have a good veterinary infrastructure, which in general has been weakened by previous policies (privatisation, deregulation and decentralisation of animal health services), and nor do they have public funding, which is still insufficient and in many cases declining.

The current avian influenza crisis is a clear example that, without strong and credible Veterinary Services, countries are able neither to prevent the introduction, emergence or re-emergence of animal diseases, nor to control outbreaks. Ineffective Veterinary Services cannot provide their trading partners with credible guarantees of the safety of the animal products they wish to export [14].

Vietnam provides a good illustration of the benefit of investment upstream of crises, in prevention, early detection and rapid response measures, which yield an optimal cost/benefit ratio, provided that such measures are in line with OIE recommendations. In the case of Vietnam, the estimated cost of investment over a 10-year period would be four to six times greater than the benefits of implementing a comprehensive strategy that includes all the recommended measures: stepped up surveillance, improved biosafety in markets, preventive vaccination and improved biosecurity in all farm categories [9]. By way of example, the estimated cost of mass vaccination—including pre- and post-vaccination serological surveillance (over a period of two years), followed by strategic serological surveillance (over five years)—is 39 million USD (operating costs), with an initial investment of 2.7 million USD. The authors estimate that total costs over 10 years would be in the order of 1.5 billion USD, that is to say, two decimal points more than what it would have cost the country to bring its veterinary infrastructure into compliance with standards to achieve a rapid response similar to Thailand's, for example (for an estimated extra investment of 15 million USD).

In recent years, the challenge posed by global diseases—whose worldwide impact calls for an international response—has increased, while, at the same time, the capacity of many countries to control the spread of diseases has diminished. International cooperation (or international solidarity according to the OIE definition) for the benefit of all is a way of redressing the current imbalance between the countries and regions of the world. Most donors (in particular the World Bank) have now taken on board the idea—put forward by the OIE—that Veterinary Services represent a 'global public good' and that bringing them into compliance with international standards (legislation, structure, organisation, resources, capacities, role of the private sector and of paraprofessionals) are a priority public investment. The World Bank and the international community have recognised that it is essential to have quality Veterinary Services, not only to control the current avian influenza crisis, but also to rapidly detect other emerging diseases and to take fast action. Strengthening Veterinary Services not only helps to lessen the risks to animal and public health, ultimately it also helps to reduce poverty (so achieving the Millennium Development Goals). Furthermore, the rich countries have acknowledged that priority must be given to supporting the Veterinary Services in developing and transition countries, not only to foster development in the world, but also to safeguard themselves against the global spread of animal diseases and zoonoses [14].

At the Geneva conference on avian influenza and human pandemic influenza, held in November 2005, the OIE listed the priority concepts to be applied in the case of emerging or re-emerging diseases and zoonoses:

- global public good;
- governance and veterinary legislation;
- appropriate resources and infrastructure for the strict application of legislation;
- early detection and rapid response;
- surveillance, transparency and confinement of pathogens;
- stamping out under animal welfare standards;
- quality diagnoses and rapid confirmation of suspect cases;
- use of vaccination;
- biosafety measures;
- sustainable financing;

and the role of international standards produced by the OIE in support of these concepts:

- trade security;
- surveillance of disease status;
- compulsory notification;
- quality of Veterinary Services;
- Reference Laboratories;
- diagnostic methods;
- quality of vaccines;
- networks of experts.

The OIE has undertaken to continue producing international standards to guarantee the quality of Veterinary Services and to help its Member Countries to implement them.

The OIE standards on the quality and evaluation of Veterinary Services were democratically adopted by the OIE's 167 Member Countries. To this end, the OIE, with the support of IICA<sup>1</sup>, has developed an interactive instrument for evaluating Veterinary Services based on the relevant OIE standards. This instrument, called Performance, Vision and Strategy (PVS), can be used as a guide to help countries to comply with OIE standards by applying a process of self-evaluation, bilateral evaluation or evaluation by a third party under the auspices of the OIE. The evaluation of Veterinary Services using the PVS instrument will therefore play a crucial role in preparing and determining the national investment that will be needed for disease prevention and control.

## B. Analysis of the answers to the questionnaire<sup>2</sup>

### B.1. Objectives of the questionnaire

- (i) To take general stock of the animal disease situation in the Member Countries.
- (ii) To gain an overview of recent major health crises, their impact, and how they were handled.
- (iii) To broadly assess the capacity of Member Countries to deal with animal diseases in general, and crisis situations in particular.
- (iv) To identify the countries' capacity to assess the impact of diseases in both economic and social terms.
- (v) To get the views of Member Countries on what could be done by the OIE and the international donor community.

1 IICA: Inter-American Institute for Cooperation on Agriculture

2 86 countries / 167 Member Countries of the OIE replied to the questionnaire (a 51% response rate) from Africa (20), Asia (21), the Americas (13), Europe (28) and Oceania (4).

### B.1.1. Overall importance of the issues

Overall, the situation in the countries with regard to the impact of animal diseases is judged to be satisfactory (taking all countries into account), in terms of livestock productivity (63% of the countries that answered the questionnaire deem their situation to be satisfactory), public health (68%), food safety (66%) and market access (55%).

However, the breakdown by OIE Regional Commission<sup>1</sup> shows that animal diseases affect Africa significantly in all the areas, and that Asia is also hard hit in terms of access to international markets.

On a world scale, the main diseases to impact on livestock productivity, public health, food safety and market access respectively, are parasitic diseases, rabies, salmonellosis, and FMD.

Although no disease has a combined impact in all four areas, FMD, avian influenza, salmonellosis, brucellosis and tuberculosis all have major repercussions on three of the four chosen indicators and, in this regard, their economic and social impacts can be all the more severe for an entire country or even continent, where diseases are highly contagious (like FMD and avian influenza).

More than 80% of countries have set up investment programmes or projects to control animal diseases. However, around 25% of African countries and 50% of countries in the Middle East—which are largely dependent on foreign aid—are not covered by programmes/projects to control animal diseases.

These programmes/projects target mainly the five diseases identified above. To cope with the current disease situation, programmes and projects for the prevention and control of avian influenza have mushroomed since 2004, particularly in Asia and Europe. Only around 10% of programmes/projects are targeted not at controlling one or more diseases but at improving overall animal health, by building the capacity of Veterinary Services.

### B.1.2. Recent major health crises

An analysis of the questionnaire reveals a great number of recent health crises around the world.

Geographically (distribution of crises), Europe is the Regional Commission least affected, with 46% of European countries not having reported recent crises. Conversely, Africa is the hardest-hit Regional Commission, with 90% of African countries reporting crises.

Quantitatively (number of crises), the Middle East reported the fewest crises (an average of 0.67 crisis per country), whereas Africa is the most affected Regional Commission (an average of 1.25 crisis per country).

On a world scale, most of the crises were caused by FMD, whereas the breakdown by Regional Commission gives mainly bovine contagious pleuropneumonia for Africa, avian influenza for Asia and the Middle East, FMD for the Americas and BSE for Europe.

The impact of health crises is very severe in all countries, with a few variations:

- For the developed countries, the impact can be very heavy (example of FMD in the United Kingdom and Ireland in 2001) but of short duration because the crisis is brought under control and free-country status recovered very quickly (less than three months on average). The brunt of the impact is borne by the stakeholders in the livestock branch.
- For the developing countries, the impact is also great, but is longer term because the disease is hard to bring under control, and at times can even evolve into an enzootic form that is much more widespread (as in the case of avian influenza in Laos). The impact can be measured, first, by an increase in poverty, as the owners of productive livestock are usually poor rural dwellers and, second, in terms of food insecurity, because it is difficult to transfer consumption to other branches (both quantitatively and financially).

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<sup>1</sup> The OIE has five Regional Commissions: Africa; the Americas; Asia, Far East and Oceania; Europe; Middle East and Africa.

Health crises tend to be well covered by the national or local press, and their positive role in informing and raising the awareness of consumers is mentioned by many questionnaire respondents.

The means implemented to control health crises are clearly inspired from OIE recommendations (definition of protection and surveillance zones; stamping-out and destruction of carcasses and products; disinfection of premises, facilities and equipment; biosafety measures). In many cases, livestock producers are compensated for stamping-out policies. Large-scale vaccination (where possible) is practised not as a first measure, but in countries where the situation has become difficult to control (enzootic).

The direct costs of crises to developed countries are usually low (rapid response), compared with the considerable indirect costs (loss of consumer confidence plus commercial repercussions on exports). By way of example, the FMD episode in Ireland, which raged for four months, cost a total of around 5 billion USD, with indirect costs representing more than 95% of the total cost. In the developing countries, the direct and indirect costs of health crises are rarely calculated, even though they are also very significant. Whatever the country concerned, governments often compensate direct losses (compensation for stamping-out policies), whereas the indirect costs of crises are borne by the stakeholders in the livestock branch and in other branches (mainly tourism).

### **B.1.3. Country capacity issues**

Overall, the countries' capacity to comply with OIE standards on the quality of Veterinary Services is perceived by 65% of the countries to be satisfactory on the whole.

Broken down, capacities are considered to be satisfactory for all the proposed categories (staffing levels; training level; regulatory framework; laboratory facilities; epidemiological surveillance; early detection/rapid response; information management; communication; collaboration between Veterinary Services and public health services; involvement of farmer organisations), except for five categories (budgetary resources; risk analysis; participation in setting international standards; involvement of trade organisations and the role of consumers). Early detection/rapid response is the capacity judged to be the most satisfactory (by 69% of the countries) and the role of consumers is the capacity judged to be the least satisfactory (by 33% of the countries).

An analysis by Regional Commission reveals that Europe has the greatest capacities: indeed, all the European countries have capacities deemed for the most part to be satisfactory, except in terms of involvement of farmer and trade organisations, as well as the role of consumers. The Middle East is generally well provided in terms of capacities; however its main weak points are risk analysis, participation in international activities, the role of consumers and, unlike the other regions, early detection/rapid response in the event of outbreaks of infection. By contrast, Africa suffers from a dire lack of capacities, as do Asia and the Americas to a lesser extent.

An analysis of the countries by development level confirms this result, showing that the developing countries have low capacities in all areas. However, capacities to involve farmer organisations and trade organisations in the definition of national policy are considered even weaker in the transition economy countries.

So, logically enough it is the European countries and, more broadly, the developed countries, that are the most able to cope with current and future crises, and the African and developing countries that are the least able to cope with them. The same distribution applies to continuous monitoring of the risk of crisis, the availability of emergency preparedness plans and the quick mobilisation of resources in the event of outbreaks.

### **B.1.4. Economic and social dimension**

The socioeconomic dimension of animal health crises is barely taken into consideration (only partially in 40% of the countries). Apart from Europe, virtually no other OIE Regional Commission measures this dimension, and Africa, and more generally all the developing countries, report major shortcomings in this area.

On the whole, the purely economic impact of crises is calculated very little if at all, whether in terms of direct impacts (measured by only 43% of the countries) or impacts in terms of a drop in domestic demand (41%), restrictions on animal movements (36%), limitations on access to export markets (36%), public health (25%), changes in people's behaviour (19%), and indirect impacts (9%). Only impacts linked with changes in the price of animals are usually calculated (88%).

The purely social impact of crises is not calculated either, because of a lack of data on the social structure of the livestock sector or on the impact of animal diseases on poverty.

This disregard for the socioeconomic impact of crises stems from a combination of countries' lack of capacities in terms of available trained staff, proper methodology and above all, availability of field data.

#### **B.1.5. International support**

There is wide support from all its Member Countries —whatever the Regional Commission— for the OIE to become more actively involved in the economic and social justification of investment in animal health, in particular by disseminating information (86% in favour), producing/disseminating methodological guidelines (90%), producing/disseminating data management and data analysis tools (92%), assisting in the assessment of institutional capacities (87%), organising training (90%) and assisting in dialogue with other international organisations (96%). Assistance in dialogue with policy makers and with the private sector and influence on national policy makers are also solicited to a lesser extent, with 68%, 31% and 71% of the countries in favour respectively.

The ALive partnership is well known in Africa (79% of countries) and there is broad support for replicating this type of partnership amongst other OIE Regional Commissions, except in Europe. Virtually all countries (more than 90%) would be interested in serving as pilot countries for the development of data management and data analysis tools by/under the aegis of the OIE.

### **B.2. Conclusions**

Since livestock production first began, animal diseases have represented a threat to animal species, people (livestock producers), communities (pastoral) and nations. Animal diseases affect the livestock capital of producers and countries, limit opportunities to access markets in animals and animal products and limit the possibilities for intensifying livestock production.

Today transboundary diseases represent a particularly serious threat to the welfare of people and regional economies, and in certain cases they can taken on a global dimension, as is currently happening with avian influenza. Transboundary diseases severely hamper the social and economic development of the countries affected and, in the case of zoonoses, pose a serious problem to public health.

The developing countries —in particular those in Africa— are hard hit by animal diseases, although they are heavily dependent on international support for implementing control programmes/projects.

In view of the emerging or re-emerging nature of such diseases ('perfect microbial storm') and the fact that they are predominantly transboundary diseases (trade globalisation tends to turn all diseases into transboundary ones), it is necessary to think not on the scale of a single country, but rather of a region, or even the whole world (change of scale), and not on the scale of a single disease but rather, of all diseases, by investing across the board in national Veterinary Services (economy of scale), as well as in reinforcing international animal health governance.

The large number of crises on all continents, plus their impact (particularly in terms of increasing poverty and food insecurity in the developing countries) and cost, are ample reasons for considering the prevention and control of animal diseases as a 'global public good' and a means for achieving the Millennium Development Goals. The prevalence of animal health crises continues to make Africa a major reservoir of pathogens, and warrants priority support from the international community.

A significant point to emerge from the questionnaires is the poor capacities of developing countries' official Veterinary Services to prevent and manage health crises, even though a number of

programmes/projects (notably the PACE<sup>1</sup> programme in Africa) have reinforced their capacities in certain areas (early detection/rapid response and epidemiological surveillance). The introduction of “derogation” measures (zoning, compartmentalisation) by the OIE has temporarily offset certain countries’ lack of export capacity, while they acquire national capacities to prevent and manage crises.

The logical correlation between the prevalence of animal diseases, their impacts and official Veterinary Services’ capacity to eradicate them has been confirmed. In particular, the speed of response and the type of control measure adopted (sanitary prophylaxis tends to be more effective than medical prophylaxis) guarantee the successful control of animal diseases.

However, in the absence of a precise methodology for evaluating the capacities of official Veterinary Services, their capacities cannot be predictably measured and so the reliability of the results obtained remains purely relative. A precise methodology for evaluating capacities is therefore crucial to designing the most effective programmes/projects for building the capacities of official Veterinary Services —particularly in Africa— and the OIE’s ‘PVS’ instrument is proving to be especially suitable for this purpose.

Apart from a few rare exceptions, the many social and economic impacts of animal health crises are not measured, with the result that it is impossible to compare the cost of crises (cost of non-intervention) with the cost of crisis prevention (cost of intervention).

In the absence of such studies (cost/benefit analyses or any other methodologies), the merit of having effective animal health systems (from the livestock producer right up to the central veterinary authority) is difficult to justify in practice, especially in the developing countries. This prevents the animal health issue from being considered as a government priority in terms of fighting poverty and makes it difficult to harness the hefty budgetary resources required (the problem is the same at the subregional and even regional level)<sup>2</sup>.

A second major outcome of this lack of socioeconomic studies is the international community’s lack of interest in animal health programmes, for the benefit of issues (notably human health) that are spontaneously recognised as having major social connotations<sup>3</sup>.

Having both the methodological and human resources to carry out socioeconomic studies of animal health crises —both actual and prospective— is therefore a priority for spurring national and international policy makers to invest more in animal health.

## C. Discussion

### C.1. Limitations of the analyses consulted — Towards boosting capacities for economic and social analysis

Only a few economic studies have been published on the impacts of major animal diseases and their control, and those that exist confine themselves to a small group of countries, products, or specific pathologies.

From the methodological standpoint, more often than not the analyses are limited to immediate effects on production (partly due to the frequent use cost/benefit analyses), failing to take into account the indirect effects described above. There is no particular standard approach commonly used for the economic analysis of the impacts of transboundary diseases [11].

Under certain conditions, the investment to be made in the countries can be evaluated using the classical approach of situations *with a project* and *without a project*. It will be possible to precisely calculate some costs and benefits, whereas others will need to be estimated. The analysis becomes more complicated in the case of transboundary diseases, but it is still feasible at the level of a group of countries. The cost/benefit analysis of the PARC<sup>4</sup> programme for a group of four East African countries (Ethiopia, Kenya, Tanzania and Uganda) concluded that the cost/benefit ratio was between 1.35:1 and 2.55:1, depending on the country [11]. As a means of evaluating national actions as part of

1 PACE: Pan African Programme for the Control of Epizootics

2 A great majority of countries had already stated that they needed to base their decisions regarding animal disease control on a larger number of economic analyses [3].

3 One of the reasons for donors’ and policy makers’ lack of interest in investing in animal health is the weakness – or lack of – economic arguments [8].

4 PARC: Pan African Rinderpest Campaign

a global response, as in the current case of avian influenza, the cost/benefit approach is severely limited.

Moreover, to be able to assess an investment programme aimed at improving the animal health and zoonosis situation, countries must not only carry out an economic analysis, they must also ascertain how great an impact the programme will have on the various stakeholders. Such an analysis can only be conducted if sufficient information is available on the social structure of the sector.

With the exception of cost/benefit analyses, the available economic analysis methods<sup>1</sup> are very little used, meaning that potentially important aspects of the analysis (concerning prices, international trade, national wealth and employment, for example) are not taken into account, ignoring some of the indirect economic impacts described at A.2. above (ripple, spillover, remote effects). Their comparative advantages determine the context in which they are most useful. These different models analyse different economic aspects of the same problem, assigning relative importance to time scales (immediate or long-term effects), spatial factors (herd, national and global effects) and risk factors, which also depend on the nature of the disease undergoing impact analysis, and require variable types and volumes of information. Their use is largely dependent on the level of information, time, financial resources and capacities available. None of them has universal application and recourse to a combination of several economic models, coupled with the available epidemiological methods, will be required for a more complete and more accurate analysis [12, 13].

## **C.2. Defining nature and level of investment — Towards a pragmatic and differential approach**

In absolute terms, according to the principle of efficiency, the level of protection should be proportional to the potential damages caused by not having such protection. According to the principle of equity, the party that imposes the risk, and/or the party that benefits from the protection, should bear the protection costs [11]. In the case of global diseases, a collective international decision would be needed on the required level of protection and on how to share costs.

In practice, it is difficult for a country to precisely assess the damages which the introduction of an animal disease might cause. Past experience of health crises can serve as a guide and be backed by more scientific risk assessments. Difficulties in assessing the probability of occurrence and the scope of the economic impacts prevent policy makers from opting for optimum protection —for which the marginal cost of protection is equivalent to the marginal benefit. These difficulties are compounded in the case of transboundary diseases, about which there is disparate scientific and economic knowledge, and in which a host of different stakeholders are involved, each with differing views on the risk, and varying degrees of willingness or capacity to control this risk [11].

The modern management of livestock pathologies does not seek to eliminate all diseases but to create an environment that makes it possible to keep pathology pressure at low levels. However, in many cases, the pathogen is too virulent, or the threat to public health or trade so serious, that it cannot be tolerated, even at very low levels. For this reason, prevention and elimination of the pathogen are the key elements to managing major diseases.

The current limitations of economic analyses suggest that a pragmatic and differential approach might be useful:

- For prevention, early detection and rapid response measures, countries should choose investments that guarantee a level of national (regional and global) protection against a series of major diseases. The nature and volume of such investments would be defined by the outcomes of the self-evaluation of national Veterinary Services (PVS instrument) and by the strategies chosen at subregional levels, in compliance with the recommendations of specialised technical agencies.
- For more costly and complex veterinary health control measures, it should be possible to specify the nature and volume of the national and regional investments required for effective control by developing user-friendly tools for more complete and accurate economic and social analysis<sup>2</sup>.

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1 Six types of economic model are analysed by the authors: benefit-cost analysis; linear programming; partial equilibrium analysis; input-output models and social accounting matrices; multimarket models; and computable general equilibrium models.

2 This could be based on the EPC (*Elevage, Pauvreté, Croissance* – Livestock, Poverty, Growth) methodology and the DAMS (Data Analysis and Modelization System) in developing countries. An EPC methodology guide for analysing the livestock sector is currently being drafted in the context of the ALive partnership; it is intended to be used in the preparation of livestock sector studies concerning the problems of poverty for the formulation of a Strategic Poverty Reduction Document. DAMS system should be used to carry out the corresponding quantitative analyses.

### C.3. Economic concepts of public good and externality — Towards greater solidarity and a global model of governance

A public good provides benefits to a large number of people (potentially everyone), without reducing the benefits that each individual may derive from it.

An externality exists where an action —or inaction— by an individual or country imposes a cost (negative externality) or creates a benefit (positive externality) for others, without this being taken into consideration by the individual or country responsible.

As global public goods, the key prevention and control functions of global diseases should be provided and funded in all countries: good governance of Veterinary Services, animal health legislation and policies, disease information, the implementation of international standards, research and development. For reasons of negative externality, a special effort should be made by the international community to boost the capacities of developing countries and countries in transition. This framework, borrowed from Jamison *et al.* (1988), takes into account both the interdependence of countries in combating global diseases and the disparities that exist in the capacity, or willingness, of countries to participate in combating them. [11]

The globalisation —and regionalisation— of control and regulation systems offers numerous benefits, including a reduction in negative externalities and an increase in the number of beneficiaries of public goods. A number of factors argue in favour of a global/regional approach. In the case of transboundary diseases, countries have an interest in cooperating, either formally via regional organisations (AU-IBAR<sup>1</sup> for Africa, IICA and PAHO<sup>2</sup> for the Americas; regional animal health centres set up by the OIE and FAO), or informally via networks (PACE epidemiological surveillance networks; national diagnostic laboratories; epidemiological or economic studies; establishment of subregional strategies; etc.), or else multi-stakeholder partnerships (the ALive platform for Africa). Major economies of scale can be achieved for emergency preparedness plans, training programmes, and the use of laboratories and of serum and vaccine banks. Improving the quality and speed of the disease information exchanged would be of considerable mutual benefit. Although highly positive examples exist (campaigns to eradicate rinderpest in Africa and FMD in Europe, South America and Southeast Asia), lack of cooperation among countries is still a major constraint on the control of transboundary diseases [11].

A further reason for grouping together several, or even all, countries is to transcend the capacity, or willingness, of the various countries to contribute, financially or otherwise, to the regional —or global— prevention and control effort. The OIE and the World Bank intend to study the feasibility of global funding and reinsurance mechanisms to support countries that do not have rapidly mobilisable emergency and compensation funds to finance rapid response measures, or an insurance system to cover certain losses associated with health crises.

An estimated 600 million poor people worldwide rely directly on livestock production for their livelihoods. These poor people are highly exposed to a large number of animal diseases because of strong pathology pressure and weak control capacity. In turn, these diseases can expose them to further economic, social, environmental or even political risks. In view of the importance of livestock production to poor people, and of the threat to their livelihoods from animal diseases affecting livestock productivity and human health, all programmes aimed at controlling and eradicating such diseases with a serious impact for the poorest sections of the human population will have a major and direct impact on poverty reduction [7]. According to some authors, animal disease control does not always benefit poor people. Production systems and control costs and methods need to be analysed before the breakdown of impacts and benefits within the population subgroups can be assessed (McLeod and Leslie, 2000) [11]. In such cases, specific policy measures can be taken to ensure that the poorest sections of the population benefit most from the positive effects and/or are not adversely affected.

At Doha in 1991, the World Bank, acknowledging the prevention and control of major animal diseases to be a Global Public Good and a key factor in poverty reduction, committed itself to supporting, jointly with its partners, programmes to build the national capacities of the developing countries. This commitment has resulted in a grant agreement between the World Bank and the OIE to strengthen global health governance and to outline a sustainable global financing mechanism for emergency and/or compensation funds. The creation of a global fund for supporting countries' rapid

1 AU-IBAR: African Union – Inter-African Bureau for Animal Resources

2 PAHO: Pan American Health Organization

response efforts in the event of outbreaks, which includes compensating livestock producers, would be of benefit to all countries, including OECD<sup>1</sup> countries, which should see it as a means for safeguarding their livestock and human populations against epizootics and zoonoses from developing countries.

Some experts fear that avian influenza will become firmly entrenched in Africa, leading to an enormous permanent outbreak in Southern Europe, giving it the dual obligation to take action: not only out of an inevitable humanitarian concern and desire for scientific and medical collaboration on the emergence of a pandemic, but also as a measure for protecting its own livestock industry. “North/South solidarity has perhaps never been so necessary, in animal health terms” [2]. Quite apart from avian influenza, emerging animal diseases, either accidental or intentional in origin<sup>2</sup>, three quarters of which are zoonotic, are set to become more and more part of the world landscape. In response to these major health risks, the international community will be required to take an increasingly active long-term role in a global system of animal disease prevention and control. This fits well with the OIE mandate which, in recent years, has significantly reinforced its partnerships with the specialised technical agencies (FAO, WHO<sup>3</sup>), representatives from the private sector (in particular the SSAFE initiative<sup>4</sup>), lenders of funds, governments (through official representatives of OIE member countries) and non governmental organisations, and is working to boost collaboration between the veterinary and medical authorities.

#### **D. Proposed actions**

The limitations of available socioeconomic analyses, the imbalance between the response capacities of rich and poor countries, and the fact that it is a ‘global public good’ to control transboundary and/or zoonotic animal diseases, all argue in favour of strengthening:

- (i) socioeconomic and financial analyses to assess the costs of animal diseases and control measures, so as to provide policy makers with better guidance on their choice of investments in animal disease prevention and control and on determining the most appropriate mechanisms for financing the chosen measures;
- (ii) the capacities of developing and transition countries for both their national actions and for involvement in collective international efforts.

For this purpose, we propose to set up an ad hoc group on support for OIE Member Countries in carrying out socioeconomic analyses, and an ad hoc group on the evaluation of the Veterinary Services of requesting countries, using the PVS instrument, for preparing and determining the national investments that will be required for disease prevention and control, based on general compliance with OIE standards.

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1 OECD: Organisation for Economic Co-operation and Development

2 80% of pathogens with the potential for bioterrorism are zoonotic.

3 WHO: World Health Organization

4 SSAFE: Safe Supply of Affordable Food Everywhere

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