

**CONTRIBUTION OF VETERINARY ACTIVITIES TO GLOBAL FOOD SECURITY
FOR FOOD DERIVED FROM TERRESTRIAL AND AQUATIC ANIMALS**

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***Summary:** Agriculture is today facing with the challenge of feeding the world's population, forecast to reach 9 billion over the coming 40 years, while at the same time preserving the earth's resources. The growth in demand for food products in a context of global change requires a major move away from purely productivist agricultural practices to ecological intensification methods. Food security is not, however, limited solely to the quantitative aspects of the food supply. Food security exists when there is reliable access to safe and nutritious food that meets dietary needs and food preferences for an active and healthy life. Livestock and fish productions make a strong contribution as a source of energy, protein with a high nutritional value and micronutrients, as well as by contributing to the income of those engaged in the production, processing and marketing chains at national and international level, and ultimately to countries' GDP. Any health problem or contamination that occurs in production systems and marketing chains will therefore have complex repercussions throughout the food chain "from farm to fork". The veterinary sector is consequently one of the guarantors of the stability and programmed development of the world food system through the activities it deploys at each stage in the system: production at farm level and processing, distribution and marketing at national and international level.*

The replies to a questionnaire that the OIE¹ sent to the Veterinary Services of its 178 Member Countries indicate that all those which have replied have established an institutional, legislative and technical framework organising veterinary activities. However, the allocated budgets and resources reveal a wide disparity between industrialised countries and developing countries, with chronic underinvestment in the least wealthy countries, illustrated by the fact that in more than 60% of the countries public investment in the relevant fields amounts to less than USD 2 per capita per year. The two main categories of activities, focused on animal health management and food safety, are organised along classical lines with systems of surveillance and control, traceability and laboratory analyses involving both public and private sector partners. The levels of activity and operational effectiveness, which are directly dependent on the allocated resources, also reveal the disparity between rich and poor countries. The majority of Veterinary Services perceived their activities as having a high impact on food security, the perception being of a fairly homogeneous impact on the four components of food security, namely availability, access, utilisation and sustainability. Virtually all of the countries wished the OIE to further increase its involvement and support in the field of food security while stepping up its work on the influence of animal production on environmental change.

¹ OIE : World Organisation for Animal Health

1. Introduction

The issue of world food security and the concomitant development of the agricultural sector, including livestock, are central to the new issues of this century. In a context of global change, the simple productivist and technical approach of the Green Revolution – launched after the Second World War, carried on in the years 1960-80², and evolving into an ‘doubly green’ revolution up to the first years of the 21st century, to take into account certain proven negative externalities (1) – can no longer provide an adequate response to the interrelated issues of global change, ecological intensification, food security, sustainability of natural resources and improving the livelihoods of human populations, especially those dependent on agriculture. The veterinary world cannot remain outside these societal debates and must consider its past, present and future contribution to these issues. The specific issue of the contribution of animal production to food security and the contribution of the veterinary sector is now, and will remain, central to these many debates for which we need to be prepared.

2. Food security: what definition?

The first comprehensive definition officially recognised since the World Food Summit of 1996 illustrates its many facets: “*Food security at individual, household, national, regional and global levels is achieved when all people, at all times, have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life.*” (2).

Food security thus goes beyond the simple notion of food self-sufficiency. Several international assessments using *national food security indices* or a detailed analysis of certain specific *indicators* have proposed world maps showing a highly differentiated world and the existence of regions of extreme insecurity (mostly in Africa) or low insecurity (Europe, OECD³) and areas of intermediate insecurity. Figure 1 shows an example of a food security index based on 18 indicators illustrating several facets of food security, including the nutritional and health status of the population concerned and the intrinsic vulnerability criteria of a country, combining the effects of food availability, its accessibility and the stability of the food supply and stocks (3).

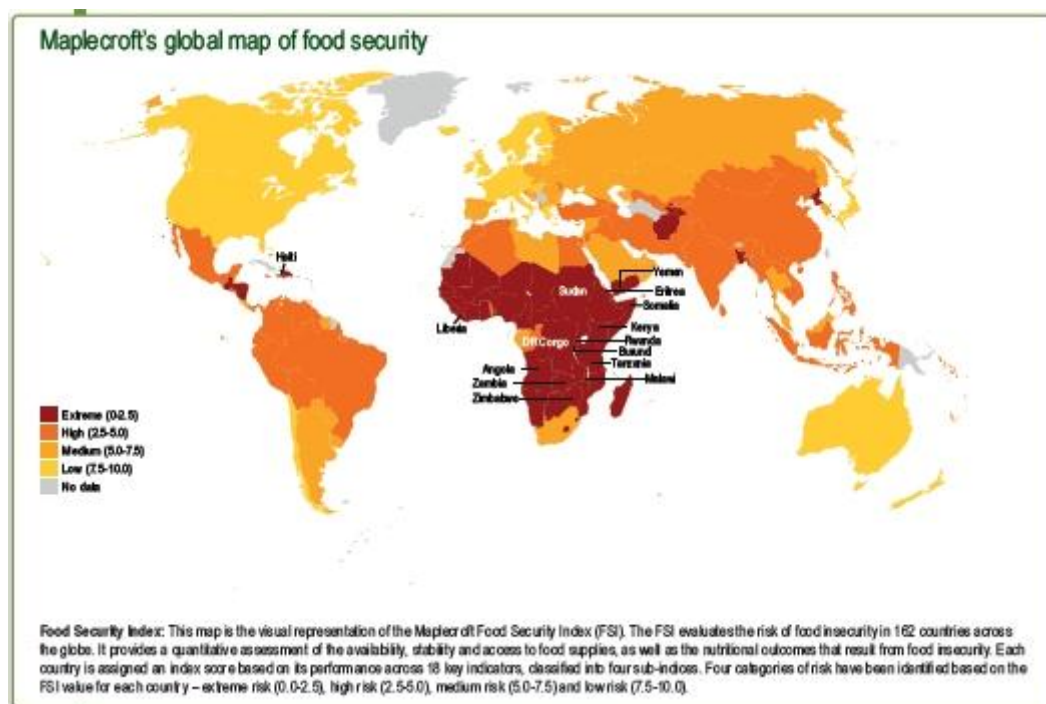


Figure 1: Food security index map (3)

² The ‘green revolution’: improvement of breeds and varieties, massive use of modern production inputs and techniques

³ OECD: Organisation for Economic Development and Co-operation

One can also, as in Figure 2, show certain specific aspects, such as the prevalence of undernourishment in the world (4).

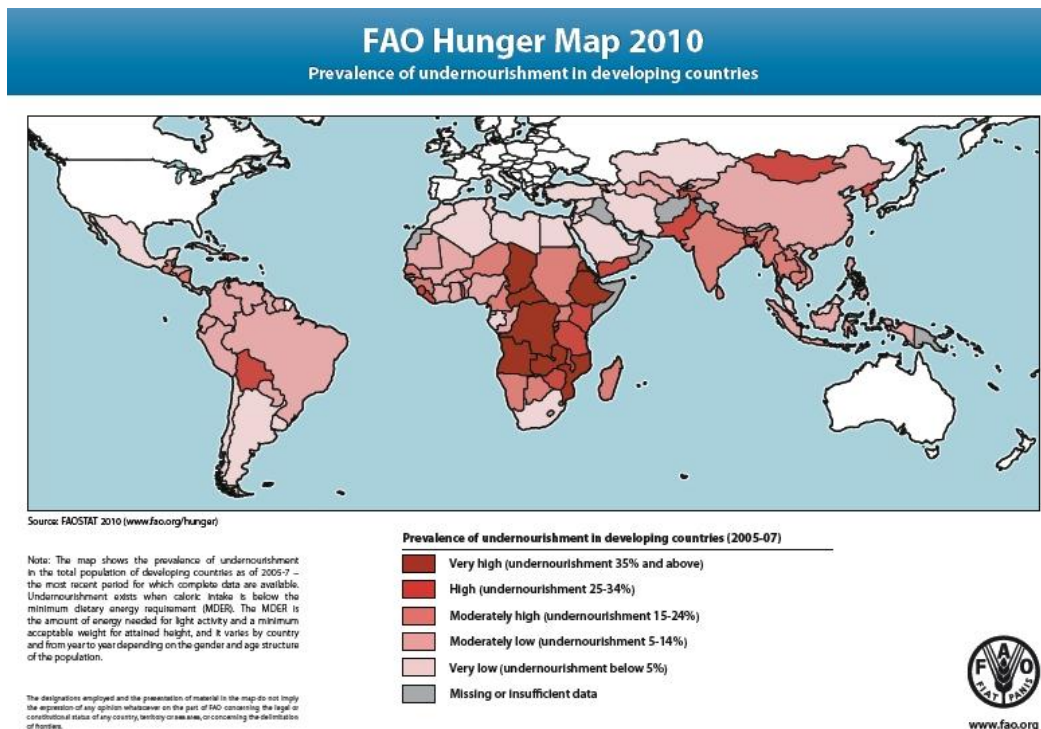


Figure 2: Map showing prevalence of undernourishment worldwide (4)

2.1. Key concepts

The literature on *food security* identifies three fundamental dimensions, which are applicable to products of animal origin: **availability** of food, **access** to food, and effective and safe **utilisation** of food (5).

- **Availability** of food, for a given country, reflects the *production* stage by suppliers of food commodities and also the balance of international *trade*. International trade is organised to acquire, either through imports or food *aid*, a sufficient volume to supplement the domestic products available on the market. It also involves the acquisition, through the export of high value food products, of foreign currency with which to purchase other food commodities. In addition, the contribution made by livestock in mixed farming systems by fertilising arable land and providing draught power remains an essential source of gains in *crop yield*, a factor generally underestimated and not properly taken into account in national statistical systems. This contribution should be included in the assessment of environmental services provided by livestock (animal traction, natural fertilizer, nature conservation, fire control, etc.).
- **Access** addresses the *physical* and *financial* capacity of households to provide themselves with food. The first component concerns the effect of distance from the consumer to the market or to producers and also the stability of temporal *supply cycles* and therefore the regulating role of any stocks. This includes the processing of perishable foodstuffs into more stable products (e.g. milk to cheese). The second component addresses consumers' access to a range of products offered at prices compatible with their income and purchasing power, which also relates to market segmentation and demand elasticity⁴ among the various categories of consumers.

⁴ *Income elasticity of demand* can be defined as the relationship between the percentage variation in demand for a product and the percentage variation in income. It measures the impact of a variation in a consumer's income on his/her demand for a given product.

Physical access is illustrated at several levels of the production system. In the case of *on-farm consumption* one can observe direct dependence on food commodities produced within households where they are both producers and consumers of these products. More generally, consumers are dependent on local producers or on *distribution and marketing* channels for unprocessed or processed food products. Furthermore, all food systems throughout the world, whether they are based on plant products or animal products, evolve to meet the demand of rural and urban consumers. Considerable variations can be seen between these three types of dependence according to the demographic characteristics and the characteristics of the agricultural sector.

In livestock or fish productions these differences can be seen between systems where animal products make a strong and direct contribution to the producers own dietary intake (such as milk in some pastoral systems), systems involving direct supply (farm-gate sales by producers in peri-urban areas, or at primary markets in rural areas), or supply systems involving a complex arrangement of operators (concept of marketing chains and value chains, including dependence on the international market). The indirect contribution of livestock to the access component of food security is often underestimated in developing countries, especially when it comes to its role in the transport of products to the local market, for example.

Financial access refers to the point of view of the consumer faced with a range of *prices* for available food products, and to the capacity of households to acquire various categories of food (plant products and animal products), obtained on the market or under the terms of a balanced exchange transaction, monetary or otherwise. For livestock or fish producers, the critical point is the direct or indirect contribution that animal production (milk, meat, etc.) and their accumulated assets (livestock) make to safeguarding and improving their *family income*, thereby increasing their food purchasing power.

Table 1 shows the wide range of complex transactions and exchanges in which animal production and animals still play a role in a large part of the world today (sale of products, barter and exchange in kind, etc.).

Table 1: Participation of animal products in the wealth of nations and economic agents and in ensuring access to food

		Financial transaction **	
		Yes	No
Market transaction*	Yes	Sale and purchase of animals and animal and plant products, processed or otherwise, and of high or low value; payment of interest (credit), payment of wages (labour)	Barter (transaction in kind: e.g., cereal crops in exchange for animals in a pastoral area; wages paid in kind (milk, meat products))
	No	Payments to other financial agents: taxes, grants, donations (redistribution)	Transfers to oneself or to other economic operators: on-farm consumption, gifts in kind (redistribution)

* within the meaning of a market institution or a formal transaction (contracts, etc.)

** involving money

- **Utilisation** of food relates to the *quantities* ingested, the overall *quality* (nutritional, organoleptic, sanitary, etc.) of the products (intake of proteins, micronutrients or energy), socio-cultural preferences (religious customs, etc.) and food consumption patterns. This component includes *undernourishment* of persons whose energy and calorie intake is insufficient for them to lead an active life (925 million people worldwide). It also includes *malnutrition* characterised by an inadequate intake of energy, protein (and specific amino acids), and micronutrients (vitamins, minerals), giving rise to delayed growth and intellectual development as well as underweight, characteristically seen in poor countries (6). In developed countries, it also relates to diseases associated with excessive food intake, as well as overweight and obesity in households, especially in urban areas.

- **Sustainability and adaptability** of the food system is a fourth dimension that can now be added to the first three. It means the capacity for sustainably maintaining agricultural *production* (including animal production), national and international *trade, storage and supply* at the national level and food *consumption* that will meet the demand in the long term and even in the context of new *constraints*. It involves the development and sustainable management of natural resources used in animal production, and productivity margins that are feasible under various scenarios and are able to contend with new societal and consumer requirements.

Among the dynamic features of food security, for which the evaluation of the use of natural capital assets is crucial, it should be noted that food security must be *stable* in the *time* dimension, and take into account both annual and multiannual production cycles (management of hunger seasons, unexpected crises and a sustainable supply). It must therefore take into account the variety in animal production cycles (i.e. short and long) and the capacity to defer the time of consumption through deferred processing and storage. Another dynamic feature of food security in the long term consists of maintaining the required geographical and *socio-economic ubiquity* of a given dietary component (range of affordable food products), which must be widely accessible to rural and urban consumers, the various socio-professional categories with their differences in purchasing power, and all segments of a heterogeneous, and now largely urban, population, with a wide range of demand.

Figure 3 outlines the different stages in the food system where veterinary activities will be implemented and have an impact.

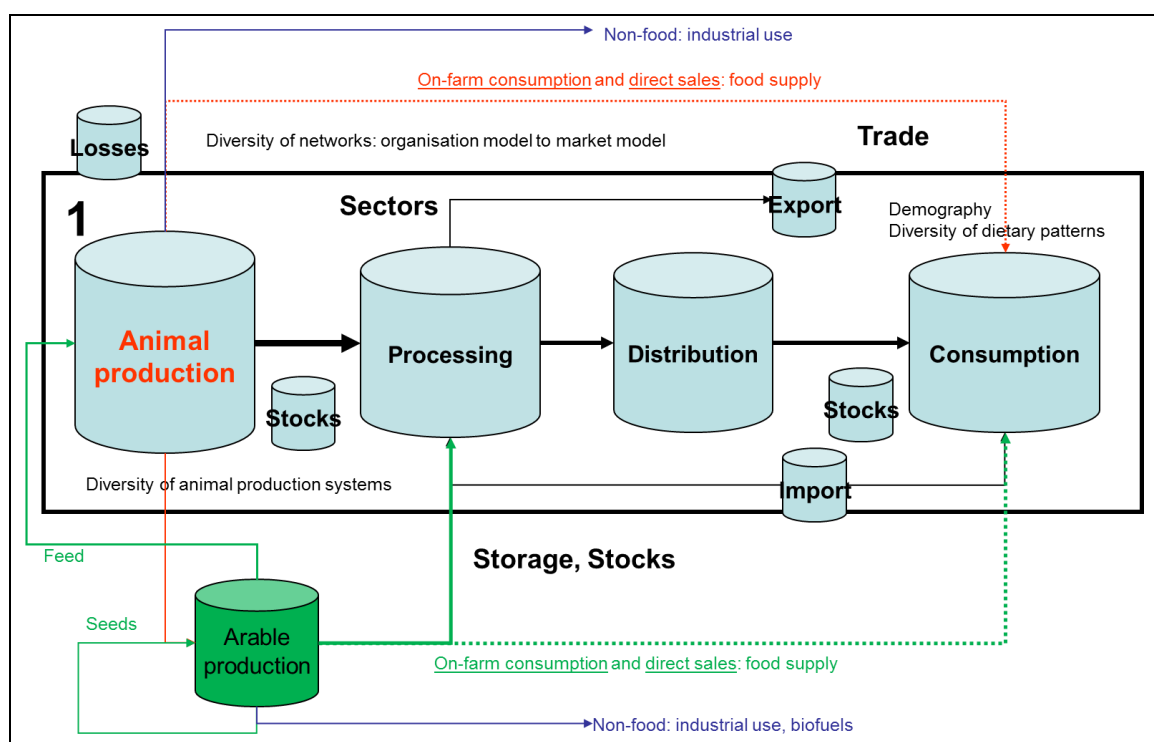


Figure 3: Food security system, between animal and plant production systems, operations in the supply and consumption networks

2.2. Indicators

The measurement of food security requires the use of numerous indicators relating to both the causes and the effects of a given context of food insecurity. Figure 4 provides a list of indicators that fit well with the model presented above; they are derived from a number of sources (4, 6, 7). Future studies, notably based on econometric models, will be able to focus more specifically on the contributions inherent in animal products.

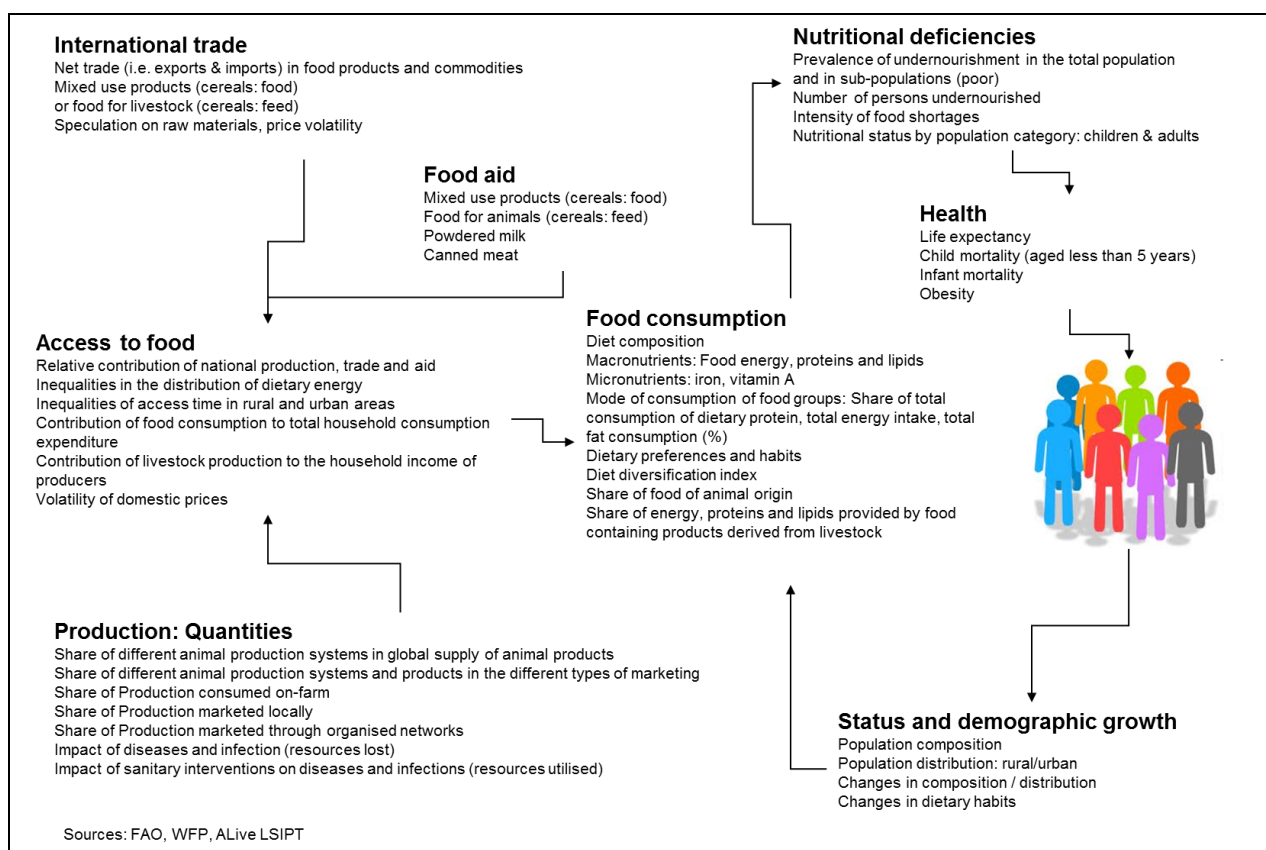


Figure 4: Relational diagram showing the food security system and the proposed battery of indicators on livestock production (derived from indicators developed by FAO⁵, WFP⁶ and ALive⁷)

3. Impact of diseases and infections on animal production and food security

Animal production contributes to food security by providing a source of energy, dietary protein of high nutritional quality and micronutrients (vitamins, essential amino acids, etc.) and by contributing directly and indirectly to countries' GDP⁸ and to the income and purchasing power of the various operators in the production, processing and marketing chains, at both the national and international level. This contribution varies and is highly differentiated according to the countries, the agro-ecological zones, and the animal production systems (e.g. for livestock: pasture-based, mixed [arable/livestock], industrial) (8). Livestock production is, however, omnipresent since two-thirds of the world's population live in mixed farming systems (arable/livestock), which might be the key to the future development of food security. These mixed farms actually account for 50% of world cereal production, and in the developing world they generate 75% and 60% of milk and meat production, respectively, at the same time providing millions of jobs (9). Furthermore, a historical analysis has revealed that all countries have gone through a development stage where livestock contributed directly and strongly to the agrarian system and had complex, multifunctional attributes (10). This situation is still very much the case today in some countries. It is useful to remember the contribution that livestock make to the maintenance of certain key assets in least developed countries with their predominance of rural households, namely the social, natural, human, financial, and technical/physical capital of animal production (11). Livestock and fish production thus pave the way for rational methods of ecological intensification and allows the emergence and development of high quality production chains that generate added value: products with geographical indications of origin, processed food products, etc.

Animal diseases or the contamination of animal products with germs or xenobiotic substances will therefore have complex repercussions throughout the food chain "from farm to fork". As a result, the veterinary sector is one of the guarantors of the stability and planned evolution of the world food system.

⁵ FAO: Food and Agriculture Organization of the United Nations

⁶ WFP: United Nations World Food Programme

⁷ ALive Platform: African Livestock, a Partnership for livestock development, poverty alleviation & sustainable economic growth

⁸ GDP: gross domestic product

Having described the contribution of livestock production to food security, we shall attempt to divide into two groups the contribution that veterinary activities make to food security.

3.1. Evaluation of sanitary risks

It is important to appreciate the variety of *impacts* that *diseases* and *infections* can have on the different stages in the food system and on food security considered in its four dimensions (availability, access, utilisation, sustainability). Sanitary *risks* can, in the same way as the demonstrated *presence* of diseases and infections, modify production systems and affect the resilience of the food system described above.

Animal diseases and infections act as a brake on the development of the livestock sector. They expose animal producers to high risks and uncertainty, which, in the case of developing countries, limit opportunities for producers to escape from the 'poverty trap' and exacerbate their food insecurity. In the past, efforts tended to focus on controlling the main sanitary risks in the field and on improving productivity, while gradually starting to develop the processing and quality control of products. For developed countries, since the control of sanitary risks is now well advanced, the majority of activities consist of controlling processing and the quality of products. Diseases have both *direct* (mortality and morbidity) and *indirect* effects. Each disease acts in a different way on the animal's body, affecting organ systems (digestive, respiratory, reproductive and musculoskeletal systems, etc.) and specific functions (producing and delivering services, such as animal traction). These effects are the source of a disease's *direct* economic impact by hampering the animal's productivity (e.g. milk yield). Diseases and infections can also interfere with the *quality* and *value* of animal products or services that are self-consumed, marketed or returned to the natural environment (manure). They impair certain functions of livestock production that are very useful for poor households, such as keeping arable land fertile by providing natural animal fertilizer, or providing draught animal power for ploughing, transporting products to market, etc.

Due to the perceived threat of certain diseases and in the absence of large-scale programmes for their control, producers are reluctant to equip themselves with all the resources and production factors that would enable them to produce more and better, and sell their products on lucrative markets. These effects are the source of the *indirect* impact, which must be measured in terms of the social and economic or natural system affected, the herd and farm, the area and local community (village), the region and nation (territory) or value chain (complex economic production system). These effects include the loss of income for households, the loss of added value and the disorganisation of value chains, a decline in GDP and the loss of potential investments in these sectors in the event of export bans, a reduction in the market price of products, the closure of some marketplaces during the control of epizootics, and spillover effects like a reduction in crop productivity (e.g. foot and mouth disease in Democratic People's Republic of Korea and the effect on rice production).

3.2. Risk management

Having clarified the impact mechanisms of diseases and infections, one can then go on to determine how, and at what level, the components of a *sanitary management system* adapted to the context (including the *veterinary sector* but not exclusively) can be applied to eliminate these threats or prevent, control or moderate their impact. Through their activities, the Veterinary Services, in the broadest meaning of the term (i.e., including their private sector: service providers and drugs distributors), help both to eliminate certain risks and to increase or maintain the level of production of livestock and fish populations and the level of quality and safety of food produced throughout the chain of production, processing, conservation and marketing at national and international level. In so doing they help to ensure food security and public health.

There is a need to elucidate more clearly the mechanisms of this impact through the variety of the activities involved and their effects on the food system. This approach is already well advanced thanks to the work on the contribution of livestock to poverty alleviation in countries of the South (7, 11). The impact mechanisms of veterinary activities are described in broad outline based on the model described above so as to help inform public policies and decision-making.

In general, we can distinguish three main types of impact of diseases and infections and an equivalent number of correction or prevention mechanisms through veterinary activities:

1. Diseases and infections that threaten the assets (capital) of households (e.g. zoonotic diseases), and consequently the veterinary activities that help to correct, control and prevent the threat.
2. Diseases and infections that hamper the efficient functioning of markets and value chains (e.g. systemic diseases), and consequently the veterinary activities that help to correct, control and prevent these problems.
3. Diseases that hamper pathways to intensify animal production systems and, more generally, agricultural systems (e.g. some endemic diseases that hinder the use of more productive exotic species); and consequently the veterinary activities that help to correct, control and prevent this problem, thereby offering greater flexibility to achieve productivity gains at the production stage.

Figure 5 illustrates the three evaluative components of veterinary activities (*capacity*, *activities* and *impact*), which reflect the logical steps of their effectiveness (intermediate and terminal efficiency, since capacity alone cannot produce a beneficial effect). They ultimately act upon the main components of a health problem affecting the food system. Most diseases and infections have effects in the three types of impact, but some have one type of impact that is more marked. This is also the case, therefore, with veterinary activities. It should be noted that some veterinary activities are directly devoted to improving production performance (reproductive performance, artificial insemination, advice on livestock nutrition, etc.) in the absence of a health problem, *stricto sensu*.

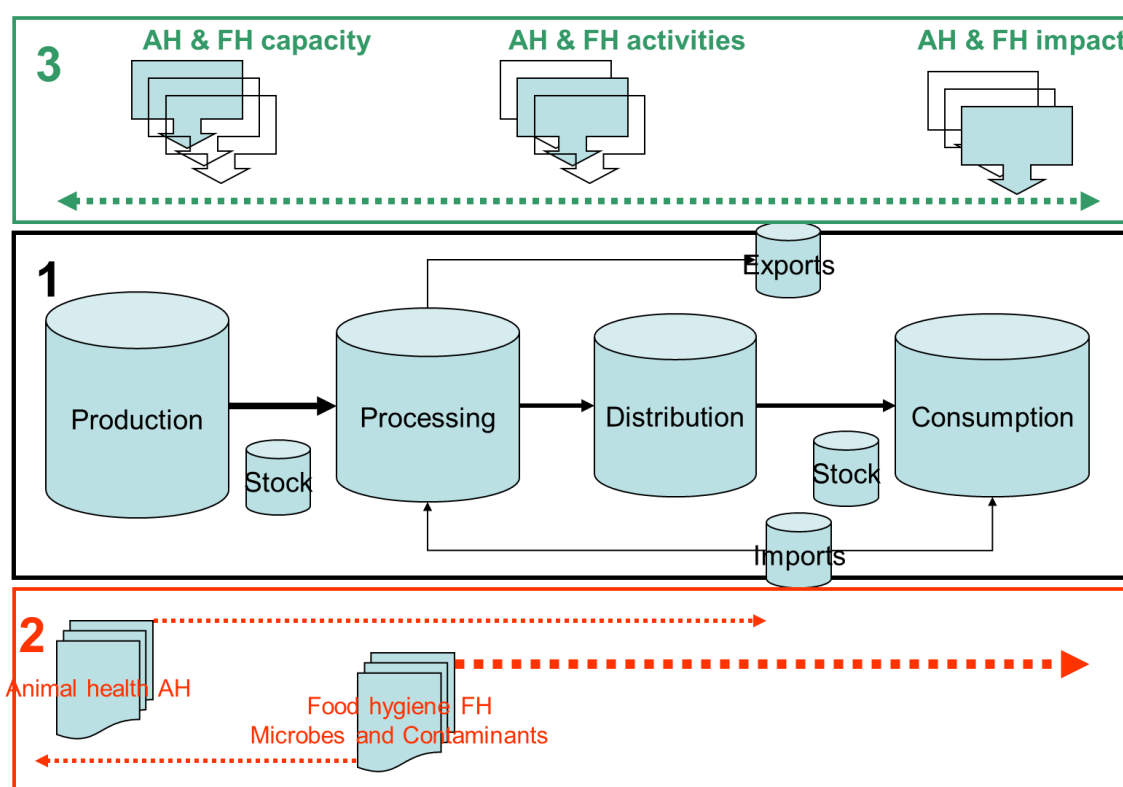


Figure 5: Model to assess the impact of veterinary activities in correcting the effects of animal diseases and infections on the different stages in the food system.

4. Veterinary activities and their impact on food security

In the complex context described above, the general aim of the Veterinary Services is to organise a technical and regulatory environment in which health risks can be identified and controlled in order to limit their impact on all livestock production sectors and on humans. In so doing, the Veterinary Services contribute to food security, economic development and human health protection.

Veterinary activities are deployed at each stage in the food system: production at farm level, processing, distribution and marketing at the local and national level or for export (Figure 5). This demands a wide range of organisational, legislative or technical competencies across both the public and private sectors (12).

To assess the perception that Veterinary Services have of their contribution to national food security, a questionnaire was prepared covering three major categories of veterinary activities: general organisation of the Veterinary Services, animal health and animal production, and food safety and public health. The questionnaire was sent to the Veterinary Services of all 178 OIE Member Countries. One hundred and eight countries replied within the set time limit. Their replies are analysed in this report.

4.1. General organisation activities of the Veterinary Services

For the Veterinary Services to be operationally effective, individual competencies must be structured within an institutional framework and in accordance with a general organisation including a clearly identified chain of command backed up by a suitably adapted legislative framework. This implies that the human resources must be qualified under an effective system of education and training, and that these human resources are allocated in sufficient numbers to the veterinary structure, which must itself be allocated a sufficient operational budget to fulfil its mandate. Although the institutional framework exists in all countries the resources allocated are often too poor in developing countries, which see an ever-widening gulf separating them from developed countries when it comes to animal production and marketing of products.

Box No. 1: Analysis of the 108 replies on the general organisation of the Veterinary Services

All the countries have an institutional framework, which in 80% of cases is placed under the Ministry of Agriculture, Livestock or Rural Development. In nearly 100% of cases the Veterinary Services participate in the preparation of sanitary legislation. A statutory body regulates the veterinary profession in 80% of countries, three out of four countries have at least one veterinary school and two-thirds have at least one school for veterinary technicians. However, the existence of a veterinary organisation does not necessarily mean that it is operationally effective, a factor that is directly related to the financial and human resources it is allocated. Over 60% of the Veterinary Services have a very low annual budget, of less than US\$ 25 million. In relation to the number of inhabitants, this means that in over half of the countries public investment in the Veterinary Services is less than US\$ 2 per capita per year. Since more than 90% of the budget consists of a State grant in over 60% of countries, the level of development of the Veterinary Services is directly related to the level of economic development of these countries. It remains very weak, therefore, in developing countries, even when the contribution of animal production to GDP is very high, as in the case of Sahelian countries, where it may amount to over 40% of agricultural GDP. We find a similar typology in terms of the number of veterinarians: more than half of the countries have fewer than 35 public sector veterinarians per million inhabitants and fewer than 100 private sector veterinarians per million inhabitants in the private sector, and very few veterinarians with an animal health mandate (median: 5.4 per million inhabitants), reflecting an overall weakness of surveillance systems in developing countries.

Classically, technical activities are grouped into two main categories: one aimed at controlling animal health in production systems and the other further downstream in the food chain and concerned more with food safety and public health. Figure 5 illustrates these two main sanitary components and their place in the food system.

4.2. Animal health and production activities

Animal health protection activities are organised within the framework of epidemiological surveillance and intervention systems, in which producers' associations, technical organisations and the official Veterinary Services work together in a public-private partnership. These activities range from epidemiological surveillance at the national level and at borders, emergency or routine diagnosis, and sanitary interventions to control or eradicate endemic, exotic or emerging diseases. Two associated mechanisms are essential if the system is to be effective. Firstly, animal identification is essential to ensure the traceability of animals and animal products throughout the production chain and to control animal movements at the national level, including animals for export (quarantine). Secondly, there must be reliable veterinary diagnostic laboratories operating under a reliable quality control system for the tests they perform.

Box No. 2: Analysis of the 108 replies relating to animal health and production

97% of countries reported having a passive epidemiological surveillance system⁹, in which the main operators involved include the central (81%) and regional (33%) Veterinary Services, and veterinarians with an animal health mandate (19%). Although diagnostic laboratories are a key part of the system, they were mentioned in only 15% of cases. Research and veterinary inspection were each mentioned in 8% of cases. The private sector operators involved include livestock producers and producers' associations (in 53% of countries), private sector veterinarians (32%) and veterinary para-professionals (8%). At a functional level, the first link in the surveillance chain was reported to be producers (48%) coupled with private sector veterinarians (16%), including those with an animal health mandate (7%).

95% of countries also reported applying active surveillance¹⁰. Among the diseases targeted in these systems, half of the first 16 diseases mentioned were zoonoses. At the top of the list were diseases that have emerged in recent years, such as avian influenza, as well as more "classical" diseases, such as brucellosis and tuberculosis, diseases that are often neglected in international programmes but continue to receive considerable attention on the part of the Veterinary Services in view of their important health implications.

86% of countries reported having the capacity for early detection. Yet 30% of them reported that there were no suspicions during the previous 5 years, which is incompatible with an effective active surveillance system. 87% of countries also reported having the capacity for a rapid response to sanitary emergency situations and among these 99% had at least one contingency plan. However, only 78% of countries reported having had simulation exercises during the previous 5 years.

76% of countries reported having an identification system for individual animals and 94% of countries stated they control animal movements at a national level with a quarantine system covering import-export movements.

In parallel with the health surveillance activities, 95% of countries stated that the Veterinary Services are involved in control or eradication programmes for major diseases. Among these, the major emerging (avian influenza) or endemic zoonoses (brucellosis, tuberculosis, rabies) were the ones most frequently reported as being the subject of control programmes.

Diagnostic laboratories were reported to exist in 91% of countries at a central level and in 82% at a regional level. 75% stated that their veterinary diagnostic laboratories operate under quality assurance, with 11% of them certified or in the process of certification in accordance with the standard ISO 9001 and 70% accredited or in the process of accreditation in accordance with the standard ISO 17025. While these figures may appear satisfactory, they do not reflect the great heterogeneity of the situation among countries. For example, over half of the countries stated that they perform no more than 2 inter-laboratory tests¹¹ per year.

⁹ Passive surveillance means any surveillance activity based on the spontaneous reporting of cases or suspected cases of diseases for which surveillance is maintained by those supplying the data (notably producers and field veterinarians).

¹⁰ Active surveillance means any surveillance activity based on the active search for data through actions programmed in advance and designed by the network administrator.

¹¹ In an inter-laboratory test or trial, a national or international reference laboratory sends a coded set of samples. The results are then compared to the expected values to assess the quality of the results obtained by the participating laboratories.

4.3. Food safety and public health activities

Food safety is situated downstream from production and is aimed at ensuring the continuity of food hygiene throughout the food chain as far as the consumer. Activities consist of inspection of infrastructure and practices in production units, collectors/transporters, agroprocessors and final distributors. As is the case with animal health, it is essential to have laboratories that can perform microbiological tests and test for xenobiotic contaminants.

Box No. 3: Analysis of the 108 replies relating to food security and public health

88% of the countries reported that they carry out inspections in farms and other animal production sites and 94% of countries perform ante- and post-mortem inspections at abattoirs for the main species of domestic animals. The number of abattoirs approved by the official Veterinary Services appears to be sufficient in terms of international standards, though without prejudging their quality. Animal product collection and processing establishments are also inspected, as well as distribution (retail) points in 84% and 79% of countries, respectively.

The percentage is lower in the case of catering services, however. These services are inspected in only about half of the countries. There is an official system for recalling non-compliant products in 64% of the countries but the descriptions given suggest that in the majority of cases the system is not fully operational.

It would therefore appear that, apart from slaughter activities, where they maintain a strong presence, the Veterinary Services' involvement in sanitary inspection activities regularly declines through the processing and distribution chain. In a high proportion of countries, sanitary inspection activities thus appear to be globally less sustained than activities directly linked to animal health.

90% of countries reported having food hygiene laboratories, conducting microbiological analyses or residue testing. In 74% of cases they are separate from veterinary diagnostic laboratories. 78% stated that their laboratories operate under quality assurance, 4% of them certified, or in the process of being certified under ISO 9001, and 71% accredited or in the process of accreditation under ISO 17025. As in the case of veterinary laboratories, the global figure would appear to suggest an adequate level of laboratory activities but the great disparity in the number of tests performed, which is frequently very small, coupled with the small number of inter-laboratory tests carried out (half of the countries perform no more than one inter-laboratory test per year) reveals wide variations between countries.

The relative weight of each of the main categories of veterinary activities differs between countries. It depends on the level of development of animal production and also on their level of economic development.

Regarding the differences in food system profiles, animal production systems and the role of Veterinary Services between developed and developing countries, it is noticeable that the latter are still very active in the *control* of major *diseases* whereas the former are now more orientated towards the inspection of *products* and *surveillance* for diseases, even if there is a renewed involvement in the epidemiology of infectious diseases within the context of emerging diseases. Nevertheless, all are now concerned about how their production environment will evolve, and the degree of food self-sufficiency to be achieved and controlled in a world of renewed major uncertainties.

4.4. Analysis of the Veterinary Services' perception of their impact on food security

The Veterinary Services of each country rated their impact on a scale of 0 to 5 for each of the six fields of activity covered by the questionnaire: (i) organisation, (ii) surveillance, (iii) disease prevention and control, (iv) sanitary inspection, (v) traceability and (vi) food hygiene. In each of these six fields, their impact was self-assessed for each of the four dimensions of food security: (1) access, (2) availability, (3) use and (4) sustainability.

A synthesis of these six tables rating the perceived impact was performed using multiple factor analysis, resulting in a single, composite score per country, thus characterising the impact perceived by the Veterinary Services of their own activities on food security. Cluster analysis revealed three classes of countries, for which the perceived impact was low, moderate or high.

To facilitate the interpretation of these classes, the medians of all the impact ratings were calculated and represented graphically (Fig. 6). Each pie chart is in four portions, representing the different dimensions of food security and proportional in size to the median of the perceived impact.

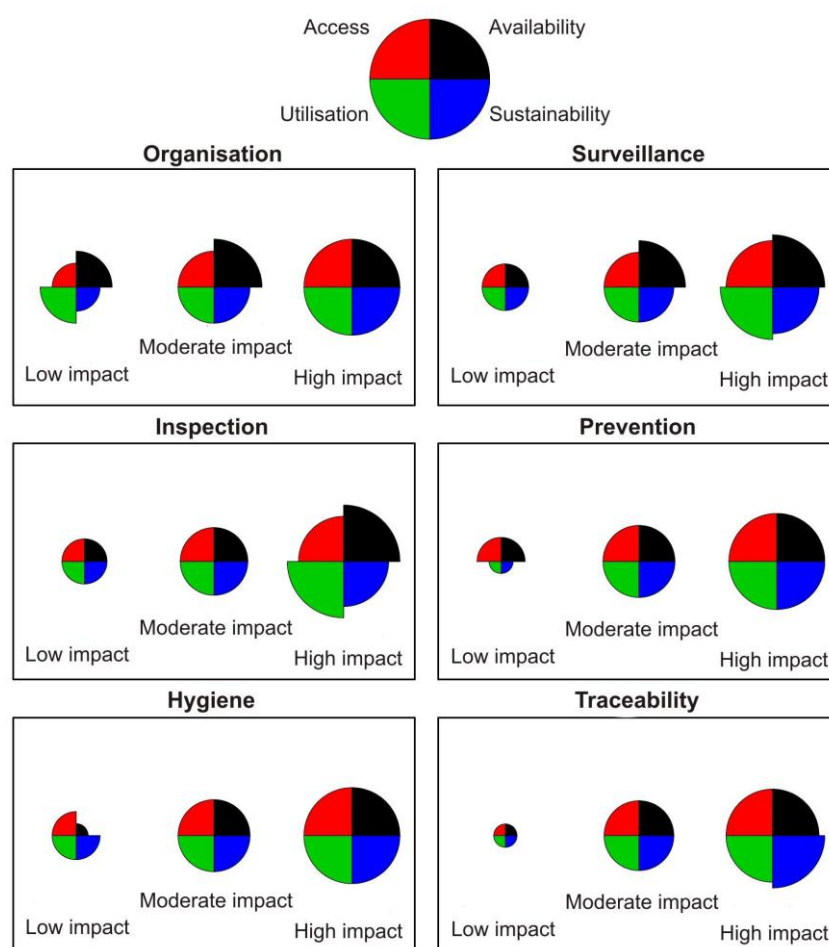


Figure 6. Veterinary Services' perception of the impact of their activities on the food security of their country. Analysis based on 108 completed questionnaires.

It is apparent that the majority of countries consider they have a high impact on food security. Nevertheless, a not inconsiderable number perceived their impact to be moderate despite the importance, as described above, of veterinary activities in production issues. Very few perceived the impact of their activities to be low. Perception of the impact on the four components of food security was globally quite homogeneous, though with a trend towards a higher perceived impact on the *availability* and *use* components for activities relating to organisation, surveillance and inspections, which together constitute a large part of the traditional core activities of the Veterinary Services. Sustainability is the component that, most logically, stands out among the activities relating to traceability.

Among the suggestions put forward, between 80% and more than 90% of the 108 countries that replied felt that the OIE should increase its involvement in the fields of food security, food safety, support for Veterinary Services, and the impact of animal production on climate change. Greater involvement in the field of animal welfare was requested by 33% of the countries that spontaneously put forward suggestions.

5. Conclusions and recommendations

In 1999, FAO alerted the world in the following terms (12): “*Sur une population mondiale qui approche les 6 milliards d’habitants, 800 millions sont sous-alimentés. Comment faire disparaître cette sous-alimentation chronique, et nourrir les quelque 4 milliards d’individus supplémentaires projetés par les Nations unies d’ici à 2050 ?*”¹²

In a context of new and complex global change, including demographic growth now forecast to bring the world’s population up to over 9 billion by 2050; quantitative and qualitative changes in dietary habits, especially in emerging countries and developed countries; the desire for better environmental protection and alternatives to fossil fuels and finite resources: food is without doubt a major challenge facing humanity in this century (13). Numerous studies are exploring possibilities for food self-sufficiency and seeking to quantify the energy resource-use balance by aggregating plant calories and animal calories, such as the *Agrimonde* initiative being carried out by CIRAD¹³ and INRA¹⁴ in France (14). These studies help to reduce uncertainty about what is feasible. Proposing food scenarios, such as the hypothesis of a mean annual consumption worldwide of 3000 kilocalories per person per day with a 15% proportion of animal products (in conjunction with plant products and fisheries products), leads us to question past trends and to prepare the animal production sector and the veterinary sector to meet the new challenges of the future. Under this scenario, the proportion of animal products in daily food intake would increase in Sub-Saharan Africa whereas it would fall in OECD countries, without requiring any large-scale acquisition of new land for agriculture but rather a marginal improvement in yields, with the exception of Sub-Saharan Africa and the former USSR. Conversely, a scenario of 3500 kilocalories would require, universally, substantial increases in both land area under cultivation and yields, including in Asia and Latin America.

The specific contribution made by livestock is complex, but nonetheless acknowledged, especially in the least developed countries. However, in these countries, quantitative studies are lacking, even if there are welcome initiatives such as “African Livestock” (ALive). ALive has been created from an initiative of World Bank and the OIE. It is functioning now on the basis of a partnership between the AU-IBAR¹⁵, the OIE the FAO including donors like the World Bank on the African continent to better document and compare the contribution of livestock to poverty alleviation and food security. ALive, still supported by the World Bank and the European Union, is helping to produce the second generation of strategic plans for poverty reduction, including the contribution of livestock production (7). Moreover, a review of the major national surveys from which food security characteristics and quantified indicators can be established is underway in many countries and there is a need for more active participation on the part of the relevant animal production services and Veterinary Services so as to ensure that animal production is properly taken into account in the data collected. These are the Household Income and Expenditure Surveys and Living Standard Measurement Study.

Since the veterinary sector contributes directly and indirectly to maintaining and improving the contribution of animal production to the food security of countries and to world food security in its widest sense, it is now important to promote quantitative studies in support of these facts.

New food security challenges are taking shape, in particular relating to sustainability of the environment and natural resources. The Veterinary Services and indeed the veterinary sector in general must continue to take into account the movement underway to transform food systems and the desire for diets that are sustainable from an environmental, societal and territorial perspective. The OIE, aware of the central role of the Veterinary Services in the world food system, offers to help countries follow the ‘OIE Pathway’, a procedure designed to sustainably improve a country’s Veterinary Services, using the OIE Tool for the Evaluation of Performance of Veterinary Services (OIE PVS Tool) (16). Within the framework of the constant improvement of this procedure, these evaluation methods will be able to evolve to reflect more strongly the major national and worldwide impact of Veterinary Services on food security.

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¹² Out of a world population approaching 6 billion, 800 million are undernourished. What can be done to eradicate this chronic undernourishment and feed an additional 4 billion by the year 2050, as forecast by the United Nations?

¹³ CIRAD: Centre de coopération internationale en recherche agronomique pour le développement (French Agricultural Research Centre for International Development)

¹⁴ INRA: Institut national de la recherche agronomique (French National Institute for Agricultural Research)

¹⁵ AU-IBAR: African Union/Interafrican Bureau for Animal Resources

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