Hon'ble Chief Minister
Puratchi Thalaivi Selvi J Jayalalithaa
Endowment Lecture

Tamil Nadu Veterinary and Animal Sciences University
Chennai - 600 051
ENHANCING LIVESTOCK AND POULTRY
PRODUCTIVITY FOR FOOD SECURITY

Hon’ble Chief Minister
Puratchi Thalaivi Selvi J Jayalalithaa
Endowment Lecture

by
Dr. K.M.L. Pathak
Deputy Director General (AS)
Indian Council of Agricultural Research
New Delhi
CONTENTS

I. INTRODUCTION 5
II. NEED FOR FOOD SECURITY 6
III. CONTRIBUTION OF LIVESTOCK SECTOR 7
IV. ISSUES OF CONCERN IN ENHANCING PRODUCTIVITY 10
V. FOCUS ON ENHANCING ANIMAL PRODUCTION 12
VI. CONCLUSION 16
ENHANCING LIVESTOCK AND POULTRY PRODUCTIVITY FOR FOOD SECURITY

Dr. K.M.L. Pathak
Deputy Director General (AS)
Indian Council of Agricultural Research
New Delhi

1. INTRODUCTION

Livestock production and agriculture are closely related to each other and assume significance in the context of overall food security in the world. With the threat to crop based agrarian economy arising from issues like fragmentation of land holding, vagaries of monsoon and poor pricing and marketing issues, allied fields of agriculture like livestock, poultry and fisheries emerge as an alternative livelihood sources and provide year round sustained income and much needed protein to farmers and their household. India has vast resource of livestock and poultry, which pay a vital role in improving the socio-economic conditions of rural masses. There are about 304.8 million bovines, 71.6 million sheep, 140.5 million goats, 11.1 million pigs and 648.8 million poultry as per 18th Livestock Census in the country. According to estimates of the Central Statistics Office (CSO), the value of output from livestock sector was about Rs. 5,37,535 crore during 2012-13 which is about 25.63% of the value of output from total agricultural, fishing, and forestry sector at current prices and 26.02% at constant prices (2004-05). India’s livestock sector is one of the largest in the world. It has 56.7% of world’s buffaloes, 12.5% cattle, 20.4% small ruminants, 2.4% camel, 1.4% equine, 1.5% pigs and 3.1% poultry. In 2010-11, livestock generated outputs worth Rs 2075 billion (at 2004-05 prices) which comprised 4% of the GDP and 26% of the agricultural GDP. Distribution of livestock is more equitable compared to that of land. In 2003, marginal farm households (≤1.0 hectare of land) who comprised 48% of the rural households controlled more than half of country’s cattle and buffalo, two-thirds of
small ruminants (goat, sheep) and pigs as well as poultry as against their share of 24% in land. Livestock contributed 16% to the income of small farm households as against an average of 14% for all rural households. According to 2001 Census, agriculture and allied activities accounted for about 15.7% of country’s GDP and is estimated to employ about 124.7 million people as cultivators and 106.8 million as agricultural labour. Livestock sector grew at an annual rate of 5.3% during 1980s, 3.9% during 1990s and 3.6% during 2000s. Despite deceleration, growth in livestock sector remained about 1.5 times larger than in the crop sector which implies its critical role in cushioning agricultural growth.

II. NEED FOR FOOD SECURITY

As per World Food Summit in 1996, food security exists “when all people at all times have access to sufficient, safe, nutritious food to maintain a healthy and active life”. Globally it is estimated that every year, nearly 3.5 million children under five years of age die due to starvation, while nearly 19 million suffer from acute malnutrition. Currently in India, 40% the population is malnourished and the infant mortality rate is 44. Hunger is a cause of poverty. As on 2010, an estimated 16% of the population in developing countries was hungry. Hunger by causing poor health, low levels of energy, and even mental impairment, hunger can lead to even greater poverty by reducing people’s ability to work and learn, thus leading to even greater hunger. Protein deficiency is another common phenomenon in the diets of rural peoples as their diets are predominantly based on cereals, which contains high energy and low protein. Inaccessibility to nutritious food stems primarily from poverty as poor households lack the resources to purchase food, and undernourished people are not able to work as much or as hard, which can create a vicious cycle between nourishment and effective employment. Increase in population is another challenge to food security as providing food to everyone remains a major challenge, even as improved technology has facilitated higher food production.

In the next 20 years, with the structural shift towards urbanisation, 290 million more Indians will live in cities and towns. Not only will they have to be fed from the rural countryside, but the pressures on water and land are expected to multiply. Indian agriculture can barely cope with this. Vast expanses of Indian farmland are un-irrigated and are at the mercy of increasingly erratic annual rains. Over-exploitation of groundwater, over-use of fertilisers on large farms and depletion of natural resources threaten agrarian productivity. Poor agricultural infrastructure is another challenge as large amount of food is wasted because of this. Poor storage conditions leave crops vulnerable to pests. In India, inadequate storage facilities result in nearly INR580 billion (US$ 8.77 billion) worth of food being wasted every year. Increase of price of food is another challenge to food security. Environmental degradation, caused by unsustainable human practices and activities, poses another challenge to food production. Land degradation may reduce available cropland and crop yields are also likely to decrease due to water scarcity, soil erosion and depletion, and infestation of plants. The increasing importance of bio-fuels has resulted in another major challenge that could reduce the supply of food available for human consumption. Apart from these there are also other challenges like crop diversification, issues related to bio-fuel and medicinal plant cultivation, mismatch between water demand and availability, recent status in production of high yielding crop varieties and agricultural crop pricing and insurance and new trends in globalization and urban encroachments. These stress the need to have food security.

III. CONTRIBUTION OF LIVESTOCK SECTOR

Milk

India has emerged as the largest milk producing country in the world with production of 135 million tonnes - 16.43% share in total milk production in the world. Post white revolution Indian dairy industry has shown a constant growth in milk production
as well as in per capita milk availability. That is 51.4 million tons in 1990 to about 127 million tons in 2011-12 and 291 gm/day respectively. India has a large livestock population as mentioned earlier. The livestock population is projected to increase to 322 million by the year 2015. India has 75 million dairy farms, more than anywhere else in the world. Milk production is estimated to have increased by 6% to about 140 million tonnes in 2013-14. Milk output during the year 2013-14 is estimated at 140 million tonnes. Among states, Uttar Pradesh continued to remain the leading milk producer, followed by Rajasthan and Gujarat. As per NDDB, the Indian dairy industry is all set to experience high growth rates in the next eight years with demand likely to reach 200 million tonnes by 2022 from 132 million tonnes in 2013. India is ranked at 18th position in world exports with a 1.6% share in total world exports. India has shown a 16% growth from 2008 to 2012 as against the 6% growth in total world’s exports. The exports are highly concentrated in SMP, casein and Ghee contributing close to 45%, 30% and 15% of our total exports respectively. During next few years till 2030 the demand of dairy products is expected to grow at a rate of 9%-12% and industry at a rate of 4-5%. Clearly Indian industry will struggle to maintain 100% self-sufficiency due to huge local demand, between 160 to 170 million tonnes of milk that would be required by 2030.

Meat

As per APEDA’s perspective, animal products plays an important role in the socioeconomic life of India. India is set to become world’s largest meat exporter, while in production it ranks eighth. Buffalo in India contributes about 30% of total meat production. Per capita meat consumption in India is low -around 5 kg as compared to the world average of 47 kg. This shows the huge potential for expansion. Mostly small animals, sheep, goat and pigs are slaughtered in unregistered and unorganized slaughter houses in small numbers ranging from 2 – 10 by the individual butchers and meat is sold fresh on

the same day. However, large numbers are slaughtered in the modern state-of-the-art abattoirs following world class sanitary and phytosanitary measures. The meat industry is likely to grow at a good pace, say, at a compound growth rate of 8% over the next five years. The processed meat industry is growing even much faster, at about 20%. There are many reasons for the slow growth of the meat industry, including the negative attitude of public towards meat on account of misinformation campaign, and socio-political considerations. Exports of animal products represent an important and significant contribution to the Indian Agriculture sector. The export of Animal Products includes Buffalo meat, Sheep/ Goat meat, Poultry products, Animal Casings, Milk and Milk products and honey. India’s exports of animal products were worth Rs. 20778.39 crore in 2012-13, which include the major products like buffalo meat (Rs. 17412.89 crore), sheep/ goat meat (Rs. 425.66 crore), poultry products (Rs. 494.93 crore), dairy products (Rs. 1412.10 crore), animal casing (Rs. 18.37 crore), processed meat (Rs. 9.37 crore), other meat (Rs. 2.33 crore), and natural honey (Rs. 356.32 crore).

Egg and poultry meat

The poultry industry of India is expected to register double-digit growth in 2015 on the back of stable feed prices and encouraging rural and urban demand. The outlook for the growth of the Indian broiler and egg sectors should be good for at least for another year according to experts. Indian broiler production at 3.8 million tons is the fourth largest in the world after US, Brazil and China. The growth is continuing at 12% to 15%. The layer farming with 220 million layers is growing at 6-8% and the egg prices are at record high. The 58,000-crore Indian poultry industry is expected to report higher margins in the years to come. The National Institute of Nutrition has strongly recommended 180 eggs and 11 kg of meat per capita consumption for our nation. At present, Per capita availability for meat is 1.6 kg. Per capita availability for egg is 42. Average consumption for
eggs in major cities is 170 eggs. Average consumption for eggs in smaller cities is 40 eggs. Average consumption of developed rural areas is 20 eggs. Average consumption of undeveloped rural areas is only 5 eggs. Analysts' studies reveal that the total egg consumption is estimated to increase from 34 billion in 2000 and to 106 billion in 2020, while poultry meat consumption has been predicted to increase from 687 million kilograms to 1,674 million kilograms.

Wool

Though wool production has got no direct reliance to ensuring food security, basic details are provided for better understanding of the contribution of animal sector. India's wool and woollen textile industry is the seventh-largest in the world. The woollen industry in the country is small in size and widely scattered. It is basically located in the States of Punjab, Haryana, Rajasthan, U.P., Maharashtra and Gujarat. The total wool production in India during 2013-14 (estimated) was 47.90 million Kg. The bulk of Indian wool is of coarse quality and is used mostly in the hand-made carpet industry. In 2014–15, wool exports (including wool yarn, fabrics, made-ups, readymade garments of wool and woollen hand-made carpets) stood at US$ 1,869.8 million. Woollen hand-made carpets contributed 72.7% to total woollen exports. The US and EU are the key importers of Indian wool and wool-blended products.

IV. ISSUES OF CONCERN IN ENHANCING PRODUCTIVITY

Feed and Fodder

Feed being the major input factor in all livestock production systems the production/productivity of livestock is strongly linked to the feed resource availability. The economic viability of livestock husbandry heavily depends on source(s) of feed and fodder as feeding cost account for about 65 to 70% of the total cost of livestock farming. The current deficits for green fodder, dry fodder and concentrates have a deficit of 63%, 24% and 76% respectively. Efficient management of feed resource is of paramount importance for optimizing livestock production. The adequate supply of nutritive fodder and feed is a crucial factor impacting the productivity and performance of the animals. Currently, scarcity of feed/fodder resources is one of the major constraints impacting livestock development. Therefore, it is important to put more emphasis on fodder development programmes for augmenting fodder/feed supply, while formulation of livestock development strategy. It is evident that the country is highly deficient in respect of availability of green fodder, dry fodder and concentrates. According to report of the working group on Animal Husbandry and Dairying for the Eleventh Five Year Plan (2007-12), Planning Commission, GOI, there is a huge deficit in the country in green fodder and dry fodder. Over the years, deficit of green and dry fodder is showing upward trend. The deficit of green fodder is 64.21% (759 million MT) in the year 2010. In year 2020, huge deficit gap of fodder is expected to be aggravated. Further, on account of diversified use of crop residues and declining trend in land availability for forage/fodder production, the gap between demand and supply of fodder is likely to widen further. The quantitative and qualitative deterioration of common grazing land owing to overgrazing and lack of proper maintenance resulted in low biomass production and increased the fodder deficit. The area under fodder crops in the country has also remained almost static around 5% for last two decades.

Animal diseases

Animal health plays a major role in the progress of livestock industry. Occurrence of diseases causes heavy economic losses in terms of livestock health and production. Introduction of exotic breeds have increased the incidence of diseases especially Foot and Mouth Disease (FMD), Haemorrhagic Septicaemia (HS), peste-des-petits ruminants (PPR), Brucellosis, Mastitis,
Blood protozoan diseases, avian influenza, infectious bursal disease, Newcastle disease (ND), chronic respiratory disease (CRD), salmonellosis, fowl pox and coccidiosis etc.

Climate change

One of the environmental threats which our planet faces today is the global climate change. These changes are harmful to both human beings and animals. Inter-Governmental Panel on Climate Change has projected that by the end of this century global earth temperature is likely to increase by 1.8-4.0°C. This global climate change could potentially lead to scarcity of water and food resources and may also cause spread of infectious diseases and heat-related deaths. By 2040, water would become a precious commodity. Further, projected climatic changes are expected to increase the risks of vector-borne and other diseases leading to change in pattern of disease transmission.

Other threats

The other threats that could indirectly affect the contribution from livestock sector are human-animal conflict for resources, migration of rural youth to urban areas, trade liberalization resulting in import of livestock products in the absence of needed compensation among livestock growers, thrust of cross breeding, depletion of indigenous breeds of animals, extinction of breeds (globally one breed become extinct in a fortnight) etc.

V. FOCUS ON ENHANCING ANIMAL PRODUCTION

Animal genetic resources management

Sustainable management of farm animal genetic resources is of vital importance to food, nutrition and environment security. Their conservation and judicious use is critical for the survival as well as improved livelihood of resource poor farmers. India is rich in its farm animal diversity being a mega biodiversity centre. There are 35 cattle, 18 buffalo, 42 sheep 21 goat and 46 other breeds (including camel, horse, yak, mithun, poultry etc.). There is a need to develop new strains of poultry, pig, sheep and goat with better production characters. In this regard, in the past three decades, atleast six strains of commercial layers that can lay over 300 eggs have been evolved through research and controlled breeding programmes. Further, improved breed varieties of backyard poultry like Vanaraja and Gramapriya, which can lay around 170 eggs have also been evolved. Strains of alternate poultry like turkey, guinea fowl, Japanese quails etc. with increased performance have been evolved. Improved strains of sheep with twinning gene expressed, goat with better milk production and pig with better weight gain have been evolved. This can solve the problem of protein shortage in the society.

Biotechnological interventions

Techniques of modern biology such as molecular cloning of genes, gene transfer, genetic manipulation of animal embryo transfer, sexed semen, genetic manipulation of rumen microbes, chemical and biological treatment of low quality animal feeds for improved nutritive value, genetically engineered immunodiagnostic and immune-prophylactic agents as well as veterinary vaccines are a reality today and are finding their ways into research and development programmes of developing countries.

Marker assisted breeding

There is shift in breeding strategy from current method of selection to marker assisted selection. It is a process whereby a marker (morphological, biochemical or one based on DNA/RNA variation) is used for indirect selection of a genetic determinant or determinants of a trait of interest (e.g. productivity, disease resistance, abiotic stress tolerance, and quality). It is also an indirect selection process where a trait of interest is selected, not based on the trait itself, but on a marker
linked to it. It can be very useful to efficiently select for traits that are difficult or expensive to measure, exhibit low heritability, and are expressed late in development. This method is mainly to introduce specific disease resistance alleles into breeds with improved production characteristics to make them more tolerant to the environments. The same method within synthetic breeds, e.g. a cross between local and improved temperate climate breeds, can allow development of a breed that is based on the best of both breeds.

**Genetically modified animals**

Genetic engineering is a targeted and powerful method of introducing desirable traits into animals using recombinant DNA (rDNA) technology. Many kinds of GM animals are in development. Largest class of GE animals is being developed for biopharm purposes to produce substances (for example, in their milk or blood) that can be used as human or animal pharmaceuticals. Another group of GE animals are under development for use as sources of scarce cells, tissues, or organs for transplantation into humans (xenotransplant sources). Yet others are intended for use as food and may be disease resistant, or have improved nutritional or growth characteristics. And others include animals that produce high value industrial or consumer products, such as highly specific antimicrobials against human and animal pathogens (e.g., *E. coli* 0157 or *Salmonella*).

**Animal cloning**

Cloning is one of the recent evolutions of selective assisted breeding in animal husbandry. Cloning animals is a method of reproducing superior livestock genetics and ensuring herds are maintained at the highest quality possible. Cloning allows farmers to accelerate the reproduction of their most productive livestock in order to better produce safe and healthy food. It reproduces the healthiest animals, thus minimizing the use of antibiotics, growth hormones and other chemicals. Consumers can benefit from cloning because meat and milk will be more healthful, consistent, and safe.

**Genetically modified feeds and fodder**

The introduction of GM crops has produced significant benefits to both farmers and consumers. GM crops have minimized the use of pesticides and provided higher crop yields; consumers benefited in the form of improved quality products. GM crops have also benefited the livestock sector as they have increased yields of feed ingredient, have better quality traits, and are safer for livestock. Transgenic crops currently approved for use as animal feed are modified for herbicide tolerance, insect resistance, modified oil content, and virus resistance. The use of GM crops with better productivity assumes significance in the context impossibility to increase cultivable land area without adverse environmental impacts.

**Nutrigenomics**

Nutrigenomics is a branch of nutritional genomics and is the study of the effects of foods and food constituents on gene expression. It focuses on identifying and understanding molecular-level interaction between nutrients and other dietary bioactivities with the genome. Nutrigenomics has also been described by the influence of genetic variation on nutrition, by correlating gene expression or polymorphisms with a nutrient’s absorption, metabolism, elimination or biological effects. By doing so, nutrigenomics aims to develop rational means to optimise nutrition with respect to the subject’s genotype.

**Integrated farming**

Integrated Farming (IF) is a whole farm management system which aims to deliver more sustainable agriculture. It is a dynamic approach which can be applied to any farming system around the world. It involves attention to detail and continuous
improvement in all areas of a farming business through informed management processes. Integrated Farming combines the best of modern tools and technologies with traditional practices according to a given site and situation. Integrated farming is a system which tries to imitate the nature’s principle, where not only crops but, varied types of plants, animals, birds, fish and other aquatic flora and fauna are utilized for production. These are combined in such a way and proportion that each element helps the other; the waste of one is recycled as resource. Many crop-animal-fish integrated models have been found to be successful in different agro-climatic zones of India, which include cattle-fish, pig-fish, goat-fish, duck-fish and poultry-fish integration models. Further, mixed farming has been reported to provide additional source of income and insurance against crops failures due to drought or floods.

VI. CONCLUSION

The nation has made an impressive economic growth in recent years despite issues with poverty and hunger. India’s poor population amounts to more than 300 million people, with almost 30% of India’s rural population living in poverty. Malnutrition and undernutrition jeopardizes children’s survival, health, growth and development, and it slows national progress towards development goals. One of the easiest ways to overcome malnutrition is to enhance production of animal products. India is more or less self-sufficient in cereals but deficit in pulses and oil seeds. Hence, as an immediate measure, support to livestock sector will result in alleviation of these issues and ensure food security.