AN ECONOMIC ANALYSIS OF FOOD-GRAINS PRODUCTION IN THE COMING DECADES IN ASSAM

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Agricultural development in Assam confronts number of challenges due to low per capita availability of land and high population growth. Over a period of about three decades, the net cropped area has not registered any significant increase and there is no likelihood of any substantial increase in it. At the same time, the population has increased resulting in increasing demand for food-grains. The present trend of food-grains production, the extent of shortfall in production is going to increase. This situation is inevitable, unless a strategy is formulated for a radical increase in cropping intensity, supported by commensurate irrigation facilities along with required (and feasible) increase in productivity levels of food-grains especially rice and wheat.

INTRODUCTION

Assam is primarily an agricultural state, which accounts for the livelihood of about four-fifths of the state's population. More than 70 per cent of the workforce is engaged in agriculture and allied activities. Rice is the staple food crop; cash crops like jute, tea, cotton, oilseeds, sugarcane, potato, etc., are also grown in the state. Agriculture is the core of the primary Domestic Product and it contributes 24.48 per cent to the Net State Domestic Product (NSDP) at constant (1999–2000) price during 2008–09 (quick estimate). However, the per capita net sown area for Assam is much lower than the All-India average. As a result, the extent of population pressure on effective land i.e. net area sown including current fallow can be gauged from the per capita figure for Assam at 0.10 hectare as in 2007–08 (Directorate of Economics and Statistics). Agriculture has now reached a stage of physical limit in terms of land. The net cropped area in the state constitutes about 32 per cent of the total geographical area (excluding the fallow land). Over a period of about three decades, the net cropped area has not registered any significant increase and there is no likelihood of any substantial increase in it. In the future, even if the current cultivable wasteland is brought under cultivation along with current fallow land involving considerable investment for land reclamation, the overall land availability is not expected to improve in any significant way. At the same time the population has increased resulting in food deficiency in the state. Every year Assam has to spend several crores of rupees in procurement of food grains, oilseeds etc from other states. The problem will be more acute if necessary policies are not formulated to increase food grain production. Under these circumstances, the present study is an attempt to focus the demand and supply of food-grains production in Assam for the coming decades, based on previous actual data, and also to make some timely some relevant suggestions.

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OBJECTIVES OF THE STUDY

The major objectives of the study are:

To make an assessment of the probable position of food-grain production in the coming decades in the state.

To estimate the projected demand for food-grains in the state on the basis of per capita consumption as suggested by experts.

To observe the discrepancy between projected demand and projected supply of food-grains.

HYPOTHESIS

For a systematic study on the basis of the objectives stated above, a hypothesis is taken out in the form of:

If the present productivity of food-grains[2] *and the prevailing crop intensity remain unaltered, Assam will face serious shortage of food-grains to meet the food requirements of her projected population by 2030.*

METHODOLOGY

The study is mainly based on available official data, supplemented by a few personal field visits. Widely used statistical tools such as regression analysis, method of extrapolation as well as existing computer programmes have been used in the study. The methodology adopted for various computations in the present study are briefly described below.

For computing the projected population of the state, the following relation has been adopted.

$$P = P_0(1 + r)^t$$

where, P = Projected population for the year under consideration, P_0 = Population at the base year, r = Annual growth rate of population, t = Time period.

The future value of food-grains production is predicted by using existing values. The predicted value is a y-value for a given x-value. The known values are existing x-values and y-values, and the new value is predicted by using linear regression.

The equation for *FORECAST* is

$$Y_P = a + bx$$

where, Y_P = Projected output of Food-grains, b = Slope, x = years for which we want trend to return corresponding Y values, a = intercept.

The values of a and b are calculated as follows:

$$a = \overline{y} - b\overline{x} \quad \text{and} \quad b = \frac{\sum(x - \overline{x})(y - \overline{y})}{\sum(x - \overline{x})^2}$$

Here, $\overline{x}$, $\overline{y}$ are the sample means.

The projected demand for food-grains are arrived at multiplying the projected population by three different per capita food requirement norms.

[2]Food-grains include rice, wheat and pulses.

AGRICULTURAL SITUATION IN ASSAM

The nature of agriculture in Assam is mostly underdeveloped. High dependence on agriculture for livelihood, widespread practice of traditional farming techniques and correspondingly low usage of modern farm inputs, low levels and low growth in productivity and incomes in the sector, widespread prevalence of subsistence cultivation, poor and inadequate agricultural infrastructure, etc. are some of the basic characteristics of agriculture in Assam. About 87 per cent of the population in Assam lives in rural areas as per the 2001 Census. About 75 per cent of the state's population is directly or indirectly dependent on agriculture, while about 69 per cent of the workforce in the state is actually engaged in agricultural activities. On the other hand, the sector's contribution to the state's income has been falling sharply over time, from nearly 50 per cent in early 1980s to about 35 per cent by the end of 1990s and further to nearly 25 per cent in 2007–08. Even though the state is richly endowed with natural resources, such as abundant rainfall, alluvial soil, rich and diverse plant and animal genetic base, development of agriculture in Assam has been slow over the decades. Consequently, the state is not just lagging behind most of the other states in the country but is also unable to meet its own requirements in many agricultural commodities.

The state Agriculture Department, in view of the declining trend in per capita land holding, has given more emphasis to increase production of food-grains to provide food security to the growing population through increased crop-productivity and cropping intensity. The Agriculture Department has given special emphasis for all round development to arrest the declining agricultural growth experienced during the previous years as well as to increase the growth rate to at least 2 per cent per annum during 11th plan period. However, the growth of agriculture and allied sector is anticipated to increase by 2.26 per cent at the beginning of the 12th five year plan.

PROJECTION OF POPULATION

The annual growth rate of population[3] during the last century shows an almost steady growth (ranges from 1.69 to 2.04) except the time period from 1951 to 1981. During this period the annual growth rate of population was around 3.31 per cent. The explosive growth of population in Assam during the last few decades is the combined result of a complexity of factors, particularly partition, leading to the influx of immigrants mainly from Bangladesh. It is true that for any futuristic study of the kind attempted here, it is always prudent to be on the safer side. Yet to avoid overestimation and to maintain reliability of the study, the latest annual growth rate of 1.89 during 1991–2001 is adopted for projecting total population of Assam in 2030–31. On this basis, the total population of Assam in 2030–31 is expected to be 467.44 lakhs (Table 1).

Table 1: Projection of Population of Assam

Year	Population (000)	Year	Population (000)
2001–02	27159	2020–21	38762
2005–06	29271	2022–23	40241
2010–11	32144	2023–24	41002
2015–16	35298	2025–26	42566
2016–17	35965	2030–31	46744

[3] $\text{POP}_{\text{PROJ}} = \text{POP}_{\text{BASE}}(1 + \text{GROWTH} \cdot \text{RATE})^{(\text{PROJ·YEAR-BASE YEAR})}$

$(1 + \text{GROWTH} \cdot \text{RATE}) = (\text{POP}_{\text{LAST}}/\text{POP}_{\text{FIRST}})^{1/(\text{LAST·YEAR-FIRST YEAR})}$

OR $(1 + \text{GROWTH} \cdot \text{RATE}) = \left(1 + \frac{1.89}{100}\right)$

PROJECTION OF DEMAND FOR FOOD-GRAINS

The projected population figures are utilized for computation of projected demand for food-grains till 2030 A.D., the terminal year of the study. The projected demands for food-grains are worked out using the following per capita consumption per annum rates: the world average cereal consumption rate of 250 kg. per person per year, M. S. Swaminathan's rate of 225 kg and Planning Commission's rate of 167 kg. The projected demand for food grains on these consumption rates are given in Table 2.

From a perusal of the table, it is seen that the projected demand of food-grains in Assam would be 9.87 million tones in 2030. The corresponding figures by Swaminathan's norm stand at 8.89 million tones. These two norms represent the ideal case of proper calorie intake by a healthy person. This may not be affordable for a large segment of the state's population. As such, the other norm prescribed by the Planning Commission is adopted. This norm yielded projected demand to the order of 6.72 million tonnes at the end of 2030. With further development in the state's economy, the per capita income is expected to register an increase resulting in higher demand for food-grains. The norms of 250 kg and 225 kg per person per year may be relevant in such a situation.

Table 2: Projected Demand for Food-grains

Demand: ('000' tones)

Year	Norm-I 250 kg/p/year	Norm-II 225 kg/p/year	Norm-III 167 kg/p/year
2010–11	6789.75	6110.78	4621.22
2015–16	7456.00	6710.40	5074.80
2020–21	8187.75	7368.98	5572.79
2025–26	8991.25	8092.13	6119.72
2030–31	9873.75	8886.38	6720.25

PROJECTION OF FOOD-GRAIN PRODUCTION

Food-grains production from indigenous sources is projected upto 2030–31 on the basis of the actual official food-grain production statistics available for the time period of 1990–91 to 2005–06 (Table 3). The projected figures are estimated by using the linear regression method and the constants by the method of least square as stated in the methodology part.

Table 3: Projected Value of Food-grains production

Production: (Lakh Tones)

Years	Food-grains Production	Years	Food-grains Production	Years	Food-grains Production
2001–02	40.23*	2015–16	41.51	2025–26	44.71
2005–06	36.80*	2020–21	43.95	2030–31	46.22
2010–11	41.20				

Source: Directorate of Economics and Statistics, Assam.

* Actual values of Food-grains production.

From a perusal of the projected values (Table 3), it is seen that the production figures at the existing pattern of agricultural development results in a very slow growth of food-grains production for the coming years. It is estimated that at the end of the years 2010–11 and 2030–31 the food-grains production will be 41.20 and 46.22 lakh tones respectively.

PER CAPITA AVAILABILITY OF FOOD-GRAINS

Before proceeding to determine the gap between the projected demand and supply of food-grains from indigenous sources in Assam during the years 2005–06 to 2030–31, it will be relevant to examine the trend of projected per capita availability of food-grains during the years. Table 4 presents the per capita availability of food-grains from indigenous sources for coming decades which are worked out by dividing the projected food grains production by the projected population.

A striking feature noted from Table 4 is that the per capita availability of food-grains during the years under projection declines continuously from 148.13 kg in 2000–01, to 128.17 kg in 2010–11, further to 113.38 kg in 2020–21 and to 98.89 kg in 2030–31. The overall percentage decline in per capita food-grains availability, during the years under projection, (2001–02 to 2030–31) stands at a staggering rate of 33.24 per cent. This is because the state population is anticipated to grow whereas the growth rate of food-grain production is very low.

Table 4: Per capita Availability of Food-grains in Assam (in Kg.) from Indigenous Sources

Production: (Lakh Tones)

Years	Projected availability of Food-grains	Years	Projected availability of Food-grains	Years	Projected availability of Food-grains
2001–02	148.13	2015–16	117.60	2025–26	105.03
2005–06	125.72	2020–21	113.38	2030–31	98.89
2010–11	128.17				

Source: Table 1 and Table 3.

DEMAND AND SUPPLY GAP OF FOOD-GRAINS

Table 5 portrays the projected gap between demand and supply of food-grains in Assam during the period 2005–06 to 2030–31. It is evident from the table that under all the considered per capita consumption norms of 250 kg, 225 kg and 167 kg per person per year, the shortage of food-grains is going to increase considerably towards the end of the projected period (2030). The extent of gap as per the norm of 250 kg per person per year increases from 101.87 kg in 2001–02 to 151.11 kg in 2030–31. These figures show a sharp increase in the deficit of food-grain production within the state by about 50 per cent over the period under projection. The magnitude of deficit as per the

Table 5: Projected Demand and Supply Gap of Food-grains in Assam

Year	Norm-I 250 kg/p/year	Norm-II 225 kg/p/year	Norm-III 167 kg/p/year
2001–02	101.87	76.87	18.87
2005–06	124.28	99.28	41.28
2010–11	121.83	96.83	38.83
2015–16	132.40	107.40	49.40
2020–21	136.62	111.62	53.62
2025–26	144.97	119.97	61.97
2030–31	151.11	126.11	68.11

Source: Table 3 and Table 4.

norm of 225 kg and 167 kg per person per year, works out to be 126.11kg and 68.11 kg respectively towards the end of the projected period (2030) which are relatively low compared to world average cereal consumption norm.

CONCLUDING REMARKS

The scenario presented above demands an inevitable increase in gross irrigated area and cropping intensity to meet the rising demand of food-grains. Assuming other things remain the same, gross irrigated area is an indicator of total demand for irrigation in Assam. There are two main sources of growth in irrigation area: expanding the irrigated area and increasing the frequency with which it is irrigated (irrigation intensity).

Among various factors affecting cropping intensity, especially for rice, irrigation water is considered to be the most crucial input. However, the data on irrigation potential utilized shows that out of the total irrigation potential created in the state only a small portion is being utilized[4]. Irrigation intensity also did not show any desired increase over the last two decades. Irrigation intensity[5] of Assam was calculated as 1.00 per cent during 1990–93. It also remained unchanged during 1997–2000. During the last decade, irrigation intensity of India has increased from 1.32 to 1.37 per cent. Further, 4.6 per cent increase in irrigation intensity contributes 33 per cent in the gross irrigated area of India (Bhaduri, 2008).

Thus the study conclude that at the present trend of food-grains production, the extent of shortfall in the food-grains production in Assam is going to increase further. This situation is inevitable, unless a strategy is formulated for a radical increase in cropping intensity, supported by commensurate irrigation facilities along with required (and feasible) increase in productivity levels of food-grains especially rice and wheat. Proportionately higher irrigated area could encourage farmers to adopt mechanization, which can help in increasing the irrigation intensity and consequently food-grains production.

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[4]It is observed that in 2000–01, out of the total irrigation potential created by the Irrigation department worth 503.99 thousand hectares, only 114.73 thousand hectares of irrigation potential was utilized during the year. Again in 2002–03, out of the total irrigation potential created by the Irrigation Department worth 520.04 thousand hectares, only 79.37 thousand hectares of irrigation potential was utilized during the year.

[5]Irrigation intensity is a crucial indicator reflecting effective gross availability of water per unit area of cultivable land. If irrigation water could be provided for a particular piece of land for more than one crop season, then the irrigation intensity naturally increases. Also, raising more than one irrigated crop in any area leads to a better use of inputs and also better utilization of residual soil moisture available from the previous crop resulting in higher crop yield and output levels. It can be defined as Ratio of gross irrigated area (GIA) to net irrigated area (NIA) IRI = GIA/NIA.

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