Factors determining availability of nutritious food in India

Seminar Paper



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Economics of Growth and Development

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# **ABSTRACT**

An analysis of population demographic and the demand and supply of food in India.

India, a country with diversity as vivid as a Van Gogh has always had self-sufficiency and eradicating poverty at the center of its socio-economic goals which is also evident from its agricultural policies. In the last few decades, there have been many developments in the world, yet, regardless of the cultural, economic and social changes that India has undergone in the form of rising population, growing economy, increasing urbanization and changing tastes and preferences, its core goals remain the same.

With its ever rising population along with the shifting food purchase patterns due to changing consumer demographic, taste, lifestyle, economic conditions and health concerns, there is an increased pressure on its limited resources to not only cater to the demands of the rising population but also to provide for the changing taste.

The attainment of good nutrition depends on and incorporates the entire food supply. Foods from animals and plants and the various types of components derived from them are the primary sources that provide nourishment to human beings. Nutrition is essential as it not only plays an important role in the growth and development of humans but also in the prevention and treatment of various types of disease. Nutrition is also fundamental to the maintenance of good health and functionality. Research on availability of nutritional food and various factors affecting it holds the key to increasing our understanding of the causes of diseases and thus holds promise to markedly influence peoples’ health and economy of India.

Over the years, many studies have been conducted on nutritional status, food security and self-sustainability but studies on nutritional food with factors determining their availability have been scarce. Therefore, it becomes imperative to bridge this wide gap in our knowledge and grow our awareness about the various factors which affect the demand and supply market of nutritional food and their availability to people.

Hence, in these dynamic times, this paper attempts to analyse the effects of different factors such as GDP per capita, total population and other factors such as rainfall on the demand and supply of different types of food in India. This paper serves as a very evident and sound mathematical analysis of the above mentioned factors on the demand and supply market, and assess the current and recent past’s demand-supply gap. This paper shall extract such relevant information that will be useful to evolve appropriate medium- and long-term strategies in the food sector through statistical analysis.

This paper brought out significant findings. Positive value coefficient estimates of both the GDP per capita and log(Population) (log taken to remove heteroskedasticity) suggests that Food Production Index increases with increase in GDP per capita and Population. Production of fisheries have increased at an approximately constant rate through the years from 1990 to 2018. The per capita per year net availability of rice, wheat, cereals as a whole and food grains (total) have increased over the years with a dip or two in the recent years. The wheat and rice production is steadily growing across the country with increasing technological development.

# **KEYWORDS**

*Food self-sufficiency; Food market; Regression analysis (GDP, Population, Rainfall, Food Production Index, Livestock Production Index, Cereals, Meat); Food security; Nutritional security; Consumption pattern; Nutritional Demand and supply analysis; Food demand and supply analysis; Import and Export; India; Food; Nutrition*

# **INTRODUCTION**

India has witnessed significant progress in most of its endeavors such as science, technology, industrialization, defense, art etc. Even after achieving this rare feat, availability and affordability of a nutritious and healthy meal, which is the basic requirement of the majority of population of our country, is still unfulfilled. The Indian economy is now one of the fastest-growing economies in the world. Real GDP per head grew at 3.95% a year from 1980 to at around 7% a year in 2010s [1]. India’s economy has grown rapidly and has been evolving constantly. In the post-economic reforms period, India not only experienced rapid economic transformation but also substantial changes in many other dimensions of well-being, including its methods of nutrition intake.

According to The World Bank Report (2011) [2], “South Asia still has the highest rates and the largest number of undernourished children in the world,” and also “The high economic growth experienced by South Asian countries has not made an impact on the nutritional status of South Asian children.” Recent estimates show that between 1996 and 2005 around half of all Indian children under five were under-weight or under-height for their age (UNDP 2007-2008) [3]. Since 1993-94, there has been slow, but steady decline in the consumption of calories in rural areas. It has reduced from 2683 Kcal/consumer unit/day in 1993-94 to 2489 Kcal/consumer unit/day in 2009-10. Similarly, in urban areas too it has declined from 2542 to 2385 Kcal/consumer unit/day. Also according to the World Bank Report (2012), [4] Under nutrition is not just a problem of poverty, children are undernourished in one-quarter of even the richest households. This is not an issue of food access, but also of caring practices and disease. Also, it should be noted that India annually loses over US$12 billion in GDP to vitamin and mineral deficiencies. Scaling up core micronutrient interventions would cost less than US$574 million per year. [4][5]

However, it should also be noted that India has shown improvement in most of the above mentioned indicators in the past few years by means of adopting various policy measures to improve food availability and security with the support of international agencies. Although the progress in this direction has been slow and satisfactory levels are yet to be attained, there is a noticeable improvement in the availability of food to people along with the quantity of food being consumed (not necessarily the quality).

Coming back to food, our food choices affect our health — how we feel today, tomorrow, and in the future. Having a balanced diet plays an integral role in leading a healthy lifestyle. Intake of nutritional food can help us to maintain a healthy weight, promotes our mental and physical health and reduce the risk of diseases. Poor nutrition can invite many diseases, some of which are common nowadays due to people’s poor eating habits. These diseases include diabetes, obesity, cardiovascular problems and hypoglycemia.

These diseases, most of which are long-term illnesses, could be easily prevented by living a healthy lifestyle.

There has never been a better time to study nutrition! Health, nutrition and food were never discussed so much in our lives before. Before writing this seminar paper we have read many research papers but none of them explained in detail about the various factors that affect nutritional food demand and supply in India in detail. So it becomes important to bridge this wide gap in our knowledge and grow our awareness about nutritional food and various factors which affect the demand and supply in this market.

With this background, this paper attempts to highlight and statistically analyses in detail a wide variety of aspects of nutritional food supply and demand in India. Factors that shall be taken into consideration to assess the Nutritional food demand and supply are: Food production index, Livestock production index, GDP per capita, Population, Life expectancy to name a few.

**Certain general trends-**

* Increasing differentiation. This applies to consumer attitudes and desires. Consumer demand for food breaks down into an increasing number of groups, and demand is also becoming more differentiated at the level of the individual consumer. On the supply side, the food market is becoming increasingly segmented.
* Increased polarisation. Among consumers, there is an identifiable split in demand between high-end products and cheap offers, partly as a function of income. The middle market segment is accordingly losing market share.
* Growing convergence. Despite the growing diversity of the food supply, differences are blurring. One contributing factor, for example, is the increasingly scientific nature of food production, and the rising number of stages in processing.

# **OBJECTIVE**

This raises a lot of questions, does increasing GDP per capita increase our nutritional food supply and demand? Does the ever increasing population of India pose a hindrance to the availability of nutritional food to people? This paper shall attempt to enable the reader to answer these questions through a statistical point of view.

We shall use year wise data from official government websites to run the regression to answer these questions, we shall use linear regression to test our hypothesis, moreover by means of testing the relations between factors relating to production and availability such as livestock production and food production and the different demographic and economic factors such as GDP per capita and Population growth.

**HYPOTHESIS**

**Hypothesis 1:**

• **H0**: Food production is significantly determined by GDP per capita growth.

• **H1**: Food production is not significantly determined by GDP per capita growth

**Hypothesis 2:**

• **H0**: population growth is a significant factor in determining Livestock production.

• **H1**: population growth is not a significant factor in determining Livestock production.

# **LITERATURE REVIEW**

Many states in India are practically large to exist as an independent country with several ethnic groups, socio-economic levels, health facilities, different food habits, etc. As a result, there is significant variation between the nutritional status of the population of different states since it results from a varying combination of factors.

Intake of nutritional food in India have been constantly changing and in past couple of decades, consumption of some cereals such as millets has declined considerably, while the consumption of dairy products, oils and salt have increased (Misra et al., 2011). Three-Fourths of the population of India are estimated to have deficiency of micronutrients as their diets have failed to provide them necessary levels of vitamins and minerals such as Vitamin A, Vitamin D, proteins and iron that are generally found in the Indian diet in green vegetables, cereals, dairy products and pulses (Rao et al., 2018). So highlighting this diet-related burden of India is the need of the hour.

**A Comparison of demand Projections:**

The prediction of the future demand of nutritional food have been made by means of different scholars in the past under assumptions of GDP per capita, population growth rates etc., at different base years. These predictions were mainly for cereals, wheat, rice and pulses based on NSS consumer expenditure data. Bhalla (2011), computed demand for total cereals in 2020 as 374.7 MT. New estimates on livestock growth were used in this study which are based on the assumption that GDP growth would be around 7.5% and also considered IMPACT model. The study by Kumar (2008) used the Food Characteristic Demand System (FCDS) according to which he predicted the total demand for cereals to be 223.7 MT in 2010 and 265.7 MT in 2020.

**Projected food demand for India, by means of different studies. (Unit: Million Metric Tons)**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Source: NSSO 2016** | **Year** | **Rice** | **Wheat** | **Total Cereals** | **Pulses** | **Edible oil** | **Sugar** |
| Mittal (2008)  (9% GDP growth) | 2011 | 94.4 | 59.0 | 188.5 | 24.1 | 16.8 | 29.3 |
| 2021 | 96.8 | 64.3 | 245.1 | 42.5 | 30.2 | 65.7 |
| 2026 | 102.1 | 65.9 | 277.2 | 57.7 | 40.9 | 100.7 |
| Rosegrant et al. (1995) | 2020 | - | - | 237.3 | - | - | - |
| Kumar (2008) | 2010 | 103.6 | 85.8 | 223.7 | 23.0 | - | - |
| 2020 | 122.1 | 102.8 | 265.7 | 30.9 | - | - |
| Bhalla (2011) | 2020 | - | - | 374.7 | - | - | - |
| Thamarajakshi (2001) | 2020 | - | - | 274.0 | - |  |  |
| Hanchate &  Dyson (2004) | 2026 | - | - | 217.6 | 16.0 |  |  |

Hanchante and Dyson (2001) also predicted the total demand for cereals to be 217.6 mt in 2026. In this paper, cereal projections were made at the state level which were subsequently summarised at the country level. The base year considered for most of these studies is 1994. Rosegrant’s study for total cereals were close to these estimates whereas Bhalla’s (2001) study for total cereals are observed to be considerably different from that of other studies.

**Supply Projections:**

Some supply projections have been made under the technological change, assumptions of cropping pattern shift, yield growth etc. Hanchante and Dyson (2001) calculated projections of supplies using area and projections of yield for total cereals and pulses for 2026.Domestic production in 2026 will be 265.8 mt according to the paper. Predictions of various nutritional foods according to various research papers have been summarised below:

**Projected food supply for India, by means of different studies (Unit: Million Metric tons)**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Source** | **Year** | **Rice** | **Wheat** | **Total Cereals** | **Pulses** | **Oilseed** | **Sugarcane** |
| Mittal(2008) | 2011 | 95.7 | 80.2 | 209.7 | 16.1 | 29.9 | 245.0 |
| 2021 | 105.8 | 91.6 | 242.2 | 17.6 | 36.9 | 255.2 |
| 2026 | 111.2 | 97.9 | 260.2 | 18.4 | 41.1 | 260.5 |
| Kumar (1998) | 2010 | 109.3 | 96.0 | 248.4 | - | - | - |
| 2020 | 134.0 | 127.3 | 309.0 | - | - | - |
| Mittal (2000) | 2010 | 112.7 | 94.8 | - | - | - | 289.0 |
| 2020 | 149.3 | 128.5 | - | - | - | 298.1 |
| Kumar & Mittal (2003) | 2010 | 107.8 | 95.4 | 236.8 | 13.9 | - | - |
| 2020 | 127.0 | 111.5 | 274.0 | 15.2 | - | - |
| Hanchate & Dyson (2004) | 2026 | - | - | 265.8 | 23.7 | - | - |

Having highlighted the past, current and future predictions of the demand and supply trends, the policies and changing demographics that accompanied them and the effects that these changes caused or affected or were simply followed by, this paper shall now attempt to bridge the gap between the known and the unknown through its objectives.

# **METHODOLOGY**

**Variables:**

**Food Production Index (FPI):** Food production index covers food crops that are considered edible and that contain nutrients. Coffee and tea are excluded in light of the fact that, although edible, they have no nutritive value. Practically all products are covered, with the main exception of fodder crops. The agricultural production index is prepared by means of the Food and Agriculture Organisation of the United Nations (FAO). The FAO indices of agricultural production show the relative level of the aggregate volume of agricultural production for each year in comparison with the base period 2004-2006. They are based on the sum of price-weighted quantities of different agricultural commodities produced after deductions of quantities used as seed and feed weighted in a similar manner. The resulting aggregate represents, therefore, disposable production for any use except as seed and feed. Time frame of the data is from 1961 to 2016. This index at the country, regional and world levels is calculated by means of the Laspeyres formula. A Laspeyres Index is known as a "base-weighted" or "fixed-weighted" index in light of the fact that the price increases are weighted by means of the quantities in the base period. The Consumer Price Index is an example of a Laspeyres Index. Agricultural data are collected by means of the Food and Agriculture Organisation of the United Nations (FAO) from official national sources through the questionnaire and are supplemented with information from official secondary data sources. The secondary sources cover official country data from websites of national ministries, national publications and related country data reported by means of various international organisations.

[http://www.usna.edu/Users/econ/rbrady/312%20Materials/LaspeyresCalc.pdf](http://www.usna.edu/Users/econ/rbrady/312%2520Materials/LaspeyresCalc.pdf)

**Livestock Production Index (LPI):** Livestock production index includes meat and milk from all sources, dairy products such as cheese, and eggs, honey, raw silk, wool, and hides and skins. Methodology for calculation of Livestock production index is very too similar to the calculation methodology of Food production index. Both feed and seed originating from within the livestock sector (e.g. milk feed, hatching eggs) are removed from the group "livestock products". For the main two livestock subgroups, namely, meat and milk, only feed originating from the respective subgroup is removed similar to the removal of fodder crops in the food production index. Base period is still considered to be 2004-06. Time frame of the data is from 1961 to 2016. This index is also calculated using the same Laspeyres index as explained above. The data is directly collected from

**GDP per capita growth (%):** Annual percentage growth rate of GDP per capita based on constant local currency. Aggregates are based on constant 2010 U.S. dollars. GDP per capita is gross domestic product divided by midyear population. GDP at purchaser's prices is the sum of gross value added by all resident producers in the economy plus any product taxes and minus any subsidies not included in the value of the products. It is calculated without making deductions for depreciation of fabricated assets or for depletion and degradation of natural resources. Data on this variable is directly collected from World Bank national accounts, and OECD National Accounts data files.

**Population Growth (%):** Total population is based on the de facto definition of population, which counts all residents regardless of legal status or citizenship. The values shown are midyear estimates. This data is also directly calculated from the World Bank data website and then converted to growth terms.

**Rainfall (in mm):** Rainfall is taken from the year 1961 till 2016 in millimetres. This rainfall is averaged out over the entire year.

**Geographic coverage:**

In terms of geography, we first analysed the supply and demand of nutritional food in India as a whole.

Secondly we analysed state-wise intake of calorie(kcal), protein(gm), fat(gm) as of the 68th round of NSSO report on “Nutritional Intake of India”, i.e. for the years 2011-12. Moving over to the supply side, we have also analysed the estimates on production of major livestock products in the year 2016-17. To see how the nutritional intake levels depends on various levels of poverty, we plotted a scatter plot of time versus levels of intake.

**Population coverage:**

The Production index of food and livestock are regressed upon the population of India for the time period 1961 to 2016, to see whether increase in population results in any actual increase in the production levels of food and livestock.

**Regressions:**  
Besides various time series and comparative analysis, we have regressed the supply of food and livestock on various factors, which are detailed below. The model mainly uses time series data of various explained above. Moreover, demand of Cereals and pulses is also regressed on upon these factors. Non veg consumption has been exempted from this analysis due to the following reasons:

#### Data is very scarcely available.

#### People eating flesh products replace the proportionate intake of pulses and dairy products. Thus, analysis of both the food groups are assumed to be approximately same.

**Final Regressions:**

#### ***FPI{t} = β0+β1(GDP per capita growth {t}) +β2(Population growth {t}) +β3(Rainfall{t}) +******µ{t}***

#### β0- The intercept term specifies how the index is changing with zero change in GDP per capita growth, population growth and rainfall.

#### β1- This coefficient specifies the marginal change in the index with respect to 1% increase or decrease in GDP per capita.

#### β2- This coefficient specifies the marginal change in the index with respect to 1% increase or decrease in Population growth.

#### β3-This coefficient specifies the marginal change in the index with respect to 1-unit increase or decrease in Rainfall.

#### µt- The error or disturbance term takes into account the deviations from trend. These deviations may arise due to unusual conditions along the lines of periods of recessions or unusually large amounts of rainfall.

#### ***LPI{t} = β0+β1(GDP per capita growth{t}) +β2(Population Growth {t}) + µ{t}***

#### β0- The intercept term specifies how the index is changing with zero change in GDP per capita growth, population growth.

#### β1- This coefficient specifies the marginal change in the index with respect to 1% increase or decrease in GDP per capita.

#### β2- This coefficient specifies the marginal change in the index with respect to 1% increase or decrease in Population growth.

#### µt- The error or disturbance term takes into account the deviations from trend. These deviations may arise due to unusual conditions along the lines of periods of recessions.

***Note:*** *FPI – Food Production Index, LPI – Livestock Production Index, GDP – Gross Domestic Product*

# **RESULTS**

**Regressions:**

* ***FPI{t} = β0+β1(GDP per capita growth {t}) +β2(Population growth {t}) +β3(Rainfall{t}) +******µ{t}***

Initial regression consisted of variables GDP per capita growth, Population growth and Rainfall. Though through further analysis it was found that high values of GDP and population led to the problem of heteroscedasticity and thus were changed to the aforementioned.

Food Production Index (FPI) does not significantly depend upon the population growth. According to the t-test, GDP per capita growth and rainfall are the only two significant variables in determining the FPI. Our model is overall significant pertaining to the high F-stat value. An 88.51% R2 shows that both the independent explanatory variables explains the variation in FPI over the years to a great extent. Positive value coefficient estimates of both the GDP per capita and rainfall suggests that FPI increases with increase in GDP per capita and rainfall. This might be due to fact that higher per capita income results in higher demand for food which in turn results in inflation in food prices thus finally resulting in an increase in supply.

***LPI{t} = β0+β1(GDP per capita growth{t}) +β2(Population Growth {t}) + µ{t}***

Initial regression consisted of variables GDP and Population. Though through further analysis it was found that high values of GDP and population led to the problem of heteroscedasticity and thus were changed to the aforementioned. Though the model itself turned out too significant, GDP per capita was found to be significant variable at 5% significance level. Population was also found to be significant as expected.

**Other Analysis**:

***Fisheries Production***:

As can be seen from the graph below production of fisheries have increased at an approximately constant rate through the years from 1990 to 2018 as expected from the increasing population of non-vegetarians India.

***Source:*** *The World Bank(Website-* <https://data.worldbank.org/>)

**(Refer to Appendix Table A.6)**

***Net food grain availability per capita per year***:

The per capita per year net availability of rice, wheat, cereals as a whole and food grains (total) have increased over the years with a dip or two in the recent years. But the availability of pulses and other cereals, which include cereals along the lines of bajra etc., have decreased and only recently began to stabilise.

**Source*:*** Pocket Book of Agricultural Statistics 2018, Directorate of Economics & Statistics, Ministry of Agriculture & Farmers Welfare, Govt. of India. (Website: <http://eands.dacnet.nic.in>)

**(Refer to Appendix Table A.7)**

***Estimates of state-wise production of major livestock products 2016-17***:**Source:** Department of Animal Husbandry, Dairying & Fisheries Ministry of Agriculture & Farmers Welfare Government of India**(Refer to Appendix Table A.5)**

***Production of wheat and rice from 1960 to 2019***:

As can be seen from the graph, the wheat and rice production is steadily growing across the country with increasing technological development. The abnormal dips in the production of wheat and especially rice can be due to adverse weather conditions along the lines of draughts, floods etc.

**Source:** IndexMundi (Website - <https://www.indexmundi.com>)

**(Refer to Appendix Table A.8)**

# **CONCLUSIONS**

Food production during the green revolution was largely supply-driven but in the current times it is mainly demand-driven on account of rising per capita incomes, urbanisation, and changes in dietary patterns towards high-value agricultural commodities.

In our analysis we found that Food Production Index does not significantly depend upon the population growth. FPI increases with increase in GDP per capita and rainfall as is suggested by the positive value of coefficient estimates of both the GDP per capita and rainfall. This might be due to fact that higher per capita income results in higher demand for food which in turn results in inflation in food prices thus finally resulting in an increase in supply. The study further reveals that the production of fisheries have increased at an approximately constant rate through the years from 1990 to 2018 which was expected from the increasing population of India. Also, the per capita per year net availability of total food grains including rice, wheat, cereals as a whole have increased over the years but the availability of pulses and other cereals (e.g. bajra) have decreased and started to stabilise in the the past few years only. The study also found that there was a steady growth in wheat and rice production across the country due to increasing technological development but some abnormal dips in their production was also seen probably due to adverse weather conditions which depends year-on-year. Moreover, a high rate of increase in productivity calls for a priority in agricultural research system coupled with more capital investment stressing the development of new production technologies for main crops and farm products.

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**Links:**

* http://www.mospi.gov.in/
* http://apps.iasri.res.in/agridata
* https://www.indexmundi.com/agriculture
* https://data.worldbank.org/
* http://www.mospi.gov.in/
* http://apps.iasri.res.in/agridata
* https://www.indexmundi.com/agriculture

# **APPENDIX**

Data Tables

A.1 FPI and LPI Data

|  |  |  |
| --- | --- | --- |
| **Year** | **Food Production Index** | **Livestock Production Index** |
| **1961** | 32.12 | 24.5 |
| **1962** | 31.68 | 24.61 |
| **1963** | 32.4 | 24.67 |
| **1964** | 33.23 | 24.62 |
| **1965** | 31.67 | 24.72 |
| **1966** | 31.63 | 25.04 |
| **1967** | 33.55 | 25.49 |
| **1968** | 35.4 | 26.71 |
| **1969** | 36.62 | 27.19 |
| **1970** | 38.52 | 26.94 |
| **1971** | 38.96 | 28.48 |
| **1972** | 37.34 | 28.87 |
| **1973** | 40.31 | 29.51 |
| **1974** | 39.04 | 30.78 |
| **1975** | 43.38 | 31.96 |
| **1976** | 42.99 | 33.62 |
| **1977** | 46.53 | 34.89 |
| **1978** | 48 | 35.6 |
| **1979** | 45.78 | 37.13 |
| **1980** | 47.65 | 38.65 |
| **1981** | 51.02 | 41.12 |
| **1982** | 50.71 | 43.59 |
| **1983** | 56.79 | 46.28 |
| **1984** | 57.86 | 48.63 |
| **1985** | 59.1 | 51.2 |
| **1986** | 60.08 | 53.1 |
| **1987** | 59.54 | 54.31 |
| **1988** | 65.24 | 55.9 |
| **1989** | 68.93 | 58.62 |
| **1990** | 70.13 | 60.66 |
| **1991** | 71.13 | 61.68 |
| **1992** | 74.12 | 63.8 |
| **1993** | 76.9 | 66.06 |
| **1994** | 79.03 | 68.33 |
| **1995** | 81.05 | 71.75 |
| **1996** | 84.09 | 74.18 |
| **1997** | 86.51 | 76.29 |
| **1998** | 88.02 | 79.1 |
| **1999** | 92.14 | 82.5 |
| **2000** | 91.53 | 84.62 |
| **2001** | 94.63 | 87.86 |
| **2002** | 87.38 | 89.62 |
| **2003** | 96.38 | 91.62 |
| **2004** | 94.74 | 95.85 |
| **2005** | 100.03 | 99.83 |
| **2006** | 105.23 | 104.32 |
| **2007** | 114.49 | 110.92 |
| **2008** | 117 | 114.55 |
| **2009** | 114.27 | 118.54 |
| **2010** | 123.19 | 123.49 |
| **2011** | 130.87 | 128.2 |
| **2012** | 133.81 | 131.89 |
| **2013** | 139.06 | 136.32 |
| **2014** | 142.88 | 143.11 |
| **2015** | 141 | 149.7 |
| **2016** | 144.39 | 152.71 |

<https://data.worldbank.org/indicator/AG.PRD.FOOD.XD?locations=IN>

**A.2 Indicators Data**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Year** | **GDP (current US$)** | **Population, total** | **GDP per capita (current US$)** | **Inflation, GDP deflator (annual %)** | **Life expectancy at birth, total (years)** |
| **1960** | 37029883875 | 450547679 | 82.18860201 |  | 41.422 |
| **1961** | 39232435784 | 459642165 | 85.35430117 | 2.14542765 | 42.027 |
| **1962** | 42161481859 | 469077190 | 89.88175669 | 4.40561673 | 42.637 |
| **1963** | 48421923459 | 478825608 | 101.1264282 | 8.353623886 | 43.252 |
| **1964** | 56480289941 | 488848135 | 115.537497 | 8.551676966 | 43.873 |
| **1965** | 59554854575 | 499123324 | 119.3189172 | 8.300369406 | 44.5 |
| **1966** | 45865462034 | 509631500 | 89.99730596 | 13.27070656 | 45.136 |
| **1967** | 50134942203 | 520400576 | 96.33913665 | 8.616204711 | 45.779 |
| **1968** | 53085455871 | 531513824 | 99.8759646 | 2.415383587 | 46.428 |
| **1969** | 58447995017 | 543084336 | 107.6223178 | 3.34336434 | 47.081 |
| **1970** | 62422483055 | 555189792 | 112.4344935 | 1.562243485 | 47.737 |
| **1971** | 67350988021 | 567868018 | 118.6032421 | 5.32484105 | 48.398 |
| **1972** | 71463193830 | 581087256 | 122.9818639 | 10.8396027 | 49.061 |
| **1973** | 85515269586 | 594770134 | 143.7786881 | 17.82971565 | 49.722 |
| **1974** | 99525899116 | 608802600 | 163.4781112 | 16.66751573 | 50.374 |
| **1975** | 98472796457 | 623102897 | 158.0361718 | -1.64868155 | 51.012 |
| **1976** | 1.02717E+11 | 637630087 | 161.0920917 | 5.981859342 | 51.63 |
| **1977** | 1.21487E+11 | 652408776 | 186.2135013 | 5.637229339 | 52.222 |
| **1978** | 1.373E+11 | 667499806 | 205.6933861 | 2.460282317 | 52.786 |
| **1979** | 1.52992E+11 | 682995354 | 224.0010168 | 15.72804321 | 53.319 |
| **1980** | 1.86325E+11 | 698952844 | 266.5778481 | 11.50832081 | 53.814 |
| **1981** | 1.93491E+11 | 715384993 | 270.4706024 | 10.82758198 | 54.268 |
| **1982** | 2.00715E+11 | 732239504 | 274.1113314 | 8.095863097 | 54.686 |
| **1983** | 2.18262E+11 | 749428958 | 291.2381101 | 8.552859607 | 55.074 |
| **1984** | 2.12158E+11 | 766833410 | 276.6679586 | 7.923232845 | 55.441 |
| **1985** | 2.32512E+11 | 784360008 | 296.4351516 | 7.193785446 | 55.801 |
| **1986** | 2.48986E+11 | 801975244 | 310.4659351 | 6.789400453 | 56.169 |
| **1987** | 2.79034E+11 | 819682102 | 340.4168316 | 9.327893305 | 56.553 |
| **1988** | 2.96589E+11 | 837468930 | 354.1492516 | 8.232515365 | 56.963 |
| **1989** | 2.96042E+11 | 855334678 | 346.1128873 | 8.436808873 | 57.4 |
| **1990** | 3.20979E+11 | 873277798 | 367.5566093 | 10.66830385 | 57.865 |
| **1991** | 2.70105E+11 | 891273209 | 303.0556053 | 13.75181894 | 58.353 |
| **1992** | 2.88208E+11 | 909307016 | 316.9539279 | 8.96515236 | 58.851 |
| **1993** | 2.79296E+11 | 927403860 | 301.1590042 | 9.861782853 | 59.349 |
| **1994** | 3.27276E+11 | 945601831 | 346.1029503 | 9.980044775 | 59.84 |
| **1995** | 3.60282E+11 | 963922588 | 373.76648 | 9.06270222 | 60.32 |
| **1996** | 3.92897E+11 | 982365243 | 399.9500768 | 7.575018288 | 60.783 |
| **1997** | 4.15868E+11 | 1000900030 | 415.493797 | 6.476271263 | 61.233 |
| **1998** | 4.21351E+11 | 1019483581 | 413.2989342 | 8.010167523 | 61.669 |
| **1999** | 4.5882E+11 | 1038058156 | 441.9987596 | 3.068395521 | 62.093 |
| **2000** | 4.68395E+11 | 1056575549 | 443.3141934 | 3.644970161 | 62.505 |
| **2001** | 4.85441E+11 | 1075000085 | 451.5730011 | 3.215616017 | 62.907 |
| **2002** | 5.14938E+11 | 1093317189 | 470.9867859 | 3.715683777 | 63.304 |
| **2003** | 6.07699E+11 | 1111523144 | 546.7266145 | 3.867798086 | 63.699 |
| **2004** | 7.09149E+11 | 1129623456 | 627.7742473 | 5.725413227 | 64.095 |
| **2005** | 8.20382E+11 | 1147609927 | 714.8610135 | 5.621903263 | 64.5 |
| **2006** | 9.4026E+11 | 1165486291 | 806.7532806 | 8.400938217 | 64.918 |
| **2007** | 1.21674E+12 | 1183209472 | 1028.334771 | 6.944418254 | 65.35 |
| **2008** | 1.1989E+12 | 1200669765 | 998.522339 | 9.193969626 | 65.794 |
| **2009** | 1.34189E+12 | 1217726215 | 1101.96084 | 7.040365435 | 66.244 |
| **2010** | 1.67562E+12 | 1234281170 | 1357.563719 | 10.52603086 | 66.693 |
| **2011** | 1.82305E+12 | 1250288729 | 1458.103527 | 8.7335779 | 67.13 |
| **2012** | 1.82764E+12 | 1265782790 | 1443.879529 | 7.934388476 | 67.545 |
| **2013** | 1.85672E+12 | 1280846129 | 1449.605912 | 6.186504001 | 67.931 |
| **2014** | 2.03913E+12 | 1295604184 | 1573.881492 | 3.331756917 | 68.286 |
| **2015** | 2.10359E+12 | 1310152403 | 1605.605431 | 2.279588108 | 68.607 |
| **2016** | 2.29043E+12 | 1324509589 | 1729.268021 | 3.124227441 | 68.897 |
| **2017** | 2.65224E+12 | 1338658835 | 1981.268706 | 3.835504789 | 69.165 |
| **2018** | 2.71873E+12 | 1352617328 | 2009.978857 | 4.111608823 |  |

<https://data.worldbank.org/country/india>

**A.3 Cereals, Gram and Pulses Consumption Demand**

|  |  |  |  |
| --- | --- | --- | --- |
| **YR** | **cereals** | **gram** | **pulses** |
| **1951** | 334.2 | 22.5 | 60.7 |
| **1961** | 399.7 | 30.2 | 69 |
| **1971** | 417.6 | 20 | 51.2 |
| **1981** | 417.3 | 13.4 | 37.5 |
| **1991** | 468.5 | 13.4 | 41.6 |
| **2001** | 386.2 | 8 | 30 |
| **2011** | 410.7 | 14.5 | 43 |

**A.4 Meat Consumption Demand**

|  |  |
| --- | --- |
| **TIME** | **MEAT** |
| **2007** | 1791400 |
| **2008** | 1919100 |
| **2009** | 2120800 |
| **2010** | 2226150 |
| **2011** | 2515600 |
| **2012** | 2712800 |
| **2013** | 2878822 |
| **2014** | 3073960 |
| **2015** | 3291664 |
| **2016** | 3335846 |

**A.5** ***Estimates on production of major livestock products***

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| ***Estimates on production of major livestock products, 2016-17*** | | | | |
| **States/UTs** | Milk | Egg | Meat | Fish |
| (In 000'Tonne) | (In Lakhs Nos) | (In 000'Tonne) | (in 000' Tonnes) |
| **Andaman and Nicobar Islands** | 16 | 1032 | 5 | 38 |
| **Andhra Pradesh** | 12178 | 158274 | 633 | 2333 |
| **Arunachal Pradesh** | 53 | 495 | 20 | 4 |
| **Assam** | 861 | 4771 | 47 | 292 |
| **Bihar** | 8711 | 11117 | 326 | 495 |
| **Chandigarh** | 36 | 154 | 1 | 0 |
| **Chhattisgarh** | 1374 | 16638 | 49 | 317 |
| **Dadra and Nagar Haveli\*** | 8 | 73 | 0 | 0 |
| **Daman and Diu** | 1 | 18 | 1 | 28 |
| **Delhi\*** | 279 | 0 | 66 | 1 |
| **Goa** | 51 | 292 | 7 | 115 |
| **Gujarat** | 12784 | 17940 | 33 | 826 |
| **Haryana** | 8975 | 52139 | 427 | 111 |
| **Himachal Pradesh** | 1329 | 959 | 4 | 11 |
| **Jammu and Kashmir** | 2376 | 2305 | 85 | 20 |
| **Jharkhand** | 1894 | 5103 | 55 | 118 |
| **Karnataka** | 6562 | 50671 | 209 | 696 |
| **Kerala** | 2520 | 23444 | 469 | 681 |
| **Lakshadweep** | 3 | 147 | 0 | 12 |
| **Madhya Pradesh** | 13445 | 16940 | 79 | 115 |
| **Maharashtra** | 10402 | 54774 | 845 | 621 |
| **Manipur** | 79 | 992 | 27 | 31 |
| **Meghalaya** | 84 | 1064 | 41 | 6 |
| **Mizoram** | 24 | 408 | 15 | 7 |
| **Nagaland** | 79 | 397 | 31 | 8 |
| **Odisha** | 2003 | 19745 | 177 | 470 |
| **Puducherry** | 48 | 116 | 15 | 70 |
| **Punjab** | 11282 | 47826 | 249 | 125 |
| **Rajasthan** | 18500 | 13633 | 180 | 44 |
| **Sikkim** | 54 | 68 | 4 | 0 |
| **Tamil Nadu** | 7556 | 166824 | 573 | 698 |
| **Telangana** | 4681 | 118186 | 591 | 264 |
| **Tripura** | 160 | 2294 | 40 | 64 |
| **Uttar Pradesh** | 27770 | 22889 | 1346 | 538 |
| **Uttarakhand** | 1692 | 4119 | 28 | 4 |
| **West Bengal** | 5183 | 65536 | 706 | 1632 |
| **India** | **165404** | **881386** | **7386** | **10795** |
| ***Source: State/UT Animal Husbandry Departments*** | | | | |

**A.6 Fisheries Production**

|  |  |  |  |
| --- | --- | --- | --- |
| **Year** | **Marine** | **Inland** | **Total** |
| **1990-91** | **2300** | **1536** | **3836** |
| **2000-01** | **2811** | **2845** | **5656** |
| **2009-10** | **3104** | **4894** | **7998** |
| **2010-11** | **3250** | **4981** | **8231** |
| **2011-12** | **3372** | **5294** | **8666** |
| **2012-13** | **3321** | **5719** | **9040** |
| **2013-14** | **3443** | **6136** | **9579** |
| **2014-15** | **3569** | **6691** | **10260** |
| **2015-16** | **3600** | **7162** | **10762** |
| **2016-17** | **3641** | **7781** | **11422** |
| **2017-18** | **3688** | **8917** | **12606** |

**A.7 Net Food grains Availability per capita per year (in kgms)**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Year** | **Rice** | **Wheat** | **Other Cereals** | **Cereals (total)** | **Pulses** | **Food grains (total)** |
| **1951** | **58** | **24** | **40** | **122** | **22.1** | **144.1** |
| **2011** | **66.3** | **59.7** | **23.9** | **149.9** | **15.7** | **170.9** |
| **2012** | **69.4** | **57.8** | **21.9** | **149.1** | **15.2** | **169.3** |
| **2013** | **72.1** | **66.8** | **19.2** | **158.1** | **15.8** | **179.5** |
| **2014** | **72.3** | **66.8** | **22.6** | **161.6** | **16.9** | **178.6** |
| **2015** | **67.9** | **61.3** | **28.4** | **153.8** | **16** | **169.8** |
| **2016** | **67.2** | **72.9** | **26.1** | **162** | **15.7** | **177.7** |
| **2017** | **66.8** | **66.7** | **29.4** | **158.4** | **20** | **178.4** |
| **2018(P)** | **69** | **64.4** | **31.2** | **160** | **20.4** | **180.3** |

**A.8 Wheat and Rice Production (in 1000MT)**

|  |  |  |
| --- | --- | --- |
| **Year** | Wheat Production(1000 MT) | Rice production(1000MT) |
| 1960 | 10320 | 34639 |
| 1961 | 10995 | 35663 |
| 1962 | 12076 | 33217 |
| 1963 | 10779 | 36998 |
| 1964 | 9854 | 39308 |
| 1965 | 12258 | 30589 |
| 1966 | 10394 | 30438 |
| **1967** | 11393 | 37612 |
| 1968 | 16540 | 39761 |
| 1969 | 18651 | 40430 |
| 1970 | 20093 | 42225 |
| 1971 | 23832 | 43068 |
| 1972 | 26410 | 39245 |
| 1973 | 24735 | 44051 |
| 1974 | 21778 | 39579 |
| 1975 | 24104 | 48740 |
| 1976 | 28846 | 41917 |
| 1977 | 29010 | 52617 |
| 1978 | 31749 | 53773 |
| 1979 | 35508 | 42330 |
| 1980 | 31830 | 53631 |
| 1981 | 36313 | 53248 |
| 1982 | 37452 | 47116 |
| 1983 | 42794 | 60097 |
| 1984 | 45476 | 58337 |
| 1985 | 44069 | 63825 |
| 1986 | 47052 | 60416 |
| 1987 | 44323 | 56862 |
| 1988 | 46169 | 70489 |
| 1989 | 54110 | 73573 |
| 1990 | 49850 | 74291 |
| 1991 | 55134 | 74680 |
| 1992 | 55690 | 72868 |
| 1993 | 57210 | 80300 |
| 1994 | 59840 | 81810 |
| 1995 | 65470 | 76980 |
| 1996 | 62097 | 80736 |
| 1997 | 69350 | 82545 |
| 1998 | 66350 | 86077 |
| 1999 | 71288 | 89683 |
| 2000 | 76369 | 84977 |
| 2001 | 69681 | 93334 |
| 2002 | 72766 | 71814 |
| 2003 | 65761 | 88522 |
| 2004 | 72156 | 83127 |
| 2005 | 68637 | 91785 |
| 2006 | 69355 | 93345 |
| 2007 | 75807 | 96682 |
| 2008 | 78570 | 99172 |
| 2009 | 80679 | 89083 |
| 2010 | 80804 | 95970 |
| 2011 | 86874 | 105301 |
| 2012 | 94882 | 105241 |
| 2013 | 93506 | 106646 |
| 2014 | 95850 | 105482 |
| 2015 | 86527 | 104408 |
| 2016 | 87000 | 109698 |
| 2017 | 98510 | 112760 |
| 2018 | 99870 | 116420 |
| 2019 | 102190 | 115000 |