FOOD SECURITY IN DEVELOPING COUNTRIES: A CASE STUDY FOR INDIA

Samarendu Mohanty

Assistant Professor, Department of Agricultural and Applied Economics, Texas Tech University, Lubbock, Texas, USA

E. Wesley F. Peterson

Professor, Department of Agricultural and Applied Economics, University of Nebraska-Lincoln, USA

Keywords: Food security, Developing countries, India, Food demand and supply, Rural and urban demand estimation, Demand estimation by income groups, Self-sufficiency, Engle equation, Quintile

Contents

Summary

This study provides food security situation in India for the next two decades. As expected, total physical land will remain more or less flat in the next two decade. But net cropped area is projected to increase through higher cropping intensity. More than 70 percent of additional area is likely to switch to horticultural and permanent crops. Among crops, oilseeds such as soybeans, rapeseed, and groundnuts account for most of the remaining additional area.

A comparison of production and consumption of various grains indicates that Indian wheat consumption is likely to exceed production. The difference between production and consumption is projected to become wider. India is also likely to be an importer of corn over the longer run. Unlike wheat and corn production, Indian rice production exceeds consumption throughout the projection period. Overall, India is expected to be self-sufficient in cereals until end of this decade, but then cereal consumption exceeds production, making India a significant net importer of cereals, particularly wheat and corn.

1. Introduction

In the next decade, most of the world's population growth will occur in developing

countries, in which population is slated to increase by 32 percent, reaching 7.5 billion by 2020 (IFPRI, 1999). Rising population along with projected increases in per capita income in developing countries will undoubtedly put severe pressure on the world food production system. This is particularly true in the case of India and China, which are projected to have strong economic growth along with more than 30 percent of total world population growth in the next two decades.

The future of the Chinese food situation was in the limelight in the early 90s with Lester Brown's statement that "China will starve the world" (Brown, 1994). However, these concerns have considerably subsided in the last few years because of surplus grain production in China, turning it into a net exporter of grain. Unlike China, very little attention has been focused on analyzing the food situation in India, the world's second most populous country, and world's fourth largest economy in terms of purchasing power parity (PPP).

2. Factors Affecting the Future of Indian Food Demand and Supply

Indian food demand in the future will be primarily driven by income and population growth. Macroeconomic forecasters such as World Bank, WEFA, Standard & Poor's DRI are now projecting average annual growth of 6 to 8 percent in India's real GDP in the coming decade. In addition to projected strong economic growth, the United Nations projects that by the middle of next century Indian population will actually exceed that of China (1.5 billion as compared to 1.4 billion in China) and more than 55 percent of the Indian population will live in urban locations as compared to 26 percent in 1996. Even more important, India has more than 250 million middle-class consumers and this number is likely to grow with economic prosperity. Income growth, urban-rural population composition, family size, and many other demographic factors are likely to influence diet preferences significantly in the coming decade. But dietary changes in India may not be similar to those observed in other countries because of its predominantly vegetarian dietary preferences.
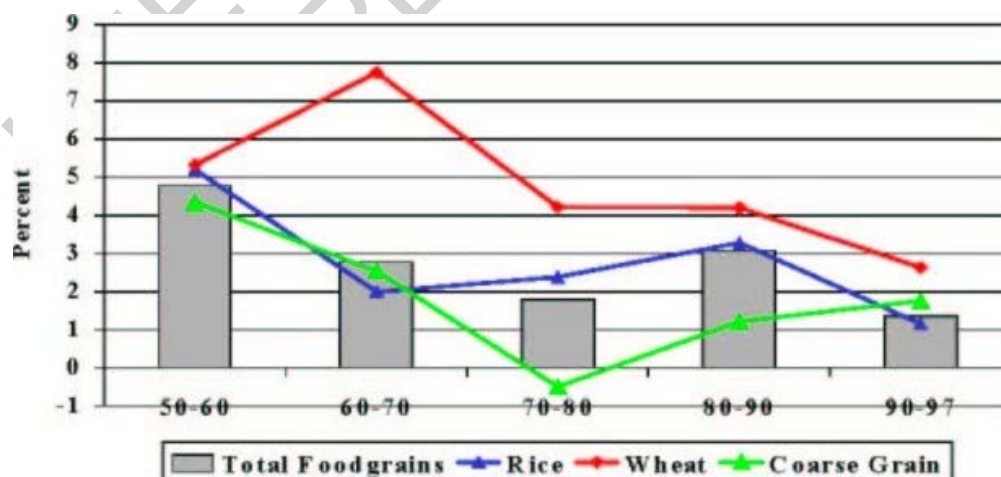

Figure 1. Indian Food Production Growth Rate

On the supply side, there have been serious concerns about a possible deceleration in

the growth of food grain production since the late 1970s (Brahmananda, 1997; Desai and Namboodiri, 1983). Growth in grain production, which has been largely obtained through yield growth since the mid 1960s, has declined from 3 percent in the 1980s to only 1.75 percent in the first six years of the 1990s (Figure 1). The three inputs -- irrigation, fertilizers, and high quality seeds -- have accounted for much of the yield growth. One explanation for declining production growth is the fall in the growth rate of fertilizer consumption. Other factors affecting production may be declining growth of both irrigation and fixed capital stock in agriculture. But of greater significance, the crop production growth rate is falling more rapidly than that of the inputs in recent years (Brahmnanda, 1997).

This study provides long-term demand and supply projections for cereals including wheat, rice, corn, sorghum and other grains. Demand projections are made separately for five income groups within urban and rural categories to capture the impacts of changing rural-urban population composition and different income responses on consumption. Separate demand projections are justified because of significant variations in food consumption between rural and urban areas. As shown in figure 2, the rural population consumes much higher amount of rice whereas the urban
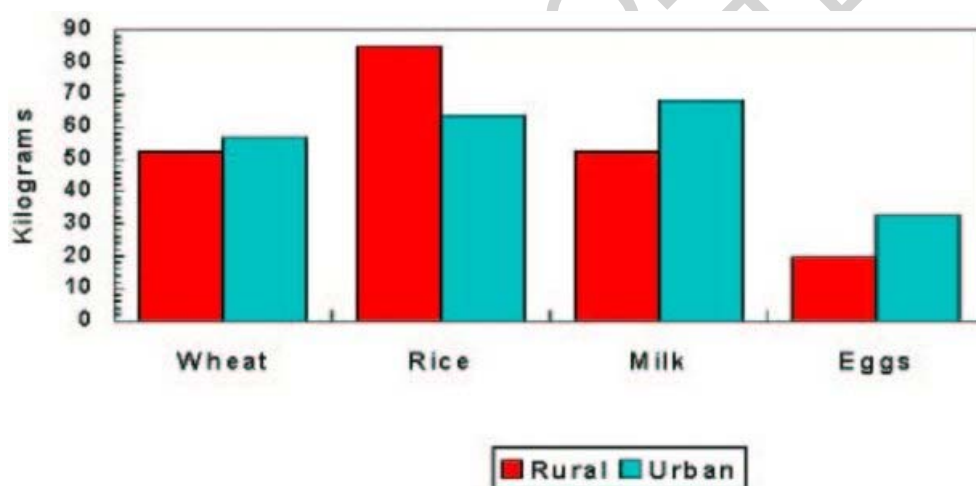

Figure 2. Per Capita Food Consumption (Rural vs Urban)

population consumes significantly more milk and egg**s**. This is particularly important for a country like India with vast geographical and cultural diversity, where consumption patterns are likely to vary substantially across regions, rural/urban sectors and income groups. On the supply side, production of each crop is calculated by estimating both area and yield. Area under each crop is estimated by taking into account total availability of land, cropping intensity, and loss of land due to urbanization and perennial crops. Detailed information on the model structure and coefficient estimates can be found in Mohanty et al. (1999).

3. Simulation Results

Demand and supply projections are dependent on assumptions about various variables such as population growth, real GDP growth, exchange rate and world prices, etc.

Projections for these exogenous variables are obtained from various sources. For example, macro economic projections such as real GDP, the GDP deflator, and the exchange rate were collected from WEFA forecasts (WEFA,2000). Population projections are collected from United Nations (UN) 1996, medium variant projection. Representative world prices for various commodities are collected from Food and Agricultural Policy Research Institute (FAPRI) projections (FAPRI, 2000). Projections of many other variables such as area under irrigation, fertilizer application rates, and feeding efficiency are determined using historical trend**s**.

3.1. Macro Assumptions

- Population growth is projected to decline from 1.77 percent in 1993 to 1.413 percent in 2000 and to 0.86 percent by 2020 (UN 1996, medium variant projection).
- The growth rate of the exchange rate and the GDP deflator until 2001 is borrowed from WEFA group projections and the 2001 growth rates are held constant for the remainder of the projection period.
- Real GDP is projected to grow at an average annual rate of 6.2 percent between 1993 and 2000, 6 percent between 2000 and 2005, 5.8 percent for 2005 and 2010 and steadily declines to 5.1 percent by 2020.
- With declining population growth, this GDP growth is translated into a per capita real GDP growth rate of 4.7 percent for 1993 to 2000, declining to 4.2 percent by 2020.
- Private consumption is projected to decline from 55 percent to 50 percent of GDP by 2010 and further declines to 48 percent by 2020. This translates into a decreasing growth rate of per capita real expenditure from 4.1 percent in 1993 to 3.3 percent by 2010. However, per capita real expenditures steadily increase after 2010 to reach 3.6 percent in 2020 as the population continues to declin**e.**
- Urban population is projected to grow from 26.2 percent in 1993 to 36.5 percent by 2010 and increases to 39 percent by 2020. Rapid urbanization even causes the total rural population to start declining after 2014, even with population growth.
- Urban and rural per capita expenditure is calculated using national average per capita expenditure based on their population share and their shares of total expenditures using:

$$E_r = E_a * (1 - S_u) / PS_r,$$

where E_r = average per capita rural expenditure, E_a = average per capita expenditure, S_u = share of urban in total expenditure, and PS_r = population share of rural.

The share rural expenditure is projected to decline from 62.3 percent of total expenditures to 51 percent by 2020. With these assumptions, urban per capita expenditures are projected to grow almost 1 percent higher than rural per capita expenditures.

- As shown in Figure 4, per capita expenditure in rural area**s** is projected to increase from 3700 to 11000 rupees whereas for urban population it increases from 5700 to 16,000 rupees.

3.2. Other Assumptions

▪ For each crop, the percentage of area under irrigation is assumed to increase according to a five year moving average growth. For example, the percentage of wheat area under irrigation increases from 85 to 98 percent by 2015. Likewise the percentage of area planted to high-yielding varieties is assumed to increase according to a moving average such that wheat area under high-yielding varieties, for example, increases from 88 to 100 percent by 2006 and remains 100 percent thereafter.

▪ Fertilizer consumption per hectare is assumed to increase from 66.67 to 122 kilograms per hectare. Annual rainfall is assumed to be normal throughout the period.

▪ World prices for major grains until 2006 are borrowed from FAPRI projections. After 2006, real world prices for grains are assumed to remain constant.

▪ One percent annual increases in feeding efficiency are assumed for the organized milk sector, whereas 1 percent annual increases in FCR are assumed for the unorganized sector. Similarly, for the chicken and egg sectors, one percent annual increases in feeding efficiency are assumed for both intensive and traditional production. In addition to the change in FCR, the composition of feed will also change over time. One percent annual increases in grain share are assumed across sectors. For example, the share of corn in feed for intensive egg production is projected to increase from 9 percent to 9.34 percent by 2030.
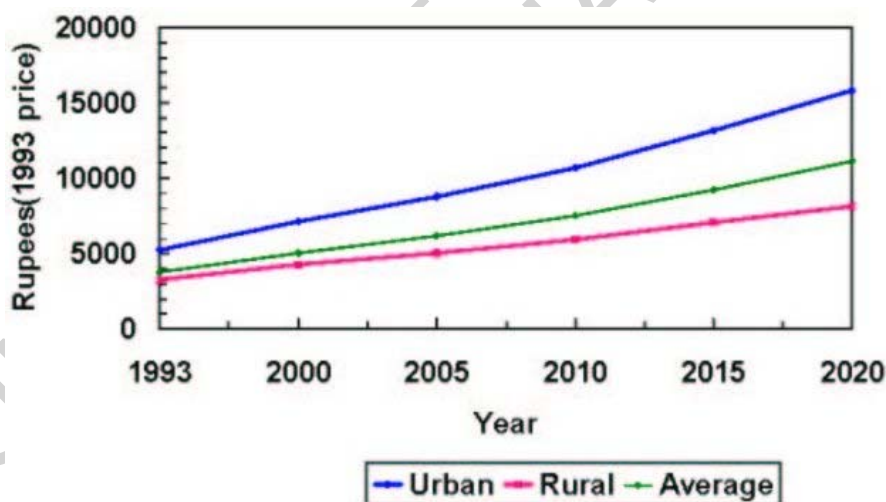

Figure 4: Per Capita Urban and Rural Expenditure

-
-
-

Bibliography

Brahmananda, P. R. 1997. *50 Years of Free Indian Economy*. Indian Economic Association Trust for Research and Development, New Delhi.

Brown, L. 1994. "Can China Starve the World, its Booming Economy is Consuming Global Food Supplies." *Washington Post*, August 28.

Desai, G. M. and N. V. Namboodiri. 1983. "The Deceleration Hypothesis and Yield-Increasing Inputs in Indian Agriculture." *Indian Journal of Agricultural Economics,* 38: 497-08.

Fertilizer Association of India. 1996. *Fertilizer Statistics of India*.

Food and Agricultural Policy Research Institute. *FAPRI 2001 International Agricultural Outlook*, Staff Report No. 1-01, Iowa State University.

Indian Ministry of Agriculture, Various Issues, *Agricultural Prices in India*. Directorate of Economics and Statistics.

_____, Various Issues, *Area and Production of Various Crops*. Directorate of Economics and Statistics.

_____, 1995 and 1996, *Agricultural Statistics at a Glance.* Directorate of Economics and Statistics.

_____, 1994 and 1995, *Indian Agriculture in Brief*. Directorate of Economics and Statistics.

International Monetary Fund. "International Financial Statistics." various issues.

Mohanty, S., N. Alexandratos, and J. Bruinsma. 1999. "Long-Term Food Security for India." Technical Report 98-38R, Center for Agricultural and Rural Development, Iowa State University

Maji, C.C. 1996. "India and Export of Rice?" *Vision of India's Rice Trade* edited by Ramseh Chand and T. Haque, 59-73.