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India's Poultry Revolution: Implications for its Sustenance and the Global Poultry Trade

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Abstract

As one of largest emerging economies, the Indian poultry market has wide-ranging implications for global poultry production and trade due to its sheer size, national market and rapid structural growth. Availability of low-priced, high-quality feeds is critical in order for domestic poultry production to remain competitive and meet growing consumer demand. Production of maize, which is a predominant feed component in poultry industry, has surged in India. With average Indian maize yields lagging world and Asian averages, there are significant maize intensification opportunities to produce even more and cheaper feed, including increased use of higher-yielding (and higher-quality) maize hybrids and associated private- and public-sector investments. Given the size of the India's poultry sector, its price competitiveness and Indian entrepreneurship, India is set to take a more active role in the global poultry trade especially with respect to exports to the Middle East.

Keywords: India, poultry industry, global poultry trade, maize, animal feed

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Introduction

In response to rising incomes and changing consumer preferences, significant market opportunities for high-value agricultural products such as meat have emerged in developing countries. Since 1960, global meat production has multiplied more than three times, and egg production nearly four times (Speedy 2003). The global demand for meat is predicted to rise by more than 55% between 1997 and 2020, with meat production reaching 455 million tons by 2050 (Alexandratos and Bruinsma 2012). Demand for poultry – primarily chicken which constitutes more than 90% of market value – is fuelled by similar economic factors (Ravindran 2013). The production of poultry meat worldwide increased from 9 million tons in 1960 to 105 million tons in 2012 (Speedy 2003; FAOSTAT 2012). On the supply side, several factors have contributed to the worldwide growth in poultry production: (i) genetic progress in poultry strains for meat and egg production; (ii) better understanding of nutrition fundamentals; and (iii) disease control (Ravindran 2013).

Most of the increase in poultry production is taking place in developing countries, especially in Asia. This region now accounts for more than a quarter of current global poultry production. India is one of the largest poultry producing countries in Asia. From being largely a backyard venture before the 1960s, the Indian poultry sector has evolved into a vibrant agribusiness spurred by domestic economic growth and consumption dynamics. The share of poultry in domestic meat production has grown from 23% in 2004-05 to 51% in 2009-10 in the country. Poultry is low-cost for consumers, relative to other meat products, and has comparatively wider acceptability across regions and religions (Manning and Baines 2004). This is particularly important in India where the predominant Hindu religion largely limits beef consumption and Islam, that of pork. On the other hand, the share of the population that does not eat any meat because of religious beliefs, as opposed to an economic necessity, is small, as low as 10-20% (Landes et al. 2004). Furthermore, the growing middle class is more likely to disregard traditional taboos and religious bias against non-vegetarianism (Rattanani 2006).

The increased availability and affordability of poultry meat and eggs for both rural and urban poor is contributing to improved nutrition and poverty reduction (Pica-Ciamarra and Otte 2010). The poultry industry in India also offers domestic employment opportunities. Furthermore, as one of largest emerging economies, the Indian poultry market has wide-ranging implications for global poultry production and trade – both in terms of the sheer size of its national market and its rapid structural growth. Availability of low-priced, high-quality feeds—a major ingredient of which is domestically-produced maize was and remains critical for domestic poultry production to remain competitive and meet surging consumer demand. This has limited the prospects for traditional poultry exporters such as the United States and Brazil to break into the Indian market. Furthermore, India is expanding its poultry exports to regions such as the Middle East, further threatening the export markets of traditional suppliers of poultry products.

Based on an extensive literature review of secondary literature, this paper reviews the Indian poultry revolution: (i) describing the exceptional growth of India's poultry industry, the structural developments and the underlying reasons; (ii) assessing its implications for the global poultry trade; and (iii) assessing the implications to sustain it, particularly in terms of feed market development and the environment.

Growth of the Indian Poultry Industry

Vertically-Integrated Poultry Production

Economic growth in India and the subsequent increased in incomes has led to a greater demand for high value products such as poultry meat and eggs. To ensure quality and consistent supply of perishable inputs and outputs, the poultry industry in India has rapidly evolved toward more vertical coordination, allowing retailers to standardize quality, improve bargaining power, and achieve economies of scale. Currently, there are about 60 thousand poultry farms in India under modern intensive systems of management. While there is still some backyard poultry farming, it is relatively unorganized, economically less significant and small-scale (Conroy et al. 2005). Growth in the poultry sector has been engineered and dominated by the large-scale commercial private sector, which controls roughly 80% of total Indian poultry production (Joshi et al. 2003) and is concentrated in the southern states of Andhra Pradesh and Karnataka (Krishna et al. 2014).

India is the third largest egg producer and fifth largest poultry-meat producer in the world (Mitra and Bose 2005). By 2003, India was producing 1.6 million tons of poultry-meat, which had risen to 2.0 million tons by 2006 (Hellin and Erenstein 2009), and now stands at 2.2 million tons per annum (www.dahd.nic.in). Poultry meat production in India is second only to China in Asia at present, whereas the annual growth rate over 2003-12 is third after South Asian neighbors Nepal and Pakistan (Table 1). By 2030, it is expected to reach about 3.0 million tons per annum (Joshi and Kumar 2012). The per capita consumption of meat is expected to increase in India, from its current level of 3.1 kg to up to 18 kg by 2050, of which 12.5 kg would be chicken (Alexandratos and Bruinsma 2012). Recent attempts to ban calf slaughter and beef products by some state governments of India (Rashid, 2015) could further increase the demand and consumption for poultry products in the country.

Table 1. Poultry Meat Production in Asia

Country	Annual average production (million MT) 2011-13	Production CAGR (%) 2004-2013	Average per capita supply (kg/ year) 2009-2011	Per capita supply CAGR (%) 2002-2011
Bangladesh	0.21	3.53	1.37	2.72
Cambodia	0.03	0.61	2.07	-1.11
China	17.20	4.39	12.17	2.97
India	2.24	6.80	1.83	5.62
Indonesia	1.68	5.09	6.50	3.58
Nepal	0.03	11.67	0.87	9.87
Pakistan	0.77	9.30	4.13	6.97
Philippines	0.94	4.48	10.57	3.18
Thailand	1.33	0.09	12.13	0.37
Vietnam	0.58	3.45	12.43	12.98

Note. MT=Metric Tons, CAGR=Compound Annual Growth Rate

Source. Computed based on FAOSTAT online database

Meanwhile, annual egg production in India increased from 10 billion to 29 billion between 1980/81 and 1998/99 (Ramaswami et al. 2006) and has continued its rapid growth ever since (Table 2). More than 75% of the absolute growth of global egg production between 1990 and 2007 were contributed by China and India (Winhorst 2009).

Egg production in India is likely to surge from the current level of about 66 billion to 95 billion by 2015. Joshi and Kumar (2012) forecast Indian egg supply to reach around 124 billion numbers by 2030. Egg production is again second only to China in Asia at present, whereas the annual growth rate over 2003-12 is just second to Pakistan (Table 2).

Table 2. Egg Production in Asia

Country	Annual average production (million MT) 2010-12	Production growth rate (%) 2003-2012	Average per capita supply (kg/ year) 2009-2011	Per capita supply CAGR (%) 2002-2011
Bangladesh	0.28	2.97	1.40	1.60
Cambodia	0.02	3.88	1.37	1.73
China	28.24	2.37	18.47	1.76
India	3.49	5.39	2.37	3.91
Indonesia	1.33	3.57	4.47	1.73
Nepal	0.04	4.11	1.13	2.05
Pakistan	0.59	5.62	2.70	3.25
Philippines	0.48	4.06	4.27	2.31
Thailand	1.01	2.16	11.57	1.86
Vietnam	0.34	4.16	3.23	4.13

Note. MT=Metric Tons, CAGR=Compound Annual Growth Rate

Source. Computed based on FAOSTAT online database.

Availability of Low-Priced and High Quality Animal Feed

The poultry industry in India has benefited from scientific advances in poultry breeding and disease control but an additional factor has been the availability of low-priced, high-quality feed (Ravindran 2013). For broiler production, feed is the largest single production cost (Davis et al. 2013) and can constitute up to 70 percent of the total costs. In the case of poultry production in India, feed accounts for 55-64% of variable costs (Landes et al. 2004). The predominant grain used in poultry feeds is maize (or corn, *Zea mays* L.). Poultry feed normally contains 60-65% of maize. For both broiler and layer rations, maize accounts for most of the energy in the feed ration, while soybean meal provides most of the protein requirement (Krishna et al. 2014). Broiler rations, on an average, contain 64% maize and 20% soybean cake, while layer rations contain 42% maize and 16% soybean cake (Landes et al. 2004).

In India, the growth of the poultry industry has been facilitated by a concomitant surge in domestic maize production (Dixon et al. 2008). Between year 2000 and 2010, the domestic poultry sector in India grew by 141.7%, whereas the maize grain production increased by 93.4% (Table 3). Growth in the poultry industry is fuelling investment in maize cultivation and processing (*Business Today*

2014; Narayanan et al. 2008). In India, maize is now widely available as a low-cost energy source, easily digestible for the birds and highly palatable.

Table 3. Expansion of Poultry and Feed Crop Sectors (Maize, Soybean) in India.

Year	Poultry stock (million birds)	Maize grain production (million tonnes)	Soybean production (million tonnes)
1990	290.60 (72%)	8.96 (74%)	2.60 (49%)
1995	333.50 (82%)	9.53 (79%)	5.10 (97%)
2000	404.40 (100% - base)	12.04 (100% - base)	5.28 (100% - base)
2005	560.34 (139%)	14.71 (122%)	8.27 (157%)
2010	867.87 (214%)	21.73 (180%)	12.74 (241%)
2013	977.50 (242%)	23.29 (193%)	11.94 (226%)

Source. FAOSTAT 2014.

Note. Figures in (brackets) show the value relative to that in 2000.

Up to the late 1980s, maize in India was predominantly (70%) consumed directly as food, with the remainder 30% going to feed and industrial use in about equal proportions (Singh and Pal 1992). Since the 1990s, there has been an increase in the quantity of maize used as feed, whereas non-feed use (including food and industrial use) has remained relatively static. Over 50% of maize production in India is now destined for the poultry industry (Chaudhary et al. 2012; Sethi et al. 2009). From 2007-2011, maize production in India registered an annual growth of 6.4%, the highest amongst all food crops in the country.

Over the last decade, maize output in India in total has grown by 56% (Business Today 2014). During 2012-13, India produced 23.3 million tons of maize grain from 9.5 million hectare of land with an average grain yield of 2.5 tons per hectare (FAOSTAT 2014). Maize production has particularly taken off as a new cash crop in the states of south India, where it is used by the neighboring vertically-integrated poultry companies.

Poultry and Poverty Reduction in India

The Indian poultry revolution is contributing to improved nutrition and poverty reduction (Pica-Ciamarra and Otte 2010). This sector now employs over 3.0 million people. At least 80% of employment in the poultry sector is generated directly by farmers, while 20% is engaged in allied activities like feed production, pharmaceuticals and equipment (Sridharan and Saravanan 2013). An increase in per capita availability of one egg or 50 grams of poultry meat is estimated to create an additional 20-25 thousand jobs (Sridharan and Saravanan 2013). Still, India's poultry revolution has seen an increasing industrialization and vertical coordination – with still unclear equity implications. Indeed, the potential impact of accelerated growth and the ongoing structural change in the Indian poultry sector on the future of small and marginal producers has been raised.

While the integrated poultry value chains are contributing to a reduction in poverty, small-scale backyard poultry can also provide important supplementary income and is generally perceived as pro-poor and socially inclusive. Small-scale poultry production development system which involves people in production, supply and services and has been depicted as a tool in poverty alleviation (Dolberg 2004). Rearing a small number of birds in a free range system, as in the case of indigenous birds under low input and low output systems, is economical since such birds derive most of their feed from scavenging (Chowdhury 2013). Very small family flocks raised for subsistence consumption and local sale are unlikely to be pushed out of production as long as they will continue to serve a safety net function for the families who own them (McLeod et al. 2009).

The Indian Poultry Industry and Implications for Poultry Trade

Thus far India's poultry sector was primarily a domestic affair whereby it competitively produced both the poultry and its feed domestically to meet the surging demand. Still, the growth of the Indian poultry industry, and the rest of Asia, has led to a decline in North American and European producers' share of the global poultry market. The United States (U.S.) is the world's second largest broiler meat exporter and exports are a significant income source for the U.S. broiler meat industry. As Davis et al. (2013) report, U.S. broiler meat exports have experienced strong growth over the past 16 years. Export shipments of U.S. broiler meat increased just over four percent per year, on average, between 1997 and 2012. Several factors have affected U.S. broiler meat exports and these include increased efficiency in domestic production, income and population growth in destination markets, exchange rate shifts, trade policy and trade conflicts, and relative price changes for other meats (Davis et al. 2013).

Henderson (2015) contends that U.S. exports will depend much on the BRIC countries: Brazil, Russia, India, and China—countries that account for more than 40 percent of the world's consumers. Forecasts suggest the rising demand for protein in BRIC countries will propel U.S. meat exports in the future. Yet, a closer inspection of historical trade patterns with BRIC countries suggests that U.S. protein exporters may struggle to expand their share of these markets – the Indian poultry market being a case in point. Davis et al. (2013) project U.S. broiler meat exports to rise about 12 percent between 2013 and 2022. India is not among their target countries, focus instead is on China and Russia, although demand in Russia is falling and the US faces stiff competition from other exporting countries such as Brazil.

The growing demand for poultry in India has not yet translated into increased meat imports and it may not do so over the coming decade(s). India remains a low-income nation, which limits its demand for meat. While protein consumption increased during the last decade, non-animal proteins accounted for the bulk of India's protein consumption. As a result, Indian's meat imports are practically nonexistent, with only minimal imports of poultry, a lower-priced meat. The increased poultry consumption is expected to be met by increased domestic production. Another reason behind India not importing poultry meat is that unlike many other countries, only about 2-3% of the total poultry meat produced in India is sold as processed meat, reflecting consumers' preference for live chicken and also inadequate processing and storage infrastructure, such as refrigerated transport. This is beginning to change and spending on ready-to-eat meals is rising and a number of poultry firms act as aggregator intermediary and have their own poultry

brand in various processed forms for the small but growing domestic market for processed chicken. Still, the live-bird market is most likely to continue to dominate in India at least for next few years.

Given the increasing size of India's poultry sector, its price competitiveness and Indian entrepreneurship, India is set to take a more active role in the global poultry trade. Indeed, some of poultry processing firms are starting to target export markets and an increased export market competition from countries such as India can be expected in the future. In summary India has a tremendous potential to play a major role in the international market, hence, representing competition for traditional exporters such as the United States and Brazil. Shanthi Poultry Farm (P) Ltd., for example, is a large integrated poultry group in South India that freezes and packs chicken that conform to stringent international quality norms that cater to international market including the Middle East, Europe and America. Another example is Venky's (India) Ltd. The company sells its processed chicken under the brand name *Venky's*. Venky's is the first national brand in the processed chicken segment and down the years, has become synonymous with nutrition, quality, and high standards in hygiene. It is a preferred supplier to the Indian outlets of McDonalds, KFC, Pizza Hut, and Domino's (Karthikeyanv and Nedunchezian 2013).

India currently accounts for less than 0.4% of the global trade in poultry. However, poultry meat from India already has a growing market in the Middle East and captured some of these markets following the outbreak of avian bird flu in Southeast Asia in 2003/2004. Furthermore, the Project Directorate on Poultry in India has identified potential markets in a number of countries (Japan, Singapore, Sri Lanka, Poland, Belgium and Australia) for poultry products other than meat, including egg powder and frozen eggs (Directorate on Poultry 2011). India started to export eggs as late as 1996 and whereas in 1995 only 2,640 t were exported, the volume increased to 60,000 t by 2005 (Windhorst 2008). India's export of poultry products has increased from about 517,000 tons in 2010-11 to 578,000 tons in 2012-13. This has implications for countries such as the United States, the leading exporter of poultry meat.

Sustaining India's Poultry Revolution

Feed Market Implications

Some commentators contend that as the BRIC countries increasingly try to satisfy their growing demand for proteins with domestic livestock production, the sharpest gains in U.S. agricultural exports may not emerge from animal products but from feed crops (Henderson 2015). Yet, even these bright opportunities may be dulled as BRIC countries bolster their own grain production, as is very much the case in India.

The sustained availability of low-priced, high-quality feeds in India is critical if poultry production is to remain competitive and to continue to grow to meet the increasing consumer demand for eggs and meat (Ali 2007; Project Directorate on Poultry 2011). Maize is set to remain the preferred energy source for poultry in India. Total maize production in India is expected to continue to grow to 28-44 million tons by 2020, owing largely to demand from the poultry industry (Narayanan et al. 2008). However, maize productivity growth in India is starting to lag demand from the rapidly expanding of poultry sector. Without large increases in maize

productivity, India might become a net importer of maize by 2018-2020 (Munro 2014; KPMG 2013). This would have implications for the competitiveness of the poultry industry in India but at the same time it provides opportunities to boost maize production and productivity.

Average Indian maize yields lag world and Asian averages and there are significant maize intensification opportunities to produce even more and cheaper feed. There exists enormous potential in India for investing in research and development (R&D) to enhance maize productivity, including increased use of high-yielding, production risk-reducing improved maize varieties/hybrids. This scenario, in turn, presents significant opportunities for private- and public-sector investments to invest in plant breeding, seed production and marketing, more so given an increasingly favorable policy environment for seed sector development. With the Industrial Licensing Policy of 1987 and the New Policy on Seed Development of 1988, the Indian Government reduced state control over seed production and marketing, and with the New Industrial Policy of 1991 foreign direct investment in the seed industry was allowed (Pray et al. 2001). Since India liberalized seed laws in late 1980s, private seed companies have captured a significant share of the market, especially in southern India (Pal et al. 1998; Singh and Morris 1997).

Alongside ensuring adequate maize volumes for the expanding poultry sector, quality or nutrient composition of the grains as a feed ingredient is equally important to ensure sustainable production of poultry. Protein is one of the major limiting ingredients in the poultry feed mixture. Maize is the major energy source in feed combinations, but it is a poor source of essential amino acids for poultry (Atlin et al. 2011). Currently, the limiting amino acids in poultry diets – methionine, lysine, threonine and tryptophan – are added to poultry feed. However, development and distribution of bio-fortified maize – Quality Protein Maize (QPM) and High Methionine Maize (HMM), containing enhanced levels of limiting amino acids – offers some prospects for the poultry industry by reducing the requirement for synthetic amino acid supplements (Krishna et al. 2014; Lopez-Pereira 1993; Prasanna et al. 2001). Bringing such innovations to market also calls for innovative value chains to capture the quality attributes of feed ingredients from farmers to poultry firms (Hellin and Erenstein 2009).

Environmental and Epidemiological Implications

Projected continued growth of India's poultry industry could be derailed by environmental and epidemiological facts. Livestock intensification has potential environmental externalities. Intensive poultry production implies birds in confined spaces with implications for handling waste and managing pests and diseases. These are aggravated when the intensive production systems cluster geographically, as is the case in southern India. A major problem facing intensive poultry production as in India is the disposal of litter (Bolan et al. 2010). Most of the litter produced by the poultry industry is applied to agricultural land. Poultry litter is a good organic source of nutrients for raising crops, such as maize but it can lead to environmental pollution when the litter is applied under agronomic, soil and climatic conditions that do not lead to the utilization of the manure-borne nutrients (Bolan et al. 2010). Poultry manure can also become a serious environmental pollutant (Gao et al. 2006) and contributor to greenhouse gases (Zhou et al. 2007). In addition, air quality has become a major environmental concern of the poultry industry. There are environmental and health issues linked to bio-aerosols (e.g. microbes, endotoxins and mycotoxins suspended in air) generated at production, manure storage facilities and during land spreading of poultry litter (Bolan et al. 2010).

The rapid growth of the poultry industry in India and other Asian countries has also raised the threat of disease pandemics. Currently there are two avian influenza virus infections that have appeared in domestic poultry and which have caused high human fatality rates, especially in a number of Asian countries: highly pathogenic avian influenza H5N1 (with infected countries widely distributed internationally) and avian influenza H7N9 (confined to China). Both H5N1 and H7N9 have pandemic potential but are currently not contagious among people in their current forms. However, although the international community through its animal health agencies the World Organization for Animal Health and the Food and Agriculture Organization of the United Nations (FAO) have developed comprehensive guidelines for the detection and control of animal influenzas, there is little prospect that the H5N1 and H7N9 infections will be eradicated in affected countries, or that new strains of influenza will be prevented from arising in the rapidly growing poultry industry.

Outbreaks of Avian Influenza is likely to have impacts on production and consumption patterns, resulting in serious financial problems of major producers and new spatial patterns of production and trade flows (Windhorst 2006). Outbreaks of avian influenza virus infections can have detrimental impacts on the poultry industry. Bangladesh, for example, experienced Highly Pathogenic Avian Influenza outbreaks during 2007 and 2008. A total of 547 commercial and 42 backyard flocks were culled with over 1.6 million birds being destroyed. As a result, demand for maize from the feed industry decreased from 3.0 million tons to 2.0- 2.2 million tons (Chakma and Rushton 2008). Disease can also affect a countries ability to export poultry meat (Davis et al. 2013). So far, India has escaped a major disease outbreak.

Conclusions

India has almost doubled its meat consumption during the past decade spurred by domestic economic growth and consumption dynamics. Still, the average Indian only consumes about 4.5 kg (10 pounds) of meat per year, reflecting the country's low-income status and preference for non-animal protein sources. Poultry occupies a crucial place in India and chicken is the most widely accepted meat in India – helped by religious taboos around beef and pork. Many Indian families in urban areas have begun to accept eggs as a regular supplementary part of their vegetarian diet. The domestic demand for poultry meat and eggs in India is expected to continue to grow at a brisk pace.

A key factor under-pinning India's poultry industry is the availability of animal feed, particularly maize. Maize production in India is expanding and changing rapidly in response to the growth in the poultry industry. Meanwhile, maize value chains are growing more sophisticated and their changing structure provides investment opportunities for public and private sector actors. Maize thereby helps drive India's agricultural and economic growth especially through its role as feed for the flourishing poultry industry. An appropriate institutional and policy environment should enable India's poultry revolution to continue into the future – with due attention for feed market development and the environment.

India's poultry revolution has already made its mark on global poultry production and trade. The overwhelming majority of the demand in India was and will continue to be met by domestic production – whereby traditional poultry exporters such as the United States and Brazil have

largely missed out on India's burgeoning poultry market. Furthermore, India is likely to become a more important player on the export market especially in the Middle East and thereby presents an emerging competitor in the global poultry trade arena.

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