



ISSN 2278 – 0211 (Online)

## Demand and Supply of Livestock Products in India and Nigeria: The Task of Food Security

**Isah Musa Ahmad**

Ph.D. Scholar, Department of Agricultural Economics,  
University of Agricultural Sciences, Dharwad, Karnataka, India

**V. R. Kiresur**

Professor, Department of Agricultural Economics,  
University of Agricultural Sciences, Vijayapur, Karnataka, India

### **Abstract:**

*The paper presents the demand and supply trends of livestock products. It provides the projections for the year 2020, 2025 and 2030 for both India and Nigeria and the future consequences on the future food security. The demand projections were computed using simple growth rate model under the assumptions of 6, 7 and 8 per cent GDP growth rate representing low, moderate and high income growth with 2013 as the base year. Supply projections were computed using Box-Jenkins forecasting Arima model. Findings reveal that the demand-supply gap in India for the year 2020 would be a surplus for milk, poultry, meat and a marginal deficit in eggs respectively. While in the subsequent years of 2025 and 2030 India would become a surplus nation in terms of milk, eggs, poultry and meat across the entire three scenarios; low, moderate and high income growth rates. Nigeria conversely, the demand-supply gap results indicated that across the three income growth rate scenarios there would be a staggering deficit in all the livestock products; milk, eggs, poultry and meat for the years 2020, 2025 and 2030 respectively. The main challenges of Nigeria are; need to improve the productivity of the local livestock breeds through artificial inseminations, improving grazing reserve with quality rich protein fodders, quality drinking water to reduce the menace of farmers/pastoral clashes that leads to the loss of thousands of livestock over the years in Nigeria which in turn reduces the availability of the livestock products. In addition, government needs to provide financial support, training and input to the local and small scale poultry farmers in order to enhance eggs and broiler production. The finding recommends that India should strengthen the local processing industries with financial support in ensuring a proper efficient processing and export of the surplus livestock products to avoid losses of these most perishable products; increasing farmers income, creating employment, export competitiveness and increasing the nation's balance of payment.*

**Keywords:** India, Nigeria, Demand, Supply, livestock products, food security.

### **1. Introduction**

Livestock supplies more than half of the value of global agricultural output and one third in developing countries. Rapid growth in demand for livestock and livestock products, in the developing countries, is viewed as a 'food revolution'. Livestock products are costly in relation to staple foods, so developing country consumption levels are still low, but increase with rising incomes. Particularly poultry consumption is growing fastest. Livestock also contribute to rural livelihoods, employment and poverty relief. They integrate with and complement crop-production, embody savings and provide a reserve against risks. Meat, milk and eggs cost more per unit energy than staple crops, so consumption is low in poor developing countries. Market demand is concentrated in urban centres and transport costs, perishable livestock products from remote production areas, are high. So too are costs of manufactured inputs. In recent years developing countries, as a group, have switched from being net exporter to being net importers of agricultural produce including all livestock products. Milk is the largest imported item by weight, while imports of poultry meat are growing fastest. The need for increase livestock production is pressing, given the rapidly growing demand for animal products and the important contribution of livestock to the income and welfare of the rural poor (Upton, 2004).

Livestock and livestock products are estimated to make up over half of the total value of agricultural gross output in the industrialized countries, and about a third of the total in developing countries (Bruinsma, 2003 as cited by Upton in 2004). The global importance of livestock and their products is increasing as consumer demand in the developing countries expands with population growth and rising incomes. This growth in consumption is reflected in improvements in the average human nutritional status due to the intake of animal protein (Delgado *et al* 2001).

Food security remains a relevant and current priority of many nations with special emphasis on developing countries like India and Nigeria. According to Kirit (1998), food security means a government is providing adequate quantity, access, and nutritional value of food to all of its citizens. "Moreover, food should be provided to all as a matter of right without inflicting any humiliation on the poor." It has been defined as a human right by many international organizations, denoting it as one of the basic human needs that every government should strive to achieve.

In comparison to other countries, India stands out as one of the most food insecure, despite its fast economic development. "The FAO's Report on State of Food Insecurity in the World 2006 confirms that no country in the world comes close to India in terms of the absolute number of people living in chronic hunger" (Madhura, 2010). Nigeria is gripped by both income and food poverty, and poor access to the means of supporting rural development being among the causative factors (FGN/WHO 2004). Atinmo 1999 rightly observed, Nigeria is one of the food-deficit countries in sub-Saharan Africa although it is arguably better in terms of production than the others. It has also not suffered any major catastrophe that could precipitate scourges of famine, mass hunger and therefore food crisis.

## 2. Literature Review

In the low-income countries, the demand for livestock products is more elastic than the demand for cereals. This implies that with the rise in per capita income, the demand for livestock products would rise faster in the third world countries. The demand for livestock products in India is highly income-and price-elastic while supply for these products is also highly price- elastic (Dastagiri, 2004).

The importance of livestock in India's economy can be gauged from the fact that 90 million farming families, cultivating 140-million-hectare area, rear 90 million milch animals. Livestock production is an important source of income and employment in the rural sector. The sector employs eight per cent of the country's labour force, including small and marginal farmers, women, and landless agricultural workers. Milk production alone involves more than 30 million small producers, each raising one or two cows or buffaloes annually. Livestock provides a large share of draught power, with about half the cattle population and 25 per cent of the buffalo population being used to cultivate 60 million ha of crop land (World Bank, 1998, as cited in Dastagiri, 2004). It acts as a supplementary and complementary enterprise. Livestock is also important as a part of agriculture diversification and income enhancement, and crucial for nutrition enhancement. Livestock plays a vital role in the economic development. In India, 25 per cent of the agricultural GDP is contributed by this sector in 1998-99 (Economic Survey, 1999-2000).

Livestock account for one third of Nigeria's agricultural GDP, providing income, employment, food, farm energy, manure, fuel and transport. They are also a major source of government revenue. Traditional livestock production in Nigeria is varied and complex. Livestock, especially ruminants, are the most efficient users of uncultivated land and can contribute substantially to crop production (Nuru, *et al*, 1984). Nigeria is a major hub of animal product consumption in West Africa. It is also one of the largest livestock-raising countries in the region. Meeting the ever-increasing domestic demand and access to these flourishing markets are major economic stakes for Nigeria and for the neighboring Sahel countries that raise livestock (Bernard *et al.*, 2011).

The part played by livestock in the economy is relatively modest, representing approximately 10 per cent of agricultural activity and less than 3 per cent of the GDP. Statistical data for the livestock sector are scarce. Moreover, the livestock population is also unequally distributed. Over 60 per cent of the country lies in the humid zone (the Guinean and forest zones), which are unsuitable for livestock production since they are infested with tsetse fly. Consequently, more than 90 per cent of cattle and three quarters of the small ruminant population are concentrated in the northern states. Only a few trypano-tolerant breeds are able to survive under natural conditions in the difficult environment of the central and southern regions (ILRI, 2014).

The strong rise in demand for animal products is due not only to the high rate of urbanisation (60% of Nigerians are city dwellers), but above all to consumers' greater purchasing power and the emergence of a new middle class. Furthermore, this trade giant accounts for nearly 60% of international trade in the region.

At the same time, more and more consumers want healthier meat from regulated slaughterhouses. Some industrial meat companies are now segmenting the market, selling frozen meat packaged in individual portions. Fast-food restaurants suited to this new type of consumer are also developing rapidly (Bernard, *et al*, 2011). Some instances of value chain integration are also being seen as the sector evolves, with a few companies processing meat in their own slaughterhouses supplied by their own networks of producers. Although this last segment is growing, it still accounts for less than 10 per cent of the overall meat product market. Despite these emerging dynamics, many people still do not have access to Sahel beef, which is deemed to be too expensive by less-well-off segments of the population. Thus, in relation to the total population, meat consumption in Nigeria is still below the regional average (2 kg per person and per year in Nigeria compared to 8 kg per person per year in ECOWAS). Demand for beef is largely driven by the Federation of Nigeria, as Nigerians make up 50% of beef consumers in ECOWAS. Nigeria is experiencing a historic demographic expansion and a spectacular change in food habits. With a population growth nearing 2.8% per year, the country's own domestic production is far from being able to meet demand. Nigeria is therefore forced to import more than 25% of the beef consumed, and is therefore a major outlet for Sahel livestock, via direct sales or the moving of herds for commercial purposes (Bernard, *et al*, 2011).

The objective of this paper is to predict the trend in the domestic demand and supply, estimate the demand-supply gap of livestock product for the years 2020, 2025 and 2030 in India and Nigeria and suggest policy measure toward enhancing future food security.

### 3. Methodology

The study was based on the secondary data compiled from the various publication of NSSO (National Sample Survey Organization) of India, Indiastat and FAOstat. Similarly, data on Nigeria consumption were obtained from National bureau for statistics publications, Central Bank of Nigeria and FAO statistics.

Demand and supply of pulses were projected for the year 2020, 2025 and 2030 using different income growth scenarios; low, moderate and high GDP growth.

#### 3.1. Demand Projections

This study uses a simple growth rate model in estimating demand for pulses both in India and Nigeria. Demand projections in general are estimated on the basis of assumptions about the base year demand, population, expenditure elasticity and economic growth. The model was adopted and used by Dastagiri, 2004 and stated as follows.

Simple growth rate model:  $D_t = d_0 * N_t (1 + y * e)^t$

Where,

- $D_t$ : is the household demand for a commodity in year  $t$ ;
- $d_0$ : is the per capita demand of the commodity in the base year;
- $y$ : is the growth in per capita income;  $e$  is the expenditure elasticity of demand for the commodity; and
- $N_t$ : is the projected population in year  $t$ .

#### 3.2. Supply Projection

Supply projections for livestock products was computed using Box-Jenkins forecasting Arima model (as employed by Mishra, et al., 2015) based on the methodology described in the classic work of Box and Jerkins. Uni-variate Arima models use only information contained in the series itself. Thus, models are constructed as linear functions of past values of the series and/ or previous random shocks (errors). Forecasts will be generated under the assumptions that the past history could be translated into predictions for the future. ARIMA modelling will be developed the standard three steps procedures.

- i. Identification of the model;
- ii. Parameter identification and;
- iii. Diagnostic and verification of the model.

The identification steps determines

- a. whether the data is stationary and the possible transformations to obtain stationary and
- b. whether the form of the data is autoregressive (AR), moving average (MA) or both (ARMA), and its orders.

Three parameters will be used in summarizing an ARIMA model and are the AR parameter  $p$ , integration parameter  $d$  and MA parameter  $q$ . Parameters  $p$  and  $q$  denote the order of AR and MA, while  $d$  denotes the degree of differencing the series to obtain stationarity. The autocorrelation function (ACF) and partial autocorrelation functions (PACF) of a series together are the most powerful too, usually applied to reveal the correct values of the parameters. The ACF gives the autocorrelations calculated at lags 1, 2 and so on; while PACF gives the corresponding partial autocorrelations, controlling the autocorrelations at intervening lags. Parameters estimation of tentative models will be determined maximum-likelihood methods. The autoregressive moving average (ARMA) model, denoted by ARMA ( $p, q$ ), is given by

$$\rightarrow Y_t = \Psi_1 Y_{t-1} + \Psi_2 Y_{t-2} + \dots + \Psi_p Y_{t-p} - \hat{\omega}_1 \varepsilon_{t-1} - \hat{\omega}_2 \varepsilon_{t-2} - \dots - \hat{\omega}_q \varepsilon_{t-q} + \varepsilon_t$$

Or equivalently

$$\rightarrow \Psi(B) y_t = \hat{\omega}(B) \varepsilon_t$$

Where  $B$  is the backshift operator defined by  $B y_t = y_{t-1}$

A generalization of ARMA models which incorporates a wide class of non-stationary time-series is obtained by introducing 'differencing' into the model. The simplest example of a non-stationary process which reduces to a stationary one after differencing is 'Random walk'. A process  $\{y_t\}$  is said to follow autoregressive moving average (ARIMA), denoted by ARIMA ( $p, d, q$ ), if  $\tilde{V}^d y_t = (1-B)^d y_t \varepsilon_t$  is ARMA ( $p, q$ ).

The model is written as  $\Psi(B)(1-B)^d y_t = w(B)\varepsilon_t$

Where  $\varepsilon_t$  are identical and independently distributed as  $N(0, \sigma^2)$ . The integration parameter  $d$  is a nonnegative integer. When  $d=0$ , the ARIMA ( $p, d, q$ ) model reduces to ARMA( $p, q$ ) model.

## 4. Results and Discussions

### 4.1. Population for India and Nigeria

The two countries are considered among the most fast growing population nations of Asia and Africa. India in the past two decades, the growth rate has been slowing down, from 2.1 per cent per annum during the 1980s to 1.9 per cent in the 1990s and presently around 1.2 per cent.

Years	India	Nigeria
2013	1279.49	177.4
2020	133.85	206.8
2025	1461.62	233.5
2030	1527.65	262.5

Table 1: Projections of population (In Million)  
Source: Faostat, 2015.

Nigeria on the other side, at present, population growth was increasing at the rate of 2.8 per cent. From Table 1 it is indicated that by the year 2030, population was projected to reach 1,527.65 and 262.5 million in India and Nigeria from the present 1,279.49 and 177.4 million respectively.

#### 4.2. Per Capita GDP Growth

It was assumed that income growth rate was 6, 7 and 8 per cent for low growth, moderate and high growth scenario for both India and Nigeria. Furthermore, the adjusted per capita income of India stands at 4.8, 5.8 and 6.8 per cent for the low, moderate and high growth scenario. Likewise, for Nigeria, the adjusted per capita income was 3.4, 4.4 and 5.4 per cent for the low, moderate and high growth scenario for the study period.

Scenario	Income		Per capita income	
	India	Nigeria	India	Nigeria
Low growth	6	6	4.8	3.4
Moderate growth	7	7	5.8	4.4
High growth	8	8	6.8	5.4

Table 2: Alternative income growth rate assumptions used in demand projection (In Million)

Population growth rate are 1.2% and 2.6% for India and Nigeria respectively under all income growth scenarios.

#### 4.3. Demand and Supply of Pulses for India

Demand projection of various livestock products was computed using three different income growth scenario of 6, 7 and 8 per cent GDP growth i.e. low, moderate and high growth for the years 2020, 2025 and 2030.

Livestock product	Years				
	2013	2020	2025	2030	Growth rate
Milk	144.6	156.6	164.8	174.7	1.12
Eggs	3.52	3.82	4.02	4.20	1.04
Poultry Meat	2.56	2.78	2.92	3.06	1.05
Meat	5.08	5.52	5.81	6.07	1.05

Table 3: Demand projections for different livestock products years in India (Low income growth)

. The units in million tons for all commodities  
. 2013 is considered as base

The results of Livestock products corresponding to the scenario of 6 and 8 per cent GDP growth (low and high income growth) are given in Table 3 and 4. Therein, the demand for milk was projected to reach about 156.6 to 161.1 million tons, 164.8 to 169.5 million tons and 174.7 to 177.21 million tons for the year 2020, 2025 and 2030 under the assumptions of low and high income growth scenario in India respectively. The observed percentage changed between the low and high income growth scenario stands at about 2.77 per cent across the years 2020, 2025 and 2030. This result depicted a possible significant difference in the quantity demanded of milk under different income growth level. That, at an increased income the quantity demand for milk may likely be increased. Research shows that as incomes increase consumption of animal products, specifically milk and dairy products, intensifies (Wenge Fu et al., 2012). In fact, India's upturn in demand for dairy products far outweighs the growth in demand for animal products such as meat and eggs. In India, to be Veg is to drink a lot of milk. In a similar study of demand and supply projections for livestock products in India by Dastagiri in 2004, reported that demand for milk will reached about 147.26 million tons in the year 2020 under the income growth of 5 per cent. Likewise, Kumar, 1998 reported that milk demand may reach 143 million tons in the year 2020. In addition, Indian economic survey reported a projection of demand of milk to likely reach 159.8 million tons in the year 2020.

Moreover, the demand for eggs would likely reaches around 3.82 to 3.92 million ton, 4.02 to 4.13 million tons and 4.20 to 4.32 million tons for the years 2020, 2025 and 2030 under low and high income growth rate scenarios. The growth rate for eggs demand under low income scenario was indicated as 1.04 per cent, and for the high income growth scenario was 1.12 per cent. From this, it could be deduced that at higher income growth, demand for eggs would likely going to be higher. Therefore, as consumers earn more income they may likely increase their demand for eggs.

By and large, the demand for poultry was projected to reach 2.78 to 2.85 million tons, 2.92 to 3.01 million tons and 3.06 to 3.14 million tons for the years 2020, 2025 and 2030 under low and high income growth scenarios respectively. The demand growth rates for moderate and high income growths appeared to be higher than that of the low income growth scenario which indicates that demand for poultry meat may likely be higher at a higher income growth. This is indicating that, consumers may be willing to demand more poultry meat when there is an increase in income. In another study conducted by Indian economic survey in 2000, it projected a demand for chicken meat to be 3.55 million tons for the year 2020. Conversely, Dastagiri 2004 projected chicken meat for the year 2020 at 1.23 million tons. However, this result appears to be quite lower than the findings of the present study. Further, the demand for meat was projected at about 5.52 to 5.69 million tons, 5.81 to 5.98 million tons and 6.07 to 6.25 million tons for the years 2020, 2025 and 2030 under assumptions of low and high income growth scenarios. Likewise, the growth rate for meat demand was found to be 1.23 per cent for the high income scenario which is implying that demand would likely be higher at a higher income compared to lower and moderate income growth. It is similarly reported by the FAO in 2011 that the absolute increase in annual per capita consumption of meat in India will be averaging at a rate of 0.2 per cent within the years of 2000 to 2030.

Livestock product	Years				
	2013	2020	2025	2030	Growth rate
Milk	144.6	161.1	169.5	177.21	1.20
Eggs	3.52	3.92	4.13	4.32	1.21
Poultry Meat	2.56	2.85	3.01	3.14	1.21
Meat	5.08	5.69	5.98	6.25	1.23

*Table 4: Demand projections for different livestock products years in India (High income growth)  
 . The units in million tons for all commodities  
 . 2013 is considered as base*

#### 4.4. Demand Projections for Different Livestock Products for Nigeria

Demand projection for different livestock products in Nigeria was computed using a simple growth model for three different income growth scenario of 6, 7 and 8 per cent GDP growth i.e. low, moderate and high growth for the years 2020, 2025 and 2030. As indicated in Table 5 and 6, the demand for milk was projected to reach about 1.09 to 1.11 million tons, 1.23 to 1.25 million tons and 1.38 to 1.41 million tons for the year 2020, 2025 and 2030 under the assumptions of low and high income growth scenario in Nigeria respectively. The observed growth rate was higher in the case of high income growth scenario and subsequently implies that demand would likely going to be higher under high income growth. As such, as income increases demand for milk would likely be increased among Nigerian consumers. This similar trend was also observed in India.

Moreover, the demand for eggs would likely reach around 2.01 to 2.04 million ton, 2.27 to 2.23 million tons and 2.55 to 2.59 million tons for the years 2020, 2025 and 2030 under low and high income growth rate scenarios. The growth rate for eggs demand under high income scenario was indicated as 2.44 per cent, and for the low income growth scenario was 2.34 per cent. From this, it can be deduced that at higher income growth demand for eggs would likely going to be higher. Therefore, as consumers earn more income they may likely increase their demand for eggs. By the way, it confirms the finding of India regarding demand for eggs.

By and large, the demand for poultry was projected to reach 0.37 to 0.38 million tons, 0.42 to 0.43 million tons and 0.47 to 0.48 million tons for the years 2020, 2025 and 2030 under low and high income growth scenarios respectively.

Further, the demand for meat was projected at about 1.97 to 2.01 million tons, 2.22 to 2.27 million tons and 2.50 to 2.55 million tons for the years 2020, 2025 and 2030 under assumptions of low and high income growth scenarios. Likewise, the growth rate for meat demand was found to be 2.45 per cent for the high income scenario which is implying that demand likely to be higher at a high income compared to low and moderate income growth. It is similarly reported by the FAO in 2011 that the absolute increase in annual per capita consumption of meat in sub Saharan Africa will be averaging at a rate of 5.32 per cent within the years of 2000 to 2030.

Livestock product	Years				
	2013	2020	2025	2030	Growth rate
Milk	0.93	1.09	1.23	1.38	2.35
Eggs	1.72	2.01	2.27	2.55	2.34
Poultry Meat	0.32	0.37	0.42	0.47	2.29
Meat	1.69	1.97	2.22	2.50	2.33

*Table 5: Demand projections of Livestock products for different years Nigeria (Low income growth)  
 . The units in million tons for all commodities  
 . 2013 is considered as base*



Livestock product	Years				
	2013	2020	2025	2030	Growth rate
Milk	0.93	1.11	1.25	1.41	2.48
Eggs	1.72	2.04	2.31	2.59	2.44
Meat	0.32	0.38	0.43	0.48	2.41
Poultry meat	1.69	2.01	2.27	2.55	2.45

*Table 6: Demand projections of Livestock products for different years Nigeria (High income growth)  
The units in million tons for all commodities  
. 2013 is considered as base*

#### 4.5. Supply Projection of Different Livestock Products for India

The projections of production (supply) as well as domestic consumption (demand) into future will be required by the policy maker in understanding and putting the necessary food policies in the right directions to forestall any envisage food shortfall in a country. The futuristic supply projections for 2020, 2025 and 2030 were presented in Table 7; the supply for milk in India would likely reaches 175.3, 201.6 and 226.5 million tons in the years 2020, 2025 and 2030 respectively. As indicated in Table 7 below, milk supply from the year 2020 to 2030 would be increasing at an impressive growth rate of 2.6 per cent. Similarly, the Indian Economic Survey, in the year 2000-01 projected the supply of milk as 156.8 million tons for the year 2020, while Dastagiri projected a supply of 218.8 for the year 2020 with a growth rate of 5.0 per cent from the year 1993 to 2020. It is clear that, going by this, future supply trend of milk in India would be quite impressive and likely the country would maintain its position as the largest producer of milk in the world. In the last three decades, world milk production has increased by more than 50 percent, from 482 million tons in 1982 to 754 million tons in 2012. India is the world's largest milk producer, with 16 percent of global production, followed by the United States of America, China, Pakistan and Brazil.

Moreover, the supply projections of eggs in India would likely reaches 3.81, 4.31 and 4.79 million tons for the year 2020, 2025 and 2030 respectively. It was observed that growth rate for eggs supply increases at a growth rate of 2.32 per cent from the year 2020 to 2030. By the way, Indian Economic survey 2000-01 projected supply of eggs reaching 175.5 billion in the year 2020.

The projected supply of poultry meat would likely reaches 4.67, 5.43 and 6.19 million tons in the years of 2020, 2025 and 2030 respectively. Growth rate for the supply of poultry meat as reported in Table 7 was 2.86 per cent from the period of 2020 to 2030. The observed changes in the food consumption pattern towards chicken, meat and eggs consumption was getting wider acceptance among many consumers in India. In a similar study conducted by Indian economic survey in 2004 it reported a supply of poultry meat to reaches 3.85 million tons in the year 2020.

On a final note, supply for meat was projected to likely reaches 5.82, 8.04 and 10.9 million tons for the years 2020, 2025 and 2030 respectively. The growth rate in the supply of meat was expected to increases at the rate of 6.48 per cent from the year 2020 to 2030. Among all the food items meat appears to have the highest growth rate invariably indicating an accelerative increase in the future supply of meat in India. A similar growth rate trend in the supply of meat was reported as 8.6 per cent for the year 2000 to 2020 in India.

Livestock product	Years			
	2020	2025	2030	Growth rate
Milk	175.3	201.6	226.5	2.60
Eggs	3.81	4.31	4.79	2.32
Poultry Meat	4.67	5.43	6.19	2.86
Meat	5.82	8.04	10.9	6.48

*Table 7: Supply projections of Livestock products in India  
The units in million tons for all commodities*

#### 4.6. Supply Projection of Livestock Products in Nigeria

The futuristic supply projections for 2020, 2025 and 2030 with Arima models were presented in Table 8. The supply forecast of milk in Nigeria would likely reach 1.07, 1.21 and 1.35 million tons in the years 2020, 2025 and 2030 respectively. As indicated in Table 8 milk supply from the year 2020 to 2030 will be increasing at an impressive growth rate of 2.35 per cent, indicating that future supply of milk will experience a significant increase. The growth rate of milk in India surpassed that of Nigeria in terms of higher growth rate and in physical quantities, by far beyond comparison.

Further, the supply projections of eggs in Nigeria are likely to reaches 0.69, 0.71 and 0.86 million tons for the year 2020, 2025 and 2030 respectively. It was observed that growth rate for eggs supply increases at a growth rate of 2.23 per cent from the year 2020 to 2030 which was very close to that of eggs supply of India (2.32 per cent). This indicated that both India and Nigeria share a common growth trend of eggs supply although the absolute quantities of the supply are not statistically same.

The projected supply of poultry meat would likely reaches 0.33, 0.36 and 0.39 million tons in the years of 2020, 2025 and 2030 respectively. Growth rate for the supply of poultry meat as reported in Table 8 was 1.68 per cent from the period of 2020 to 2030. This growth rate stands far below of what was reported in India.

On a final note, supply for meat was projected and likely to reach 1.78, 1.96 and 2.14 million tons for the years 2020, 2025 and 2030 respectively. The growth rate in the supply of meat was expected to increase at the rate of 1.86 per cent from the year 2020 to 2030. Similarly, this stands far below the growth rate of meat in India during the same period of study.

Livestock product	Years			
	2020	2025	2030	Growth rate
Milk	1.07	1.21	1.35	2.35
Eggs	0.69	0.77	0.86	2.23
Poultry Meat	0.33	0.36	0.39	1.68
Meat	1.78	1.96	2.14	1.86

Table 8: Supply projections of Livestock products in Nigeria  
The units in million tons for all commodities

#### 4.7. Demand – Supply Gap for Livestock Products in India

The base-line scenario in the year 2013 revealed that the production trends for all the commodities closely followed those for consumption. Interestingly, across the three income growth scenarios, the result indicated an average surplus in milk at 16.4 million tons, eggs a marginal deficit of an average 0.06 million tons, poultry meat a surplus of 1.85 million tons and average surplus of 0.2 million tons of meat.

With this trend in demand – supply gap for the year 2020, it is clear that in terms of milk, poultry and meat India would be not only self-sufficient but would become surplus in these food products. While at the same it would be in deficit of eggs going by the findings of this study

Items	Years		
	2020	2025	2030
Milk Demand	156.6	164.8	172.3
Supply	175.3	201.6	226.5
Surplus	18.7	36.8	54.2
Eggs Demand	3.82	4.02	4.20
Supply	3.81	4.31	4.79
Surplus	0.01 (Deficit)	0.29	0.59
Poultry Demand	2.78	2.92	3.06
Supply	4.67	5.43	6.19
Surplus	1.89	2.51	3.13
Meat Demand	5.52	5.81	6.07
Supply	5.82	8.04	10.9
Surplus	0.3	2.23	4.83

Table 9: Demand - Supply gap of Livestock products in India (Low growth income)  
. The units in million tons for all commodities

Subsequently, in the year 2025 under the three income growth scenario, an average surplus of 34.4, 0.26, 2.46 and 2.14 million tons of milk, eggs, poultry meat and meat respectively. Interestingly, the result of the year 2025 indicated an improvement from the previous 2020 where there was a deficit in eggs, but in 2025 deficit would become a surplus. Meaning in the year 2025 the country will not only be self-sufficient in eggs but will be having a surplus of about 0.26 million tons of eggs. During this same year, also, India would be having a surplus of all the all livestock products under study. Thereafter, lays the bigger challenge of ensuring the proper processing for the export of the surplus food commodities to avoid losses especially the most perishable milk, eggs, meat and poultry; there by increasing farmer's income, creating employment and increasing the nation's balance of payment.

As the case may be, in the year 2030, a similar trend with the previous year was also been observed with an average surplus of 51, 0.53, 3.09 and 4.74 million tons of milk, eggs, poultry meat and meat respectively. Interestingly, the result of the year 2030 indicated an improvement from the previous 2025 where the surplus has increases significantly with about a percentage change of 34.8 per cent for milk, 40.4 per cent for eggs, 20.6 per cent for poultry and 55.6 per cent for meat respectively.

Items	Years		
	2020	2025	2030
Milk Demand	161.1	169.5	177.21
Supply	175.3	201.6	226.5
Surplus	14.2	32.1	49.29
Eggs Demand	3.92	4.13	4.32
Supply	3.81	4.31	4.79
Surplus	0.11 (Deficit)	0.28	0.47
Poultry Demand	2.85	3.01	3.14
Supply	4.67	5.43	6.19
Surplus	1.82	2.42	3.05
Meat Demand	5.69	5.98	6.25
Supply	5.82	8.04	10.9
Surplus	0.13	2.06	4.65

Table 10: Demand - Supply gap of for Livestock products in India (High growth income)  
The units in million tons for all commodities

#### 4.8. Demand – Supply Gap for Livestock Products in Nigeria

It is believed that the findings will showcase what would likely be going to occur in the nearest future on livestock products surplus or deficit and at large its implication on food security situations of the country. Alarmingly enough, the demand for livestock products by far out weight the forecasted local production, a result which indicates that in the year 2020 there would be a marginal milk deficit of an average 0.04 million tons, for eggs a deficit of 1.39 million tons, for a poultry meat a deficit of 0.04 million tons and average deficit of 0.21 million tons of meat across the three income growth scenario.

With this trend in demand – supply gap for the year 2020, it is glaring factual that Nigeria would be a deficit nation in terms of milk, eggs, poultry and meat if the policy makers and stake holders refuse to take an appropriate averting measure.

Subsequently, in the year 2025 under the three income growth assumption scenarios, there would be an average deficit of 0.03, 1.52, 0.06 and 0.28 million tons of milk, eggs, poultry meat and meat respectively. It was also observed critically that the deficit gap was furthering wider especially in eggs, poultry meat and meat from the previous 2020 respectively. This is a strong indication that the country would be heading to a serious and profound livestock products deficit; its domestic supply cannot satisfy domestic demand, creating a deficit that only be filled with massive importation. This poses a bigger challenge to the Nigeria policy to as a matter of must, stand up with vigorous policy plan and programs aimed at stamping out this dangerous trend.

Items	Years		
	2020	2025	2030
Milk Demand	1.09	1.23	1.38
Supply	1.07	1.21	1.35
Deficit	0.02	0.02	0.03
Eggs Demand	2.01	2.27	2.55
Supply	0.69	0.77	0.86
Deficit	1.32	1.50	1.69
Poultry Demand	0.37	0.42	0.47
Supply	0.33	0.36	0.39
Deficit	0.04	0.06	0.08
Meat Demand	1.97	2.22	2.50
Supply	1.78	1.96	2.14
Surplus	0.19	0.26	0.36

Table 11: Demand - Supply gap of Livestock products in Nigeria (Low growth income)  
The units in million tons for all commodities

As the case may be, in the year 2030, a similar occurrence with that of previous 2025 scenario would also be observed with, the result discloses further, a deficit of 0.04, 1.71, 0.08 and 0.28 million tons of milk, eggs, poultry meat and meat respectively. While India would be making a significant improvement from 2025 to 2030, Nigeria on the other hand would be ditching into aggravated deficit situation if proper mitigation strategies and comprehensive actions are not put in place by the policy makers. Similarly, the report of Adeoye *et al.*, 2011, that the Nigerian population has increased at a much higher rate than the growth in food supply increasing the gap between national food production and the local demand for food. And this trend in population growth was estimated to increase sharply in the years to come while food deficit is expected to widen further if serious proactive measure is not put in place. By and large, it is evident from the report of FAO in 2012 that, during 2007 - 2009, the undernourished population of Nigeria was 11 million people or 7.0% of the total population and during 2010 - 2012; the estimate of the undernourished population has increased to 14 million people or nearly 9.0% of the population. To add to this, Omonona2008, states that although the incidence of poverty declined



from 65.6% to 54.4% between 1996 and 2004, the actual number of poor people in Nigeria increased from 67 to 70 million during those years.

Meanwhile, as Atinmo 1999 rightly observed, Nigeria is one of the food-deficit countries in sub-Saharan Africa although it is arguably better in terms of production than the others. It has also not suffered any major catastrophe that could precipitate scourges of famine, mass hunger and therefore food crisis. This does not in any way prevent public policy makers from being conscious of avoiding the debilitating impact of food shortages in neighboring countries which has however made food security become a first order priority of the present Nigerian government.

Items	Years		
	2020	2025	2030
Milk Demand	1.11	1.25	1.41
Supply	1.07	1.21	1.35
Deficit	0.04	0.04	0.06
Eggs Demand	2.04	2.31	2.59
Supply	0.69	0.77	0.86
Deficit	1.35	1.54	1.73
Poultry Demand	0.38	0.43	0.48
Supply	0.33	0.36	0.39
Deficit	0.05	0.07	0.09
Meat Demand	2.01	2.27	2.55
Supply	1.78	1.96	2.14
Surplus	0.23	0.31	0.14

*Table 12: Demand - Supply gap of for Livestock products in Nigeria (High growth income)  
. The units in million tons for all commodities*

## 5. Conclusion and Recommendation

The findings reveal that in the two countries demand for livestock products changes with the change in income level, demand increases in an event of relative change in income. It is glaring factual that, India would become a surplus nation for all the livestock products in the coming years of 2020, 2025 and 2030 with the exception of eggs deficit likely be observed in the year 2020.

Nigeria conversely, would be staggering with deficit in all the livestock products for the years 2020, 2025 and 2030 respectively. The main challenges are; need to improve on the productivity of the local breeds of livestock through adoption of artificial inseminations, improving grazing reserve with high quality protein grasses and fodders, quality drinking water to reduce the menace of farmers/pastoral clashes that leads to the lingering loss of thousands of livestock over the years in Nigeria, which in turn reduces the availability of their products. In addition, government needs to provide financial support, training and input to the local and small scale poultry farmers in order to enhance eggs and broiler production.

For India, government should strengthen the local processing industries with financial support in ensuring a proper efficient processing and export of the surplus livestock products to avoid losses of these most perishable products; increasing farmer's income, creating employment, export competitiveness and increasing the nation's balance of payment.

No doubt, livestock is vital to the economies of developing countries and if giving adequate attention to this sector; improving the animal and veterinary services will increase productivity, income, save cost and reduce losses of livestock and India in particular will improve access to world market. These effects will invariably bring additional benefits in income, food and nutritional security of the countries.

## 6. References

- i. Atinmo, T. and Adeniran, T. (1999), "Policy Failure in the Search for Food Security in Nigeria" in Ogunrinade, A., Oniangio, R. and May, J. (eds), Not by Bread Alone: Food Security and Governance in Africa, South Africa, Toda, Institute for Global Peace and Policy Research.
- ii. Bernard, C., Guibert, B. and Bonnet, B., 2011, Demand for Farm Animal Products in Nigeria: An Opportunity for Sahel Countries? Special Report, The Institut de Recherches et d' Applications des Methodes de Développement (IRAM). Pp 14-15.
- iii. Bruinsma, J., 2003, World agriculture: towards 2015/2030, an FAO Perspective. London: Earthscan.
- iv. Delgado, C.L., Rosegrant, M.W. and Meijer, S., 2001, Livestock to 2020: The revolution Continues. Paper presented at the annual meeting of the international Agricultural trade research consortium (IATRC), Auckland, New Zealand.
- v. Food and Agricultural Organisation (FAO), FAO Statistical Data Base, <http://apps.fao.org/>, (2014)
- vi. FGN/ WHO, 2004, Millennium Development Goals Report. Abuja: FGN/WHO.
- vii. Gahukar, R.T. 2011, "Food Security in India: The Challenge of Food Production and Distribution," J. of Agricultural & Food Information 12: 271.
- viii. GOYAL, S. K. and SINGH J.P., 2001, Demand versus Supply of food grains in India:
- ix. Implications to food security. Paper to be presented at the 13<sup>th</sup> International IFMA Congress of Farm Management on "Feed the World- please the Consumer-Maintain the Environment" to be held at Wageningen, The Netherlands.

- x. Ilri, 2014, The Nigerian economy: Agriculture and Livestock sector.  
<https://www.ilri.org/InfoServ/Webpub/fulldocs/Bulletin06/Nigerian.htm#TopOfPage>
- xi. Joseph M. Awika, 2011, Major Cereal Grains Production and Use around the World. ACS Symposium Series, American Chemical Society: Washington, DC, 1-8
- xii. Kirit S. Parikh, "Food Security: Individual and National," in India's Economic Reforms and Development: Essays for Manmohan Singh, ed. Isher Judge Ahluwalia and I.M.D. Little (New York, NY: Oxford University Press, 1998), 253.
- xiii. Madhura S., 2010, "Population and Food Security," in Handbook of Population and
- xiv. Development, ed. A.K. Shiva Kumar, Pradeep Panda, and Rajani R. Ved (New York, NY: Oxford University Press), 53.
- xv. Ojehomon, V.E.T., Adebayo, S.B., Ogundele, O.O., Okoruwa, V.O., Ajayi, O., Diagne, A. and Ogunlana, O. (2009). Rice Data Systems in Nigeria: National Rice Survey.
- xvi. Parthasarathy Rao P, Basavaraj G, Ahmad W and Bhagavatula S. 2010. An analysis of availability and utilization of sorghum grain in India. J. of SAT Agric. Res. 8:1-7
- xvii. Nuru, S. and Buvanendran, V. 1984. The indigenous cattle breeds of Nigeria: Problems and potential. Paper presented at the Workshop on Evaluation of large Ruminants, Rockhampton, Australia.
- xviii. Upton, M., 2004, The role of Livestock in economic development and poverty reduction. Pro-Poor Livestock policy initiative working paper No. 10.