World Organisation for Animal Health

TECHNICAL ITEM II

Economic aspects of effective and sustainable animal health programmes, with special focus on surveillance systems

Author: Vitor Salvador Picão Gonçalves*
EpiPlan - Faculty of Agriculture and Veterinary Medicine - University of Brasilia

Co-author: Fernando Ferreira*
School of Veterinary Medicine and Animal Science – University of São Paulo

Co-author: José Soares Ferreira Neto*
School of Veterinary Medicine and Animal Science – University of São Paulo

Co-author: Sílvia Helena Galvão de Miranda*
Department of Economics, Administration and Sociology – ESALQ – University of São Paulo

**All authors are members of the Brazilian branch of the WOAH Collaborating Centre for the Economics of Animal Health - (Americas Region)*

28th Conference of the WOAH Regional Commission for the Americas
(2–6 November 2026, Asunción, Paraguay)

TECHNICAL ITEM II
Economic aspects of effective and sustainable animal health programmes, with special focus on surveillance systems

Introduction

The Americas have experienced important changes in animal health priorities over recent decades, although these transitions differ considerably across subregions and production systems. In South America in particular, substantial progress has been made in the control and eradication of major transboundary animal diseases, especially foot-and-mouth disease (FMD). As Members move from intensive disease control programmes towards maintaining disease freedom, surveillance, early warning, emergency preparedness and sustainable financing become increasingly important.
At the same time, Veterinary Services must respond to a broader range of animal health priorities, including emerging and endemic diseases, zoonoses, food safety and animal welfare, while operating within increasingly constrained resources.

In this context, economic analysis can provide valuable evidence to support priority setting, resource allocation and the design and financing of animal health programmes. This Technical Item examines how economic approaches can contribute to effective and sustainable surveillance and disease-control systems, drawing on selected examples from Brazil to illustrate their application in strategic decision making, emergency preparedness and the control of endemic diseases. It also considers opportunities to strengthen regional capacity and cooperation in animal health economics, through WOAH and its expertise network, such as the WOAH Collaborating Centre for the Economics of Animal Health - Americas Region (CCEAH-A).

This Technical Item is aligned with WOAH's 8th Strategic Plan (2027–2031), particularly Strategic Orientations Two and Three, which aim respectively to strengthen Members' animal health systems and to position animal health as central to global policy and investment decisions. By supporting evidence based resource allocation, sustainable financing and assessment of the socioeconomic value of animal health, economic analysis can contribute to stronger and more sustainable Veterinary Services.

Building on the discussions at WOAH's 93rd General Session and Resolution 35 on investing in animal health, this Technical Item explores how economic evidence can help Members translate the case for investment into practical decisions on resource allocation, sustainable financing and the design of animal health programmes.

A changing animal health landscape, with special reference to South America

Foot-and-mouth disease has been the focus of animal disease control and eradication programmes in South America over the last 50 years (Rojas and Romero, 2017). The successful path towards eradication of FMD in most of the region, as well as classical swine fever (CSF), contributed to the growing importance of international trade of livestock products as a major source of income for Members. It also brought about a paradigm shift for Veterinary Services in several Members. During the long journey pursuing FMD control and eradication through vaccination and surveillance, the mission, planning and funding of Veterinary Services revolved around such goals and activities.

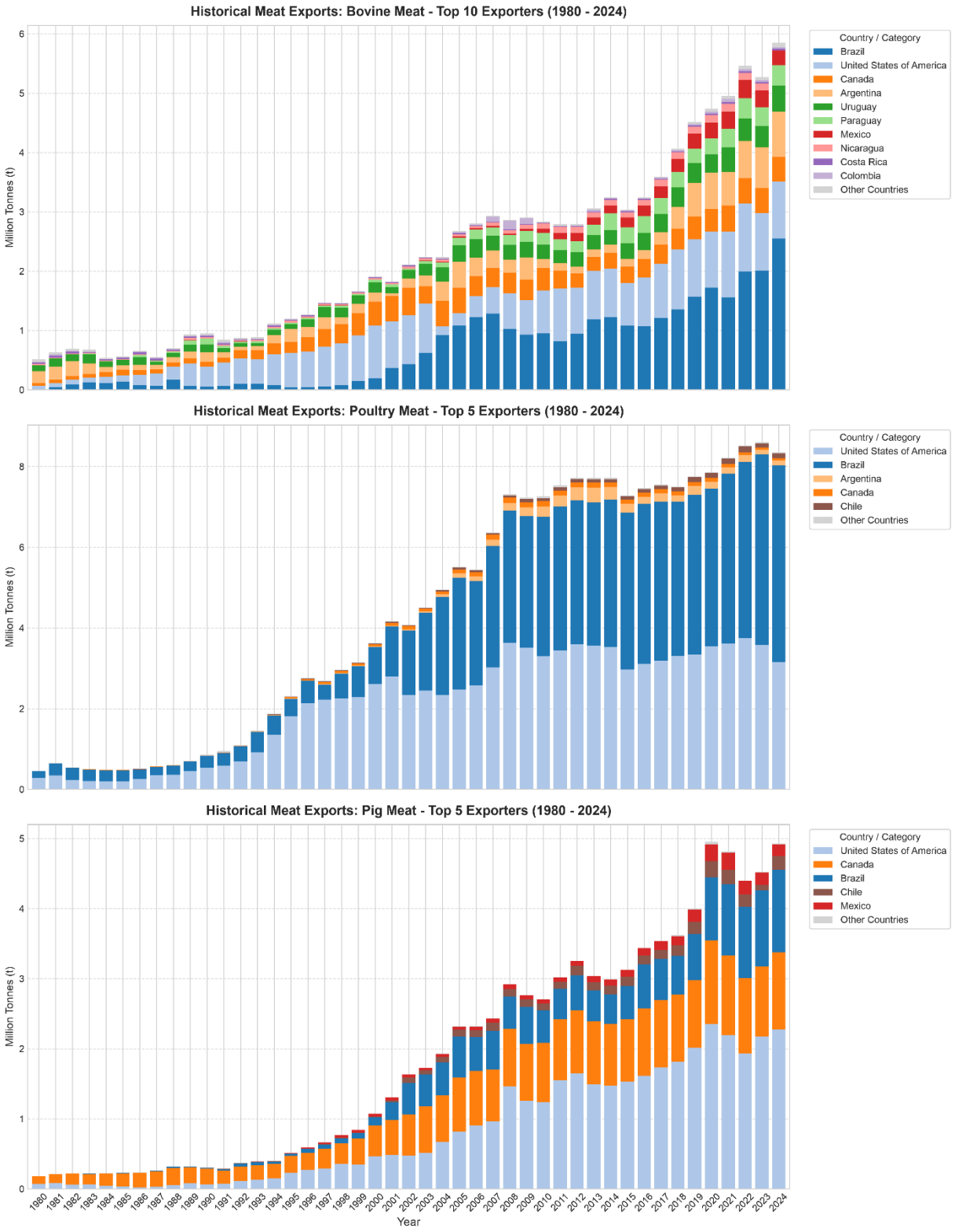
The societal value of Veterinary Services was very much tied to the objective of FMD eradication and the expected increase in trade, which, in turn, led to remarkable growth of livestock value-chains and certainly contributed to improve exports, as illustrated by selected data shown in Figure 1.

Although environmental requirements have gained more prominence worldwide, sanitary issues remain highly critical to maintain international trade flows, which can be severely disrupted when countries face disease outbreaks. A clear example of market disruption due to animal health events is the recent epidemic of high pathogenicity avian influenza (HPAI) in the United States which caused severe trade shocks and realignments in global protein supply chains, as described by Padilla *et al.* (2025).

Achieving and maintaining these animal health gains has required sustained investment in disease control, surveillance and preparedness. In the case of FMD control and eradication programmes, financing responsibilities have historically been shared between public and private stakeholders. In most places, the cost of private goods and services, such as vaccination, were borne by farmers, while surveillance and diagnostic services were treated and funded as a public good, very often with an important contribution of private funding through cooperative financing mechanisms.

As vaccination is phased out, maintaining disease freedom places increasing emphasis on surveillance, early detection and emergency preparedness. These activities generate important public benefits but may also provide sector-specific benefits, raising questions about sustainable financing and the appropriate distribution of costs between public and private stakeholders. Other transboundary animal diseases, of epidemic nature, such as HPAI, are also major threats and require complex surveillance systems, given the need to apply multi-institutional One Health approaches. From an economic standpoint, the challenge doesn't differ much from FMD. How do we mobilise and optimise public and private resources to achieve surveillance, disease control and risk mitigation systems that are effective and sustainable over time?

Figure 1 – Evolution of beef, pork and poultry exports from the Americas, from 1980 to 2024 (Faostat, 2026).



The latest report on the State of the World Animal Health (WOAH, 2026a) highlights that *"surveillance systems, early warning mechanisms, laboratory networks, veterinary workforce development, and preparedness planning are all foundational to effective disease control. When they are underfunded, the entire system becomes more reactive, less coordinated, and more vulnerable to shocks*".

In this context, Resolution 35 of the 93rd General Session of WOAH (2026b) highlighted both the need to strengthen animal health financing arrangements and the importance of the evidence base underpinning investment decisions. It recognised that "*current financing systems at the national level do not always adequately reflect the diversity of actors in animal health systems, contributing to the inefficient allocation of public resources, under-provision of public goods, and insufficient mobilisation of private capital*". Beyond the mobilisation of financial resources, effective investment also requires evidence to identify priorities, assess alternative interventions and demonstrate their value. In this regard, the Resolution further recognised that "*gaps in quality data availability, limited transparency, economic analysis - including cost-benefit and return-on-investment assessments - and communication capacity constrain investment planning, prioritisation, and the ability to demonstrate return on investment in animal health*". Strengthening the use of economic analysis within Veterinary Services can therefore contribute not only to mobilising investment, but also to prioritising available resources and informing decisions on how they can be used most effectively.

These financing and investment challenges become particularly relevant as Veterinary Services seek to maintain disease freedom while responding to a broader range of animal health priorities. Members must manage the sustainability of their disease-free status and must comply with additional food safety and animal welfare standards (Rojas and Romero, 2017). There is a growing importance of programmes to control endemic diseases, including zoonoses, as well as of other emerging issues, such as antimicrobial resistance and responsible and prudent use of antimicrobials, animal welfare and the need to foster One Health approaches. These require long-term commitment and investment. It is necessary to define priorities (e.g. what is the disease burden?), demonstrate the societal value of such programmes and integrate economics into the methods used for planning with a view to optimise the use of resources.

Integrating the economic dimension of animal health policies into the decision-making process: a few examples from Brazil

The interest of Veterinary Services in the economics of animal health has grown in Brazil, mostly to justify budgets and investments of public organisations and of privately managed funds dedicated to animal health.

Justifying strategic decisions

One of such investment programmes was ProDefesa, managed by the Ministry of Agriculture and Livestock and funded by IDB, which focused on optimising resource use and improving the efficiency of Veterinary Services. The foot-and-mouth disease was one of the core programmes addressed by ProDefesa. The economic analysis was conducted by the agricultural economics team of Escola Superior de Agricultura Luiz de Queiroz (ESALQ/USP), under the coordination of Prof. Silvia Miranda, one of the CCEAH-A partners. The study provided evidence of the benefits of withdrawing FMD vaccination and achieving the status of FMD-free without vaccination, with an average NPV of US$1.5 billion, over 20 years. An ex-post assessment is under way; although results are still being consolidated, the Benefit/Cost ratio is above 1 (Miranda, personal communication).

Securing Budgets for Animal Health Emergencies

Another interesting example of the use of economics for decision-making is an epidemiological and economic assessment of an hypothetical reintroduction and spread of FMD in the state of Goiás, which holds more than 22 million cattle, the third largest herd among Brazilian states. This was commissioned by the state's animal health fund – Fundepec-GO - a private body that aims to compensate farmers in cases of sanitary slaughter of animals with notifiable diseases, in addition to supporting prophylactic actions and the development of the livestock sector, in partnership with Agrodefesa, the state's animal health service. The study was conducted by a group of veterinary epidemiologists (Prof. Fernando Ferreira and Prof. José Soares Ferreira Neto) and agricultural economists (Prof. Silvia Miranda), from USP, also partners of the CCEAH-A. One of the key objectives of this project was to estimate the appropriate amount of financial and human resources to deal with a putative FMD reintroduction.

The methodology combined a mathematical model that simulated the introduction and spread of FMD in the state, considering the density of holdings and susceptible animals, the movement of animals and the number of neighbours of the properties with susceptible animals, with the estimation of the financial costs of the health emergency, net losses and loss of profits of producers and the impact on exports (unpublished report, Ferreira, Ferreira-Neto and Miranda, 2025).

Dealing with endemic diseases

A very useful guide on the use of economics assessment in animal health programmes has been published by the Inter American Institute for Cooperation on Agriculture (IICA) (Romero, 2017) and provides a basis for joint projects. One of these collaborative projects looked at the societal value of the bovine brucellosis control in the largest cattle state in Brazil, Mato Grosso. It involved the Instituto de Defesa Agropecuária do Estado de Mato Grosso (Indea MT), the Ministry of Agriculture and Livestock (Mapa), IICA, and the university partners of CCEAH-A in Brazil (UnB and USP).

From 2001, due to the launching of the National Programme for the Control and Eradication of Brucellosis and Tuberculosis (PNCEBT), Brazil began a series of studies aimed at the epidemiological characterisation of bovine brucellosis in its federative units. In the state of Mato Grosso, studies conducted in 2003 and 2014 showed a reduction in the prevalence of infected herds from 41.2 % to 24 % and in the prevalence of seropositive animals from 10.2 % to 5.1 % (Barros *et al.*, 2023). These results stemmed from the efficient heifer vaccination programme with S19 implemented by the state. The study quantified and compared the benefits and costs of bovine brucellosis control in the state.

When considering private and public costs, the Net Present Value (NPV) was estimated at US$ 37.5 million, the Internal Rate of Return (IRR) was calculated at 31 %, and the Benefit-Cost Ratio (BCR) was 2.3. When considering only the private costs, the NPV was US$ 51.3 million, the IRR was 46 % and the BCR was 3.43, indicating that the cattle producer in Mato Grosso had a return of US$ 3.43 for each US$ 1.00 invested. Therefore, the bovine brucellosis control actions carried out in the state of Mato Grosso between 2003 and 2014 were highly advantageous from the economic point of view (Barros, 2023). As the state approaches a more advanced eradication stage it may be necessary to include indirect benefits of brucellosis control in economic analysis, for instance those associated with human health.

The *Guidelines for Animal Disease Control* (OIE, 2014), developed by WOAH, state the following: "*The epidemiology of the disease including its zoonotic potential, along with the availability of technical tools as well as public health, social, environmental and economic considerations should dictate whether eradication is achievable or whether control at a certain prevalence is the desired endpoint. In certain situations, the emphasis of a programme should be on reducing the health and economic impact of the disease. In other cases, it may be concluded that a programme is not feasible or cost beneficial. Specific objectives and indicators leading to the success of the programme should be established*". This is rooted in the fact that animal diseases are an element of complex human activities, and the success of animal health programmes depends on how the social and economic factors are integrated into the methods used to make rational decisions and allocate resources.

This is particularly relevant when Members seek to maintain high levels of biosecurity in disease-free zones while talking into account the diversity of production systems and levels of market participation. The incentives and priorities of producers may differ according to production system, market access and farm size. Producers with limited participation in international markets may derive fewer direct benefits from trade-related disease status and may place greater emphasis on diseases affecting productivity and livelihoods (Rojas and Romero, 2017).

A very high proportion of the vast livestock resources held in the region are kept on family farms, which makes the case for controlling endemic zoonoses even more compelling. When planning the control and eradication of endemic zoonoses (e.g. brucellosis, tuberculosis, rabies), one needs to assess the economic and zoonotic burden of diseases to prioritise investments and assess the benefits, costs, as well the cost-effectiveness of alternative interventions. *The Global Burden of Animal Diseases Programme* - https://gbads.woah.org/ - is gathering available data and developing an innovative methodology to determine the economic burden of animal diseases. The findings will inform governmental and non-governmental responses to animal health issues.

One of the cornerstones of the PNCEBT in Brazil is the voluntary accreditation of free herds. Belchior *et al*. (2016) stressed that small farms should be included in control efforts because these are the vast majority of herds, albeit with lower individual risk. A study conducted at the University of Brasilia (Leite *et al*., 2018) developed a stochastic cost–benefit analysis model for two types of dairy herds (high yield Holstein-Zebu crossbred females and lower productivity smaller scale herds) to identify the technical and economic constraints of this process and demonstrated that herd accreditation schemes might not be the best option for small and medium sized herds. These results triggered an on-going wider study on the impact of bovine brucellosis and tuberculosis in the dairy value-chain that started with a characterisation of the widely diverse farms in the largest dairy states. The established typologies reflect different social and economic realities, as well as the associated production levels, in an extremely asymmetric landscape. This baseline characterisation is used to understand how disease is spread across the geographical area and farm typologies and to provide economic farm-level models to assess its economic and public health impact.

This project also highlights the case for developing reliable and comprehensive databases where animal health, animal production, economic and environmental data, that are scattered in multiple and fragmented sources, can be integrated and made accessible for appropriate analytical use, subject to relevant data governance, confidentiality and data sharing requirements, thereby improving the quality and validity of epidemiological and economic models and reducing the risk of conclusions based on incomplete or poorly characterised data.

Concluding remarks

Veterinary Services across the Americas face evolving investment and financing needs as they seek to sustain surveillance, preparedness and disease-control systems in diverse epidemiological and production contexts. The progress achieved in the control and eradication of major transboundary animal diseases (TADs) such as FMD and CSF, illustrate how these challenges can reshape priorities. As Members move from intensive disease-control programmes towards maintaining disease freedom, greater emphasis is placed on surveillance, early warning, emergency preparedness and response. This may involve wider ranging surveillance systems that comprise targeted risk-based components as well as sensitive disease notification systems, maintaining farmer's awareness at adequate levels. Effective early warning also needs to be coupled by adequate preparedness and response capacity.

Achieving and maintaining disease freedom for major transboundary animal diseases is an important achievement, but Veterinary Services must also address endemic diseases, including zoonoses, as well as food safety, animal welfare and other emerging priorities. The region is characterised by a wide diversity of livestock production systems, where small and medium-sized family farms predominate. The incentives and priorities of producers may differ according to production system, market access and farm size. Producers with limited participation in international markets may derive fewer direct benefits from trade-related disease status and may place greater emphasis on diseases affecting productivity and livelihoods.

This evolving context raises important economic questions for Veterinary Services, particularly regarding how sustainable surveillance and preparedness systems should be financed and how limited resources should be allocated. Sustainable financing arrangements should consider the distribution of costs and benefits among stakeholders and may include appropriate combinations of public and private financing, depending on national circumstances. This also reinforces the need to demonstrate the societal value of surveillance and preparedness systems and to assess the cost-effectiveness of alternative surveillance and control interventions.

The need to widen the scope of Veterinary Services with a view to tackling endemic diseases and other emerging issues must be underpinned by economic analysis, not only for the allocation of budgetary resources but, most of all, to inform priority setting and guide appropriate and effective diseases control measures.

The more widespread use of economic analysis by Veterinary Services requires a better understanding of economic principles and how these relate to animal diseases and to disease control and surveillance. Robust economic analysis depends on the availability of quality data and on the collaboration between economists, epidemiologists and disease control specialists in multidisciplinary teams. It also calls for decisionmakers who understand the economic dimension of animal health issues and the value of economic tools to support informed decision-making. The Regional Conference therefore provides an opportunity to identify Members' priority needs in animal health economics and consider how the CCEAH-A, together with other relevant WOAH partners, can support Veterinary Services in addressing them.

The WOAH Collaborating Centre for the Economics of Animal Health – Americas Region (CCEAH-A)

Members in the Americas play a vital role in global livestock and aquaculture production and trade. In this context, there has been growing interest in the use of animal health economics to support policy development, priority setting and resource allocation (Pendell et al., 2024). The WOAH Collaborating Centre for the Economics of Animal Health – Americas Region (CCEAH-A) brings together five partner universities: Kansas State University, the University of Brasília (UnB), the University of São Paulo (USP), the National Autonomous University of Mexico and Washington State University.

The CCEAH-A can contribute to strengthening the economic foundations of animal health policies within a One Health context. In line with the role of WOAH Collaborating Centres, it can provide scientific and technical expertise, contribute to research and data analysis, support training and capacity building activities, facilitate knowledge exchange and networking, and provide technical advice within its area of expertise.

The Regional Conference provides an opportunity to identify Members' needs and priorities in relation to animal health economics and to consider how regional expertise and cooperation, including through the CCEAH-A and other relevant partners, could support Veterinary Services in addressing them. Such cooperation can contribute to strengthening the use of economic evidence in decision-making, optimising resource allocation and demonstrating the societal value of investment in animal health.

Current collaboration between the Brazilian partners institutions at the University of São Paulo and the University of Brasilia and federal and state Veterinary Services provides examples of how multidisciplinary expertise can be applied to practical animal health policy and investment questions.

References

Barros M. L., Barddal J. E. I., Santos J. C. Q., Negreiros R. L., Rosa B. M, Teixeira R. C., Romero Prada J. R., Goncalves V. S. P. & Ferreira Neto J. S. (2023). Retrospective benefit-cost analysis of bovine brucellosis control in the state of Mato Grosso, Brazil. *Preventive Veterinary Medicine* 218 105992

Belchior A. P. C., Lopes L. B., Goncalves V. S. P. & Leite R. C. (2016). Prevalence and risk factors for bovine tuberculosis in Minas Gerais State, Brazil. *Trop. Anim. Health Prod.* 48:373–378 DOI 10.1007/s11250-015-0961-x

Leite B. M., Lobo J. R., Ruas R. M., Ferreira F., Geeverghese C., Freitas M. L. & Goncalves V. S. P. (2018). Economic Analysis of the Policy for Accreditation of Dairy Farms Free of Bovine Brucellosis and Tuberculosis: Challenges for Small and Large Producers in Brazil. *Journal of Agricultural Economics*, Vol. 69, No. 1, 262–276 doi: 10.1111/1477-9552.12227

Padilla, S.L.; Baker, Q.J.; MacLachlan, M. J. The impact of HPAI trade restrictions on U.S. poultry exports in 2022–23. *Applied Economic Perspectives and Policy,* John Wiley & Sons, v. 47, n.3, p.933-948, July/2025

Pendell D. L., Romero J., Benavides E., Flores J.L.D., Goncalves V.S.P., Marsh T.L., Meza C. & Miranda S.H.G. (2024). A Collaborating Centre for animal health economics in the Americas. *Scientific and Technical Review* **43,** 152-158

Rojas H. & Romero J. R. (2017). Where to next with animal health in Latin America? the transition from endemic to disease-free status. *Rev. Sci. Tech. Off. Int. Epiz.* 36 (1), 331-348.

Romero, J. 2017. Evaluación económica de programas de salud animal. Perú, IICA. 20 p. (Aporte técnico, Nº. 1)

OIE (2014). Guidelines for Animal Disease Control. https://www.woah.org/en/document/a_guidelines_for_animal_disease_control_final/

World Organisation for Animal Health (2026a). The State of the World's Animal Health 2026. Paris, 192 pp. https://doi.org/10.20506/woah.3742. Licence: CC BY-SA 3.0 IGO.

World Organisation for Animal Health (2026b). Resolution Nº35, Investing in Animal Health to Secure Everyone's Future, 93rd General Session, Paris. (https://www.woah.org/app/uploads/2026/06/sg93-final-resolutions-en.pdf)