

CHALLENGES OF POULTRY SECTOR IN INDIA-A STUDY

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ABSTRACT- The poultry production in India continues to exhibit spectacular growth in spite of several challenges encountered over the years. With increasing demand for chicken egg and meat, the poultry production in India foresees further expansion and industrialization. Adoption of small scale poultry farming in backyards of rural households will enhance the nutritional and economic status of the rural people. India is the third-largest egg producer in the world after China and the USA and the fourth-largest chicken producer in the world after China, Brazil and the USA. In India, the per capita consumption of eggs has gone up from 30 eggs per annum to 69 eggs per annum, and that of chicken from 400 gms per annum, to 2.8 kg per annum in the last 25 years. Human nutritionists recommend a minimum of 180 eggs & 10 kg chicken per annum for a healthy adult human, which means that the Indian poultry market is laden with opportunities. Adult population in most developed countries consume over 240 eggs and 20 kg of chicken per annum. India has 1.25 billion people and the number is growing every year. The focus is on “Development”, meaning good food, better health & living conditions for everyone. People spend more money on food when they earn more.

KEYWORDS-POULTRY, LAYER, BROILER, SELLER, MARKETING, CHICKS, FEEDS,

INTRODUCTION

India is the third-largest egg producer in the world after China and the USA and the fourth-largest chicken producer in the world after China, Brazil and the USA. In India, the per capita consumption of eggs has gone up from 30 eggs per annum to 69 eggs per annum, and that of chicken from 400 gms per annum, to 2.8 kg per annum in the last 25 years. Human nutritionists recommend a minimum of 180 eggs & 10 kg chicken per annum for a healthy adult human, which means that the Indian poultry market is laden with opportunities. Adult population in most developed countries consume over 240 eggs and 20 kg of chicken per annum. India has 1.25 billion people and the number is growing every year. The focus is on “Development”, meaning good food, better health & living conditions for everyone. People spend more money on food when they earn more.

Healthy food at attractive price will therefore be the issue in focus. Eggs and chicken are accepted by almost all communities and is available across the country at reasonable prices. Poultry is the most organised sector in animal agriculture in India, worth Euro 15,500 million. Production of broiler meat has increased to 4.2 million tons per annum in 2015-16. Demand for processed chicken meat has been growing by 15- 20% per annum. Total layer production in India has gone up to reach 80 million eggs per annum. Industry sources estimate CY 2018-19 feed consumption to go from 20 to 23 million tons, which includes corn and soya bean and pearl millet. Eggs and chicken were “agriculture produce” few years ago but are considered as “food items” today. Safe food has become a priority. Besides maintaining his production efficiency, the producer has to concentrate on the nutritive values, the adulterants and contaminants of his produce. The ministry of food processing industries at the central govt. level and food inspection authorities at the local levels have started keeping track of eggs and chicken production in India for quality and nutrients. Poultry Production has three segments: 1. Layers, 2. Broilers, 3. Backyard / Family Production (Both eggs and chicken)

Layers

Some 70% of the layer birds are being raised in the states of Andhra Pradesh, Telangana, Tamil Nadu, Karnataka and Maharashtra in south and Haryana in the north of India. Broilers Feed (65%) and chicks (25%) account for 90% of the broiler inputs and consolidation is being observed in the market. Smaller producers engage in ‘contract farming’

Backyard / family production

At one time, 30% of the eggs produced in India were produced in the backyards. Improved varieties of ‘Low technology input birds’, which are dual purpose, i.e., producing eggs and meat, are new being bred in India for the purpose of backyard/family production. The final food products, i.e., eggs and chicken are not exported in huge quantities as there is a huge gap in supply and demand within India.

Export trends-

As per Agriculture and Processed Foods Products Export Development Authority (APEDA), India has exported 659,304 MT of poultry products for the worth of INR 7,680 million during 2015-16. Majority of the exports are destined for the Middle East. Each year, India exports around 5000 MT of poultry products into Europe, the largest chunk of which is destined for Germany, although the share of the Netherlands has grown significantly over the last few years.

Main market players

A large group of poultry companies are based in and around Hyderabad. Andhra Pradesh and Telangana (erstwhile Andhra Pradesh) account for majority of the birds and eggs produced in India. Hyderabad in Telangana is the epicentre for the poultry industry in India owing to the presence of large producers as well as the existence of organisations such as the Directorate of Poultry Research (DPR), a Indian Council Agriculture Research (ICAR) institute and Indian Poultry Equipment Manufacturers Association (IPEMA).

The key stakeholders in the Indian poultry market are as follows.

a) Sneha Foods Limited, Telangana b) Srinivasa Hatcheries (SH Group), Telangana c) Balaji Hatcheries, Andhra Pradesh d) V S N Hatcheries, Andhra Pradesh e) Mulpuri Group, Andhra Pradesh f) Venky's (V H Group), Maharashtra g) Suguna Foods, Tamil Nadu h) R M Group, Haryana. i) Skylark Foods, Haryana j) Komarla Group, Karnataka k) I B Group, Chattisgarh l) Bharati Poultry, West Bengal

Challenges and Opportunities

Currently, the poultry sector in India faces the following challenges, which in turn could open up opportunities for the Dutch entrepreneurs

a) Low productivity

The production facilities and methodologies followed by the poultry farmers in India are not in line with international standards. A good majority of the poultry farms in India are open buildings with no climate control or quarantine mechanisms in place, which exposes the birds to various climate variation as well as potential diseases and epidemics. In order to mitigate the risks posed by that, the density of birds in farms have to be kept low, which in turn negatively affects productivity per farm. Latest farming technologies such as climate controlled farm houses, automated feed lines etc. can help improve the productivity in Indian poultry farms.

b) Lack of storage, cold chain and transport

More than 60% of broiler birds produced in India are produced in 6 states (Andhra Pradesh, Telangana Karnataka, Maharashtra, Punjab and), similarly more than 60% of eggs produced in India are produced in 6 states (Andhra Pradesh, Telangana Haryana, Maharashtra, Punjab and Tamil Nadu). Birds are currently transported alive between the states, which causes them to be transported in inhumane and sometimes unhygienic conditions. Many birds are killed during transport. Lack of dry processing and cold chain facilities make it a logistical nightmare to be transporting good quality poultry produce within India. Poultry produce neither are transported using refrigerated trucks nor are specialized equipment used for packing or transporting poultry produce. Latest expertise in the field of cold chain can be of immense benefit to the Indian poultry farmer.

c) Supply of quality feed

Soya bean and maize are widely utilized by poultry farmers in India as the main feed. These help only in fulfilling minimum nutritional requirements, and do not help in raising high quality, healthy birds. There is shortage of quality feed in the market and lack of knowledge about the benefits of using quality feeds. The problem is compounded by the fact that there is no alternative protein source available either. This opens up immense opportunities for poultry feed manufacturers and dietary supplement producers

d) Quality standards for farm management

There are no quality standards in farm management in India, prescribed either by the Government or by self-regulating industry bodies. For export market, APEDA has imposed strict quality standards and regular audits to ensure quality is maintained up to international standards.

However, in the domestic market, there is a lack of comprehensive regulating authority to maintain hygiene in farms, processing and transportation. Licensing of farms is done on municipality level, who often lack the knowledge, expertise and human resources to strictly enforce quality standards. Europeans and USA poultry industry has a lot to contribute to the Indian poultry industry in the form of trainings, best practices, skill development etc.

e) Lack of processing facilities

There is a lack of dry processing capabilities in the Indian domestic poultry market. For lack of knowledge and awareness, Indian consumers prefer to go for freshly culled birds which are not processed in clean and hygienic conditions. Wet processing machineries pose serious environmental concerns owing to poorly managed waste disposals. There exist limited storage facilities which can conserve the products without loss in quality. Processing

machineries that are clean and hygienic, coupled with waste treatment plants are the need of the hour in Indian poultry market –

F) Feed Resources

Success on poultry production rests primarily on the quality of the bird employed, comforting environment and provision for good feed, the last being most expensive of all other inputs, deserves befitting attention. Feed accounts for 65- 70% of broiler and 75-80% of layer production cost. Maize is the popular cereal used in combination with protein meal like soybean meal which generally determines the cost of compounded feed. Production of maize increased from 9.65 million tons in 1989-90 to only 24.4 million tons in 2015. Similarly, soybean meal production increased to 11.35 million ton in 2015 from 3.52 million tons in 1999-2000. Average increase in maize availability has been 3.8% per annum which is far below the growth rate of egg or meat production. Thus, there is a need to increase the production of maize and soybean or explores the usefulness of other alternate energy and protein rich feedstuffs to maize and soybean meal, respectively, in poultry diets. In view of the large gap between the demand and availability of feedstuffs for poultry production, a holistic approach is needed to meet the demand of ever growing poultry industry. Some of the approaches in these respects are

Identification of newer feed resources –

Since the production of cereals and oil seeds may not increase significantly, the availability of grain and oil seed meal to feed industry is expected to decrease. This would lead to escalation in the cost of feed ingredients and consequently the cost of eggs and meat. To some extent such a situation can be corrected by developing strains that need less feed input. However, alternate feed ingredients that are not related to human consumption and available in plenty should be identified and their suitability should be tested including the economic aspects.

Utilization of structural carbohydrates and phytate phosphorus

With the advancement of technology, the reduction in dependency of poultry on the storage plant carbohydrate, protein or other nutrient and to allow them to make greater use of structural carbohydrates and other nutrients. Hence the dimension from research should change from as such providing feed than technologies that utilize feed better. There are many components of feed such as β -glycans, pentosans, mannans, cellulose, lignin and phytic acid which cannot be digested by poultry under normally. These non digestible feed ingredients frequently generate digestive stress in poultry with a consequent reduction in nutrient utilization and wet litter problems. These problems could be largely alleviated by use of feed enzymes.

Overcoming limitations of Agroindustrial byproducts and unconventional feed stuff – The nutritive value of a variety of maize and soybean meal replacers has been examined and despite their potential, the utilization in practical formulations is negligible due to constraints imposed by several antinutritional, technical and socioeconomic factors. These constraints need to be resolved by the feed industry utilizing the services of scientists, planners and policy makers.

G) Food safety

Reduction of antibiotics use in animal feed demands substantial improvement of herd health issues, but also sensible and professional management of the antimicrobial drugs is necessary to prevent the threats of antibiotic resistance in human being. Antimicrobial drugs may be used for effective therapeutic and prophylaxis purposes, but the pulsing or continuous use of antibiotics in-feed has been severely questioned, besides public health issues, because of the consequences in intestinal microbiota and the gastrointestinal barrier harmonic function. There is a worldwide concern to minimize the use of antibiotics in poultry because of disease resistance and antibiotics residues in food chain. In such case suitable alternatives need to be explored, which could be beneficial and cost effective.

Many products of such nature like probiotics, gut acidifiers, immunomodulators, eubiotics, organic acids etc. are available in the market, but need further research. Ensuring safe food is paramount for the protection of human health and for enhancement of the quality of life. Safe food plays an important role, whether domestically produced and consumed, imported or exported. In addition, the production of safe food represents an opportunity for income generation and market access. Over the last decades, the food chain approach has been recognized as an important step forward to ensure food safety from production up to consumption. This approach requires the commitment of all players in the food chain, involving producers, traders, processors, distributors, competent authorities as well as consumers. The role of animal feed in the production of safe food is also recognized worldwide, and several events have underlined its impacts on public health, feed and food trade, and food security. Concerns prompted by the outbreak of bovine spongiform encephalopathy (BSE), and other more common food problems associated with Salmonella, enterohaemorrhagic Escherichia coli and other contaminants, have encouraged professionals and the feed industry to scrutinize more closely the causes of these diseases and methods for their control.

H) Marketing

Though, commercial production of eggs and chicken meat on scientific principles has been well standardized, marketing of eggs and broiler meat are not fully organized except few in urban sectors. Eggs are still transported in open condition and in un-refrigerated vehicles. Eggs are sold as commodity in India and purchased by consumers mostly from shop next door for daily needs. Eggs are channeled through wholesale dealers, sub-dealers, retailers etc. in two to three stages, which raises the cost of eggs by 10-15% over the actual sale price at producer's place. Broilers are sold live or slaughtered at the place of sale. Sometimes the birds are dressed and displayed for sale in the open air without any concern for hygiene. Similarly eggs are sold in open without consideration for preservation of their quality. Seasonal variations in consumption and demand of eggs and meat pose greatest challenge to the stabilization of prices. The fluctuations at times go to the extent of up to 25-30% in a short period of 3-4 weeks. Thus, there is a need to strengthen the marketing system. Some of the approaches in this direction are Development of reliable and stable market chain round the year for marketing of poultry products.

Facilities for hygienic slaughter and preservation of eggs should be made available at market places in both urban and rural areas. Formation of producer co-operatives/associations and rural market yards will help in proper marketing. National Egg Coordination Committee, a farmers' cooperative agency has been contributing to the improvement in marketing of eggs. However, more systematized marketing strategy and the state's involvement in minimizing the channels are required for making poultry farming remunerative and cost effective in the years to come. Because of the location of farms in urban and peri-urban areas that too concentrated in few states, availability of eggs and chicken meat are high in these areas only, but in rural areas and rest of the country the availability is low. Thus, there is a vast scope to tap the rural markets and remote areas of the country where availability is low.

I) Processing and exports

Trading of chicken in India is primarily done in number and not by weight at the wholesale level. Live and fresh dressed broilers account for the bulk of sales and sale of processed meat is limited (below 10%). However, acceptance of processed chicken is on the rise, particularly in the urban markets. Due to pollution and environmental concerns, slaughtering of birds under unhygienic conditions at open places is being discouraged. Thus, the sale of slaughtered chicken is expected to increase.

Hence, there is a need to develop processing facilities. Hence, there is an urgent need of many chicken processing plants in the near future and sale of processed chicken to increase both to cater domestic as well as export markets. A few plants for processing eggs have been installed using state of the art machinery in some states with an average daily turnover capacity of 0.7 – 0.8 million eggs. Whole egg powder, yolk powder, egg weight powder, lysozyme etc. are being produced under high standards of operation. Egg powder from India is well accepted in EU, Japan and Far-east. However, to tap the international market there is a need to establish many more egg processing plants. It has been told that India is geographically ideally located to cater to the Middle East and far eastern countries for shell eggs.

Therefore vast scope exists to increase the export of shell eggs from India to these countries. Exports of poultry produce are very low, about Rs.651crores per annum and the trade is very small in global market (Shukla and Nayak, 2015). At present mainly table eggs (UAE, Kuwait and Oman), hatching eggs. (UAE, Oman and Kuwait) and egg powder (Japan, Poland, Belgium and UAE) are exported from India. Our major markets Middle East and Asia. Egg powder is exported to Japan and EU. India has infra structure to export eggs including all primary packaging mechanism and cold chain to deliver top quality produce to customers.

J) Value addition in Poultry

Value addition in poultry plays an important role in increasing the profits. The value addition may be through nutritional manipulations, processing and transgenesis. Omega-3 enriched eggs and meats are available in the market for premium price developed by nutritional approaches. Feeding the chicks with rich sources of omega-3 fatty acids will aid in increasing the levels of omega-3 fatty acids in eggs and meat of the birds. Experiments on fortification of Zinc and Vitamin B12 in chicken egg and meat through dietary manipulation for enhanced value addition and shelf life are going on and need commercialization. The second one is through biotechnological approaches, where in the gene (inter species) responsible for specific trait can be made through transgenesis. However, this approach is still in primitive stage where in research is being carried out. The commonly utilized method for value addition is processing of the poultry products. By value addition low valued meats and by products can be processed into a highly nutritious finished products adding to the returns.

K) Welfare concerns in Poultry

Welfare of poultry has become an important issue in recent days since EU banned cage rearing of birds. Animal welfare activists increasingly argue that rearing of these high producing and rapid growing birds in intensive system of rearing resulted in some of the welfare and health issues which were not apparent in slow growing

extensively reared birds. Animal welfare activists allege that the welfare of birds reared particularly in conventional cages (CC) is compromised.

The space provided in CC is not sufficient for birds to do normal activities such as to stand, lie down, and turn around without touching each other and sides of the enclosure (Chatterjee and Haunshi, 2015). The birds kept in CC do not have sufficient space to express their natural or highly motivated and comfort behaviours. Highly motivated or internally driven and comfort behaviours in laying hens are nesting behaviour, preening, dust bathing, wing flapping, wing stretching, foraging, pecking, etc. Wing flapping is often referred to as “comfort” (stretching) behaviour, Wing flapping requires more space than wing stretching (one wing stretched downward) and wing raising (slight elevation of both wings). All these behaviours are not seen in birds kept in conventional cages. Broilers are reared mostly on floor in open sided houses for a short period of time i.e. up to 6 weeks of age.

Hence, welfare issues in broiler production are entirely different. Genetic selection for higher body weight over the last 50 years resulted in increase in growth rate by over 300% from 25 g per day to 100 g per day (Nicol, 2013). This phenomenal increase in growth rate of broilers resulted in emergence of metabolic disorders such as ascites and sudden death syndrome (Bessei, 2006). Other welfare problems are leg disorders and lameness in the fast growing broilers and hunger in the broiler breeders (Weeks and Butterworth, 2004). Extreme hunger in broiler breeders due to feed restriction to prevent accumulation of fat and in-turn affecting the egg production is considered to be one of the welfare concerns in broiler breeders. Incidence of contact dermatitis (Pododermatitis) that includes hock burns, breast blisters and foot pad lesions is considered to be another welfare issue.

Policy makers should consider both positive and negative aspects of the problem before making a decision on the issue related to cages. A layer bird producing 330 eggs annually in a conventional cage and a broiler growing at rapid rate (2.5 kg in 42 days) in itself is very good example that the birds are quite comfortable. One cannot imagine a spectacular productivity from birds if the birds are under stress or uncomfortable

Major challenges faced by the Indian poultry industry

Global compound feed production is estimated at a bit less than 900 million tonnes, out of which more than 30% are in Asia. Poultry feed represents 44% of the total volume (Source: IFIF). Top 5 meat chicken producers in 2012 were USA, China, Brazil, India and Mexico, whereas for egg production the ranking was China, USA, India, Japan and Mexico (Source: UNA Mexico).

According to various sources, broiler meat production in India was less than 1 million tonnes in 2000 and has reached 3.4 million tonnes 2014 . This is an increase of 350% over the last 10 years. Different estimations have been given for the future. Assocham has stated that broiler meat production in India will reach 6 million tonnes in 2015, but a more realistic figure would be 4.1 million by 2020 (Source: ICRA). Today, per capita broiler meat consumption in India is around 3 kilo per year, a very low figure compared to, for instance, 66 kg for Kuwait, 47 kg for Hong Kong or 41 kg for Brazil. Indian table egg production is around 66 billion per year, and is forecasted to almost double by 2020. The average Indian person consumes 55 eggs per year (around 3.3 kg), far less than for instance in Mexico (almost 21 kg), Singapore (18.8 kg) or Japan (16.3 kg). Therefore, there is no doubt that there is a huge growth potential for Indian poultry meat and egg industries.

However, Indian feed and meat businesses have to face serious challenges if they want to continue expanding, starting with land availability. India counts about 1.22 billion citizens, meaning 17.5% of total world's population. But, India occupies only 2% of world's total land, and a bit more than 7% of the arable land available. This land shortage means that Indian agriculture must be more efficient in future. According to Cassidy et al. (2013) who studied crop allocations in terms of calories, protein and weights of 41 major crops combined, India directs 89% of produced crop calories to food, leaving little room for feed production, but also indicating that more food can only be produced if agriculture is more efficient.

According to FAIDA (2013), India has the potential to double the yield of most of its crops. However, there are several prerequisites to achieve this. Indian agriculture must improve the quality of seeds used, work on farming techniques and education, put in place proper water irrigation, adequate mechanization and encourage research. It is also essential to ensure a proper management of resources such as land and water. Partnership between private industry and farmers is also needed to develop successful interactions. Through an appropriate policy regime, India should improve the marketing of agricultural goods. Last but not least, the creation of a new segment of branded foods will help to generate demand and ensure consumers of traceability and quality.

The challenges for Indian poultry industry are multiple. Raw material availability and prices are already an issue. Considering that about 1 kg of corn is required to produce 1 kg of broiler (based on FCR = 1.65 and 60% corn in feed), it means that, for broiler production only, and depending on the different forecasts, an additional 1 to 3 million tonnes of corn will be needed in the next years.

Another challenge or issue is the fact that production is not evenly distributed in the country. More than 60% of broilers are produced in 5 states (Andhra Pradesh with 20%, Karnataka, Maharashtra, Punjab and West

Bengal) while more than 60% of eggs are produced in 5 states (Andhra Pradesh, Haryana, Maharashtra, Punjab and Tamil Nadu). This creates logistic and quality issues related to transport.

The third challenge that India needs to overcome if it wants to continue expanding its poultry production is a lack in education and access to technology. For instance, most of poultry farms use open buildings, which means no control of climate and high risks related to potential poor biosecurity. On the positive side, this means production costs are reduced. India poultry producers also have to deal with a lack of genetic diversity. Two breeds, namely Vencobb and Babcock, represent respectively more than 70% of birds in broilers and 80% in layers. This means a potential rapid spread of diseases across the country. However, these breeds are well adapted to Indian conditions and ensure optimum performance. Last but not least, India currently lacks skilled manpower.

There are not enough managers, veterinarians, nutritionists, or researchers, to ensure a top quality management in each operation. To allow expansion, efforts are needed to change the way poultry products are offered in India. Less than 5% of eggs are processed, and about 90 % of poultry meat in India is consumed in fresh form, as many consumers prefer to buy live poultry and get it dressed in their presence. This has several consequences: it is difficult to transport non-processed products from one region to another one, and high mortality and shrinkage rates due to transport of live birds are observed. Also, prices are determined by daily local supply and demand, which encourages volatility.

More efforts are needed to improve supply and distribution of poultry meat in India. Indeed, poultry dressing facilities are usually manual and lack sanitary measures. This does not ensure a hygienic and scientific slaughter, and proper utilization of by-products. There is also a shortage of adequate and cost effective infrastructure, leading to poor distribution and risks on quality. Cold storage facilities are lacking, which is a serious issue because meat and egg demand vary a lot over the year, due to different religious rituals. Last but not least, adequate quality control standards need to be implemented. For instance, large eggs are sold at same price as small ones, which do not encourage producers to deliver quality. In summary, investments in infrastructures (slaughter houses, processing plants, transportation, warehousing and cold storage), as well as quality certification systems, are necessary to ensure growth of the Indian poultry industry. One should, however, keep in mind that same needs are required for imported products.

In spite of rapid growth, the poultry industry suffered many setbacks in recent times due to rising cost of feed, emergence of new or reemerging of existing diseases, fluctuating market price of egg and broilers, etc. which need to be addressed to make the poultry sector as a sustainable enterprise. Issues relating to animal welfare and environmental pollution by poultry units have been of increasing concern.

A major constraint affecting the growth of the poultry industry in India is the lack of basic infrastructure such as storage and transportation, including cold chain. As a result, there are wide price fluctuations in the prices of poultry products, i.e., eggs and broilers. An inefficient marketing system- The presence of so many market intermediaries harms both the producer and the consumer. The price and availability of feed resources- Maize or corn plays a major role in broiler production, as it constitutes 50 to 55 percent of broiler feed. As the broiler industry is growing at the rate of 8-10 percent per annum, the demand for maize and soya is thus likely to increase. Emerging and re-emerging diseases of poultry- Mutations in viral genomes leading to new variants in viruses and developing resistance to vaccines and antibiotics. Avian Influenza outbreaks occurring in parts of India, is a very good example. The policy measures that are required to improve the poultry industry must involve:

(a) improving infrastructure facilities, which will help not only to stabilize the price of poultry products in the domestic market, but will also make them available in remote areas;

(b) creating an efficient marketing channel that will help provide remunerative prices to producers (in other words, India's marketing set-up should also grow along professional lines).

CONCLUSIONS

The poultry production in India continues to exhibit spectacular growth in spite of several challenges encountered over the years. With increasing demand for chicken egg and meat, the poultry production in India foresees further expansion and industrialization. Adoption of small scale poultry farming in backyards of rural households will enhance the nutritional and economic status of the rural people. With the advent of knowledge and new discoveries in different fields of poultry, the future challenges will not be a hindrance and thus sees a bright future for poultry production in this country.

REFERENCES;-

- Appleby, M.C.; Hughes, B.O.; Elson, H.A. (1992). Poultry Production Systems: Behaviour, Management and Welfare. CAB International.
- "[Global Animal Slaughter Statistics And Charts](#)". Faunalytics. October 10, 2018. Retrieved November 5, 2019.

- "Compassion in World Farming – Poultry". Ciwf.org.uk. Retrieved October 3, 2018. There are more chickens in the world than any other bird. In fact, more than 50 billion chickens are reared annually as a source of food, for both their meat and their eggs.
- "Compassion in World Farming – Poultry". Ciwf.org.uk. Retrieved October 3, 2018. Chickens farmed for meat are called broiler chickens, whilst those farmed for eggs are called egg-laying hens.
- Damian Carrington, "Humans just 0.01% of all life but have destroyed 83% of wild mammals – study", The Guardian, 21 May 2018 (page visited on 19 August 2018).
- State of the World 2006 World Watch Institute, p. 26
- Food-Animal Production Practices and Drug Use, National Center for Biotechnical Information. National Academies Press (US). 1999. Retrieved February 28, 2016.
- Woods, Prince T. (October 2008). "Fresh-Air Poultry Houses". Norton Creek Press. Retrieved April 18, 2012.

