

# High-technology revolution in India's agriculture refutes the zero-growthers

by Sylvia Brewda

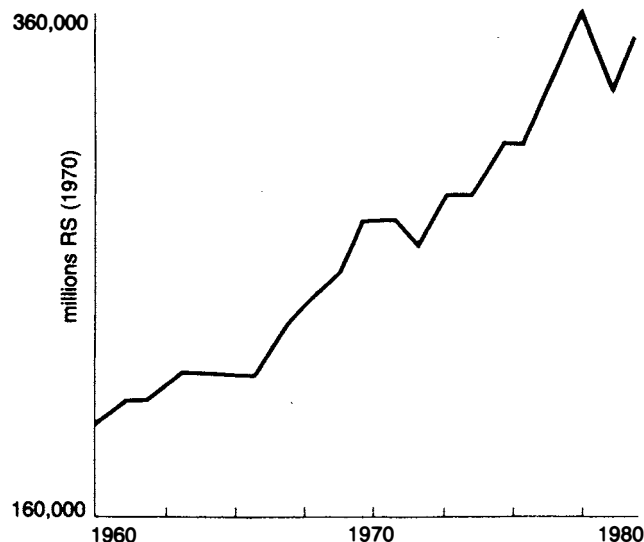
In the past two decades, India has proven that the most fundamental premise of Malthusianism is a prescription for disaster, not a description of reality. In that time, India has moved from being an importer of 10 million tons of food grains to being a net exporter of food. This technological revolution, based on newly developed High Yielding Varieties (HYVs), has been accomplished in widely varying agricultural areas, and has provided the basis on which the well-known scientific and industrial achievements of India rest.

The course of the Indian economy from 1960 to 1980 is shown in **Figure 1**, with the "service" component deducted. The relative stagnation of the early '60s was followed by 12 years of rapid growth, interrupted by the effects of the worldwide recession caused by Paul Volker in 1980. Studies of developing nations have consistently shown that, in the attempt to break out of a condition of economic dependence or backwardness, the agricultural sector is key. A study of Mexico, done in 1980 for the Fusion Energy Foundation, highlighted the role of agriculture by a simulation run in which the effects of a "gift" of \$13 billion per year to the subsistence agriculture sector led to results worse than without such a gift. The reason for this apparent paradox is that a certain

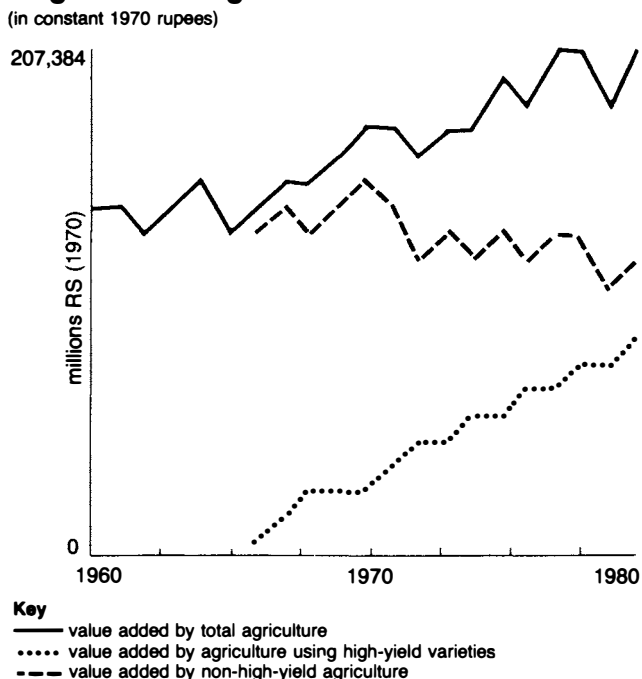
minimal level of support for all members of the population in the form of schools, roads, medical services, and so forth is required. If a certain sector of the population is producing less than this average per capita cost, the economy will suffer when that sector is enlarged.

In India, agriculture makes up the major portion of the economy. In terms of value added, its share has dropped from 70% to 55% over the last 25 years, but in terms of the economically active population, it still consumes the efforts of 147 million (67%) of the 220 million workers registered by the 1981 census. These agricultural workers till plots of an average size of 2.0 hectares (ha), less than 5 acres. Seventy percent of the rural workers were illiterate in 1971. In other words, if India has been able to create the capability to feed itself and export food, there is no further excuse for those who announce that the objective conditions in most Third

**FIGURE 1**  
**India's economy maintains overall growth**  
(in constant 1970 rupees)



**FIGURE 2**  
**High-technology agriculture transforms stagnation into growth**  
(in constant 1970 rupees)

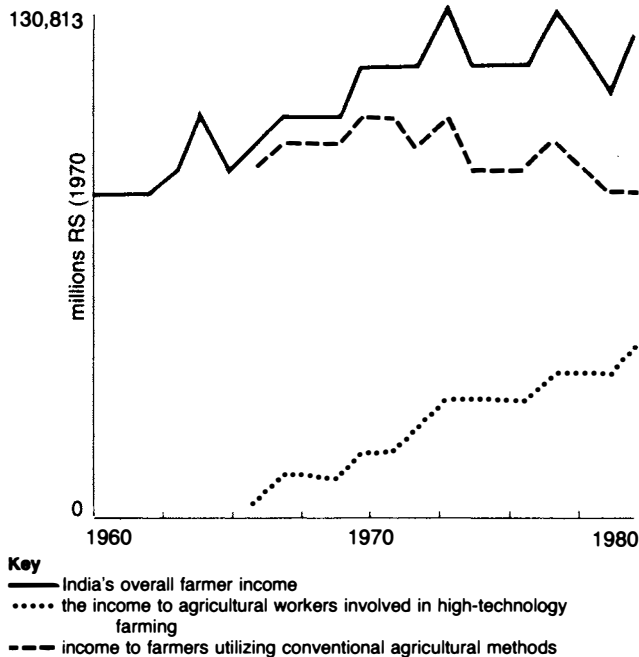


**Key**  
 — value added by total agriculture  
 ..... value added by agriculture using high-yield varieties  
 - - - value added by non-high-yield agriculture

If it were not for India's high-yielding varieties of agriculture, overall agricultural production would stagnate.

**FIGURE 3**  
**High-technology agriculture raises workers' incomes**

(in constant 1970 rupees)



The value of tangible goods consumed by the agricultural work force during the period from 1960 to 1980.

World countries forbid them from doing the same.

Clearly, India had certain advantages. By 1966, at the start of the HYV period, approximately 27 million ha of agricultural land was receiving irrigation benefits, out of a base of 137 million ha. However, fertilizer use was relatively low at 5 kilograms per ha, compared to 42 for Mexico, 32 for the Philippines and 107, for the United States. The major advantage, identified many years ago by Nehru in *The Discovery of India*, may well have been the remarkably high level of culture which persisted throughout the Indian peasant population. The fact is that despite a per capita national income of barely over \$100 in 1965, the people of India were able to carry out a massive upgrading of the crucial function of food production.

The course of agricultural production in India, as shown in **Figure 2**, was in a period of stagnation in the early 1960s. Earlier decades of improvement had been based on the combination of recovery from British looting and the use of the existing "improved varieties" of crops. By the mid-1960s, these improved varieties were reaching a dead end. In fact, as the graph shows, the progress of conventional agriculture since that time has been, at best, continued stagnation. It should be noted that in the early years of that stagnation, the HYV were being grown on less than 10% of the agricultural

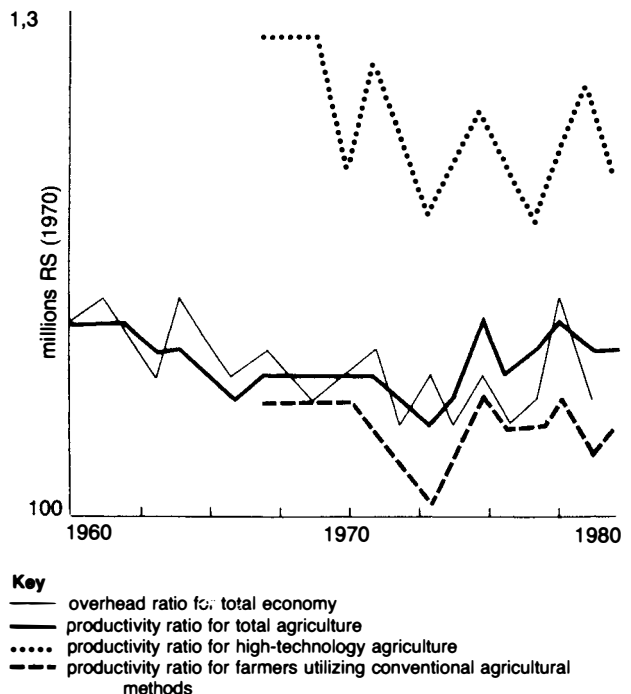
land, and therefore could hardly be said to be crowding out the others. In the period after 1970, that situation changed somewhat, but by 1979 less than a quarter of the cropped land in India was planted with HYV crops. However, in the same year, over half of the food grain produced in India came from these crops.

The HYVs which have transformed Indian agriculture consist of five major crops: rice, wheat, maize (American corn), jowar (barley), and bajra (millet). In general, HYV crops produce yields which are double those of the others. For wheat, the difference is less spectacular, with approximately a 50% advantage for the HYV yields. HYV crops require higher levels of fertilizer and irrigation than conventional varieties, and the consumption of fertilizer in India has increased more than 6-fold in the period since 1966. Irrigation has also increased, and now covers more than 50 million ha. Although the data used in **Figure 3** are approximate, it is also clear that the levels of income have risen for agricultural workers connected with the HYVs, both owners and hired workers.

Another aspect of the growth of HYV use is not shown

**Figure 4**  
**High-technology farming keeps productivity above overhead costs**

(in constant 1970 rupees)



Through its development of high-technology agriculture, India stands in marked contrast to most Third World countries, in which the agricultural sector has not been productive enough to support its share of the total economic overhead of the country. Above, agricultural productivity ratio (surplus produced: agricultural labor costs) and overhead ratio (total non-productive spending: total labor cost).

in the figures because it involves the spatial distribution of these crops. The first—and still the most intensive—users of the new varieties were in Punjab, one of the northwest states which has traditionally been an area of large and relatively prosperous farms. The state which ranks second, however, in terms of area under HYV, is Tamil Nadu at the southern tip of India, with almost 40%. The benefits which have come from the “miracle grains” of HYV, both to particular regions and to the country as a whole, would not have been possible without the participation of areas such as Tamil Nadu.

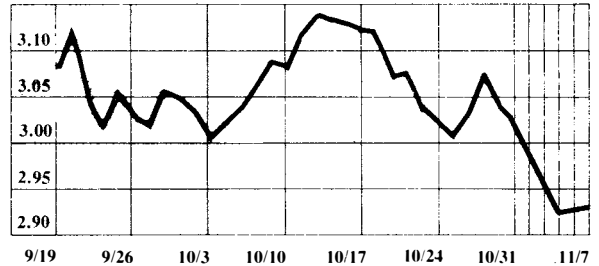
The specific effect of the introduction and adoption of HYV crops on the Indian economy is portrayed in **Figure 4**. The categories used here require a brief explanation. The measure of productivity and overhead cost are defined in terms of the tangible cost of labor. This represents the value, in producer prices, of the tangible goods consumed by the productive work force, that is, all those operatives actually involved in the production and transportation of tangible goods. Productivity is measured as the ratio of surplus production to this labor cost, where surplus is defined as the value added by a particular economic sector, less the cost of maintaining both the physical plant and the operatives. The overhead ratio is defined as the ratio of the total tangible cost of all non-productive activity in the economy to the labor cost of productive activity, as defined above. Thus, if the productivity of a sector falls below the average overhead ratio for the total economy, the sector is not producing sufficient value, over and above that needed to continue its own physical production process, to support its share of the total economic overhead. The problem of most Third World countries over the past decade has been that their agriculture has remained in this condition, absorbing whatever surplus value their economies might generate elsewhere. As **Figure 4** shows, this pattern was also true of India, and would have continued to be true in the absence of the HYV crops. The relatively enormous productivity of the labor employed in growing these crops has broken the trap, and has allowed the overall productivity of Indian agriculture to remain, on the average, just above the critical level defined by the overhead ratio.

The adoption of the HYV varieties was not easy for India. Concentration of scarce resources in a few areas, reliance on crops which require relatively high levels of inputs, the altering of accepted, “safe” methods of farming, all took leadership with a commitment to the future of the country, and the kind of love which would not allow the future to be merely a continuing, losing struggle against the ‘overwhelming problems’ of imperialism past and present. The political implications of the agricultural revolution were well recognized by India’s enemies. The major areas of destabilization were the Punjab in the north, and the southern areas adjacent to Sri Lanka, the area of Tamil Nadu. Now the question is, will India’s friends have as clear an appreciation of the importance of this aspect of India’s development, either to foster or to imitate it?

## Currency Rates

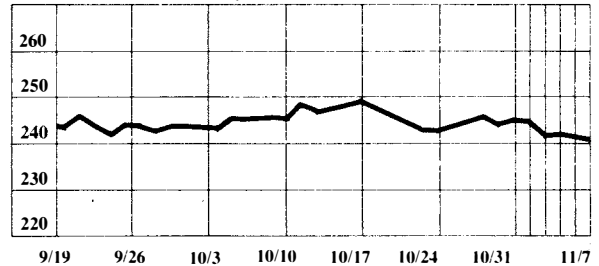
### The dollar in deutschemarks

New York late afternoon fixing



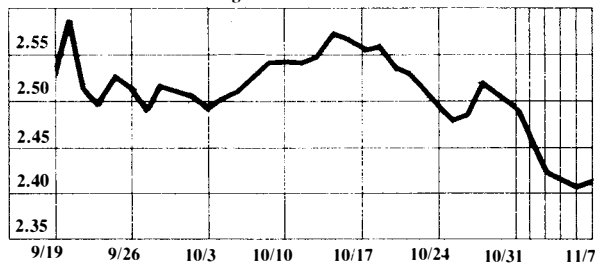
### The dollar in yen

New York late afternoon fixing



### The dollar in Swiss francs

New York late afternoon fixing



### The British pound in dollars

New York late afternoon fixing

