



## Research Article

# FOOD SECURITY WITH REFERENCE TO DEMAND-SUPPLY GAPS AND PROJECTIONS OF FOOD GRAINS IN AKOLA DISTRICT

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**Abstract-** The food security is a primary concern of any developing country. Adequate nourishment is necessary to sustain healthy life and per capita availability of food has been considered as a measure of food security. So in this context, an effort has been made to examine the "Food security with reference to demand- supply gap and projections of food grain crops in Akola district". The current investigation was grounded on secondary data composed from different government publications. The data covered a periods of 20 years i.e. 1990-91 to 2009-10. In order to study the production projection exponential growth function has been used assuming that the earlier inclinations will endure in the future. The supply projection for food grain crops was based on exponential trend fitted. The demand for the projected population of a given year was worked out as per the dietary recommendations of Indian Council of Medical Research. The results showed that on an average the district will have to face shortage of total food grains and will be surplus in pulses, especially in gram. The study revealed that the gap of cereals availability and requirement is widening and will remained widened in forthcoming years from 245212 tons during 2015 to 340765 tons during 2025. These forecasts have been constructed on adjustment in productivity levels, variations in price, growth of population and earnings progress. Demand and supply projections act as pointers to policy creators to frame their medium and long-term agricultural policies.

**Keywords-** Demand, Supply, Gaps, Projections, Population, Trend analysis, Food security

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## Introduction

Seasonal changes in day length or photoperiod act as an external temporal clue to Theories of food security has been grew in the former thirty years to imitate variations in official policy thinking [1-2]. The term first invented in the mid-1970s, when the World Food Conference (1974) defined food security in terms of food supply - assuring the availability and price stability of basic foodstuffs at the international and national level. An important early step in improving world food security was the formation of the Global Information and Warning System on Food and Agriculture for creating advance facts about the conceivable food crises in diverse portions of the world, so that anticipatory actions might be taken for the susceptible populations and regions. The basic idea behind food security is to ensure adequate supplies of food to world people at all times, irrespective of climate or harvests, social status or income. The World Conference of Human Rights (Vienna, 1993) emphasized the need to ensure the right to food for everyone [3].

Various research studies have predicted that India will have surplus in food grains production to meet the future demand. However, it is revealing note that the per capita net availability of food grains has declined from 171.1 kg per annum in 1961 to 162.1 kg in 2009. Per capita availability of food grains has declined from 500 gms/day in 1997 to 444 gms/day as on date. While per capita annual net availability of cereals has declined marginally, the per capita availability of pulses has declined drastically from 25.2 kg in 1961 to 13.5 kg in 2009 [4]. Likewise per capita consumption of edible oil is less than 12 kgs per annum as against 16 kgs per annum as recommended by the nutritionist [5].

Per capita cereal consumption and percentage of population above poverty are significant factors in reducing undernourishment among cultivar and labour households in India. Cereals are the principal source of calorie and protein for rural commonalities. They are also the cheapest source of energy and protein in country. Due to low level of per capita income, rural commonalities are not in position to pay for the nutritional deterioration due to decline in cereals by rising consumption of fruits and vegetables, milk and meat etc. to get sufficient nutrition. Thus, prices of cereals plays important role in determining food and nutrition security of the Indian population. Any increase in actual prices of cereals results in their concentrated consumption, which assistance in building up grain surplus but is detrimental to household food security. Dietary diversification away from cereals requires much bigger increase in intake on non-cereal foods to maintain the same level of nutrition. This does not seem to be affordable at present level of income in the country. Due position must continue to be permitted to cereal and pulses for food and nutritional security in India.

## Materials and Methods

The methodology followed for the present study is presented below.

For the present study, the major food grain crops of Akola district including Washim were selected. The major food grain crop namely wheat, rice, jowar, red gram and gram were selected and commercial crops like soybean and cottons were also selected for the comparative analysis between food grain crops and commercial crops. Thus, the study was confined to major food grain crops of Akola district with an assumption that excluded crops having fewer shares in daily

consumption requirement. To project the supply and demand of major food grains following crops were selected because they are having highest share in the recommendation of dietary allowances prepared by the Indian Council of Medical Research. i.e. Rice, Wheat, Jowar, Red gram and Gram.

### Sample and data

The present study was confined to Akola district including Washim. Time series secondary data on area and production of selected crops were collected from Epitomes of agriculture in Maharashtra and office of the District Superintendent Agriculture Officer, Akola and Washim district. The data pertains to a period of 20 years i.e. year from 1990-91 to 2009-10.

To study the performance of area and production entire study period was divided into two periods i.e. period I (1990-91 to 1999-2000) and period II (2000-01 to 2009-10). To study the supply-demand gap of food grains, house hold level data from various rounds of consumption surveys conducted by the National Sample Survey Organization (NSSO) were used. The data on balanced diet, based on the recommendation of the dietary allowances prepared by the Indian Council of Medical Research and the data on population on Akola and Washim district were used to project the food grain requirement.

### Sources of data

The data required to fulfill objectives were collected from different Government publications. Such as, Statistical Abstract of Maharashtra state, Directorate of Economics and Statistics, Government of Maharashtra, Mumbai, Epitomes of Agriculture in Maharashtra, District Socio-economic review, a report of the Expert Group of the Indian Council of Medical Research, National Institute of Nutrition, Hyderabad[6], Census report, Office of Collector, and Government of Maharashtra.

### Analytical tools and techniques

The methods of analysis adopted in the present study are elaborated under the following headings.

#### Analysis of annual per capita availability of food grains.

Per capita Availability

$$= \frac{\text{Annual production} - (\text{Seed, feed, wastage and industrial demand})}{\text{Population}}$$

#### Analysis of supply-demand gap

Supply-demand gap = Per capita availability – per capita consumption

#### Analysis of supply projection

The supply of selected food grains is defined as production in the district, for 2015, 2020 and 2025 was estimated by exponential trend fitted.

$$Y_t = a \cdot b^t$$

Where,  $Y_t$  = Production for  $t^{\text{th}}$  year,

$a$  = Intercept,  $b$  = Regression coefficient, and

$t$  = Years which takes values 1, 2 ... n

#### Analysis of demand projection

The demand of food grains for projected population for the years 2015, 2020 and 2025 was worked out as per the per capita consumption recommendation of dietary allowances prepared by the Indian Council of Medical Research [6].

**Demand (Projected) = Projected population x Per capita consumption requirement**

The methodology suggested by Kumar Pradyuman is based on the last time rural and urban regions, income groups and population projections. In the present study the data on lifestyle, income and regions has not been considered, considering the total population of the districts.

#### Analysis of population projection

The population for the years 2015, 2020 and 2025 was worked out with uniform growth of 0.89347 per cent per annum [7].

### Result and Discussion

Food availability is the core element of food security. Food availability mainly depends upon growth trend and variability of food grain production. It helps to find out red signals in agriculture. The compound growth rate and coefficient of variation of area and production of food grains has been estimated. The food grain production and per capita availability has been examined because cereals happens to be the most important source of energy while pulses of protein and availability of both can go long way in reducing the hunger and malnutrition among the people. Per capita availability of food has been considered as a measure of food security. Thus, the per capita availability and consumption trend of food grain in different past scenarios has been estimated.

Household level data was collected from various rounds of consumption surveys conducted by the National Sample Survey Organization (NSSO). The gaps between food availability and requirement shows surplus or deficit i.e. status of food security about particular commodity. The production and consumption requirement scenarios act as guidelines to strategy makers to frame their medium and long term agricultural strategies. So, the production and consumption requirement for the years 2015, 2020 and 2025 has been estimated from this point of view. The data on balanced diet were based on the references of dietary allowances prepared by the Indian Council of Medical Research [6].

#### Population projection for Akola district:

The population of Akola district including Washim was projected with the uniform growth of 0.89347 per cent each year is presented in [Table-1].

**Table-1** Projected population of Akola district including Washim.

| Sr. No. | Year | Population |
|---------|------|------------|
| 1       | 2011 | 3015331    |
| 2       | 2012 | 3042272    |
| 3       | 2013 | 3069454    |
| 4       | 2014 | 3096879    |
| 5       | 2015 | 3124548    |
| 6       | 2016 | 3152465    |
| 7       | 2017 | 3180631    |
| 8       | 2018 | 3209049    |
| 9       | 2019 | 3237721    |
| 10      | 2020 | 3266649    |
| 11      | 2021 | 3295836    |
| 12      | 2022 | 3325283    |
| 13      | 2023 | 3354994    |
| 14      | 2024 | 3384969    |
| 15      | 2025 | 3415213    |
| 16      | 2026 | 3445727    |

#### Projection of supply-demand of food grains for Akola district in the year 2015, 2020 and 2025

**Table-2** Projection of supply-demand of food grains for Akola district in the year 2015. (in '00' tonsnes)

| Sr. No. | Commodity         | Supply  | Demand  | Gap      |
|---------|-------------------|---------|---------|----------|
| 1       | Wheat             | 954.68  | 1724.64 | -769.96  |
| 2       | Rice              | 0.27    | 2874.41 | -2874.14 |
| 3       | Jowar             | 1268.74 | 1351.37 | -82.63   |
| 4       | Total Cereals     | 2146.93 | 4599.05 | -2452.12 |
| 5       | Red Gram          | 1179.99 | 517.39  | 662.60   |
| 6       | Gram              | 1633.12 | 287.44  | 1345.68  |
| 7       | Total Pulses      | 2594.61 | 1092.27 | 1502.34  |
| 8       | Total Food grains | 4591.71 | 5691.33 | -1099.62 |

<sup>1</sup> denote demand is more than the supply

**Table-3** Projection of supply-demand of food grains for Akola district in the year 2020. (in '00' tonsnes)

| Sr.No. | Commodity         | Supply  | Demand  | Gap      |
|--------|-------------------|---------|---------|----------|
| 1      | Wheat             | 1375.74 | 1798.40 | -422.66  |
| 2      | Rice              | 0.08    | 2997.33 | -2997.25 |
| 3      | Jowar             | 981.28  | 1409.15 | -427.87  |
| 4      | Total Cereals     | 1854.74 | 4795.72 | -2940.98 |
| 5      | Red Gram          | 1424.24 | 539.52  | 884.72   |
| 6      | Gram              | 2847.02 | 299.73  | 2547.29  |
| 7      | Total Pulses      | 2906.41 | 1138.98 | 1767.43  |
| 8      | Total Food grains | 4411.65 | 5934.71 | -1523.06 |

<sup>1</sup> denote demand is more than the supply

**Table-4** Projection of supply-demand of food grains for Akola district in the year 2025. (in '00' tonsnes)

| Sr. No. | Commodity     | Supply  | Demand  | Gap      |
|---------|---------------|---------|---------|----------|
| 1       | Wheat         | 1982.52 | 1878.74 | 103.78   |
| 2       | Rice          | 0.02    | 3131.23 | -3131.21 |
| 3       | Jowar         | 758.94  | 1472.11 | -713.17  |
| 4       | Total Cereals | 1602.31 | 5009.96 | -3407.65 |
| 5       | Red Gram      | 1719.04 | 563.62  | 1155.42  |
| 6       | Gram          | 4963.20 | 313.12  | 4650.08  |

|   |                   |         |         |          |
|---|-------------------|---------|---------|----------|
| 7 | Total Pulses      | 3255.68 | 1189.87 | 2065.81  |
| 8 | Total Food grains | 4238.65 | 6199.83 | -1961.18 |

‘-’ denote demand is more than the supply

#### Estimation of supply-demand gaps of food grains in Akola district

The estimated supply-demand gaps of food grains in Akola district is presented in [Table-5].

**Table-5** Supply-demand gaps of food grains in Akola district (Kg/person/annum)

| Commodity         | Years        |             |       |              |             |       |              |             |       |
|-------------------|--------------|-------------|-------|--------------|-------------|-------|--------------|-------------|-------|
|                   | 1993-94      |             |       | 2004-05      |             |       | 2009-10      |             |       |
|                   | Availability | Consumption | Gap   | Availability | Consumption | Gap   | Availability | Consumption | Gap   |
| Wheat             | 11.9         | 54.6        | -42.6 | 2.3          | 53.5        | -51.2 | 39.9         | 52.2        | -12.3 |
| Rice              | 2.5          | 79.9        | -77.4 | 0.1          | 73.8        | -73.7 | 0.1          | 70.5        | -70.4 |
| Jowar             | 187.2        | 19.8        | 167.5 | 61.1         | 12.6        | 48.5  | 41.3         | 9.8         | 31.5  |
| Total Cereals     | 203.9        | 154.2       | 49.7  | 64.3         | 139.9       | -75.5 | 82.7         | 132.6       | -49.9 |
| Total Pulses      | 110.7        | 9.6         | 101.1 | 53.3         | 9.0         | 44.3  | 99.6         | 9.0         | 90.5  |
| Total Food grains | 314.6        | 163.8       | 150.8 | 117.6        | 148.9       | -31.3 | 182.3        | 141.6       | 40.7  |
| Soybean           | 4.3          | Nil         | Nil   | 73.9         | Nil         | Nil   | 75.3         | Nil         | Nil   |
| Cottons           | 28.5         | Nil         | Nil   | 70.4         | Nil         | Nil   | 112.1        | Nil         | Nil   |

One of the purposes of the current study is to project the demand and supply of food grains in Akola district. The demand and supply projections for the selected food grains namely wheat, rice, jowar, red gram, gram are worked out on the basis of projections of district population on the basis of 2011 census up to 2026 with the uniform progress of 0.89347 per cent per annum [8-9].

The supply (production) projections for wheat, rice, jowar, total cereals, red gram, gram, total pulses and total food grains are based on exponential trend fitted. The demand is worked out for the population of a given year as per the references of dietary allowances fixed by the Indian Council of Medical [6]. The projected population is presented in [Table-1], and the projection of supply and demand for the time period 2015, 2020 and 2025 are presented in [Table-2-4]. The gap in supply and demand is worked out. The negative sign indicates that demand is more than supply which is to be fulfilled from the adjoining district or state.

It is revealed from the tables that on an average district will have to face shortage of total food grains especially of rice and total food grains. However the district was observed to be surplus in pulses, especially in gram. This position might have been due to the shift in area under soybean and cottons.

The per capita availability, consumption and gap of selected food grains is prescribed in [Table-5] along with per capita availability of soybean and cottons which are the sources of shift in area. It is revealed from the table that per capita availability of soybean and cottons during 2009-10 was 75.3 kg per annum which caused shift in area thereby reduction in production of cereals like jowar and wheat. Therefore, the gap of cereals availability and requirement is widening and will remain widened in forthcoming years from 245212 tons during 2015 to 340765 tons during 2025 and the population in the district will have to depend in the arrivals of the adjoining district of the state to meet the consumption requirement. The availability of cereals is as per the actual production in this study area as the area under cereals is declining day by day. The variability is also in production. It needs the attention of policy makers.

#### Conclusions

The projections of demand and supply in cereals indicated gap of 340765 tons in cereals, while surplus of 206581 tons in pulses production. It can be estimated that these gaps can be accomplished future demand of cereals by adopting yield by improved practices. The estimated food grain production can be accomplished mainly through progress in efficiency. The high rate of proliferation in productivity was for significance in agriculture research system joined with more capital investment emphasizing the more growth of new production technologies for key crops and farm products. In this light, the paper recommends that the policy consideration requires to be placed, and productivity enhancements in agriculture of Akola district

#### Conflict of Interest: None declared

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