

## LIVESTOCK DEVELOPMENT AND ANIMAL HEALTH IN LATIN AMERICA

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*Summary.* Livestock and its related agricultural and industrial processes represent an economic activity of great importance to several countries in the region of the Americas. The socio-economic development, the technological advances, the environmental conditions, and the preferences of national and foreign consumers are basic determinants of the level of livestock evolution. This evolution may be measured through bioproductive indicators such as the mortality and natality rates, age at first birth, age at slaughter, and profits in milk and meat. The indicators and the specific forms of intervention of the systems for veterinary attention and livestock development define the animal health profile. The livestock space in which this profile is developed, is a product of events accumulated by the action of men over environment. The health profile in each country is also related to the presence of different systems of livestock production. Veterinary epidemiology is assumed as a discipline that considers society, with its socio-economic organization, as an essential source to explain problems concerning this health profile and its possible transformations. To achieve this, an interdisciplinary effort is necessary to incorporate the strategic approach into the planning.

Livestock raising is an economic activity linked to the needs of local consuming and/or exportation, which follows and on certain occasions influences significantly, the social, economic, and political evolution of Latin America. In this region, there are cases in which livestock has been basic to the formation of important economic spaces and in others, constituted a productive sector of great interest, subsidiary to several exploitations, such as mining and plantations.

The concentration of inhabitants in urban areas and the technological advances, made way for industrial processes of greater complexity which have enabled their usage in feeding, medicine, clothing, and in the elaboration of dyeing and other products.

The changes in consumer tendencies and in productive techniques, modify the desired animal health profile. On this basis, animal health involves the situation of productivity and the trade of agricultural animals as well as the actions for their transformation. These vary according to social conditions and to the actions effected to reach the desire profile.

Health profile is part of a historic process in which men transform the environment to promote livestock development. On a more recent stage, this profile acquires other connotations due to the greater interest in breeding and consuming agricultural animals without interference by agrochemicals, antibiotics, steroids, and other products foreign to the natural conditions required for the growth and reproduction of these species.

Other aspects that are not derived necessarily from a specific biological agent are also important in the analysis of animal health. Generally, they obey multiple environmental factors or management of animals, the so-called "production diseases". These aspects have an outstanding position due to their important direct and indirect effects over the mortality of animals and productive and reproductive defficiencies.

The approach proposed is consistent with a strategic vision to improve the intervention not only by the veterinary services but also by the rest of actors involved in the modification of the health profile. In this way, answers to the economic adjustments in Latin America, come out inspired in this

conception. This is the case of veterinary attention at the local level.

These topics are developed in this paper on the basis of the experience of the transformations occurred in the Latin American region during the last decades as perceived the authors.

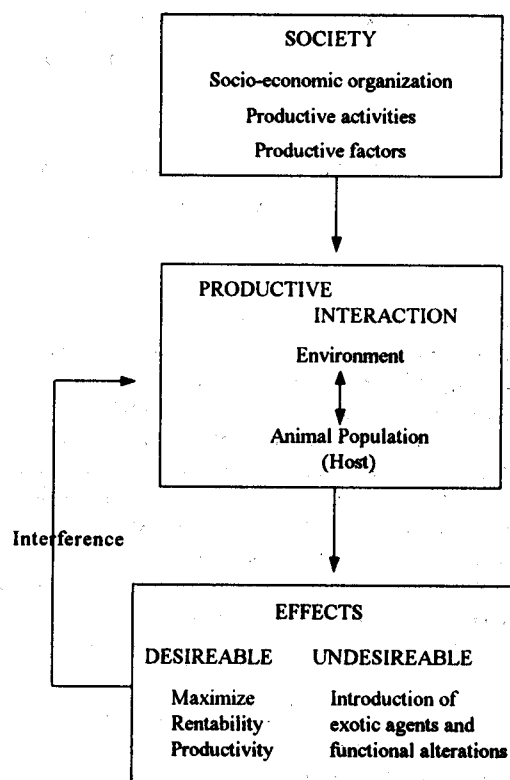
### THE LIVESTOCK PRODUCTION

Livestock production is a consequence of the processes of transformation undertaken by men over the agrolivestock environment through investments, technification, administration, and management. (1). This action is part of a strategy to meet the needs of having available food and other goods, of maximizing utilities, exporting, or obtaining other economic objectives related to the type of society to be dealt with. It is also the result of a conjunction of components including the political, social, economic, environmental, cultural, and administrative aspects.

Therefore, the general conditions as well as the strategic alignments of distinct social and economic actors involved, and the interactions produced among them, have influence over the development of livestock in a country. In this process, men introduce biologic, chemical or physical elements that affect the production capacity of the animals. On the other hand, the intensification and specialization of the productive processes cause unfavorable side effects whether on reproduction, survival or other aspects related to productivity. In both cases, the health of the herd is affected, interpreted not only as associated with the presence of a disease of known etiology, but also as a state that reaches the animal population, in a space and a determined period, represented by demo-productive parameters (Figure 1).

Through this process of transformation, different sectors are formed, closely linked to livestock raising. This diversity is first found within the livestock activity. Livestock exploitations are organized under dissimilar technological, social, and economic conditions, although within the same nation. Secondly, other sectors appear as the degree of technological complexity evolves, and these in-

FIGURE 1. Livestock, animal health, and diseases.



tegrate to the space of interests and conflicts inherent to the different perspectives and interests at stake.

As an example, in several evolutionary models of the livestock export industry in South America, incipient forms of tanned products, salting places, wool processing, cold storage slaughterhouses, veterinary product industry, and other different suppliers, mainly of balanced food, agrochemicals, machinery, and equipment were successively incorporated. Concomitantly, a highly important network of commercial activities, other industries and several services was developed, having financial activities and transportation among the outstanding ones. In addition, the activities at livestock auctions, other centers of commercialization, rural exhibitions as well as the industry and the trade linked to the production of physical infrastructure storage and to the services in ports. (1)

Also, the official veterinary services with their laboratory and field systems, were developed, and programs mainly linked to the requirements of foreign trade were implemented.

These social sectors form a "livestock space" in which an intricate combination of factors is articulated. An ecological spatial structure and an other animal-demographic one may be identified, besides livestock production, industrial, social and political. The flows of animals, products, people, and financial resources are included in this livestock space, whose direction and intensity are indicators of the prevailing productive process.

Today, it is not possible to obtain an adequate knowledge to solve animal health problems in Latin America if it is not clear how they relate within their social sphere.

#### THE PRODUCTIVE SYSTEMS IN LIVESTOCK BREEDING

The social approach of cattle raising enables seeing the animal population as an element within a production structure in which there are no divisions among biologic, ecologic, administrative, economic, and social aspects.

In the entire livestock productive aggregate, continuous relationships do not necessarily occur among each of these parts of livestock raising as a whole. There are variations that are manifested through differences in technological development and in the type of social relationships established, giving rise to distinct forms of organization. In each production system, the specific livestock populations share the fact of being linked to the same category, for having the same production structure. This characteristic appears somewhat clear in the geographic space, and enables delimiting livestock regions in accordance with the forms of animal production.

In each of these modalities, the health-disease phenomena are manifested as animal health profiles, specific and proper of these productive systems. From this perspective, it is possible to identify those causal relationships of animal health problems that transcend those which are merely biological.

These considerations on the livestock productive space are essential to the understanding of animal health profiles due to their different expression, according to their regional relationship with the organization of the production systems.

The animal health indicators enable the characterization of different situations according to the predominant structure of animal production.

Following are some of the most common production systems in Latin America (3, 6):

##### *Extensive system of beef cattle*

This system is predominantly extractive, for raising beef. There is a great release of young male heifers. They are characterized by an extensive management of large herds in wide extensions of land. The investment in capital goods, labor, and technology is scarce. They occupy new (peri-selvatic regions) or marginal geographic spaces (extensive overflowed or dry plains, mountain sides) of limited productive capacity. They have a position distant from the large urban centers, communicating through a poor road infrastructure.

##### *Breeding systems of beef cattle*

This system differs from the previous one on its better use of lands (that are improved or have a greater productive potential). This is reflected in the prolongation of the productive cycle in the same property (completion), and for this reason, the production turns out less extensive than in the previous system. The size of properties and herds is also smaller. A larger application of labor, capital, and technology is added to the value of the animal capital (womb and breeding). When this system is implemented in more productive lands, it is located in areas closer to small towns, with a better access to highways.

##### *Fattening systems of beef cattle*

They are exploitations exclusively intended to the terminal fattening of cattle, and occasionally to the repasturing of animals. It is an activity of transformation of the capital animal into product animal, by means of the terminal conversion of in to into

animal protein. The enterprising condition is given by the great investment of capital, labor, and technology.

The lands are of high value for their capacity for alternative use, usually located near medium sized cities, with good access to transportation networks and to the infrastructure of transformation of the product, such as slaughterhouses and cold storage houses.

#### *Enterprising dairy production systems*

They are production systems intended to raise cows specialized in producing milk in order to commercialize their production. No large extensions of land are required but a high degree of intensification is. The land has alternative uses, thus its high value. The enterprising characteristic is given by the high investment of capital and technology, as well as by the greater proportion of salaried labor.

The exploitations are near the middle-and large-sized urban centers. Thus, they have a good access to the road network, on which they have a strong level of dependency due to the constant need to send a perishable product to the processing plants.

#### *Family systems of production*

They are characterized by the diversity of species raised (milking cows, swine, poultry, rabbits, etc.). The labor used is mainly familiar. The production is intended to the selfconsuming and to the sale of surplus, which is characterized for commercializing milk, cheese, male calves and hogs. Regarding this modality of animal production, the more integral use of productive resources is found in the cooperative or community groups. Another characteristic of these systems is the hand-crafted transformation of the production: dairy produce, corn, textiles.

In general, the systems of familiar production hold spaces that are near urban centers (large, medium, and small) and they are frequently shared with the activity of milk enterprises. In other cases, the spaces held by these familiar methods are exclusive and relatively distant from the other forms of production and commercialization, par-

ticularly in colonization areas or indian community areas (for instance, the andean region).

In summary, animal exploitation is intensified by the transforming action of men in those spaces in which the systems of enterprising production prevail. This occurs through the investments of capital, technology, and labor, specialized in some cases. Provided the existence of levels of productivity-comparatively high in relation to the pre-enterprising and family systems of production, the animal health profile in the enterprising milk production presents a high natality rate, a low mortality rate, and a relatively early age at first birth. In the systems of enterprising fattening production, mortality is low and the slaughter age of steers is early, depending on the quality of the pasture lands, the management and the supply of additives in food.

FIGURE 2. Relationship among structures of livestock.

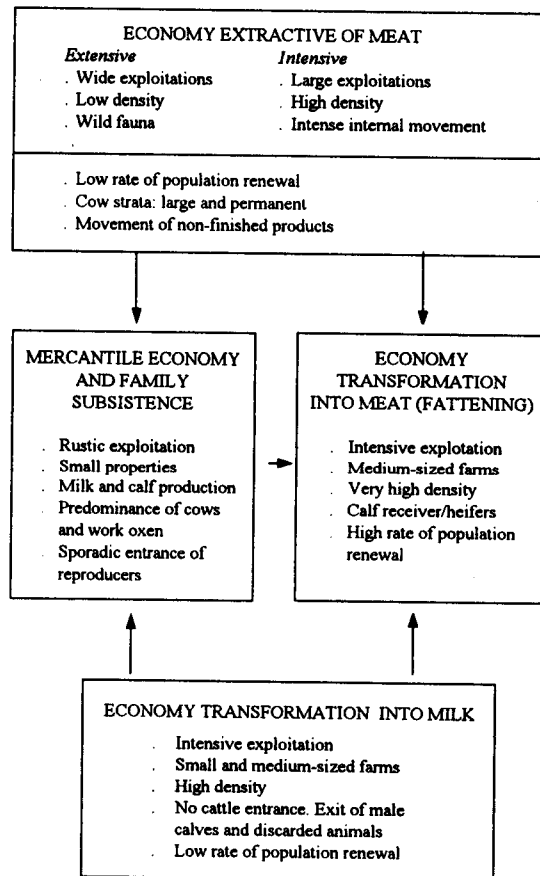
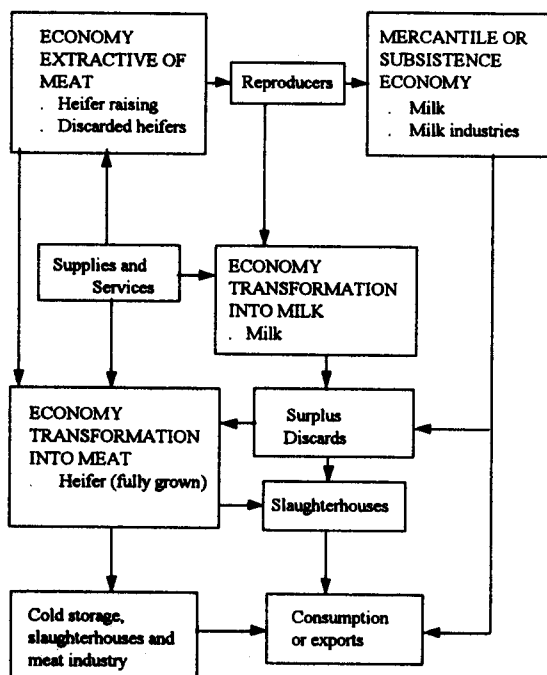


FIGURE 3. Flows among economic structures of livestock.



The epidemiologic and economical interrelations that appear from the articulation of these systems are observed in Figures 2 and 3.

#### ANIMAL HEALTH AND EPIDEMIOLOGY

It has been pointed out that the health of animals is the result of the transforming action of men over the environment. Other factors that are random and uncontrollable take part in this interrelation, such as the trophic strategy of survival of the pathogenic microorganisms that are parasitic in livestock; the health disorders of non-communicable, functional type associated with a decrease in the ecological valence of livestock; or the deficient answers to production stimulus.

This interaction is expressed as a state of health that reaches the animal population in a determined moment and concrete space. On this account, the health level will be considered good,

when the expectations of the society prevail, represented by the activity of men.

Therefore, the health-animal disease binomial is a process originated from the social organization and from the livestock production systems. The states of health-disease are a consequence of the alterations introduced in the livestock environment by the economic and social determinants. Thus, these alterations modify the ecologic animal-environment process eventually producing as a final result, disease, functional disorder, or death.

Nevertheless, these indicators have several expressions according to the characteristics of the different forms of production, or the type of animal species under consideration.

In the case of cattle production, the relevant indicators are the following: i) natality and mortality, for the familiar production systems; ii) age at first birth, natality and mortality, for the extensive raising system; iii) natality, age at first birth, mortality and slaughter age, for the enterprising raising systems; iv) for the enterprising areas of fattening, slaughter age and mortality, and v) for the enterprising dairy areas, natality, mortality, and age at first birth.

On this basis, the health of animals is not limited to the non-existence of disease but it also incorporates the effects of the foster activities of the health of animal population, including its protection against disease.

The concept of "disease" should be characterized for the agricultural animal population, as the effect of any event that disturbs or damages its health and productive and reproductive capacity. In the context of this paper, the appearance, maintenance, and spread of any animal disease is an unexpected product of the transforming action of men in order to increase production, livestock productivity, and/or profitability.

The knowledge and understanding of the mechanisms responsible for these problems as well as the overall interpretation of animal health may only be focused in an integral way by a totalizer discipline like epidemiology.

In order to solve the health problems of the animal population, it is necessary to understand their reality as a whole, in each country or region. An effective solution starts from an objective

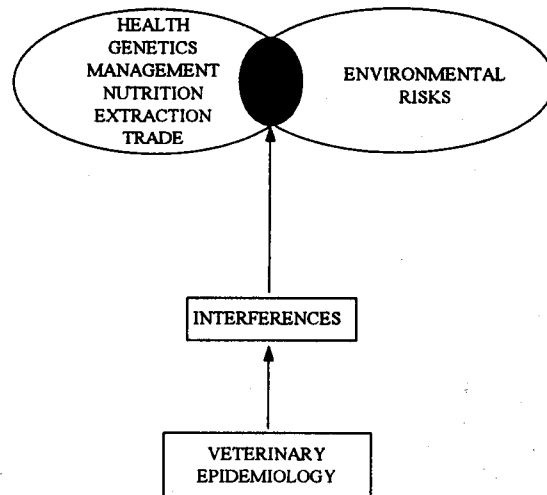
knowledge of the determinant factors of animal health in a given space and moment. Once the problem is tackled, it is necessary to identify sub-spaces according to their particular risk factors to which the animal populations are exposed. The concept of risk factor is related to the identification of the economic, social, and ecological determinants that partially explain the health problems. In this analysis, the fact should be incorporated that the animal population in a livestock space is subdivided into a series of distinguishable animal sub-groups. These are characterized by a composition which is inherent, either through special production conditions and/or through their special interrelation with the environment.

Epidemiology has a very important role to play in this task, specially concerning its larger dimension, which is the understanding of animal health as a whole. Thus, it is a matter of applying epidemiology as a discipline that considers society, with its social-economic organization, as an essential source to understand the problems and their possible solutions.

In the approach employed in this study, veterinary epidemiology incorporates, as a matter of concern, the influence of the structure and the economic and social dynamics of cattle production over the genesis and distribution of the health-disease status in the agricultural animal populations in order to prevent disease and improve animal health. Epidemiology should be interested in everything that interferes, affects, or delays animal health and production and not only with the infectious and parasitic diseases, as is customary (Figure 4).

This concept implies recognition of the animal health-disease relationship as a historic, socio-economic, and ecological process and therefore, veterinary epidemiologic knowledge should analyze the effects (productive or pathogenic) of the bi-univocal relationship between the economic-productive and the natural-biological. Therefore, it is necessary to change the present orientation of this discipline towards the productive-biological aspects so as to identify the quantitative differences that the health-disease profile suffers before the changes in the production structure. In all the

FIGURE 4. Approach of veterinary epidemiology.



analyses, veterinary epidemiology should recognize the unity between the social-economic reality and the biological reality of the herd. On this account, it is important to evaluate the epidemiologic profile of a given animal population, which is equivalent to analyzing livestock strata with different production characteristics, with different risks, and with different productive potentials.

Due to the characteristics and the applications of epidemiology in animal health besides the epidemiologists other professionals of animal health and public health, such as ecologists, economists, planners, health administrators, laboratory staff, field veterinarians, extension agents should be included. In short, it is a matter of granting epidemiology a multidisciplinary character.

#### ECONOMIC IMPACT AND ANIMAL HEALTH PROBLEMS

Among the socially unfavorable effects derived from animal health problems, those affecting public health merit special consideration. One of these problems is the scarce availability of food of animal origin, mainly milk, meat, and eggs, with its sequels of hunger and malnutrition.

Zoonoses constitute other animal health problems that affect public health. These represent an important threat for the welfare of human populations. In the urban and rural areas of the countries under development, zoonoses continue to present high frequencies.

Besides these aspects, there are other sectors of the socio-economic structure of the countries that are seriously affected when disorders in the field of animal health are presented. This situation differs in each Latin American country according to the importance it has in the livestock as a social and economic activity.

#### CARE OF THE ANIMAL HEALTH PROBLEMS: VETERINARY ATTENTION AT THE LOCAL LEVEL (2)

In the field of animal production, animal health, due to its economic and social implications, constitutes an asset for each community. It is inscribed in a curve whose limit is given by the potentiality of the production of the animal herd, in socially acceptable terms. Therefore, the objective of any animal health policy, represented concretely by a set of activities intended to promote the health status of agricultural animals, should have as an objective the health of the animals, and not the fight against their diseases.

The animal health activities undertaken by the veterinary services should consider the actions required by the presence of disease as a necessary evil and a temporal event. On the contrary, it is usual to identify the activities of veterinary services of animal health with the diseases and not with the productive aspects of animal health.

Management of animal health services (veterinary attention) involves at least two fields: (7): formulation, application, control, and evaluation of strategic and political proposals; and the appropriation, distribution, and control of their own resources for the instrumentation and practice of these proposals. This means that the administrative process of veterinary attention is manifested when there are decision instances that carry out the management and control of political proposals and resources.

This administration process of veterinary attention has two great moments: a) the moment to lead, which consists on the formulation of policies and elaboration of specific strategies, appropriation, distribution, and control of resources and responsibilities; definition and supervision of organization and administration styles adequate to the strategies; monitoring and strategic evaluation of the changing process; development of the capacity of perception and management of junctures (administration); b) the moment to manage, administering the changing process into practice, optimizing the effectiveness, efficacy, and efficiency in the management and control of resources and of procedures, and to generate information about the environment (operations).

This way of viewing the administrative process of veterinary attention (direction and management), places its perspective and work in the identification, multidimensional analysis, prospective evaluation and hierarchy of the problems that arise in the relationship between the institution of animal health service and the macrosocial reality in which this service is inserted.

The administrative instances recognized are the following: instances of guidance and central management in which political and general strategic features, distribution of resources and corresponding responsibilities are established; instances of intermediate guidance and management; and local instances, which are units for producing services, and for their execution, where the social vision acts and where practice enables carrying out the policies, strategies, plans, and rules and where the knowledge that feedbacks the process is gathered. All these in a given livestock space, object of the animal health policy.

These principles are consubstantial with those of situational planning that require, as starting point, the characterization of the Latin American societies, and establish, directional arches in terms of health and not disease whenever programs of animal health are written (4, 5).

Priorities in animal health are conditioned by ecologic, economic, and social history. Animal health is therefore, a result of numerous social bioeconomic conditionings that operate over the

genetic capacity of the animals and as such, a variable state dependent on ever changing influences. Accordingly, animal health programs will be modified according to the power correlation among social agents involved, and according to the perception and action of each one of them, including the health authorities of a country.

On passing to the level of the impact that induce the behavior of the several actors involved in the animal health processes, it is taken as a wide framework that health-disease problems are an inherent part of the social event, with all the characteristics of historicity, complexity, uncertainty, conflict, and dependence implied.

In summary, the health profile of an animal population results from its particular way of insertion in the productive process, in a given moment and in a determined space. The health situation of a livestock population is given by a set of problems, or problem-situations referring to the health-disease phenomenon and to the service systems organized to deal with them, explained from the perspective of each social actor, bearing in mind how they operate according to their views on the general determinants and the specific conditions.

Prospective scenarios should be reviewed periodically to adjust them for the development of changes in the animal health situation (8). In order to develop this process of situational change the following steps could be considered: to analyze the current situation animal health situation, its determinants and conditioning factors in the different livestock populations, according to the ways of animal production; establishing the deficits in terms of situations attained by animal health of each one of the ways of production, according to alternative hypothesis of evolution of the determinants and conditioning factors; defining political options of animal health policies that may be capable of resolving current problems; evaluating the economic repercussions of these policies; to establish an information, monitoring, and epidemiological surveillance system to reanalyse the problems, revise the modifications, and readjust the operations in terms of the new situation.

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