

**Review Paper**

Veterinary Services as a Panacea for Agricultural Development and Increase in Nigeria's Gross Domestic Product (GDP): A Review

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Abstract

Veterinary Services means the governmental and non-governmental organizations that implement animal health and welfare measures and other standards and guidelines in the OIE Terrestrial Code and Aquatic Animal Health Code (Aquatic Code) in the country which is under the overall control and direction of the Veterinary Authority. The role of veterinary professionals is relevant in the improvement and protection of animal and human health, animal welfare, food quality, food safety, food security, ecology, ethology, epidemiology, development of drugs and pharmaceuticals, biomedical research, educators, trainers, policymakers, wildlife conservation, protection of the environment and biodiversity. In Nigeria, this sector faces peculiar challenges such as persistence of notable livestock diseases, administration of Veterinary Services by quacks, insufficient funding in the control of diseases, lack of political will to implement policies in disease control such as movement control of animals within and across the country's borders, poor hygienic practices in the abattoir, lack of proper meat inspection, lack of access of bank loans to livestock farmers and limited registration of farmers with Nigerian Agricultural Insurance Cooperation. These poor practices constitutes a setback in livestock production hence posing significant threat to animal and human health, food quality, food safety, food security and other vital sectors where Veterinary Services are included. This pivots the necessity for improved Veterinary Services in both public and private sector for increase in livestock production. Improved privatization of Veterinary Services will provide employment to the ever increasing veterinary professionals and the society at large which is no doubt a means to agricultural development due to advances in livestock production, international trade and subsequently increase in the nation's Gross Domestic Product (GDP). Growth in agricultural GDP is at least twice as effective in reducing poverty as nonagricultural GDP growth. Without adequate investments in agriculture there will be higher food prices, which is a risk that could eradicate five to ten years of poverty reduction efforts.

Key words: *Veterinary Services, animal health, agricultural development, livestock, gross domestic product*

Introduction

Agriculture remains an important economic sector in many developing countries. It is a source of growth and a potential source of investment opportunities for the private sector. Two-thirds of the world's agricultural value added is estimated to be created in developing countries. Nearly half of the world's population about 2.9 billion people, live in rural areas. Agriculture is a source of livelihood for an estimated 86% of these people (World Bank, 2008). Agriculture provides employment to 68% of the population in agriculture-based countries and 48% in transforming economies. About 94% of rural households live from their agricultural activities in agriculture-based countries; this proportion falls to 76% in transforming economies (Nnadi *et al.*, 2013).

Many developing countries have seen major shifts in their agricultural policies toward the modernization of the agricultural sector over the past two decades. The change in policy contributed to more sustainable growth of the sector (Nnadi *et al.*, 2013). CSAC (2008) noted that growth in agricultural productivity and food prices was important in determining food security, wage levels and competitiveness in the economy as a whole. Agriculture can contribute to spurring growth, reducing poverty and sustaining the environment. GDP growth in agriculture is at least twice as effective in reducing poverty as nonagricultural GDP growth (World Bank, 2008). Agriculture remains the dominant sector in a large number of developing economies. It accounts for a major share of the gross national product and is still the main source of employment (Mahul, 2010). Despite these problems, agriculture constitutes approximately 30% of Africa's GDP and contributes about 50% of the total export value, with 70% of the continent's population depending on the sector for their livelihood (CEEPA, 2002).

Livestock play an essential role in food production and are likely to do so for some time to come (Bonnet *et al.*, 2011). Nigeria's livestock resources include 13,885,813 cattle, 34,453,724 goats, 22,092,602 sheep, 3,406,381 pigs and 104,247,960 poultry. Traditionally managed stock is over 85% for all species while commercially managed is only significant for poultry at 13.8% and to a lesser extent for pigs at 3.24% (Tewe, 1997). Demand for livestock products may be stagnating in the developed world but, in developing countries, where many people depend on animals for transport as well as food, demand is likely to increase. According to the report of a study presented at an assembly of the World Organization for Animal Health (OIE) in Paris, a shortage of veterinarians in many countries is limiting development and putting global food security at risk (Bonnet *et al.*, 2011).

Veterinary Services means the governmental and non-governmental organizations that implement animal health and welfare measures and other standards and guidelines in the OIE Terrestrial Code and Aquatic Animal Health Code (Aquatic Code) in the country which is under the overall control and direction of the Veterinary Authority. While the Veterinary Authority is the governmental authority of a country, comprising veterinarians, other professionals and paraprofessionals, having the responsibility and competence for ensuring or supervising the implementation of animal health and welfare measures, international veterinary certification and other standards and guidelines in the OIE Terrestrial Code in the whole country (OIE, 2007).

Over the years, veterinary professionals have played significant and contributory roles in animal health (include advising the farmer on proper herd health management practices such as proper de-worming, vaccination, nutrition, environmental sanitation, disease prevention and control and treatment of animal illnesses), human health, animal welfare, food quality, food safety, food security, ecology, ethology, epidemiology, physiology, psychology, development of drugs and pharmaceuticals, biomedical research, as educators, trainers, and policymakers, and in wildlife conservation, protection of the environment and biodiversity (FAO, 2015; Springer, 2015). As challenges have arisen, veterinarians have found ways to adapt given that their knowledge and training makes them multifunctional professionals. This aids societies and its animals to stay healthy and productive. It is therefore not surprising that Veterinary Medicine is very popular among young people deciding on a career (FAO, 2015).

The prevention and control of animal diseases is a frequently reoccurring problem at all national and international levels which usually brings about direct action being taken by Veterinary Services. Livestock diseases in Nigeria have seriously influenced the productivity of livestock population. In Nigeria, the loss of livestock exists at a much higher rate than in developed countries and at times such production losses range between 30 and 40% which could be estimated at a minimum of 200 million naira per annum at 1981 price (Majiyagbe and Lamide, 1997). It is now widely acknowledged that healthy and productive livestock make important contributions to food production, income generation, job creation, economic growth, and poverty alleviation (FAO, 2015).

As for global food security, institutional estimates indicate that a total of 925 million people were undernourished in 2010 compared with 1.023 billion in 2009. Most of the decrease was in Asia, with 80 million fewer hungry, but progress was also made in sub-Saharan Africa, where 12 million fewer people went hungry. However, the number of hungry people is higher in 2010 than before the food and economic crises of 2008-2009 (FAO, 2015).

On the issue of aquaculture, a high level of management involving the maintenance of adequate hygiene practices, use of good water quality, disease resistant species and the employment of services of qualified aquatic/fish veterinarian will help prevent or reduce the incidence of diseases. Lack of skilled and experienced Aquatic Veterinarians with adequate knowledge of principle of disease prevention and control in the aquaculture industry is a major factor affecting fish culture in Nigeria. This has resulted from the non-inclusion or little time allocated to the teaching of Fish and Wildlife Medicine to veterinary students in the Veterinary Curriculum in Nigerian Universities (Agbede *et al.*, 2003; Adedeji and Okocha, 2011).

This review highlights the role of Veterinary Services, challenges of these services in Nigeria, the need for privatization of veterinary services and the resultant effect of improvement of these services which will lead to increase in livestock production, improved international trade, food safety and food security and invariably leading to agricultural development and increase in the nation's GDP.

Veterinary Services

Types of Veterinary Services

Veterinary Services can be classified in four categories: (a) curative services, particularly the diagnosis and treatment of diseased animals; (b) preventive services to stop the emergence and spreading of diseases through vaccine production, vaccination, vector control (tick control, tsetse control) and control measures, such as quarantine and forced slaughter of affected animals, veterinary surveillance, diagnostic support, drug quality control and veterinary research; (c) production of veterinary pharmaceuticals (production and distribution); and (d) human health protection, such as sanitary inspection of animal products (de Haan and Umali, 1992).

Functions of Veterinary Services

The Veterinary Services contribute to the achieve their objectives, through the direct performance of some veterinary tasks and through the auditing of animal and public health activities conducted by other government agencies, private sector veterinarians and

other stakeholders. Where veterinary or other professional tasks are delegated to individuals or enterprises outside the Veterinary Authority, clear information on regulatory requirements and a system of checks should be established to monitor and verify performance of the delegated activities. The Veterinary Authority retains the final responsibility for satisfactory performance of delegated activities (OIE, 2007).

Veterinary Services at the farm level

Through their presence on farms and appropriate collaboration with farmers, the Veterinary Services play a key role in ensuring that animals are kept under hygienic conditions and in the early detection, surveillance and treatment of animal diseases, including conditions of public health significance and it also involves vaccination of animals against diseases. Veterinary Services also provide livestock producers with information, advice and training on how to avoid, eliminate or control food safety hazards (e.g. drug and pesticide residues, mycotoxins and environmental contaminants) in primary production, including through animal feed. Producers' organizations, particularly those with veterinary advisors, are in a good position to provide awareness and training as they are regularly in contact with farmers and are well placed to understand their priorities. Technical support from the Veterinary Services is important and both private veterinarians and employees of the Veterinary Authority can assist. The Veterinary Services play a central role in ensuring the responsible and prudent use of biological products and veterinary drugs, including antimicrobials, in animal husbandry. This helps to minimize the risk of developing antimicrobial resistance and unsafe levels of veterinary drug residues in foods of animal origin (OIE, 2007).

Biosecurity

Veterinary professionals also share responsibilities for bio-security. This is a joint effort that must be shared by all who have obligations for animals and/or animal products, both farm and companion animals. The conventional barriers that nature provides can no longer be relied upon to exclude pandemic dissemination from country to country. In this view, the veterinarian is a sentinel for the early detection of, and early response to, accidental or intentional introduction of exotic diseases. The veterinarian is, in fact, the first line of defense that society counts on against agroterrorism and bioterrorism. In sum, veterinary professionals are key players on bio-defense, and thus for national security and welfare (FAO, 2015).

Meat inspection

Slaughterhouse inspection of live animals (ante-mortem) and the carcass (post-mortem) plays a key role in both the surveillance network for animal diseases and zoonoses and ensuring the safety and suitability of meat and by-products for their intended uses. Control and/or reduction of biological hazards of animal and public health importance by ante- and post-mortem meat inspection is a core responsibility of the Veterinary Services and they should have primary responsibility for the development of relevant inspection programmes. Wherever practicable, inspection procedures should be risk-based. Management systems should reflect international norms and address the significant hazards to both human and animal health in the livestock being slaughtered. The Codex Alimentarius Code of Hygienic Practice for Meat (CHPM) constitutes the primary international standard for meat hygiene and incorporates a risk-based approach to application of sanitary measures throughout the meat production chain (CAC, 2005).

Certification of animal products for international trade

Another important role of the veterinary services is to provide health certification to international trading partners attesting that exported products meet both animal health and food safety standards. Certification in relation to animal diseases, including zoonoses, and meat hygiene should be the responsibility of the Veterinary Authority. Certification may be provided by other professions (a sanitary certificate) in connection with food processing and hygiene (e.g. pasteurization of dairy products) and conformance with product quality standards (OIE, 2007).

Other roles of the Veterinary Services

Most reported outbreaks of foodborne disease are due to contamination of foods with zoonotic agents, often during primary production. The Veterinary Services play a key role in the investigation of such outbreaks all the way back to the farm and in formulating and implementing remedial measures once the source of the outbreak has been identified. This work should be carried out in close collaboration with human and environmental health professionals, analysts, epidemiologists, food producers, processors and traders and others involved (McKenzie and Hathaway, 2006).

In addition to the roles mentioned above, veterinarians are well equipped to assume important roles in ensuring food safety in other parts of the food chain, for example through the application of hazard analysis and critical control points (HACCP) based controls and other quality assurance systems during food processing and distribution. The Veterinary Services also play an important role in raising the awareness of food producers, processors and other stakeholders of the measures required to assure food safety (McKenzie and Hathaway, 2006).

When zoonotic diseases strike any given geographical location, veterinary professionals are the first source of informed opinion on veterinary issues for governments, veterinary surgeons, the media, civil society organizations and charities, action and consumer

groups and the public. It has long been recognized that analyzing, studying, and recording animal diseases resulting in epidemic events is of tremendous benefit for generations to come. To this end, veterinary scientists, scholars, and professors are the leading providers of veterinary news, research, and information, including clinical and scientific developments to the wider veterinary community and other interested disciplines in science. Closely aligned with information dissemination, the improvement of the welfare of all animals through veterinary science, education, and debate among interested parties has resulted in highlighting and promoting discussions on pertinent welfare issues which are taken forward by institutions and society (FAO, 2015).

Approaches to food safety

The concept of the food production continuum

Food safety and quality are best assured by an integrated, multidisciplinary approach, considering the whole of the food chain. Eliminating or controlling food hazards at source, i.e. a preventive approach, is more effective in reducing or eliminating the risk of unwanted health effects than relying on control of the final product, traditionally applied via a final 'quality check' approach. Approaches to food safety have evolved in recent decades, from traditional controls based on good practices (good agricultural practice and good hygienic practice), via more targeted food safety systems based on hazard analysis and critical control points (HACCP) to risk-based approaches using food safety risk analysis (McKenzie and Hathaway, 2006).

Risk-based management systems

The development of risk-based systems has been heavily influenced by the World Trade Organization Agreement on the Application of Sanitary and Phytosanitary Measures ("SPS Agreement"). This Agreement stipulates that signatories shall ensure that their sanitary and phytosanitary measures are based on an assessment of the risks to human, animal or plant life or health, taking into account risk assessment techniques developed by relevant international organizations. Risk assessment, the scientific component of risk analysis, should be functionally separated from risk management to avoid interference from economic, political or other interests. The SPS Agreement specifically recognizes as the international benchmarks the standards developed by the OIE for animal health and zoonoses and by the Codex Alimentarius Commission for food safety. The role of the supervisory authorities is to analyze scientific information as a basis to develop appropriate food safety standards (both processing and end product standards) and monitoring to ensure that the control systems used by food operators are appropriate, validated and operated in such a way that the standards are met. In the event of noncompliance, regulatory agencies are responsible to ensure that appropriate sanctions are applied (CAC, 2005).

2.4.0 Optimizing the contribution of the Veterinary Services to food safety

In order for Veterinary Services to make the best possible contribution to food safety, it is important that the education and training of veterinarians in the roles outlined above meets high standards and that there are national programmes for ongoing professional development. There should be a clear and well documented assignment of responsibilities and chain of command within the Veterinary Services. The national Competent Authority should provide an appropriate institutional environment to allow the Veterinary Services to develop and implement the necessary policies and standards and adequate resources for them to carry out their tasks in a sustainable manner. In developing and implementing policies and programmes for food safety the Veterinary Authority should collaborate with other responsible agencies to ensure that food safety risks are addressed in a coordinated manner (McKenzie and Hathaway, 2006).

Constraints Peculiar to Veterinary Services in Nigeria

The lack of implementation of laid down policies such as animal movement control within and between states, regions and across the country's border contributes to the persistence of transboundary animal diseases such as Avian Influenza (AI), Newcastle disease (ND), African Swine Fever (ASF) and Peste de Petite Ruminant (PPR). There is also the issue of lack of political will by the government in the control of animal diseases. Factors such as insufficient funding by the government results in the lack of active and passive surveillance of diseases for example passive surveillance of diseases such as bovine tuberculosis (BTB) could have been of significant importance in the control of the disease but antemortem and postmortem inspections are usually taken for granted in our abattoirs and hence the spread of diseases. In the case of active surveillance; very few laboratories in the country are operating at standard level, another issue is the supply of consumables to carry out analysis on the samples that are sent to the laboratories. The fact that diseased carcasses in the abattoir cannot be condemned due to lack of compensation as a result of non-funding by the government is a big problem in terms of disease control. Animals that are brought to the abattoir lack identification system which could be used to trace back an infected animal from where it was sourced. The hygienic situation in over 90% of our abattoirs is quite deplorable and carcasses are prepared in unhygienic situations invariably leading to easy putrefaction of dressed carcasses. Quacks are frequently employed by farmers to deliver Veterinary Services at cheaper rates which have led to their acceptance by farmers even though such practices may come with heavy losses to the farmer in the long run due to misguidance or poor treatment. Insufficient data on the various diseases has also hidden the true state of diseases. The absence of sufficient data which is useful in understanding the epidemiology of a disease has slowed down success in the control of diseases.

Maintenance of cold chain in the storage of vaccines is also a problem to this sector due to incessant supply of electricity in the country. There is need for the production of vaccines that are more heat stable in order to overcome this challenge. Sometimes, the issue of improper vaccine storage leading to vaccine failure is the cause of outbreaks after vaccinating a flock or herd. Poor biosecurity on farms especially the poultry sector is a major means of the spread of outbreaks. There are a lot of issues facing

Veterinary Services in the country; another issue is the selling of fake drugs to farmers. In some of our local markets drugs are being sold to farmers irrespective of the source of the drugs which also leads to treatment failure and sometimes the death of the animals. Poverty and ignorance cannot be left out as factors that contribute to the spread of diseases; there is need to educate the public through the media (radio and television programmes), posters and distribution of hand bills on some vital zoonotic diseases such as (AI) and some food borne diseases (salmonellosis) which will aid in the control of diseases.

The rapid development of aquaculture in the last twenty years and the concomitant increase in fish and shell fish diseases have led to the increase in the use of veterinary drugs, biologicals and other chemicals in the aquaculture industry (Adedeji and Okocha, 2011). Various studies in the country have reported huge economic losses and failures of aquaculture, thus necessitating increased use of veterinary drugs, biologicals and chemicals to combat diseases in farmed fish. The increased usage coupled with increased cost of these drugs, biological and chemicals and high cost of veterinary care have led to increased cost of production and reduction in profit. Abuse of veterinary drugs, biologicals and chemicals are other problems encountered in the industry (Akolisa and Okonji, 2005; Ihuahi and Omojowo, 2005). Lack of adequate knowledge about prevention, treatment and control of fish diseases which is also compounded by absence of diagnostic laboratory for fish diseases is another problem that have limited the growth of the industry in Nigeria (Adedeji and Okocha, 2011).

Changing livestock production systems and emerging constraints

The demand for information on livestock production is growing, both in the sense of demands expressed by the producers themselves, and in the more general sense of a growing potential for increasing production through the delivery of information. Three linked factors are at play: processes of intensification and crop-livestock integration taking place especially in Africa; increased commercialization of livestock production, particularly in peri-urban areas; and the gradual overcoming of animal disease as a constraint on production (Morton and Matthewman, 1996). A great numbers of livestock in Africa are now kept by people without a traditional background in livestock production, or used for non-traditional purposes within rapidly changing production systems (Morton and Matthewman, 1996).

The concentration of government services on livestock health has been justified by the immediacy of animal diseases. As farmers gain confidence that diseases are under control, they are prepared to invest more in animal production. New constraints, particularly in genetic potential, and nutrition and husbandry, are now becoming limiting (Morton and Matthewman, 1996).

Livestock subsector is one of the fastest growing agricultural subsectors in developing countries and the growth is driven by the rapidly increasing demand for livestock products. This demand is being stimulated by population growth, urbanization and increasing incomes in developing countries (Delgado, 2005)

The Need for Privatization

Privatization of some Veterinary Services has received a strong impetus in the developing world over the last decade. Several factors contributed to this trend (de Haan and Umali, 1992):

Fiscal constraints and poor management of resources have led to a decline in the operational efficiency of public sector services.

The number of veterinary staff has grown faster than the means (such as vehicles and fuel, drugs and vaccines) to support them in many African and Asian countries, thus forcing the services to cut back on field activities. For example, while 33% of the budgets of the Veterinary Services of six Sahelian countries was allocated to operating expenditures in 1961-1962, this share has declined to 25% by 1975 and to 16% by 1988 (de Haan and Bekure, 1991). Five countries in West Africa allocated less than 5% of their national livestock budget to the funding of non-salary recurrent expenditures while the situation in other regions may be less serious than in these Sahelian countries, the general tendency of relatively decreasing availability of recurrent funds is evident in most of the developing world (de Haan and Umali, 1992).

The development of new technologies has shifted the focus from mostly herd-level prevention, which is more compatible with public intervention, to the treatment of individual animals, which is more suitable for private handling.

Declining land areas for grazing due to population pressures have led to more intensive production. This, in turn, spurred the use of more capital intensive technologies, such as higher value hybrid animals, for which individual treatments are more easily economically justified. Moreover, the introduction of mass fabrication of veterinary pharmaceutical reduced their cost of production and subsequently their prices, making individual interventions more attractive economically (de Haan and Umali, 1992).

Traditional livestock farming is shifting toward more commercialized operations.

Cattle ownership is shifting from the traditional cattle-owning ethnic groups with considerable indigenous knowledge, to much less experienced commercial crop farmers in several regions of Africa and China. These commercial operations require a higher level of service. At the same time, there is an increasing awareness by traditional livestock herders of the benefits of modern veterinary medicine (de Haan and Umali, 1992).

Increasing supply of veterinarians and shrinking public market.

Due to fiscal constraints, governments have been forced to abandon their policy of employing all veterinary graduates. In addition, some regions (that is, the Anglophone developing world, particularly India and East Africa), have seen a proliferation of veterinary faculties resulting in an increasing supply of veterinarians. Private practice is further enhanced by the opening of opportunities to sell related products such as drugs, feeds, and farm tools. These factors contribute to the large numbers of veterinarians seeking to establish private practice. Thus demand for Veterinary Services has increased strongly over the last decades, whereas public sector supply in many countries stagnated or deteriorated. At the same time a group of young graduates, are keen to establish themselves privately, has become available in many developing countries. Together these factors are generating a significant force for privatization (de Haan and Umali, 1992).

Economic Principles of Veterinary Services

In assessing whether these services can be privatized, it is necessary to obtain a clear understanding of the nature of the service (Umali *et al.*, 1992). Veterinary services can be classified into four categories (de Haan and Umali, 1992):

Private good

A good or service wherein the person who paid for the good or service exclusively benefits from it and no one else is able to avail of the good or service at the same time (for example, treatment of an animal's broken leg). In vector control, the economic nature of the control measure depends on the technology used, more recent technology using individual herd or animal treatments, such as special screens and traps, minimize the externalities involved in their utilization and enable individual farmers to capture the benefits almost exclusively. They are, therefore, more suitable for individual management and payment. The production of pharmaceuticals (vaccines and drugs) is a private good. Although the profits of new veterinary pharmaceuticals can be appropriated more easily, the market for veterinary medicines against specific tropical diseases in many developing countries is so small. This presents a major disincentive to research into socially desirable products by local private pharmaceutical companies (de Haan and Umali, 1992).

Private good with externalities

A private good or service whose production or consumption has spillover effects on other individuals, although the other individuals are not charged for the spillover benefits or compensated for the negative spillover effects (for example, vaccination provides spillover disease protection to animals owned by others) (de Haan and Umali, 1992).

Private good with moral hazard problems

A private good or service whose quality is not transparent or cannot be easily assessed (for example, vaccine quality cannot be easily evaluated) (de Haan and Umali, 1992).

Public good

A good or service where in the consumption of the good or service by one individual does not reduce its availability to others and the person who paid for the service cannot exclude others from using the service as well (for example, food hygiene and inspection). Vaccination against contagious diseases involves externalities (protection of animals belonging to other farmers and export interests), which to some extent can be internalized through government interventions. These measures may take the form of mandatory regulations such as the issuance of vaccination certificates or the subsidization of vaccinations. However, in the absence of good enforcement measures for such ex-ante controls in many developing countries, the direct involvement of the government is required either through direct provision or subcontracting to private operators. Veterinary surveillance, which ensures that proper steps are taken to avoid the spread of a highly contagious disease to other farmers, is a public good (de Haan and Umali, 1992).

Economic Viability of Private Veterinary Practices

Entry into the Veterinary Services market by a private practitioner will depend on whether a practice can be profitably sustained. If a favorable economic environment already exists, private profitability will depend primarily on the type of production system, the prevailing livestock density, and the extent to which economies of scale apply (Umali *et al.*, 1992). Economies of scale are highly relevant in veterinary services, because their provision involves a large proportion of fixed costs. The provision of clinical and preventive care requires veterinarians and veterinary auxiliary personnel to travel to the points of service delivery (for example, the farm, veterinary posts, or a designated stop). In such situations, the larger the number of units of service provided to clients at each point of service delivery, the lower will be the cost per unit. Specifically, the veterinarian's fee, transportation, and other transport-related costs can be spread over a larger number of animals and thus reduce per unit cost of the service. The lower the costs, the more economically attractive they become to livestock farmers (de Haan and Umali, 1992).

Because the provision of Veterinary Services entails significant indivisible fixed costs, veterinarians will not set up private practices unless the market for their services is large enough to sustain profitable operations. Thus, high density livestock areas will favor private sector participation, because these localities can generate a volume of demand sufficient to sustain private veterinary practice. From the farmer's perspective, this cost differential can become a screening device as to who can afford veterinary services. Farmers

with large herds are better able to take advantage of Veterinary Services than small farmers, because their cost per unit is smaller and thus makes the services more affordable. However, small farmers can overcome this handicap through membership in producer organizations and cooperatives that provide livestock health and support services. As a result of the pooling of veterinary service needs of smallholder farmers through these organizations, they are able to take advantage of economies of scale in the delivery of the services as well as provide farmers with a mechanism for internalizing the externalities associated with some services (de Haan and Umali, 1992).

Thus privatization cannot and should not be undertaken as a broad strategy; instead a selective policy should be pursued, taking into account the economic character of each of the veterinary services and the economic feasibility of private practice. As a first step, the transfer of private good services to the private sector should be promoted. Second services that involve externalities or moral hazard problems will require some form of public intervention. Subcontracting to private operators is one option. Third choices also have to be made regarding the type of veterinary practitioner to promote. In many livestock production systems, the establishment of professional practices is not viable financially and lower cost operators such as auxiliaries need to be promoted (de Haan and Umali, 1992).

Global State of Veterinary Services

In a study conducted, 108 out of the OIE'S 178 member countries were part of the study, which assessed the numbers of public and private veterinarians involved in food production. More than half of the participating countries reported that they had fewer than 35 public sector veterinarians per million inhabitants, and fewer than 100 private sector veterinarians per million inhabitants involved in the food chain. Veterinary activities are deployed at each stage in the food chain; production at farm level, processing, transport and distribution at the local and national level or for export. When veterinarians are too few to pursue their duties then the whole food security and food safety systems are affected (Bonnet *et al.*, 2011).'

The study also examined the animal health infrastructure in the countries surveyed. Although all the countries had established an institutional, legislative and technical framework for organizing veterinary activities, there was a marked disparity between industrialized and developing countries, 'with chronic underinvestment in the less wealthy countries, illustrated by the fact that in more than 60% of the countries, public investment in the relevant fields amounted to less than US\$2 per capita per year' while 86% of the countries reported having a theoretical capacity for early detection of animal health hazards, 30% of them confirmed that they had had no suspected animal disease outbreaks during the previous five years, which, the OIE points out and puts the effectiveness of the surveillance system in doubt (Bonnet *et al.*, 2011).

Regarding food safety policy, the study found that, as things stand, the resources of Veterinary Services are mainly devoted to slaughter inspection services, with input diminishing further along the food chain. Discussing differences in the role of Veterinary Services in developed and developing countries, the authors note that, in developing countries, Veterinary Services are still very active in attempting to control major diseases while, in developed countries, they are now more orientated towards inspection of products and surveillance for diseases. They noted that, although all the participating countries had an institutional framework for Veterinary Services, the resources allocated are often too poor in developing countries, which is an ever-widening gulf that is separating them from developed countries when it comes to animal production and the marketing of animal products (Bonnet *et al.*, 2011).

The OIE paper also draws attention to the veterinarian's role in helping to reduce the environmental impact of livestock production and this, too, is an area to which more attention should be devoted in the future (Bonnet *et al.*, 2011).

Nigeria's Gross Domestic Product (GDP)

Available literature reported that in spite of Nigeria's rich agricultural resource endowment; there has been a gradual decline in agriculture's contributions to the nation's economy (Ekpo and Umoh, 2012; Mohammad and Atte, 2006) as evident in the contribution of agriculture to the GDP of the nation as well as the rising value of food import (CBN, 2010). The sectors contribution to GDP is as follows; 1960-1964 (61.65%), 1965-1969 (53.27 %), 1970-1974 (39.69%), 1975-1979 (23.8%), 1980-1984(31.3%), 1985-1989 (38.12%), 1990-1994 (32.55%) 1995-1999 (34.32%), 2000-2004 (37.05%), 2005-2009 (33.5%) (CBN, 2010), for the years 2010-2012, the GDP was 37.02% (Ahungwa *et al.*, 2014). From the data gathered for the nations GDP, it could be said that throughout the 1960's (1960-1969), agriculture remains the main source of livelihood and income to the country and from 1970 upwards there has been a fluctuating decline in the GDP and the lowest being 23.8% (1975-1979), this may probably be due to the oil boom era experienced by the nation and the attention of the government which drifted from agriculture to crude oil processing.

Nigeria has witnessed strong economic growth in the past few years, averaging 8.8% real annual GDP growth from 2000 to 2007. However, the agriculture sector has lagged behind GDP growth, growing at 3.7% in 2007. Reviewing the production and postharvest constraints affecting agricultural productivity in Nigeria is an important step in formulating policies to reverse these trends in the future ((Phillip *et al.*, 2009)). In Nigeria, the livestock industry accounts for about 5% of national GDP and 20% of agricultural GDP (Garriba, 2014). The poultry sector in Nigeria accounts for about 58% of the total livestock production (Amos, 2006) indicating that

poultry is the major source of livestock production in the country hence more attention should be paid in the development of this sector.

International Food Policy Research Institute (2008), carried out a study using empirical analysis to find out the public spending on agriculture in Nigeria from 2001 to 2005. Their findings revealed that public spending on agriculture was exceedingly low. Less than 2% of total Federal expenditure was allotted to agriculture during 2001 to 2005, which is much lower than what is being spent in other key sectors such as education, health, and water. This spending contrasts dramatically with the sector's importance in the Nigerian economy and the policy emphasis on diversifying away from oil, and falls well below the 10% goal set by African leaders in the 2003 Maputo agreement. Nigeria also falls far behind in agricultural expenditure by international standards, even when accounting for the relationship between agricultural expenditures and national income. The spending that is extant is highly concentrated in a few areas. They recommended that there is an urgent need to improve internal systems for tracking, recording, and disseminating information about public spending in the agriculture sector (Idoko *et al.*, 2012).

Gradually the nation has come to realize that crude oil alone as a natural resource is not able to sustain the needs of the nation with a population of over 160 million people and still on the increase. The awareness of the need to revisit and remodel our agricultural sector has led the government to the agricultural transformation agenda (ATA) which is set to improve agriculture as well as livestock production in the country. The Federal Government of Nigeria (FGN) in 2011, came up with the Transformation Agenda identifying seven sectors of the economy as the main growth drivers during the transformation period (2011-2015), this include agriculture, water resources, solid minerals, manufacturing, oil and gas, trade and commerce as well as culture and tourism. The decision was prompted by the fact that the performance in these sectors has been constrained by several challenges including low productivity, low level of private sector investment, non-competitiveness, inadequate funding, shortage of skilled manpower, low investment in research and development, poor development of value chain and low value addition, poor regulatory environment, poor quality of goods and services and poor state of physical infrastructure, policy instability and discontinuity, low level of technology, paucity and poor flow of information and high cost of doing business (FGN, 2011). Government thus assumed a baseline GDP growth rate of 11.7% per annum within the period, which will translate to real and nominal GDP of about N428.6 billion and N73.2 trillion, respectively at the end of the programme period (Ahungwa *et al.*, 2014).

A study conducted by Ahungwa *et al.*, (2014), examined the pattern and contribution of agriculture to the nations GDP within a time frame of 53 years (1960-2012) using time-series data emanating from National Bureau of Statistic (NBS), Central Bank of Nigeria, National Planning Commission (NPC) and CIA Fact book . Results were analyzed using trend and regression analysis; the results showed that the share of agriculture to the total GDP had a downward trend, yet maintaining a clear dominance over other sectors from 1960-1975. Further analysis depicted an undulating trend, intertwining with the industrial sector from 1976-1989. The regression results showed that agriculture has a positive relationship with GDP and contributes significantly with a coefficient of 0.664, implying that a percentage increase in the contribution of agriculture can increase the GDP by 66.4% which is higher than any other sector. This cumulative effect of agriculture on GDP clearly affirmed the dominance of the sector's contribution to the GDP of Nigeria. The study therefore recommended that government should create an enabling environment by increasing the budgetary allocation, friendly policies framework for strong and efficient agricultural sector that can accelerate the attainment of Nigeria's dream of achieving the targeted growth rate and the proposed vision of becoming one among the 20 leading world economies by the year 2020 (Ahungwa *et al.*, 2014).

Indicators of African Agricultural situations

Arable Land

Agriculture is one the foremost sectors of the economy that needs land for its activities. North and West Africa have the largest average arable land per country. The average arable land in the North African zone has increased from 3629.19 hectares between 1970 and 1975 to 6319.66 between 2006 and 2009, while that of the West African zone increased from 3608.88 to 41152.66 for the same period (Mkpado, 2013).

Livestock

Livestock are animals raised for income, food or other products, or kept for use as farm assets, especially farm animals such as cattle, pigs, goats and poultry (Gitau *et al.*, 2009). Generally, over 90% of the world's 5 billion goats were in developing countries with 30% of world goat population in Africa (FAO, 1985). A recent study by Kanani (2009), indicated a decrease in the goat population in Africa, out of a total of 744 million estimated world goats population, Asia produced 513.4 million (69.6%), Africa 172 million (21.0%), South America 23 million (4.8%), North America 16 million (1.7%), Europe 14.7 million (2.0%) former Soviet Union 7.9 million (1.1%) and Oceanic 1 million (0.3%). Thus, the percentage of goats in Africa is relatively high when compared with other regions of the world other than Asia. The study showed that up to 89% of the 21% of goat population was located in 14 countries of Central and Eastern African regions. About 70% of Africa's goat population is located in 14 countries of central and eastern Africa. The five other contributing countries by descending order are Nigeria, Sudan, Ethiopia, Kenya, Tanzania, Uganda, and Cameroon (Kanani, 2009).

Employment

It may be interesting to note that a decreasing trend characterized the labour employment in Africa. One of the reasons is low per capital real income among farmers (Mkpado and Arene, 2003; Salami *et al.*, 2010). The decreasing trend could indicate that agriculture is releasing labour to other sectors. Analysis of the labour employed across African zones showed that East and Central had the highest proportion of labour employment in agriculture. Their record was closely followed by West African Zone. Labour employed in West African Agriculture ranged from 63.63 to 48.75%; a decreasing trend was also observed. The percentage contributions of agriculture to GDP among African countries were very high compared to other regions. There is a unique opportunity to use agriculture in Africa as an engine of growth and employment creation through improved investment in science and technology (Mkpado, 2013).

Exports

Export of agricultural products or produce is one of the ways Africans can benefit from the ongoing globalization (Mkpado, 2013). Allaro, 2011, observed that despite the worldwide fall in trade barriers that has occurred in the last two decades, export performance has varied substantially across countries. World exports increased almost 220% in twenty years. The figure jumps to 720% for East Asian and Pacific countries and falls to 80% for Sub-Saharan countries. Export of primary agricultural production is still very high in African compared to other regions of the world. The needs now include capacity development in agro-processing. This could provide lots of opportunities to create wealth, employment and reduce poverty (Mkpado, 2013).

Experiences in Veterinary Service Privatization

In the developed world, Veterinary Services are mostly privately operated. Veterinary Services in these countries share several common characteristics. The government role is generally reduced to the delivery of pure public goods. This includes control over epizootics, zoonoses, food control and hygiene. Growing priority is also given to the enforcement of animal welfare legislation by the Public Veterinary Services. Externalities involved in the control of enzootic diseases are internalized through the creation of disease control funds, financed by compulsory memberships in insurance schemes and producer organizations and special product levies. The private input supply companies (pharmaceuticals and feed) are becoming increasingly involved in extension. In the developing world, overall progress in privatizing Veterinary Services has been slow. A survey of livestock specialists from the World Bank and other government agencies carried out by Umali *et al.*, (1992) showed that in only a small number of developing countries are Veterinary Services provided by private practitioners. The progress in Africa is noteworthy (de Haan and Umali, 1992).

In Nigeria, a comparative analysis of public and private Veterinary Services delivery among commercial poultry farmers in Delta state was conducted by Adesiji *et al.*, 2013. The study revealed that majority of the respondents 53.6% who patronized private Veterinary Services used the battery cage system with 46.4% in egg production indicating cost of Veterinary Services (mean= 1.71) been ranked first as their major constraint. Results further revealed that there was a significant relationship between flock size and affordability with constraints in access to Veterinary Services (at $p \leq 0.05$). Independent T-Test shows that there was significant difference ($t=1.737$, $p \leq 0.05$) between private Veterinary Service delivery and public Veterinary Service delivery. The study concluded that private Veterinary Services provider provided better poultry health services delivery compared to public Veterinary Services delivery in Delta State. Government should therefore provide an environment conducive for the emergence of private veterinary practice and create a level playing field between public and private service providers as well as monitoring and enforcing standards for service delivery and making the necessary information available to the poultry farmers (Adesiji *et al.*, 2013).

Policy Requirements for Privatization

The main policies required to bring about privatization are indicated below as follows:

Elimination of policies that promote unfair competition

Subsidized services and "moonlighting" by government veterinary agents are one of the most serious barriers to entry. The introduction of full cost recovery for private good services and supplies provided by the public sector is thus a key prerequisite for any privatization effort. Other barriers to entry, which should be eliminated, include veterinary drug import and distribution restrictions and price controls. Studies in the developed world (for example, Wise 1988) as well as indications from the developing world show that the sale of pharmaceuticals accounts for between 30 and 50% of the income of a veterinary practice (de Haan and Umali, 1992).

Institution of attractive subcontracting policies

Many of the public good services (meat inspection and diagnostic services) and private goods with externalities (compulsory vaccinations) can be very effectively subcontracted to private operators under government supervision (de Haan and Umali, 1992).

Establishment of mutual insurance schemes and/or producer groups, to create the funding mechanisms for the control of diseases, which cannot be funded through direct payment.

The creation of an autonomous fund would provide a more reliable source of financing for the payment of private subcontractors than the unreliable government budget and would, therefore, be an important feature of any privatization effort (de Haan and Umali, 1992).

Establishment of the enabling legislation, adapted to the conditions of the country, which will protect and stimulate private animal health practice

This means that in those countries where the availability of private professional veterinarians and/or the nature of the economic environment constrain the establishment of private professional practices, legislative provisions should be established for auxiliary practices. Passed legislation in the developing world has tended to copy the very restrictive European regulations, which reserved the right to administer most veterinary drugs to professional veterinarians (de Haan and Umali, 1992).

Research and Technology Needs

Veterinary research tends to concentrate on disease control technology as such, with inadequate attention given to the capabilities of the system to deliver this technology. However, the delivery system most likely will remain poor in much of the developing world, and future control strategies and technologies, therefore, need to be tailored increasingly to fit deficient funding and poor infrastructure. This means that greater priority needs to be given to the definition of the cost-effectiveness of the disease control measures and the development of diagnostic and control techniques, which are low cost and can be manipulated by nonprofessional staff under poor infrastructure conditions (de Haan and Umali, 1992).

Cost-effective disease control measures can only be developed on the basis of a good understanding of the relative importance of different diseases. This information is notoriously absent in developing countries, and the use of cost-benefit analysis in decision making concerning the launching of a disease control campaign or moving from control to eradication policies is very rare. Staff availability and political pressure seem to be more important criteria. A better definition of the relative importance of different diseases in any given environment and of the economic returns to eventual control or eradication campaigns deserves a high priority in publicly sponsored animal health research programs (de Haan and Umali, 1992). Low-cost and easily manipulatable diagnostic tools and control technologies will also be important inputs into sustainable animal health care systems. The following exiting research is being carried out in this area, which could revolutionize animal health care systems (de Haan and Umali, 1992).

Animal side diagnostic sets

Monoclonal antibody techniques will yield simple test sets to allow lay persons to diagnose disease types with a high degree of reliability (Winrock International forthcoming) (de Haan and Umali, 1992).

Genetically resistant animals

Clearly, genetically based disease resistance is the most sustainable form of disease control and there is increasing evidence that there is considerable genetic resistance to several diseases, such as African animal sleeping sickness and internal parasites. Further development of disease resistance will be assisted by the considerable ongoing research effort in identifying genetic markers, which will allow early identification and accelerated multiplication of the most resistant genotypes (ILRAD, 1991).

User-friendly parasite control methods

Great promise is provided by the development of screens and traps to catch tsetse flies (the transmitter of African animal sleeping sickness) and by a new generation of pyrethroid-based insecticides with a long residual effect, which kills the flies before they can transmit the disease. These technologies are simple to apply and their benefits accrue almost exclusively to the owner and thus eliminate some of the free rider and spillover problems involved in the classical methods of aerial spraying against the tsetse fly and dipping of cattle for tick control respectively. The system of fly traps and screens, used by nomadic herders in the Central African Republic, has been demonstrated to reduce fly population by 5 to 10% of their original size (Cuissance, 1989).

User-friendly vaccines

The development of a thermo stable vaccine against Newcastle disease in poultry which can be mixed in the feed removes one of the key constraints to village poultry production and is now being introduced on a national scale in South-East Asia. More attention still needs to be directed to the development of multivalent vaccines, which again would significantly simplify their delivery and reduce costs (Spradbrow, 1991).

Conclusion

The improvement of Veterinary Services in a country like Nigeria is of paramount importance if any meaningful agricultural development is to occur. Veterinary Services in the country are faced by a lot of challenges which requires a more pragmatic approach in order to overcome these challenges. The organization of veterinary delivery services is required for proper administration of Veterinary Services down to the rural level. The need of trained extension officers cannot be overemphasized as the number of veterinarians in the country will not be enough to cover the entire nation in Veterinary Service delivery. The Veterinary Authority needs to delegate services to the appropriate sector (private/public) depending on the suitability of the sector to carry out a particular function. Privatization of Veterinary Services in Nigeria has been functioning for over two decades and needs only to be upgraded, more organized and make it more attractive to future veterinarians and other professionals in this field for rendering of better services and employment opportunities for upcoming professionals.

Pertaining disease handling, there is need for a clear understanding of the economic importance of the disease to decide on curative and prophylactic strategies. The nature of the service required will, to a large degree, determine whether private delivery will result in a socially optimal level of supply. Active involvement of government in the supervision of disease control, with private operators carrying out the actual implementation, is in many cases an attractive alternative. The nature of the disease and the profitability of the livestock enterprise will determine whether private delivery is economically feasible. The economic feasibility of private supply will depend on several key factors including whether professional or nonprofessional staff will be used, and to what extent economies of scale can be achieved. The promotion of producer organizations is an option. The modern technological developments will have a significant impact on these choices, because they will lower costs and simplify the application of disease control interventions, and thereby increase the opportunities for private operators (de Haan and Umali, 1992).

In Nigeria, the loss of livestock exists at a much higher rate than in developed countries and at times such production losses range between 30 and 40% which is on the high side. This further necessitates the need for farmers to be enlightened to register with agricultural insurance company or other forms of cooperatives where they can be remitting some amount of money so as to aid them in terms of losses due to any disease outbreak encountered in the future. This type of intervention will aid in combatting losses which is usually accrued to livestock production. There is need for livestock farmers to gain access to loans so as to improve their farming systems and be able to expand their scope for better productivity. The government needs to accrue more money to the agricultural sector for more efficient system of production. In Summary, improvement of veterinary services is a sure way to agricultural development and will efficiently lead to increase in the nation's GDP.

Based on the growth of aquaculture in the country, there is need for improved Veterinary Services, in terms of training, dissemination of information to aqua farmers and extension services in order to combat diseases and increase productivity. Furthermore, the government needs to set up standard fish disease investigation laboratories which will assist and encourage veterinarians in providing adequate service thereby increase aquaculture productivity.

Despite Nigeria's strong economic growth in recent years, the country still faces significant challenges in its development efforts, including governance issues, limited capacity for policy formulation and implementation, infrastructure gap, high unemployment, and high level of poverty among others. However, the country has enormous potential and opportunities which if efficiently and effectively harnessed will accelerate the rate of economic growth and job creation (Anonymous, 2012).

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