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Agro-Economic Environment And Food Security

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ABSTRACT

The Indian government enacted the National Food Security Act (NFSA) on September 12th, 2013. About two-thirds of India's population will get subsidized food grains under the NFSA. Agricultural output and food production are interdependent. Increases in per capita wealth, urbanization, and dietary preferences pose significant difficulties, particularly when it comes to meeting the growing demand for food. The research shows that annual growth in the food grain business of 3.75 % is needed to achieve the statutory requirement. We observed some oblique effects on industries other than food grains. Area under food grains showed essentially little growth (0.001%) over the study period, as measured by increases in both production and area. Th e government should prioritize increasing agricultural output and establishing more environmentally friendly farming practices if it wants to ensure a steady supply of food grains for its economy.

Keywords: agriculture, agricultural development, food security, nutrition security.

INTRODUCTION

The purpose of food security is to guarantee that all people, at all times, can get and prepare enough healthy food to satisfy their dietary requirements and preferences. Food security rests on four pillars: availability, accessibility, use, and consistency. The nutritional context is essential for a complete understanding of food security. In light of the common opinion that the world has reached a post-food surplus disposal period, the concept of food security seems to have divided into two different but complimentary topics, notwithstanding its lengthy presence on the policy agenda. People who are undernourished are a major issue, especially those who reside in rural areas of low-income countries where poor infrastructure and transportation make it hard to import food and technology.

However, high-income countries are concerned about the volatility of food markets and are working on long-term solutions to ensure that "Food security exists when all people, at all times, have physical, social, and economic access to sufficient, safe, and nutritious food to meet their dietary needs and food preferences for active and healthy life." Access to sufficient food supply is one of the four pillars of food security, the ability to use those supplies, the prevention of wasted food, and spoilage. The nutritional side of the food security problem is crucial. With the world ostensibly entering a post-food surplus disposal period, the concept of food security, which has been on the policy agenda for some time, appears to have broken into two connected but separate challenges.

In rural areas of low-income countries, where poor transportation and infrastructure make it difficult for people to reach markets and other sources of food and nutrition, undernourishment is a serious issue. However, high-income countries worry about food insecurity owing to volatile markets, so they concentrate on medium- and long-term strategies to guarantee food is easily accessible and cheap. Academic research on the issue of food security is quite comprehensive. Increasing agricultural productivity is an essential goal, and talks on this issue have included considerations of biotechnology's benefits, the green revolution's dwindling influence, and the need of adopting new technologies. Another expanding area of research is macroeconomic analysis of price fluctuations, trade, and market stability.

More over a third of all arable land (not including Greenland and Antarctica) is used for farming, making it the world's greatest land user. Most of the best land has already been cultivated, and what's left is either too rocky, too steep, too shallow, too dry, or too cold to be suitable for farming. Farmers, consumers, and legislators all have a hand in determining the availability and viability of farmland in the United States.

LITERARTURE REVIEW

Michael Clark (2017) More than seven billion people's lives are directly tied to agriculture; However, it is also a major contributor to the deterioration of our natural surroundings. The environmental impacts of agriculture may be reduced by the use of more environmentally friendly agricultural production techniques, more efficient agricultural inputs, and more diverse food options. Organic systems need more land, cause more eutrophication, use less energy, and release comparable levels of GHGs, whereas low-input aquaculture and non-trawl fisheries use less land and create less GHG emissions than traditional systems. GHG emissions from grass-fed cattle are comparable to those from grain-fed beef, and more land is needed to produce it. We also demonstrate that improving crop and livestock systems' input efficiency has favorable environmental consequences. Plant-based foods have the lowest footprint when taking into account all environmental indicators and nutritional units; eggs, dairy, pork, poultry, non-trawling fisheries, and non-recirculating aquaculture are in the center; and ruminant meat has a footprint roughly one hundred times larger. Our findings suggest that shifting from conventional to sustainable farming practices like organic farming or grass-fed cattle would have a smaller positive impact on the environment than increasing the efficiency with which farms use their inputs.

MALANCHA CHAKRABARTY (2016). Climate change has compounded India's already severe food security problems. Most studies focus only on food availability, despite the fact that there are many other factors contributing to food insecurity. This study examines the three elements of food security in India in the context of the effects of climate change. Sustainable agricultural practices, increased focus on urban food security and public health, the provision of livelihood security, and long-term relief measures in the event of natural disasters are some proposed solutions to the challenge of ensuring food security in the face of climate change.

Prof. Kalpana singh (2014), Healthy eating and enough nutrition for everybody have long been policy priorities in India. Access, availability, and use are the three cornerstones of food

security. All three of these are connected. The primary goal of this research is to assess progress made in these three areas of food security in India. There is a clear demarcation between the years before and after the "green revolution" (1950–1967), making it possible to compare average yearly growth rates in yields and acreage for food grain production, early-green-revolution (1967-1979), mature-green-revolution (1980-1989), early-economic-reform (1990-1999), and late-economic-reform (2000-2011) time periods. India's food grain production has dropped since the nation joined the contemporary, globalized era. As a consequence of the free market at work, food grain production in India declined when the country adopted the New Economic Policy (NEP). Long-term trends in family consumption pattern show a decreased per capita direct intake of food grains, raising concerns about the availability aspect of food security. India's attempts to provide food security have not, unfortunately, led to better nutritional outcomes. The 2012 Global Food Security Index, released in September in New Delhi, assessed India as having "moderate" food security. Ranking at #66 out of 105, it identified price as India's primary constraint to food security rather than availability. The availability of food is best (51.3) but lowest (38.5) in India. It also brings attention to the ineffectiveness of food transportation caused by infrastructure problems. The 2013 Food Security Index ranked India at #70, a new low for the country. The lack of a steady supply of food is to blame for the current state of affairs.

P. S. Brahmanand*, (2013) India's rapidly growing population has placed a severe pressure on the country's limited resources in recent years, making food shortages an urgent issue. The progressive movement in human preference toward diverse techniques of crop production has resulted in many new risks in the field of food security. The many challenges that India has in maintaining food security are explored. Emerging globalization and urbanization trends, crop diversification, problems with biofuel and medicinal plant production, climate change, a water demand/supply imbalance, the current state of high-yield crop variety production, agricultural crop pricing and insurance, and more are all subject to close scrutiny.

Aviral pandey (2015). India's food security is just as bad as that of several African countries. Food insecurity and malnutrition in India are the product of both supply- and demand-side factors. This study supports the assumption that growing agricultural production mitigates the effects of rising food costs on developing nations. India's food security problem is exacerbated by weak demand. Increasing consumer demand might lead to more food availability and hence greater food security. Based on the data, states with lower per capita income had a greater prevalence of food insecurity. Using data on the country's food supply, the Indian government has approved the Food Security Bill. Our research suggests that expanding India's agricultural production is necessary for the nation to achieve food security. Food security, poverty reduction, and economic growth are all reliant on increases in agricultural productivity. In a state like Bihar, where food storage facilities are poor, it is unclear how the provisions of this Bill will be implemented.

METHODOLOGY

In an interdependent industrial environment, the Leontief model is the best appropriate tool to capture knock-on effects of output change. This model might be used to analyze the effect of a shift in output across sectors by taking into account both direct and indirect linking effects.

Leontief's model, on the other hand, has only been able to address the consequences of the production function on the demand side. The supply side ramifications of the Leontief framework were not fully captured until Ghosh (1958) presented a technique. The model may identify the "forward linkage" impact inside a network of interconnected industries.

Table 1 Food grain production in India over time (in million tones)

Year	Food grain production (in million tonnes)
2001–02	212.85
2002–03	174.77
2003–04	213.19
2004–05	198.36
2005–06	208.6
2006–07	217.28
2007–08	230.78
2008–09	234.47
2009–10	218.11
2010–11	244.49
2011–12	259.29
2012–13	257.13

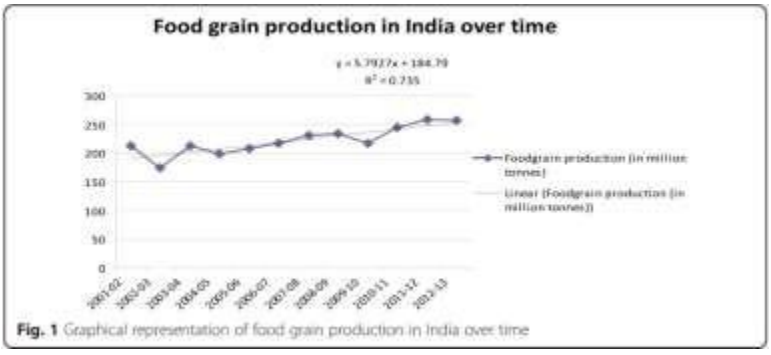

Fig. 1 Graphical representation of food grain production in India over time

Our system differs from the demand-driven and supply-driven models in that it treats gross outputs of 'food grains' as an exogenous variable. The production numbers are regarded endogenous in both the Leontief and Ghosh models, but the demand numbers are always considered exogenous. Given that both the demand for and supply of food grains are assumed to be constant, we may treat food grain production as an exogenous variable. To analyze the challenges of resource mobilization necessary to maintain an economy's long-term development aim, we create a revised I-O framework. Adjustments have been made to the system of equations to account for the exogenous output figure of food grains. Using the Ghosh model, we can make an educated guess as to how much of an influence NFSA's introduction will have on prices. The primary goal of our research would be to determine the extent to which the economy as a whole would be affected in order to meet the scenario-based standard for food grain production.

Impact on environment

The total quantity of pollution may be estimated by relating it to industrial production. Then, the ultimate demand and industry production dependencies may be displayed. The Leontief model is then used to build the pollution model. By rearranging (2), we get the pollution equation:

$$TP_{i=1...n} = EZ = E(AX + Y) = E(I\text{-}A)^{-1} Y = ELY$$

Where $L = (I\text{-}A)^{-1}$

The total pollution, or TP, is a scalar in this context. Production of CO2, CH4, N2O, BOD, COD, SS, and DS in an industrial setting is denoted by the letter 'i'. The coefficient vector E in (1xn) dimensions represents the intensity8 of industrial pollution per unit of production. A (nxn) input-output matrix describing the interdependencies between industries' inputs and outputs; L (nxn) Leontief matrix giving industrial output per unit of final demand; inverse matrix of industrial output: L= (I-A)1. X and Y are (nx1) vectors of industrial output and (nx1) vectors of final demand, respectively.

DATA ANALYSIS

We report the findings in light of two possible futures outlined in Section 1. At current rates, the market value of the 230.78 million metric tons of grain consumed in 2007–8 was INR 4033366.6 million, according to Chapter Four, Section Five of Agricultural and Food Economics by Sengupta and Mukhopadhyay. As usual scenarioThe average estimate for food grain demand in 2016–17 is 276 million tonnes, or INR 4823681.3 billion. Therefore, in Scenario 1, we have calculated the potential 2016–17 food grain values and their associated knock-on effects. However, Scenario 2 analyzes the results of using NFSA in Scenario 1. at get at Scenario 2, we used the demand for food grains in Scenario 1 and added Rs. 1000 billion (as predicted by NFSA). We have calculated the demand for the other 22 sectors and the resulting impact on inflation, assuming that food grain output is exogenously fixed at INR 4847625 million. To calculate the impact of backward and forward linkages in a mutually supportive industrial system, we used the Leontief and Ghosh models. Table 2 displays the outcomes that were achieved.

Table 2 BAU and NFSA production of the various sectors of the Indian economy (Rs. Million)

Sr. No.	Commodity	Demand side Scenario 1	Demand side Scenario 2	Supply side Scenario 1	Supply side Scenario 2
1	Foodgrains	4847625	5847625	4847625	5847625
2	Other oilseeds & crops	1569891	1585892	1583942	1619028
3	Plantation crops	1138461	1141582	1137401	1139320
4	Fruits & Vegetables	1531171	1533829	1530569	1532592
5	Live Stock Products	2843393	2899536	2828048	2867174
6	Forestry, Logging and Fishing	1422978	1425381	1421241	1421527
7	Mineral Fuels	1142333	1168841	1121018	1121367
8	Non-Fuel Minerals	1286719	1292177	1282798	1283476
9	Food Products	3748227	3756526	3794909	3864354
10	Textiles	3554085	3561265	3551640	3556050
11	Wood Products	1558329	1562694	1555782	1557086
12	Leather, Rubber and Plastic Products	1736103	1740581	1735047	1738403
13	Petroleum & Coal Tar Products	4399407	4427739	4377627	4379298
14	Chemicals & Chemical Products	3714162	3806953	3644663	3652508
15	Non-Metallic Mineral Products	1448816	1453126	1446274	1447528
16	Iron & Steel Products	3624835	3634216	3619173	3621739
17	Non-Electrical Equipments	4098836	4110875	4091409	4094487
18	Electrical & Electronics Equipments	2102333	2106325	2100570	2102040
19	Transport & Transport Equipments	9757032	9797452	9731863	9743897
20	Precision Tools	255903.2	2561721	2558456	2560565
21	Miscellaneous Manufacturing Products	1790360	1792111	1790183	1791803
22	Amenity Infrastructure	14000000	14100000	14000000	14000000
23	All Services	26700000	26800000	26700000	26700000

Table 3 Rates of expansion expected under the status quo and the NFSA scenario

Sr. No	Commodity	Demand side Scenario 1	Demand side Scenario 2	Supply side Scenario 1	Supply side Scenario 2
1	Foodgrains	20.19	44.98	20.19	44.98
2	Other oilseeds & crops	0.84	1.86	1.74	3.99
3	Plantation crops	0.22	0.50	0.13	0.30
4	Fruits & Vegetables	0.14	0.32	0.10	0.23
5	Live Stock Products	1.63	3.63	1.08	2.48
6	Forestry, Logging and Fishing	0.14	0.31	0.02	0.04
7	Mineral Fuels	1.93	4.29	0.02	0.06
8	Non-Fuel Minerals	0.35	0.77	0.04	0.09
9	Food Products	0.18	0.40	1.43	3.28
10	Textiles	0.16	0.37	0.10	0.22
11	Wood Products	0.23	0.51	0.06	0.15
12	Leather, Rubber and Plastic Products	0.21	0.47	0.15	0.34
13	Petroleum & Coal Tar Products	0.53	1.17	0.03	0.07
14	Chemicals & Chemical Products	2.08	4.63	0.17	0.38
15	Non-Metallic Mineral Products	0.24	0.54	0.07	0.15
16	Iron & Steel Products	0.21	0.47	0.05	0.13
17	Non-Electrical Equipments	0.24	0.53	0.06	0.13
18	Electrical & Electronics Equipments	0.15	0.35	0.06	0.14
19	Transport & Transport Equipments	0.34	0.75	0.08	0.18
20	Precision Tools	0.09	0.19	0.06	0.15
21	Miscellaneous Manufacturing Products	0.08	0.18	0.07	0.16
22	Amenity Infrastructure	0.27	0.60	0.05	0.11
23	All Services	0.33	0.74	0.22	0.40

From a demand standpoint, cattle products and other oilseed & crops are most crucial. On the supply side, the most important industries are those dealing with food and cattle. As a result, we can observe that other oilseeds & crops and live stock items are the most valuable. Boosting food grain output will need development in each of these areas.

Food production scenario

Table 2 shows the compound growth rates for area and production of food grains throughout the research period. Area under food grains changed very little (0.001%). Area beneath food grains was negative until period III, when it was discovered to be 0.41 percent. A shift in government policy about food grain procurement pricing likely accounts for recent positive expansion in acreage. A favorable trend in grain output was seen throughout all time periods. The use of new technologies in farming methods, such as the use of hybrid seeds and chemical fertilizers, has been credited with boosting output. The calculated growth rates of land used for cereal crops were consistently negative across all time periods. Weather fluctuations, less profitable crop choices, or a move to higher-value crops in response to rising incomes and the resulting desire for more healthful fare might all be to blame. Technology's favorable impact on productivity is shown throughout all time periods considered. India's population and wealth growth over the next decade mean the country's grain output would need to increase by 4.2% annually from 2015 to 2020, up from less than 2%, making the decline in area under cereals very concerning. Cereals are a staple in the Indian diet (particularly for those living in poverty), although they are not necessarily a nutrient-rich food option. Cereals provide over 66% of Indians and urban Indians with 56% of their protein, although they are of poorer quality than beans, meat, fish, and eggs. Rural Indians get 76% of their protein from cereals, whereas Urban Indians get 67%, making cereals especially significant to the bottom 30% of the population in terms of mean per capita expenditure.

Table 4: The annual percentage increase in land used for growing food grains, cereals, and pulses in India

Period	Food grains (%)		Cereals (%)		Pulses (%)	
	Area	Production	Area	Production	Area	Production
1988-89 to 1997-98(I)	-0.40	1.66	-0.38	1.80	-0.51	-0.93
1998-99 to 2007-08 (II)	-0.01	1.03	-0.19	1.04	0.86	0.90
2008-09 to 2017-18(III)	0.41	2.12	-0.13	1.91	2.5	4.71
1988-89 to 2017-18(Overall)	0.01	1.69	-0.11	1.70	0.51	1.61

The overall growth performance of pulses in the nation was negative from 1988–1989 to 1997–1998 (Period-I). One possible explanation is that pulses are an afterthought, often adapted for a rainfed environment. During the other time frame, 2008-09 to 2017-18, the area planted and the amount harvested also increased, with the latter showing a particularly high growth rate. Improved production and productivity of pulses throughout the nation has been a focus of the ongoing National Food Security Mission (NFSM) during the last four years.

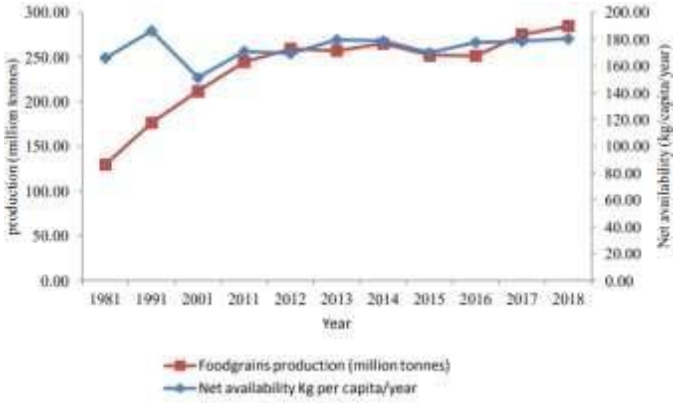

Fig.1. Foodgrains production and net availability (kg / capita / year

The average annual net food availability increased from 151.9 kg in 2001 to 180.30 kg in 2018 (Fig. 1). In 2016, each individual has access to 177.7 kg of food grains each year. China had 450 kg of food grain available per person in 2015, whereas Bangladesh had 200 kg and the United States had almost 1,100 kg.

CONCLUSION

By providing heavily subsidized essential meals to more than 800 million Indians12, the National Food Security Act (NFSA) implemented in 2013 represents a watershed moment in India's battle against hunger and malnutrition (WFP 2015). In this context, this research assesses how NFSA has affected the Indian economy as a whole. It predicts how many people will be needed to do the job, how much the economy will expand, and how it will indirectly affect other industries. The research also quantifies the effect of NFSA on the costs of various economic activities. Environmental effects such as air and water pollution and the need for new land have also been estimated.

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