Chapter

Introductory Chapter: Livestock Health and Farming - Regional to Global Perspectives

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1. Introduction

Livestock comprises a global asset of more than $1.4 trillion. The livestock sector is important in both developed and developing counties. Almost 1.3 billion peoples are involved with the livestock sector directly or indirectly. Animals are an important source of nutrients in the form of meat and milk. Livestock products provide 33% of total protein intake throughout the world [1].

Livestock is one of the major subsectors of agriculture that is growing rapidly because of the increase in demand for livestock products [2]. According to estimates, global meat production would increase to 465 million tons by 2050 from 229 million tons in 1999. Similarly, milk production is expected to increase to 1043 million tons by 2050 from 580 million tons in 1999 [3].

There is a vast difference between the livestock sector of developed countries and developing countries [4]. There are more chances of an increase in the value of livestock in developing countries due to growing demand, but in industrialized countries, demand is stagnant. To meet this requirement, farmers should work on the vertical expansion of livestock [5].

The livestock sector has many environmental impacts. Globally, the livestock sector is the second-largest pollution-producing sector after the electricity industry [6]. Animals are responsible for emissions of gasses such as ammonia (NH_3), carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O). These gasses are the cause of global warming and acid rains [7].

The health of animals can be described as normal physiological functioning of all the systems of the body of animals to achieve the highest production or the lack of disease. Whenever an animal gets ill, economic issue arises. Livestock diseases result in loss of production, treatment cost, prevention cost, and a barrier to trade [8].

In developed countries, any livestock disease outbreak would affect the economy of the farm and country. On the other hand, in developing countries in case of any livestock disease outbreak, additional factors like food scarcity, loss of draught power, and social security are also emphasized [9]. Public health is also an issue related to livestock disease as many of these diseases are zoonotic. Transmission of these diseases takes place either by direct contact (tuberculosis, brucellosis) or via vectors (Lyme disease, West Nile disease, Rift Valley fever) [10]. Spread of antimicrobial resistance because of the misuse and abuse of antibiotics in the livestock sector is also an iceberg that we are facing today [11].

2. Animal production systems

Animals are reared under different types of production systems throughout the world. Animal production systems are mostly categorized on the basis of capital investment and outputs. The first and most primitive animal production system is an exploitation production system, which is categorized by no capital investment and minimal human labor. Animals depend upon environmental resources and outputs are highly variable [12].

Animal production system is an extensive production system. This production system is categorized by minimal inputs and outputs. The survival of animals is important as compared to peak productivity. This system is a not market-oriented system. Subsistence farming and ranching are two examples of the extensive production system. In subsistence farming, animals are kept to fulfill the need of the family of a farmer [13]. Sometimes extra products are sold. Ranching includes large herds of animals grazing here and there. Treatment or vaccinations are performed rarely in the extensive production system [14].

The intensive animal production system is featured by high input and high output. Animals are kept in a favorable environment and all the nutrition requirements are met. Animals are vaccinated according to schedule. Prompt treatment of diseased animals is also a silent feature of intensive farming. To get maximum production from animals is the main aim of this system [14].

3. Effect of climate change on livestock health

Climate change has the potential to affect animal health both positively and negatively. Climate change can affect animal health directly, indirectly, and by altering environmental conditions. The direct impact of climate change on animal health is manifested by an increase in temperature and heat waves [15]. Heat stress in animals can cause metabolic problems, immunosuppression, and oxidative stress. These complications can eventually lead to the death of the affected animal [16].

Indirect impacts due to climate change on animal health can be due to change of microbial distribution or density, the incidence of vector-borne diseases, and water and food scarcity. For instance, a slight temperature change can alter the relative humidity and promote the reproduction of insects. These insects can act as a vector of many protozoan and viral diseases [17].

Climate change also affects the parasitic diseases of animals as most of the gastrointestinal parasites of animals live only a short life span inside the body of the animal and most of the remaining life cycle of these parasites is completed outside the body of their host. So, the life cycle of gastrointestinal parasites is affected by climate change [15, 18].

4. Impact of livestock movement and trade on disease incidence

Infectious diseases can be transmitted from one host to other susceptible hosts in different ways like direct contact, vector-borne, and airborne transmission. Animal diseases can be controlled by decreasing the direct contact of healthy animals with sick ones. Trade of livestock and its products is a complex process [19].

Although the OIE has set standards about animal health and the spread of zoonotic diseases, still, most of the livestock trade is based on the bilateral agreement of countries. Two main areas of focus by the OIE in livestock trade are animal

health and the welfare of animals. Movement of animals can introduce exotic animal diseases or zoonotic pathogens [20, 21].

FMD outbreak of 2001 in England is one of the major examples of the spread of disease by animal movement. The first outbreak of FMD was reported in February 2001 from the North of England. Within 2 months, FMD virus had spread to France and the Netherlands by the transportation of animals from England. This outbreak resulted in the loss of almost £8 billion to the public and private sectors [1, 22].

Another example of the spread of disease by the movement of animals is the rabies outbreak in Flores Island in Indonesia. Until 1997, Flores Island was rabies-free. Rabies outbreak was reported after the import of three dogs from rabies-endemic area. This outbreak resulted in the death of 113 humans and 50% of the dog population was culled. But still, rabies is endemic in Flores Island [23, 24].

Markets play a very important role in the spread of livestock diseases. It is vital to understand the role of quarantine measures and risks associated with the movement of animals. Spread of diseases by animal movements and trade is not the issue of any one country, rather it is a global problem. Following standards for animal trade and global cooperation can help in minimizing the disease spread by animal movements [1, 20].

5. Political instability and livestock health

Political stability and food security of any country are directly linked. A politically stable country would be superior to a country that is politically unstable in terms of food availability, the health of humans and animals, and education [1]. In any emergency situation, migration of people and animals would increase the chances of zoonotic outbreaks. For instance, during the Gulf War, rinderpest was introduced in Turkey by the migration of animals from Iraq. Rinderpest outbreak caused panic in Turkish farmers too, and they started to sell their sick animals in the markets. This panic approach further spread the disease [25].

Before 2014 uprising Syria was at stage 3 of Health "Progressive Control Pathway" for FMD. But after that due to lack of veterinary services, that status is lost. Vaccination of animal herds against brucellosis was also impeded by this revolt which resulted in a marked increase in brucellosis incidence in the human population [26]. In 2014, political instability in Nigeria became one of the reasons for the re-emergence of H5N1 in poultry. Because of improper control strategies, H5N1 outbreaks were also documented in the next 2 years from neighboring countries [1].

6. The social effects of livestock diseases

The diseases of livestock can affect the community at different levels varying from an individual farmer to a multinational food chain. Due to livestock disease in any area, society would be affected either directly or indirectly. A direct effect of livestock disease includes the zoonotic aspect and possible morbidity and mortality due to these zoonotic pathogens. An indirect effect of livestock diseases includes financial burden and social and indirect health consequences [27].

In developing countries, livestock farming is not only their business but the way of their life. Livestock diseases in developing countries where most of the livestock is kept under subsistence farming can seriously affect the social norms [28]. The decrease in livestock production would affect the total income of farmers and hence living standards. Indirect health consequences due to animal disease include stress,

anxiety, and depression to livestock producers [29]. For example, culling of animals due to the outbreak of bovine spongiform encephalitis in Canada resulted in stress and guilt feeling in owners of those animals. Many of these livestock owners were keeping inherited herd [27].

7. Role of biosecurity in livestock farming

Biosecurity at the farm level involves all the steps taken to limit the entry of pathogens and the spread of disease at the farm. Biosecurity applies to both contact of farm animals with other live animal and indirect contact with any contaminated vehicle or equipment [30]. External biosecurity measures are those that are used to decrease the chances of entry of pathogens into a farm. Internal biosecurity includes steps taken to prevent the spread of disease to healthy animals within a farm from diseased animals [31].

Enforcement of biosecurity at every farm and country border is a global responsibility for combating threats like food security and animal and human diseases. Good farm biosecurity can play a vital role in minimizing the outbreaks of both endemic and exotic diseases [32].

Farm biosecurity is based on four principles. The first is limiting the introduction of new animals in the herd and adopting quarantine measures. The second biosecurity principle is controlled movements of people and vehicle and equipment hygiene. The provision of feed and water that is free from pathogenic contamination is the third principle. The fourth principle is the regular vaccination of animals against endemic diseases along with accurate surveillance and reporting of transboundary animal diseases [33].

8. Conclusion

Animal health is directly linked to food security. Now the world should accept the fact that animal diseases are not a problem of any specific country or region, rather they are global issues. Developing countries should adopt the international standard for the trade of animals and augment the disease surveillance system. For a better future of the world, decision-makers should turn their attention toward the food-producing system and epizootics.

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