

Review

## Biophysical and the socio-economics of chicken production

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This paper reviews the socio-economics of poultry production with the aim of delivering summarized and synthesized information for the beneficiaries. Poultry production and product consumption are progressively growing in the world. Poultry accounts for about 33% of the global meat consumption and is expected to grow at 2 to 3% per year in the world. Literature stated that large size poultry farms were more efficient, but these farms are few in the developing countries. Although there is prediction that technology favors the intensification of poultry production in these countries, village poultry still is profitable that contributes to poverty alleviation and has no market problems. Women and children are responsible for caretaking of poultry and they are also beneficiaries. The largest off-take rates of birds occur particularly during holidays and festivals in Ethiopia. Chicken population and *per capita* consumption of egg and poultry meat has been declining to the face of population growth in Ethiopia. Livestock production is likely to be increasingly affected by climate change; however poultry industry has a natural advantage over others livestock because of its low global warming potential. Thus, poultry meat and egg production is the most environmentally efficient animal protein production system. But, poultry production has been facing with a problem of food-feed competition and other critical gaps that need to be filled by the institutions of research and development. The study showed that such poultry technologies should be compatible with local socio-economical interests. Further improvement would be possible by lowering the prices at the consumer level and by improving the profitability of producers. It is concluded that poultry production has so many socio-economical advantages in satisfying the demands of animal source foods.

**Key words:** Health and climate change, poultry production, protein foods, socio-economics.

### INTRODUCTION

Shortages of protein availability are a well-known problem in Africa. Poultry is by far the largest group of livestock species (FAO, 2000a) contributing about 30% (Permin and Pedersen, 2000) of all animal protein consumed in the world. From the total poultry population, chicken constituted around 98% in Africa (Gueye, 2003) and almost 100% (Alemu, 1995) in Ethiopia. Moreover, local chickens are widely distributed in the rural areas of

the tropics. Indigenous chickens in Africa are hardy and they can adjust themselves to the fluctuations (Kitalyi, 1998). Importance of indigenous poultry breeds for subsistence farmers in many developing countries (David, 2010; FAO, 2006) combined with many consumers' preference for their eggs and meat suggests that these genetic resources are not under immediate threats.

The poultry sector is characterized by its industrialization, faster growth in consumption and trade than any other major agricultural sectors in the world. According to Bos and De Wit (1996), poultry provides an acceptable form of animal protein to most people throughout the world. Moreover, FAO (2010) reported that poultry meat represents about 33% of the total global meat production. Scanes (2007) reported also that to reduce child mortality and to improve maternal health, in sub-Saharan Africa, poultry products provide an excellent source of nutrient (e.g., B<sub>12</sub>). Wiebe (2007) reported also that poultry meat and egg production is the most environmentally efficient animal protein production system. Poultry and egg sales are decided by women that they provide immediate income and source of self-reliance for them. Moreover, poultry are used for strengthening marriage partnerships and social relationships of the society. Chicken population in Ethiopia is estimated to be around 34.2 million (CSA, 2007) that constitutes 60% of the total population of East Africa (Mekonnen et al., 1991).

From which 97.82% of them are local birds kept in extensive production systems (FAO, 2008). Dawit et al. (2009) reported also that the role of poultry in Ethiopia has been becoming more important over time. Therefore, the need of reviewing chicken production and the socio-economic in Ethiopia is a prioritized issue that for improved production of chicken a country. Moreover, reviewing the successful experiences of chicken production and its socioeconomics, and thereby delivering synthesized form of information for beneficiaries is also another milestone to improving the production of poultry in the country. Based on this outlined background, the objectives of this paper were:

1. Review chicken production scenarios and the socio-economics of chicken production
2. Avail the socio-economic essentials of chicken productions for the beneficiaries

Most of the research findings, which focused on socio-economics of poultry productions, were reviewed. Various research findings that focused on the social and economical impacts of poultry production were reviewed. Effects of food-feed competitions on chicken production types of chickens were also reviewed, depicted and sourced. Trends of production, trade and consumption of poultry were reviewed. Comparative studies of family member participations in poultry production and their share of benefits were reviewed. Moreover, the impacts of climate change on poultry production were also reviewed and synthesized.

## **OUTLINED DESCRIPTIONS OF POULTRY PRODUCTION**

Poultry production can be described not only as the

production of meat and eggs, but also distribution and retailing of these products. Based on its level of biosecurity and birds/products marketed, poultry production sector is classified into 4 viz; industrial, commercial, medium-commercial and village chicken productions systems (Jonathan et al., 2004) in the world. Most poultry production, in developing countries is possibly described as a scavenging/ village systems (Kitalyi, 1998) sector. Kryger et al. (2010) reported also that around 80 percent of rural households in developing countries engage in smallholder poultry production. According to Sonaiya and Swan (2004), in sub-Saharan Africa, 85% of poultry sector is managed in village production systems. Moreover, around 97.82% of chicken production in Ethiopia is traditionally managed (FAO, 2008).

Although traditional practices continue to dominate domestic poultry production in Ethiopia; there has been a shift to industrial production (FAO, 2008). According to ILCA (1993) reports, chicken population in Ethiopia was around 56.5 million; however, this number was declined to 34.2 (CSA, 2007) millions. About 99% of the annual poultry meat and egg production comes from the indigenous chickens kept under the traditional systems (FAO, 2008) in Ethiopia. Exotic breeds of chicken are only 2.18% of the total poultry population in a country (CSA, 2005). All of these, except some managed by small scale intensive, are used by large scale (private and government) commercial poultry farms (FAO, 2008) in Ethiopia.

Indigenous chickens are characterized by low performances: Average annual egg production is estimated to be around 60 small eggs with thick shells and a deep yellow yolk colour (Alemu and Tadelles, 1997). Average body weight gained by male birds was also around 1.5 kg at 24 weeks of age (Teketel, 1986). Estimated egg and poultry meat per capital consumption (in the mid 1990s) was 57 eggs and about 2.85 kg (ILCA, 1993), respectively in Ethiopia. However, *per capita* consumption of egg and poultry meat has been declining (2003) by 0.12 and 0.14, respectively (USAID, 2006) to the face of population growth in Ethiopia. Inputs and technologies are always required to improve poultry production and thereby to satisfy the socio-economical needs of the producers.

## **INPUTS AND TECHNOLOGIES TO IMPROVE POULTRY PRODUCTION**

Inputs and appropriate poultry technologies can be local practices or be adopted from other countries. According to Muchenje et al. (2001), poultry technologies should be compatible with local interest. Aichi (1996) observed that many developed production technologies are not compatible with the socio-economic circumstances in the village chicken production system. Furthermore, Adebayo

and Adeola (2005) in Nigeria reported that a national support is required in the area of finance and input to strengthen the poultry production. In Sudan, Abda and Amin (2010) reported that feed cost was the main production cost (90.87%) in different poultry farm types and sizes. Similarly, Achoja et al. (2006) in Nigeria reported that the price per bag and poor road network (market access condition) were the major problems affecting efficient marketing of poultry feeds in the study area.

The high cost of commercial poultry feed discourages farmers from supplementing local chicken; therefore farm feed formulations using locally available materials should be encouraged (Njue et al., 2004). Alemu and Tadelle (1997) reported that the quality of mixed feed for commercial poultry production is generally poor in Ethiopia.

According to Vincent et al. (2010), the resources used in poultry production were not properly utilized. The authors recommended that farmers should use inputs more efficiently by reducing their levels of employment. Danielle et al. (2009) reported from Tanzania that vaccinations did increase chicken production and egg and meat consumption. Various scholars are always advising poultry producers to adopt appropriate technologies and practices in order to boost production.

### **ADOPTION OF IMPROVED POULTRY PRODUCTION PRACTICES**

Generally, adoption of improved poultry production practices may involve the transfer of appropriate new technologies and local experiences to be used in improving productivity of the stocks. The pace of adopting new technologies by farmers can vary due to controversial reasons. Teklewold et al. (2006) reported in Ethiopia that farmers' decision on the extent of adoption of exotic poultry breed was positively influenced by age of the household head, experience in adoption of poultry technology, expected benefit from poultry and market problem. Moreover, Truong and Yamada (2002) reported from Vietnam that Farmers' changes of technology use are influenced by technical training, meeting, oral transmission, trust on technician and belief level on technology. Moreover, Nnadi and Akwiwu (2005) reported that there is a varied rate of adoption of the improved poultry production practices in Nigeria. The same authors recommended that extension education campaign should be intensified to avail rural women of new practices in poultry.

According to Augustine (2010), the socioeconomic characteristics of the poultry farmers collectively have positive but low relationship with the cost of inputs adopted by the farmers. However, Eze and Okudu (2008) reported from Nigeria that Income; stock and educational levels were the most valuable variables determining the

poultry farmer technology adoptions potential. Moreover, Olaniyi et al. (2008) identified the major constraints to utilization of poultry production technology was access to get capital and inadequate extension contact.

According to Khandait et al. (2011) from many technologies, marketing were highly adopted followed by feeding and watering in the backyard poultry practices of India. However, the same author stated that the least adoption was for health care practices. Truong and Yamada (2002) reported that factors that trigger adoption of new technologies comprise of young and educated male farmers. On the other hand, the author stated the factors, which could limit adoption of poultry technologies included conservative old men, and weak belief on ensure high yield of new technology. Olaniyi et al. (2008) reported that age, awareness and education shows negative relationship with constraints to utilization of poultry production technology. According to Truong and Yamada (2002) usually men use technologies for rice, fruit and fish production; whereas, women use technology for pig and chicken production. In Nigeria, Musa et al. (2008) reported the wide use of ethno veterinary remedies by rural chicken farmers in Plateau State.

Augustine (2010) reported that the socioeconomic characteristics of the farmers collectively have positive but low relationship with medication practices adopted by the farmers. In Ethiopia, Dana et al. (2006) emphasis the need to transform the traditional piece meal approach of poultry technology transfer into promotion of carefully selected and packaged technologies in a multi-institutional framework with due consideration to the input-output market if the potential role of poultry research in development is to be realized. Adoption of improved poultry production practices and transfer of such appropriate new technologies and local experiences may vary according to poultry production systems and socio-economic status.

### **POULTRY PRODUCTION SYSTEMS AND THE SOCIOECONOMICS**

Socio-economical status of farmers can vary according to poultry production systems. Kryger et al. (2010) reported that there are emerging signs of restructuring—with a shift away from small-scale commercial production towards larger-scale production. Likewise to this, Mekonnen (2007) from Ethiopia reported that efforts have to be made to shift the chicken production paradigm to semi intensive in Ethiopia with a holistic support of services such as health, housing and feed to make it productive and sustainable. According to Abda and Amin (2010) the large size farms are more efficient than other sizes and type of the poultry farms. Jugessur et al. (2004) reported from Mauritius that about 65% of the households wished to expand family poultry production as they found this system of production more profitable than rearing

improved commercial broilers and layers.

Kryger et al. (2010) reported that due to its provision of utility among all wealth groups, village chicken production is likely to persist within their livelihoods of country's rural population. Permin et al. (2004) by using a holistic approach, it is possible to improve village poultry development, which may help the poorer farmers in developing their skills and creating a sustainable income with very few inputs.

According to Scanes (2007), village poultry contribute to poverty alleviation and improvement of food security. Njue et al. (2004) reported that supplementation and vaccination of local birds was economically profitable. In Bangladesh, Sumy et al. (2010) reported that backyard chicken rearing is profitable for farmers. Vaccinations and balanced diets have a decisive effect on chicken rearing, providing quality products for human consumption and reducing nutritional deficiencies and poverty of the country.

Adrian and Michael (2009) in South Africa observed that small-scale poultry production has the ability to initiate economic growth. Small scale poultry producers face higher transaction costs. Also, FAO (2011) reported that advances in technology favours the intensification of poultry production in developing countries. In Kenya, Vincent et al. (2010) reported that poultry production is one of the most important economic activities to the smallholder farmers. Technical and physical constraints are evident which have resulted in low production of poultry and poultry products to meet population demand and for socio-economic sustainability of the livelihoods.

## PROTEIN FOOD DEMANDS AND TRENDS OF CHICKEN PRODUCTIONS

The demand of protein food is progressively growing with the improvements of society's income and population growth that affects trends of chicken production. The enormous surges and the driving force behind livestock and poultry sectors growing at an unprecedented rate is a combination of population growth, rising incomes and urbanization. Similarly, FAO (2009) reported that there is a strong positive relationship between the level of income and the consumption of animal proteins. According to Dagher (2009) the current growth of poultry production and consumption makes a good case for the need and desire for future growth of the poultry industry. Dave (2007) also reported that poultry consumption is expected to grow at 2 to 3% per year.

According to David (2010), chicken meat and eggs are the best source of quality protein for those who are under-nutrition in sub-Saharan Africa (SSA) and South Asia. Muchenje et al. (2001) reported that poultry provide major opportunities for increased protein production and incomes for smallholder farmers. Abedullah and Bakhsh (2007) noted that the major contribution of poultry

consumption in improving *per capita* nutrients level is well documented.

Village chicken in Ethiopia provides 12.5 kg of poultry meat per capita per year, whereas cattle provide only 5.34 kg" (Kitalyi, 1997). According to Windhorst (2008), an increase in egg and poultry meat consumption for least developing countries is 26 and 2.4%, compared with only 2.4 and 1.6% in the most developed countries. FAO (2010) reported also that chicken meat is relatively healthier than others; containing low total fat and it has high desirable monounsaturated fats. Costa (2009) described the attributes of chicken meat to its intensively-based and vertically integrated operation. Furthermore, Paweł (2005) reported that consumption of poultry and fish has not been found to be associated with increased risk of cancers. Arrey (2009) reported also that the possibility of village poultry as a viable sector to boost protein deficiencies in Cameroon is documented. To improve chicken production and to satisfy the demands of protein foods, participation of family members in the household is highly required in the phenomena of poultry productions.

## POULTRY PRODUCTION AND PARTICIPATIONS OF FAMILY MEMBERS IN THE HOUSEHOLDS

All family members are participating in poultry production. However, Aichi (1996) noted that subsistence village chicken production in Africa is the domain of women and children. Similarly, Permin et al. (2004) reported that women are the caretakers of poultry in most of the poor countries. The contribution of smallholder poultry production to the income and internal household position of women is widely recognized (Kryger et al., 2010). Scanes (2007) observed that poultry may be one of the few, or only, sources of cash income for women and children. Okoh et al. (2010) reported that women enjoyed about 53.6% level of involvement in commercial poultry farm decision-making and only about 28.7% rate of accessibility to farm resources. According to Dawit et al. (2009), at the micro-economic level poultry is very important especially for women in Ethiopia. Mammo et al. (2008) reported that in Ethiopia shared and individual ownerships are the main mode of ownership of village chickens in the family. Also, Hunduma et al. (2010) stated that around 92.4% of the households' village chicken production is accomplished by women and children. Similarly, about 70% of overall care-taking of chickens, feeding of chickens, cleaning of birds-quarter, treating of sick birds, decision for off take of poultry products in Ethiopia were the responsibility of women (mammo et al. 2008).

Kryger et al. (2010) reported that poultry development interventions offering women beneficiaries much more than economic profits; along with economic empowerment come social empowerment. On the other

hand, Eze and Okudu (2008) argued that women are more affected by the avian influenza crisis since they are the ones directly involved in the care and handling of poultry particularly in small-scale backyard production. It is sensible that the active participation of family members, in the household of poultry production should always be with their purpose of home consumption, social purpose or incomes generation.

## PURPOSE OF POULTRY PRODUCTION AND THE ECONOMICS

Every type of poultry production system has its own purpose, while rearing birds such as: Home consumption, social purpose or to generate incomes. According to Kryger et al. (2010) reports, income and consumption have been considered the main rationale for keeping village poultry. Hunduma et al. (2010) reported from Ethiopia that most of village chicken keepers used chickens and their by products for home expenditure followed by home consumption. Tadelle et al. (2003) reported from the same country that maximum amounts of the eggs produced were used for hatching followed by for sale and home consumption, while more birds were used for sale followed by replacement and consumption. Similarly, Jugessur et al. (2004) reported from Mauritius that almost every household keeps of semi-scavenging poultry for food and to generate additional incomes. However, Adebayo and Adeola (2005) reported that finance and input are essential for substantial improvements in the contribution of the poultry enterprise to household food production and economic well being of poor farmers.

According to Jugessur et al. (2004) reports, family poultry had a guaranteed market. All the poultry merchants who marketed the family poultry found their business profitable, and wished to expand it (Jugessur et al., 2004). That is why Maqbool and Bukhsh (2007) reported from Kenya that commission agents were earning 47% of the total profit in poultry industry, followed by retailers (28%) and producers (25%). Based on this result, these authors conclude that it would be impossible to improve the contribution of poultry in total nutrients uptake of human beings in the country without reversing the trends in profit share. Thus, Maqbool and Bukhsh (2007) reported that inequitable distribution of profit share was assumed to be one of the major obstacles in the expansion of poultry industry

Mammo et al. (2008) in Ethiopia reported that fluctuation in the prices of the village chickens and chicken-products were mainly due to purchasing power of the consumers, fasting and availability of products. However, Mekonnen (2007) reported that more than half of the respondents did not have any information about the price of the chickens. According to Tadelle et al. (2003), the overall gross return as percent of initial values

and gross return per breeding female per year were 67.5% and 12.48 Birr, respectively. However, Solomon (2008) reported that the export market for poultry products in Ethiopia is very limited, but it may be worthwhile studying consumer preferences in neighboring countries to determine if niche markets exist for extensively raised indigenous birds and their eggs. The major criteria used to determine the price of local chickens were body weight, plumage colour and comb-type (Mammo et al., 2008).

According to Ajala and Otchere (2007), incomes from sales of birds and eggs serve as reserve for important household expenditures. In addition, Jugessur et al. (2004) reported that the profit obtained from the sale of chickens and eggs, and the monetary value of sale and home consumption of these commodities represented 9 and 18% of the total income of the family, respectively. Olasimbo (2006) observed that the variation in returns from table egg production was comprised from numbers of birds kept and type of production system used. Generally, Adrian and Michael (2009) reported that government policies should focus on absorbing transaction costs of small-scale poultry producers and interventions like provision of mentoring and training services to stakeholders.

## POULTRY PRODUCTS AND PHENOMENA OF CONSUMPTIONS

Livestock and poultry sector globally is highly dynamic, particularly in developing countries that are evolving in response to rapidly increasing demand for animal products. Thus, with this fatly growing poultry production, trade and consumptions, human health should also be considered. Poultry production and consumption has increased in the world (Philip, 2011). Poultry meat accounts for about 33% (87% chicken and 6.7% Turkey) of the global meat consumption (FAO, 2010). Similarly, Costa (2009) reported that the consumer demands for chicken meat has been growing steadily over the last decade. FAO (2010) reported that the human population benefits greatly from poultry meat and eggs, which provide food containing high-quality protein, and a low level of fat with a desirable fatty acid profiles.

According to Maqbool and Bukhsh (2007), the major contribution of poultry consumption in improving *per capita* nutrients level is well documented, however, further improvement would be possible by lowering the prices at the consumer level and by improving the profitability of producers through up-taking of poultry technologies. Moreover, David (2010) reported that semi-scavenging backyard indigenous poultry are extremely important in providing income and high-quality protein in the diets of rural people whose traditional foods are typically rich in carbohydrate but low in protein.

In Serbia, Rodić et al. (2010) reported that poultry accounts for about 12% of the total value of country's

livestock production. The author added that poultry provides relatively cheap food of high quality to the people. Solomon (2008) in Ethiopia reported that the largest off-take rates flocks occur particularly during holidays and festivals and during the onset of disease outbreaks. The periods of low bird sales and consumption in Ethiopia coincide with the pre-Easter fasting period and pre-Christmas fasting period. On the other hand, Danielle et al. (2009) in Tanzania reported that shortages in protein availability are a well. Nutritional importance of animal-source protein is increasingly being recognized in village economics to solving the neurological problem, especially in Africa. Protein food demands increments and progressively growing of the phenomena of poultry product consumption needs to be given emphasis for reduction of climate change.

### **HARVESTING, CONSERVATION AND VALUE ADDITION OF POULTRY PRODUCTS**

According to Deogade et al. (2008), market for value added chicken meat products are popular in local market, but now a day's big player of market are launching their products mainly ready to eat and ready to cook type. Froning (1998) reported that although shell egg consumption has declined, the growth of value added egg products has been very encouraging. The author added that approximately 30% of our egg consumption is in the form of value egg products. For world's poultry (2009) egg processing serves a rapidly increasing market worldwide. Meanwhile, there is an increase in demand for product differentiation to meet separate market requirements. On the other hand, Hafez (1999) reported that post-processing food handling is also a very important factor in reducing foodborne infections.

### **CLIMATE CHANGE POULTRY PRODUCTION**

Both climate change and animal production have always negative impacts on each other. Climate change could affect animal production due to the impacts of increasing air temperature, feed-grain availability and favouring the diseases (Adams et al., 1990; Bowes and Crosson, 1993). To adopt the improved poultry production practices, socio-economic characteristics of the target population as well as bio-physical environmental considerations are needed (Nnadi and Akwivu, 2005). David (2010) reported that poultry production has a less detrimental impact on the environment than other livestock and uses less water. Moreover, Wiebe (2007) reported that poultry meat and egg production are the most environmentally efficient animal protein production system. Intensive poultry production has much less impact on global warming than organic or free-range production (Wiebe, 2007). However, Guèye (2009)

reported that despite efforts to develop intensive poultry production, family poultry remains important in the developing countries of Africa. Similar to this argument, Sungno and Robert (2006) reported that small farms of livestock (poultry) are better able to adapt to warming. However, organic egg production needs more energy than non-organic that increases environmental burdens. The disadvantage, from environmental point of view, is litter-free breeding of birds, which causes great amounts of liquid manure. Obayelu and Adeniyi (2006) reported also that climate change has an effect on poultry feed intake, encourages outbreak of poultry diseases, which invariably reduce egg production. However, Gilbert et al. (2009) reported that little is known about the direct effect of climate change factors on highly pathogenic avian influenza transmission of domestic birds and persistence to allow inference about the possible effects.

Jan and Henning (2008) reported that the global poultry industries have faced competition for feed ingredients including the prospect of future ethanol production.

Philip (2011) reported that livestock production is likely to be increasingly affected by carbon constraints, environmental and animal welfare legislations. However, Costa (2009) observed that the poultry industry has a natural advantage over other livestock industries because of its low global warming potential. For sustainable poultry production, a collaborative effort of research and development institutions is required.

### **COLLABORATION OF RESEARCH AND DEVELOPMENTAL INSTITUTIONS FOR POULTRY IMPROVEMENT**

With collaborative efforts of research and developmental institutions, improvements of poultry production would have to be achieved. Smallholder farming systems are bio-economically complex involving several kinds of resources and input/output flows such that it would not be advisable to study poultry production only without considering other crop-livestock components of the farming system (Muchenje et al., 2001). According to Adrian and Michael (2009) in South Africa reported that alleviating constraints for a large number of small enterprises of poultry productions is expected to impact more positively on the rural economy than if a few larger enterprises were encouraged to grow bigger. Critical gap of poultry production still needs to be filled by the research extension outfit in combining the technical and socio-economic aspects of poultry production in order to boost Nigeria's egg and meat production (Adebayo and Adeola, 2005). Njue et al. (2004) reported that sustainable cost effective interventions are necessary if full potential is to be realized in local chicken production of Kenya. Sonaiya and Swan (2004) reported also that research and development in the field of family poultry (FP) must first examine the social, cultural and technical

constraints faced by this sector. Muchenje et al. (2001) reported that the economic importance of poultry is not adequately appreciated by researchers and decision-makers because poultry products in the smallholder farming sector only passes through non-formal marketing channels. Moreover, Kryger et al. (2010) reported that the smallholder poultry production is practiced by most rural households throughout the developing world; despite the fact that its contribution to livelihoods appears to be of little nominal value when observed by researchers and other outsiders. Rural poultry sector in Serbia is important; however, it has actually no institutional support for many years (Rodić et al., 2010). Past research has not explicitly included user differentiation and participation in the technology development process (Aichi, 1996). Social and capital aspects of smallholder poultry production have been given little attention in research and or in development projects (Kryger et al., 2010).

However, Scanes (2007) reported that there is tremendous scope for chicken improvements. Okeke (2001) reported that the special features of the innovative poultry brooding technology of the project are that it harnesses solar energy and uses locally available materials; it can be adapted to both rural and urban poultry production.

## CONCLUSION AND RECOMMENDATIONS

Poultry production and consumption is highly growing agricultural sector in the world. Moreover, the socio-economics of poultry production is also acceptable and feasible. This all makes poultry production the preferred and recommend production types to supplying the future protein demand of the society.

In most cases, poultry production in developing countries is mainly traditional; however, technologies favour the intensification of poultry production in such countries, but if not managed, environment and health issues will be the concerns of the future. A grain yield is adversely affected by warming that leads to food-feed competitions. This competition gives rise to search for alternative feeds and other ingredient utilization techniques for birds. It is therefore concluded that intensifying poultry production will reduce negative impacts of climate changes and it will also satisfy the demands of proteinaceous foods.

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