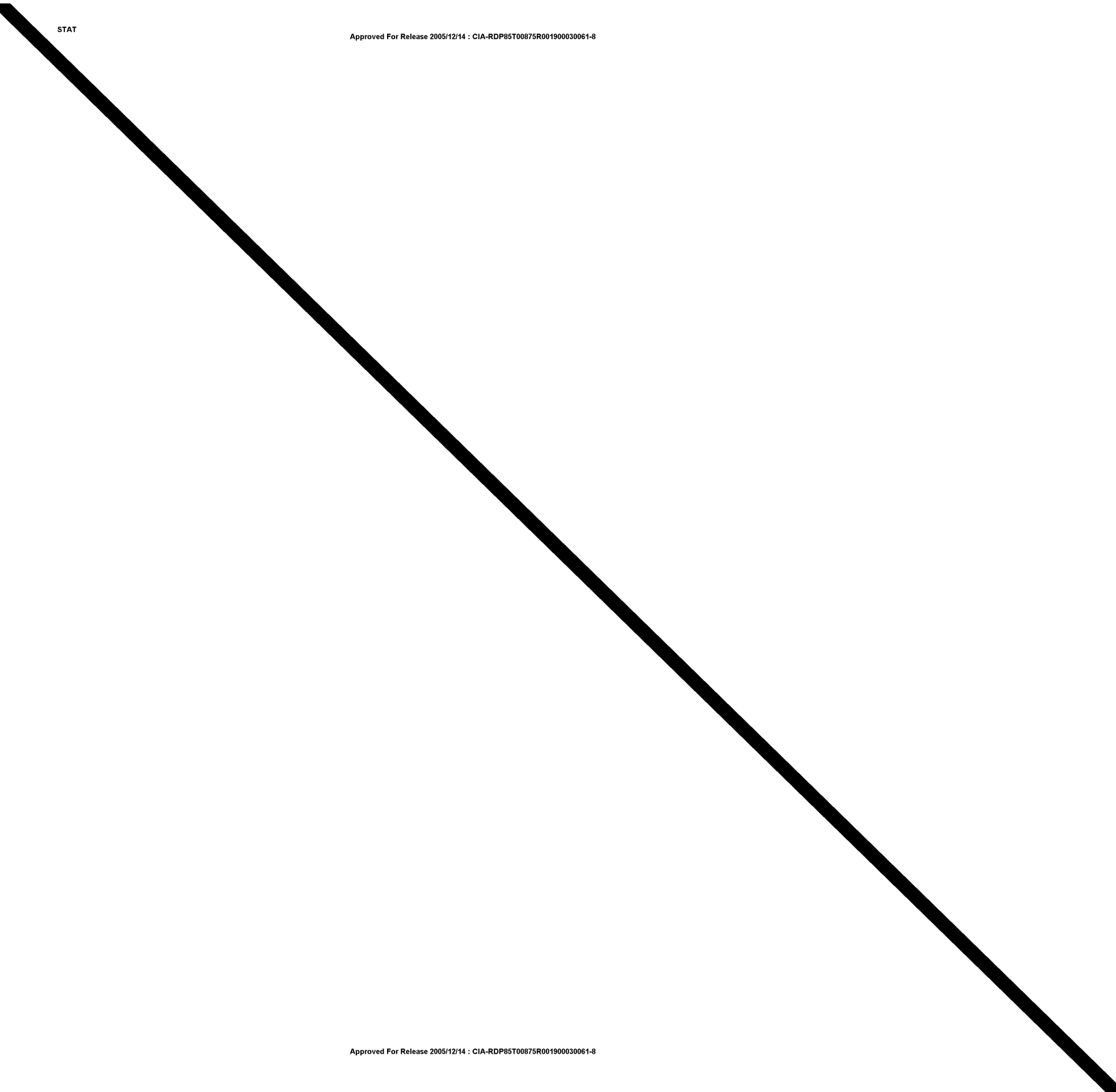

INDIA: The Foodgrain Outlook Through 1985

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I. INDIA: The Foodgrain Outlook Through 1985

Objectives

The objectives of this paper are to assess past and prospective Indian agricultural development and, on the basis of this assessment, to forecast the probable 1985 gap between foodgrain production and requirements.

Conclusions

Indian agriculture has made solid advances since the government began giving greater emphasis to its development in the mid-60s. Peak year foodgrain production rose from 77 million tons in the 1950s to 99 million tons in the 1960s and 108 million tons so far in the 1970s. Imports declined steadily from a high of 10 million tons in 1965/66 to less than half a million tons in 1971/72, but since then have been rising.

But New Delhi will have to muster a more concerted effort even to maintain the current rate of agricultural growth. Moreover, accelerated growth must be attained if requirements are to be met from domestic production over the next decade.

The pressure of population growth on India's agricultural resources has been growing at an increasing rate.

No significant decline is in sight. Death rates have fallen sharply, but family planning measures have had little impact. Budgetary support for birth control programs is declining and pro-natalist policies extending tax, land and welfare privileges to large families are being continued. Whereas Indian planners forecast a sharply declining birthrate and a 1985 population of 695 million, independent demographers consider Indian estimates of the current birth rate and population understated, foresee little change in the birth rate and project a 1985 population approaching 750 million.

Clearly, there is good potential for raising agricultural production. For example, India ranks among the world's lowest in fertilizer application; nearly 80% of cultivated acreage is unirrigated; less than 20% of cultivated land is under high yielding varieties (HYV) of grain; and less than 1% is sown to high quality HYVs.

There are also substantial obstacles to the realization of India's agricultural potential. Heretofore, in formulating its agricultural policies, New Delhi has usually bowed to expediency, adopting a patchwork of measures having limited impact and sometimes countereffective. Now that many of the easier steps toward agricultural gains have been taken, the going will get tougher. Areas that require particular attention include:

- More rapid development of irrigation, especially of intensive systems capable of supporting the multi-cropping of HYVs.
- Improved interstate coordination of planning and implementation of irrigation projects, now under state autonomy.
- Massive improvement in the development, production and distribution of HYV seeds.
- Increasing production incentives and reducing government interference in domestic grain trade.
- Expanding agricultural credits and giving a larger share to small farmers.

We believe that the Indian government could formulate and implement policies that would promote self-sufficiency in food-grains by 1985. In the light of past performance, however, this is an unlikely achievement. We believe Indian agricultural policy will continue to be sporadically responsive to production shortfalls.

Unless government performance changes dramatically, the 1985 gap between production and domestic demand appears likely to fall within a range of 8 to 16 million tons. Then, as now, India will have great difficulty financing imports to close that gap.

II. Background

About three-quarters of the Indians are farmers most of whom provide just about enough food for their families. Domestic food supplied to cities and food deficit areas accounts for a relatively small share of total output. Primitive production methods hold down yields and farm income, and the resulting poverty in turn hinders the adoption of improved agricultural methods. Living on the margin of subsistence, large numbers of farmers are heavily burdened with debts and are unable to buy more fertilizer, water, or improved seeds. Many seek not the biggest crop, but the surest one, and they rely on time-proven methods. For the country as a whole the shortfall between production and consumption at present low per capita levels is small. In most years imports amount to less than 5% of total food consumption. Nevertheless, closing the gap is difficult because the volume needed runs into the million of tons and India has difficulty paying for it.

Some less developed countries have resolved their food shortage problems by increasing exports to pay for food imports. A few have become self-sufficient through expanding cropped areas and using improved technology. But many, including India, have been unable to do either and often seek foreign aid to meet some of their foodgrain needs.

India ran out of newly available land for cultivation by the early 1960s; with only one-sixth of the cultivated land diverted to needed nongrain crops (mostly sugarcane, oil seeds, and cotton), there have been few opportunities to expand grain acreage. Furthermore, India's development strategy over the years has been focused on building an industrial base, and this has required large amounts of foreign exchange. With exports stagnating India depended heavily on foreign aid for two decades. From the beginning of the PL-480 program in India in 1957 until India ceased taking concessional grain at the end of 1971, PL-480 foodgrain imports amounted to 59 million tons valued at US $3.7 billion, accounting for 3/4 of India foodgrain imports during the period.

Production Since 1950

Foodgrain output, according to revised Indian data, peaked at about 108 million metric tons in 1970/71,* following two decades in which output increased an average of about 3.5% annually. Much of the increase came during the first decade (see Table 1), however, when output expanded at 4.3% per year compared with 2.6% during the 1960s. The major

* Crop years, 1 July-30 June. Rates of increase computed using a three-year moving average, with 1949-1951, 1959-1961, and 1969-1971 as bases and final years. Since 1970, the Indian Bureau of Statistics in the Ministry of Agriculture has revised the whole series of foodgrain production data beginning in 1949. Growth rates computed using the old series show output growing at 3.5% during the 1950s and 2.2% during the 1960s.

reason for the slowdown was the decreasing availability of cultivable land in the 1960s, whereas expansion of cultivated area accounted for some 40% of the increase in production during the fifties (see Table 2). Surprisingly, the growth in yields for all foodgrains also declined from 2.6% per year in the 1950s to 2.0% in the 1960s (see Table 3). Average yields were retarded in the 1960s by the virtual stagnation of yields of coarse grains and pulses, which were allocated the poorest lands. Significant increases in yields achieved in the relatively small areas sown in high-yield wheat did not offset the less than 1% annual growth in yields of coarse grains and pulses, which together accounted for 60% of the foodgrain area in 1960. Rice yields also increased at only about 1.1% annually in the 1960s.

While it appeared in the late 1960s that an upward shift in the production growth rate was occurring, poor growing weather since the bumper harvest of 108 million tons in 1970/71 distorts any attempts to measure growth. In 1972/73, output declined to 105 million tons, in part because of dry weather in the upland coarse grains area; the 1972/73 monsoon failure dropped output in all seasons and for all crops to only 95 million tons; and in the 1973/74 crop year just ended, a dry cold winter and other →

production problems (to be discussed below) held output to about 103 million tons.

Production trends during the 1970s re-emphasize India's basic problem of insufficient water. The growth of production has been not only very slow but also highly irregular because of variations in the weather. At times, annual rises and declines have been spectacular. Absolute declines in foodgrain output have occurred in about one out of every three years since 1950. With nearly 80% of the farmland lacking irrigation, the monsoon's failure to arrive on time and/or with enough precipitation is critical, influencing not only yields but the area planted as well. In monsoon areas, there is practically no rainfall except during the monsoon season. Largely because of poor monsoons, production gains during the early 1960s were small. The 1965 and 1966 droughts, the worst in 60 years, caused foodgrain output to drop 20% in 1965/66 and to remain at nearly the same level in 1966/67. Fortunately, improvements in Indian agriculture, mainly the addition of tubewell irrigation and use of new wheat seeds, made the decline in output following the poor monsoon in 1972 considerable less severe.

Because foodgrain production during the early 1960s lagged behind increasing demand, imports rose from 3.8% of total foodgrain available in the 1950s to about 6.3% in the

1960s. In absolute terms, grain imports averaged 2.8 million tons annually during the 1950s and 5.8 million tons in the 1960s, with a peak of 10.3 million tons in 1965 (see chart, Figure 1). Imports slowed in the late 1960s as domestic production increased and government buffer stocks were built up. In 1972, following the 108 million-ton bumper crop, buffer stocks of about 10 million tons filled all available storage areas and imports amounted to only 500,000 tons, the lowest level in 20 years. The 1972/73 drought, however, quickly drew down stocks and brought India into the commercial grain market in late 1972. Imports in 1973 rose to 3.7 million tons; in 1974 imports probably will reach 5 million tons.

Serious efforts to improve the performance of India's agriculture began in the mid-1960s, prompted by the disastrous drought and growing import needs. New Delhi's strategy consisted of applying new technology in water-assured areas, expanding irrigation, increasing the general availability of chemical fertilizer, pesticides, and other modern inputs, and maintaining farm prices at incentive levels. The success of the new technology -- the so-called "Green Revolution" -- depended on new high-yielding varieties (HYV) of seeds and the whole package of inputs required to make them productive. *

* The critical characteristic of the new varieties is their short stiff stems which enable them to carry heavy seed heads -- produced by heavy applications of fertilizer and water -- without falling over, or lodging. Traditional varieties, when heavily fertilized, grow tall and lodge when [the] heads become heavy.

Aside from higher yields, the HYV have the added virtue of a short growing season, making possible more multiple cropping.

Current Situation

8. New Delhi planned to have 27 million hectares, or 20% of its foodgrain area, planted to HYV seeds during 1973/74, the last year of the Fourth Five Year Plan. This acreage was expected to be the principal means by which foodgrain output would be raised to 128 million tons in 1973/74. Unpublished data from the GOI Ministry of Agriculture report indicate that the total area goal was achieved right on target.

Million Hectares

	1973/74 Goal	1973/74 Estimated Achievement	Percent Difference
TOTAL	25.0 (revised to 27.0)	27.2	
Rice	10.1	10.2	+ 1
Wheat	7.7	11.5	+50
Maize	1.2	0.5	-58
Sorghum	3.2	1.2	-62
Spiked Milled	2.8	3.8	+38

HYV rice increased as planned, wheat and millet considerably exceeded their goals, but plans for maize and sorghum failed. Growth in maize acreage was limited because it is not a popular food for human consumption. HYV sorghum has poor grain quality and can be severely affected by pests when grown under traditional methods.

Despite the rapid increase in HYV area, production remained far below goals in 1973/74 because yields did not increase as expected.* In addition to extreme variations in rainfall and insufficient irrigation, the major causes of unsatisfactory HYV yields can be simply stated and will be expanded in following sections:

-- Development of new rust and disease-resistant seeds has lagged.

-- Quality standards for the HYV seeds have deteriorated.

-- Fertilizer applications are continuing below the recommended levels.

-- Changes in farming practices, particularly necessary for the HYV rice to be productive, have not been made.

-- Water control in irrigated and rainfed rice lands is inadequate.

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* Actually, HYV area may have been inaccurately reported, either through difficulties of estimating areas now sown under central control or over-estimation through the inclusion of areas sown not to HYV, but merely to newly introduced varieties.

Variations in weather and lack of data make it difficult to quantify the impact of the HYV seeds on output or to measure the shortfall in yields. When the new varieties of rice and wheat were first introduced in the mid-1960s, HYV rice achieved average yields at least 65% higher than indigenous rice and HYV wheat yields were at least three times higher. Wheat naturally became the basis of India's Green Revolution. By 1971/72 total wheat area and the average wheat yields had each increased by 6% annually compared with 1967/68, the first year following the drought; in the same period wheat (indigenous varieties included) increased its share of annual foodgrain output from 17% to 25%.

In the two years since 1971/72, however, wheat yields have declined by 18% and have been a major factor in lagging foodgrain production. The decline can be partially attributed to dry weather, although concentration of new irrigation in wheat areas brought water to about 50% of the wheat area. A greater part of the decline in wheat yields, however, is believed to be due (a) to the spread of new races of rust to which the new wheat varieties are not resistant, (b) to shortages of power to run the irrigation pumps, and (c) to fertilizer shortages that held applications well below recommended levels.

Rust has attacked the Kalyan Sona variety and its deriviatives which by 1972/73 had been distributed to about 80% of the traditional wheat area in northwestern India and to new wheat areas in northeastern India. When first introduced this variety was resistant to leaf and stripe rust, but by 1971/72 it was showing signs of being susceptible to newly appeared species of rust. A serious attack in 1972/73 caused areas growing Kalyan Sona to suffer losses estimated at up to 3 million tons. Emergency replacement of that variety was considered. Unfortunately, lack of adequate seed production infrastructure and inadequate attention on the part of breeders to rust resistance has left the country without the means of responding rapidly to the crisis. (See Section on HYV seeds below.)

Rice remains the most important cereal and the one with the largest gap between potential and performance. Despite the spread of HYV rice seeds to 25% of the rice area in 1971/72 compared with 5% in 1967/68, average rice yields increased by only 2.5% annually during the period. The reasons were mainly (a) the very high susceptibility of the early high-yielding varieties to pests and disease and (b) poor water management, which influences dates of planting and harvest, and holds down fertilizer use. The first problem seems to be well on the way to solution -- new Indian varieties, similar to the IR26

with inbuilt resistance to broad ranges of pests and diseases, are in advanced stages of development. Given an adequate seed production program, they should rapidly replace Jaya, the current leading HYV.

Water management, essential to effective HYV utilization, is progressing slowly, however. Unless a farmer has his own tubewell, control of the timing and volume of water application is out of his hands. Most established rice areas are dependent on surface water sources, such as from canals or rainfall. Timing of canal opening and closure are decided from above; a farmer cannot control the planting date and the periodicity of drying fields for fertilizer-zation required by his HYV seeds. Even when all farmers in a given area may agree on schedules, the design of the irrigation system is often such that they cannot be accommodated. (See irrigation section below.) So far, most of the increase in rice yields has been from HYV rice grown as a second crop following the wheat harvest in northern India, and from a dry season crop -- grown during January-May -- mainly in eastern India on the larger farms with tubewells.

III. Factors Affecting Future Demand

According to New Delhi, India now has about 586 million mouths to feed, or more than the combined populations of the Western Hemisphere. Western demographers believe this official estimate is conservative. Their checks indicate the population could well be 30 million higher. Either way, India is the world's second most populous nation.

The Indian government estimates the present growth rate of population at 2.0% annually with a subsequent decline to 1.3% by 1985. Analysis of factors influencing population growth, however, indicates that the present growth rate is higher and that little decline can be expected during the next decade. Independent demographers' estimates range from 2.1% to 2.5% with 2.2% as the most common estimate. Thus, New Delhi projects population at 695 million in 1985, but it is more likely to be around 750 million.

Trends in birth and death rates give India a high potential for population growth. Based on Indian census data, death rates have declined more rapidly over the last 20 years than birth rates, and consequently, population growth rates increased from 1.3% during the 1940s to 2% during the 1950s and to 2.2% during the 1960s. Success in reducing infant and child mortality through improved sanitation and disease control has so changed the population age structure that the proportion

of women of childbearing ages has increased markedly. Several demographers believe that death rates may have hit a plateau, after declining for 50 years. Estimates of the death rate range from 14 per 1,000 to 17 per 1,000. The death rate was much higher in some states (e.g., in Uttar Pradesh, Bihar, and Orissa) and lower in others (Kerala, Haryana, and Punjab). Birth rate estimates range from 37 per 1,000 to 42 per 1,000.

Government plans to slow population growth are unlikely to have much impact in the near future. The Indian government introduced a program of family planning in 1951, but implementation from its inception through 1964 was slight. From 1964 through 1972, public expenditures on family planning rose eightfold. Unfortunately, 1972 expenditures may prove to be a peak since family planning expenditures fell 13% in 1973 and are budgeted to decline another 1% in FY 75* despite rapid inflation. The program has encompassed all means short of coercion: contraceptives of all types, sterilizations, raising the legal age of marriage, and reducing tax exemptions for large families. The government's family planning program has bogged down, as the encouraging momentum built up during the late 1960s has been dissipated. Ambivalence and scepticism toward population control at the top levels of the Indian government, the often mediocre quality of many family planning officials, and incompetent lower-level management have further

*The Indian fiscal year ends on 30 Jun of the year designated.

hindered population control performance. Even at its peak, the family planning program reached only a small fraction of the population. On the other hand, New Delhi's provision of tax, land, and welfare advantages to large families are pro-natalist policies that undermine its family planning goals.

Not only are government birth control programs insufficient, but also the pre-conditions for their success do not yet exist. Although religion is not an obstacle to birth control, tradition and economics are. A large family is a form of social security and parents, aware of the high rate of child mortality, continue having children until at least one son grows to manhood. In addition, tradition required that a son be present to light his parents' funeral pyre. The low level of literacy and economic development also hampers the success of any birth control program. These conditions are not likely to change rapidly in India, where 80% of the population lives in rural areas where they are engaged principally in subsistence agriculture.

The quality of the average diet is very low and malnutrition is endemic. While most of the rural population subsists on what they grow, the average urban wage-earning family spends nearly two-thirds of its budget on food. Consumption of leafy vegetables is low, and meat is not eaten by many Hindus because of religious prohibitions. In most

homes, only non-perishable foodstuffs can be stored. Thus foodgrains account for 80% of the calories and a major share of the protein in the diet. With little margin for decreasing per capita consumption, declines in foodgrain availability can quickly become disastrous. Despite massive foodgrain import campaigns, droughts in 1966, 1967, and 1972 caused serious food shortages in affected areas that led to increased deaths through lowered resistence to disease, if not by starvation.

In general, India's population can be considered immobile, with only 3% of the people residing outside of the states in which they were born. The strongest force for interstate and intrastate migration is the lure of the large cities. The percentage of the population living in urban areas increased from 18.0% in 1961 to 19.9% in 1971. Although small compared to the total population, this represented 108 million people. Furthermore, the migration to the cities has been accelerating.

The continuing migration to urban areas further complicates the feeding and employment of the population. The Indian government pays a disproportionate amount of attention to its urban populations partly because of their sheer density, and partly because city dwellers are often more sophisticated and politically active. Low incomes and high unemployment make the cities potential trouble spots. To feed large urban populations requires complex food distribution systems,

unnecessary in rural areas. In an attempt to be responsive to urban food needs, New Delhi maintains a food distribution system at subsidized prices to supplement the free market.

Since 1955, official foodgrain stocks have been distributed in scarcity areas through government fair-price shops -- small private ~~sellers~~ stores licensed to sell at fixed prices. Each state establishes the prices of foodgrains sold in the fair-price shops within its borders. In 1965, the government greatly expanded the system of fair-price shops and also began the statutory rationing of foodgrains in some areas. Statutory rationing continues in Bombay, Calcutta, and the Durgapur-Asansol area of West Bengal. Under the more wide-spread informal rationing, consumers with identity cards can purchase limited quantities of foodgrains from the fair-price shops, while supplementing their rations through purchases on the open market.

Foodgrain demand also is affected by the price and income elasticity of demand -- the degree to which changes in the price of foodgrains and average income will affect consumption of foodgrains. Three factors lead to the exclusion of price elasticity from consideration:

- Since foodgrains make up such a large part of the diet and substitutes are scarce, it is reasonable to assume that price elasticity of demand is low.

- The few studies undertaken suggest that the price elasticity of demand is in fact very low.
- There is no reliable method for predicting changes in the Indian price structure over the next decade.

Therefore, it is assumed that the price structure remains basically unchanged.

The income elasticity of demand for foodgrains on the other hand cannot be ignored because per capita income levels probably will change significantly over the next decade. Sample measurements of income elasticity in India by the FAO and the National Council of Applied Economic Research in New Delhi, each using several methods of calculation, range from .38 to .49. (An income elasticity of .45 means that for each 1% increase in per capita income, the per capita demand for foodgrains would increase 0.45%.)

IV. Supply Factors

A. Government Policy

Following the two disastrous droughts of the mid-1960s, government investment in agriculture increased sharply. Investment shifts favorable to agriculture also occurred in industry -- priorities were given to producing fertilizer, pesticides, agricultural implements, and products for other agricultural needs. Emphasis on agricultural investment continued throughout the Fourth Five Year Plan, although investment in irrigation fell considerably short of target (see Table 5). Fifth Plan investment goals give relatively less emphasis to direct agricultural investment, but increase allocations to fertilizer and electric power production.

Although government policy establishing the level of agricultural investment plays an important role in expanding production, the conception and execution of agricultural programs also are important considerations. Agriculture has been hindered by the inconsistency of New Delhi's efforts to expand the fertilizer and electric power industries and by inept administration, particularly over the production and supply of improved seeds, and the provision of credit to cultivators. The government also has been deficient in (a) promoting new research on dry farming and seed improvement; (b) initiating agricultural programs with adequate preliminary planning; and (c) introducing constitutional changes essential to the establishment and enforcement

of national agricultural goals -- states have virtual autonomy in matters relating to land and water rights.

Implementation of agricultural policy has been erratic. During and immediately following agricultural crisis, agriculture has been given priority. After a few good harvests, however, support invariably has been reduced, agricultural programs shunted aside, and long-term projects postponed. To counter recurring agricultural crises, New Delhi has had a propensity for crash programs that tend to quickly fade away. The sharp down-turn in foodgrain production in 1972/73, for example, prompted New Delhi to institute an emergency program to raise foodgrain output through expansion of irrigation facilities and increased use of essential inputs. The program was ill-organized, had little lasting effect, and virtually no impact on production. Occasionally, ad hoc programs appear to be designed more for window-dressing than effectiveness. In late June 1974 a 5-member Cabinet Committee headed by the Prime Minister was established to implement an emergency plan to boost farm production in selected well-irrigated areas by providing all the fertilizers and insecticides required. The "emergency" plan is yet to be funded.

Government neglect of the electric power industry has affected agriculture directly by limiting the effectiveness and availability of power and tubewell irrigation and indirectly by hampering production of materials -- fertilizer,

insecticides, cement, and pipes -- needed to improve agricultural production and irrigation. During the Fourth Five Year Plan (1969-73) only 50% of planned additions to installed electric power generating capacity was achieved -- 4.6 million kw. compared to a 9.3 million kw. plan. The shortfall has further increased the gap between demand and supply which is likely to persist through the next decade.

Failure of the government to ensure priority consignment of crucial raw materials -- especially diesel fuel and cement -- to the agricultural sector also has hampered production and irrigation. Government intervention has been limited to appeals by the Minister of Agriculture that non-farm sectors divert essentials to agriculture.

In the 1960s changes in New Delhi's policies on agricultural prices, taxes, and subsidies improved the farmers' capacity to invest in agriculture. Farmers' terms of trade became increasingly favorable until they peaked in 1967-68 and since 1971-72 have again been improving (see Chart 2). Since 1966, agriculture has been heavily subsidized and lightly taxed (see Table 6). Mrs. Gandhi's concern with the nation's mounting inflation, however, prompted her recently to exhort state governments to increase agricultural taxes. She specifically requested taxation of incomes of wealthy land-holders -- currently virtually tax exempt -- and withdrawal of subsidies to power and water for irrigation, which also benefit wealthy land-owners in particular. Whether state governments will take this action against the class

that provides much of their political support remains to be seen. For her part, Mrs. Gandhi in July 1974 withdrew a major federal subsidy to fertilizer sales.

India's grain pricing policy in recent years has been increasingly oriented to the interests of consumers rather than to those of farmers.* Both support and procurement prices have been established annually for each grain. Support prices have been pegged so far below market prices as to be meaningless, however, and were abandoned altogether for this year's kharif crop. Procurement prices in the past two years have fallen far behind rising market prices (see Table 7).

New Delhi's programs for procuring foodgrains and redistributing them at subsidized prices worked effectively to benefit both producers and consumers in the 1960s and early 1970s. During the late 1960s, the procurement price was set relatively high compared to the market price, thus supporting the grain market and providing an incentive to farmers. In those years harvests were good, the difference between market and procurement prices was slight and procurement was not difficult. Grain also was available on the world market at prices below those in India and often on concessional terms. Thus, domestic procurement could readily be supplemented by imports to meet seasonal needs.

* This trend is a reversion to earlier consumer-oriented policies.

New Delhi's redistribution program dealt mainly in wheat, which provided the largest marketable foodgrain surplus since the beginning of the Green Revolution. The system was effective because dependence on it was not pressing.

The situation has changed since 1971. Domestic production -- especially of wheat -- has fallen. World grain supplies have become tight and high-priced. Shortages have caused open market prices to soar and made procurement difficult at any price, yet New Delhi granted only small raises in procurement prices and placed tight controls on grain trade. (See Table 7.) Consequently, production incentives have been dampened.

Rather than concentrating on measures to increase grain production, New Delhi has shown a compulsion to tamper with the marketing process, usually with unfavorable results. In early 1973, the govenrment nationalized the wholesale wheat trade. Six months later, after wheat procurement fell off drastically, the scheme was abandoned and plans to nationalize the rice trade were dropped. Early this year, in another move to boost procurement New Delhi established wholesale and retail price ceilings for wheat and ordered wholesalers to earmark half of their wheat purchases for resale to thegovernment at somewhat lower prices. The policy has encouraged cultivators to shift to other crops (despite their lower yields), to hoard grain and to sell illegally, thereby circumventing government goals in all instances.

The execution of agricultural policies established by the central government is often frustrated or at least modified by the states, which have constitutional authority for the development of agriculture. Because New Delhi has been unwilling to impinge upon state authority, conflicts between national and local interests are not easily resolved. Efforts to make states earmark project funds in order to maintain the pace of construction tend to be defeated in periods of rapidly rising costs and resource constraints, as is now the case. As a result, construction schedules are frequently delayed. Theoretically, the states must conform their plans to contral government priorities in order to obtain assistance -- states are dependent on the central government for about a third of development funds. In practice, the states have easily circumvented such stipulations and followed their own priorities.

A major failing in federal-state relations is that New Delhi has no national policy regarding interstate rivers, which are solely the property of the states through which they flow. All too often, irrigation schemes which are crucial to regular and consistent increases in foodgrain production, are stalled by state controversies over the sharing of water from major rivers. The Navagam Dam to be built across the Narmada River in Gujarat has been delayed since the late 1960s because of a dispute among the four states sharing its waters

over the height of the dam. Interstate disputes are also stalling development of the Krishna-Godavari and Cauvery Rivers.

Allocations for major and medium-surface irrigation have been increased from Rs. 11.7 billion in the Fourth Five Year Plan (1969-73) to Rs. 24.0 billion in the Fifth Plan (1974-78). Irrigation construction, however, usually falls short of planned targets. E.g., the area to be irrigated by canals in the Fourth Plan was underfulfilled by a third. Furthermore, state governments are inclined to focus on large irrigation projects -- e.g., dams and canals that may take 8 to 15 years to complete. Their preference for extensive rather than intensive irrigation could slow the growth of grain production because high-yielding varieties require the assured and controlled water supplies that are best provided by intensive schemes. Moreover, the lack of technical studies required for some of the Fifth Plan's irrigation projects for drought-prone areas will preclude their implementation during the plan period.

Medium- and long-term farm credits are to be increased 85% to Rs. 24 billion during the Fifth Plan. Such credits finance private, small scale irrigation projects as well as purchases of equipment and materials. Credit distribution has been uneven, the bulk of it going to the larger, wealthier cultivators who have accounted for most of the increases in

grain output since 1966. Disproportionate shares have also gone to selected states, especially to Gujarat, Maharashtra, Punjab and Tamil Nadu. Because the development of private tubewell irrigation has approached its limits among wealthy landowners, the maximization of credit effectiveness requires that the major share now be directed to the small farmers. There are no signs that such a reorientation of credit is in the offing.

IV. B. Prospects for Growth in Foodgrain Production

Increases in productivity are the key to greater output. The Draft Fifth Plan (1974-78) recognizes this. Under the Fifth Plan, foodgrain output is to increase by 4.2% per year; with additional crop area expected to account for only about one-fourth of the increase, improved productivity is to provide the other 75% of growth. Although the plan sets out a 10-point "multipronged effort" to achieve its goals, the key factors will be improvements in the supply and utilization of water, seeds, fertilizer, and credit. India must also increase production of non-food crops, principally cotton, oilseeds, jute, and sugarcane, whose growth output has lagged behind that of foodgrains since the mid-1960s. The non-food crops will compete with foodgrains for land, irrigation and other resources needed to raise yields.

Irrigation -- the Key Production Constraint

Increased foodgrain output depends mainly on improving yields in areas already under cultivation. Irrigation will be the main constraint. Fertilizer, HYV seeds, pesticides, and farm machinery can be made available in a relatively short time. The labor supply is ample; indeed, the change in production techniques associated with the new seeds has the social, as well as economic, virtue of shortening the slack period, which is the major source of rural underemployment. But construction of major irrigation systems

requires considerable leadtime -- at least five years and more often 20 years -- before appreciable benefits can be obtained. Moreover, tubewell exploitation of groundwater, which has accounted for 2/3 of the increase in irrigated area since 1965, is almost fully developed in some areas.

Only a small part of the 142 million hectares of India's net cultivated land* is watered well enough to take much advantage of the HYV seeds. Between 75% and 80% of the cultivated acreage has no irrigation whatever. Furthermore, of the 30-35 million hectares irrigated, apparently only 7-10 million have sufficient water to grow more than one crop a year. Because most medium and large scale irrigation systems were designed for extensive rather than intensive irrigation**. Extensive systems account for about 40% of the area currently irrigated. They provide wide areas with a little water to supplement rainfall, but rarely the large and controlled supply needed to multicrop HYVs. Many fail to provide even enough water for a single crop. Moreover, in much of the area, gravity carries water from one field to the next, and with it, much of the fertilizer and plant protection chemicals. Water depth in individual fields cannot be controlled sufficiently

* Estimates of irrigated land vary greatly depending on the definition and estimating prodedures used. For example, Indian government data on irrigated area and increases planned normally refer to gross area, i.e. any of the irrigated area that produces more than one crop is counted more than once. India's draft Fifth Plan states that gross cropped area in 1973/74 was about 169 million hectares.

** For the most part, extensive distribution systems were designed to provide about 1 acre foot of water per year, compared with the 3 to 4 feet needed for HYV.

for HYVs, and sometimes the drying of fields in time to harvest the new, early maturing varieties is not possible.

Poor drainage is also a major problem. By 1970, about 15 million acres, or an area equal to one-sixth of all irrigated land, had been damaged by water-logging and salinity caused by inadequate drainage, leaking irrigation ditches, and poor water management. The deteriorated area increases each year. If foodgrains can be grown at all in such areas, yields are low.

Tubewells and other minor irrigation systems capable of providing the water supplies needed for effective use of HYV seeds have increased rapidly. The number of private tubewells rose from 113,000 in 1955/56 to 550,000 in 1971/72. In the same period, government tubewells increased from 14,000 to 18,800. In addition to the pumps in tubewells, more than 2 million diesel and electric pumps lift irrigation water from ponds and rivers. They are widely used to supplement canals or other irrigation systems by improving water supply, control and drainage, and by extending irrigation periods well into the dry season after dams and ponds have gone dry. Thus, it is difficult to attribute increases in irrigated areas to any one source. The Indian government reports that tubewells have proliferated at an increasing rate, as indicated below, and now account for about 35% of the area irrigated.

	(thousand hectares) 1955-59	1960-65	1966-70
Increase in Net Area Irrigated	1,903	1,682	4,949
Canals	985	577	1,570
Minor surface water schemes	367	-258*	198
Groundwater (mainly tubewells)	551	1,363	3,181

* Decreased because tubewells replaced minor surface schemes.

Irrigation Prospects

Significantly, there has been a major acceleration in the rate of growth of the net irrigated area since the mid-1960s, of which about two-thirds was from more rapid growth of groundwater and the other one-third from canal irrigation. The net increase in irrigated area averaged about 1 million hectares per year in the late 1960s. The gross area irrigated (net area irrigated plus multiple cropping on irrigated land) increased by an average of 1.3 million hectares annually during the same period.*

Preliminary data for 1973/74, the last year of the Fourth Five Year Plan, show the goal of 7.1 million hectares of gross irrigated area was achieved as planned (see Table 8), raising the average increase to 1.4 million hectares per year. The draft Fifth Plan calls for a further significant increase of 11.2 million hectares in the next five years, for an average increase of 2.2 million hectares per year.

* Unfortunately, data on irrigation added during the 1970s is available only on a gross basis, but even so, it is helpful in determining trends.

Gross cropped area is to be increased from an estimated 169 million hectares in 1973/74 to 180 million hectares in 1978/79. In the next five years expansion of groundwater irrigation is expected to continue at a high rate, 4.5 million hectares vs. 4.0 in the past five years, and canal irrigation is to expand at double the past rate (see Table 8). Other information, most of it also included in the Draft Fifth Plan, indicates that there are serious obstacles to expanding either form of irrigation at a fast pace.

Groundwater

The assumption that the rapid rate of groundwater development can be continued is optimistic for a number of reasons, but principally because the groundwater resource has already been highly developed in areas favorable to its adoption. The Fifth Plan states that "In some states, such as Gujarat, Haryana, Punjab, Rajasthan, and Tamil Nadu, development of groundwater will be reaching its limit during the Fifth Plan period." While the GOI, lacking extensive groundwater surveys, may not be accurate in this assessment, it is quite likely groundwater development in such areas will be slowed. The states cited -- all located in northwestern India -- include areas where private tubewell expansion has been rapid because the farmers were comparatively well off, having relatively large farms and access to some canal

irrigation. They installed tubewells to improve water control and to plant the HYV seeds, particularly wheat and a second crop of rice. Those large farmers who have not already installed tubewells may consider the incentives for doing so less strong than formerly because of shortages of HYV seed and other inputs, inflation, and adverse government policies on grain prices and land reform.

The alluvial areas of northeastern and coastal India remain the major area for further groundwater development.* Groundwater is abundant in the alluvial plains, but its utilization has lagged, partly because farmers in those areas expect plenty of rainfall (if not too much) during the monsoon season, but primarily because of social and institutional factors. The alluvial northeast encompasses most of India's 37 million hectares of rice land; the fragmentation and small size of average holding and high incidence of tenancy make tubewells uneconomic or unfinanceable for most. For a tubewell to be profitable it generally must irrigate at least 4 hectares. Few rice farmers have plots that large,** or the funds and willingness to pool with neighbors. Nevertheless, the pace of groundwater development has started to increase in the plains in the past two years. With

* A large share of Peninsular India consists of hard rock areas with limited groundwater resources. Wells in such areas are expensive to drill and often do not find water. In some parts, the resource is apparently nearly fully developed.

** For all of India (including the larger wheat, coarse grains, and commercial crop farms) the latest available data (1961-62) shows that 89% of the farms have 53% of the land in holdings of 6 hectares or less and about 2/3 of the farms have 2 hectares or less.

institutional encouragement -- which is unlikely -- the rate could accelerate.

Moreover, factors working against a net increase in irrigated area will be gathering strength. During the period of the Fourth Plan, it was expected that 1.6 million hectares of irrigation would be lost by tubewells going out of operation; in the Draft Fifth Plan the figure has been raised to 3 million hectares. Therefore, to get a net increase of 4.5 million hectares of tubewell irrigation in the next five years, the gross irrigated area must increase by 7.5 million hectares. To some extent the 3-million figure allows for discrepencies in data, but largely it reflects recognition that tubewells have a limited life -- filters clog and pumps and motors become unserviceable -- that improper drainage will render some lands saline, hence unusable, and that over-exploitation of the water supply will lower the water table, probably putting a number of wells out of operation. Furthermore, if current land reform laws were to be enforced, large land holders would be inclined to put many wells out of operation and defer new installations because the laws generally provide for lower ceilings on holdings of irrigated land than on non-irrigated land. Moreover, diesel and electric power shortages could continue to restrict use of all small scale irrigation pumps for many years.

Surface Water

A faster pace of surface irrigation development will be necessary to compensate for a possible slowing in groundwater development. Compared with about 3.1 million hectares of gross area added from all types of surface irrigation schemes in the past five years (far below the target of some 3.9 million hectares), 6.7 million hectares are to be added in the next five years. Allocations for major and medium surface irrigation are to increase from Rs. 11.7 billion in the Fourth Plan to Rs. 24.0 billion in the Fifth. Priority is placed on completion of on-going projects which account for almost 90% of the planned additions. There is nothing in the Fifth Plan, however, to convince one that achievement of objectives will be greater than the past Plans. In those, too, priority was given to completion of on-going projects and larger allocations were made for their completion. The GOI rightly blames the shortfall largely on sharply rising project costs, inadequate project preparations, and changes in project design. All of these factors remain and rising costs are likely to be even more of a problem. Because irrigation is a State responsibility, there is little that New Delhi can do. Attempts to persuade the States to earmark funds for irrigation have been unsuccessful in periods of inflation and resource restraint. Inevitably the result is prolongation of construction schedules.

To improve utilization of existing irrigation schemes, the Fifth Plan proposes to establish a Command Area Development Authority. The Authority would deal with all problems hindering utilization, such as control of flow, distribution, drainage and so on. Its influence would extend over 15 million hectares and 50 major irrigation projects. It is likely to be so severely handicapped by lack of survey data and technical agreements with State governments, however, that little impact on its target problems should be expected before the 1980s.

In summation, one can not be optimistic about increases in production being achieved through additional irrigated areas. We expect that the gross area irrigated could increase by about 1.4 million hectares per year, as it has in recent years, and that this increase would permit the gross area sown to increase at about the same rate. There appears to be little prospect that the rate will be speeded up during the next ten years. If we assume that the additional land will be divided on an 80-20 basis of foodgrains to non-foodgrains much as it was during the 1960s, about 11.2 million hectares of foodgrains will be added by 1985, or an increase of 0.8% per year, compared with about 135 million hectares devoted to foodgrains at present. Yields on this land will increase, however, to the extent that it is planted with HYV seeds and adequately fertilized.

Indian Fertilizer Production

Increased fertilizer production is an essential part of India's effort to increase agricultural production. Under favorable irrigation and weather conditions, the application of one ton of fertilizer yields incremental production of as much as 15 tons of food grains.

Consumption of fertilizer in India is low relative to demand and relative to usage in other countries (see below).

Nitrogen Consumption, 1971
(kg/hectare of arable land)

Country	Rate
Netherlands	441
Japan	161
Egypt	123
UK	129
US	38
Pakistan	12
India	11
Australia	3

The great potential for increased fertilizer use, the balance of payments strain of fertilizer and/or food imports and the recent difficulty of finding adequate fertilizer or

food to import have led to planned major expansions of both nitrogenous and phosphatic fertilizer capacity. (India produces no potash.) Plans call for installed capacity to be raised to 7 million tons of nitrogen and 1.7 million tons of phosphate during the Fifth Five Year Plan (1974-79), a more than three-fold increase.

Indian Fertilizer Production Capacity, Present and Projected, 1974-79
(million metric tons)

	Nitrogen	Phosphate	Total
Present Capacity	1.9	.6	2.5
Projects expected to be completed during 1974-1979	2.2	.6	2.8
Projects in approved or planning stages	2.9	.5	3.4
Total	7.0	1.7	8.7

Construction delays are common, however, and because a substantial portion of anticipated new capacity is still in the planning stages, the capacity goals are not likely to be met until the early 1980s. Moreover, actual production is likely to be considerably below capacity. Capacity utilization of Indian fertilizer plants in recent years was only 70%. Projecting Indian fertilizer production based on an improved utilization rate of 75% provides the following estimates of domestic fertilizer production through 1985.

million metric tons

	1979		1985	
	Capacity	Production	Capacity	Production
Nitrogen	4.1	3.1	8.4	6.3
Phosphate	1.2	.9	2.0	1.5
Total	5.3	4.0	10.4	7.8

Fertilizer Demand and Consumption

India's consumption of fertilizer has been increasing at an average annual rate of about 17% since 1964 when 576,000 tons were used. Consumption last year totalled 2.8 million tons,* about half of which was imported at an estimated cost of $250 million dollars. Domestic production will not be increased sufficiently to cover estimated demand during the next decade. Comparison of our production forecast with the IBRD's projections of fertilizer demand yields the estimated deficits -- to be covered by imports -- tabulated below:

million metric tons

	1974		1979		1985	
	N	P_2O_5	N	P_2O_5	N	P_2O_5
Consumption	1.8	.6	4.0	1.3	7.0	2.8
Production	1.1	.4	3.1	.9	6.3	1.5
Deficit	.7	.2	.9	.4	.7	1.3

New projects that were based on fuel oil as feedstock for nitrogen production were conceived before the recent increase in petroleum prices. If the fifth plan were to be implemented as it stands, nearly half of the 7 million tons of capacity would be based on fuel oil, a third on naphtha, about 10% on coal and less than 7% on ~~natural~~ NATURAL gas. India is planning a major expansion of coal production during the fifth plan and is considering design changes that would facilitate conversion of new plants from

* Including nitrogen, phosphorous, and potash nutrient base.

petroleum to coal. Changes in plant design, or changes in the feedstocks such as a major shift to coal ~~is~~ ARE likely to cause delays and entail losses of domestic production that could necessitate additional imports.

HYV Seeds

Continuous supplies of high quality seeds are required to accelerate -- or even sustain -- agricultural production. As hybrid varieties (most varieties of maize, sorghum, and millet) must be grown from newly purchased seeds, area expansion of these crops is entirely dependent on expansion of the seed industry. Seed of self-pollinated varieties (e.g., rice and wheat) must be replaced every four or five years for optimum maintenance of varietal characteristics. The draft Fifth Plan stresses the provision of breeder and foundation seed* to the seed industry. Proposals for accomplishing this are inadequate, however, according to World Bank experts, who have an on-going project in India's seed industry.

Output of certified cereal seeds is to double in the next five years. While this is a large increase, it would only raise certified seed coverage from 4% to about 8% of the area currently under HYV wheat and rice. At the same time, HYV foodgrain area is expected to increase from 27 million hectares to 42 million hectares, a 9% annual increase. Obviously, a much larger seed production effort is needed. Without it, much of the HYV area will continue to be planted to low quality seeds.

A faster growth of certified seed output will involve a substantial restructuring of the seed industry, from production

*Foundation seed is derived in one generation from breeder seed produced in very small qualtities at research stations. Only seed derived from foundation seed in one generation and meeting legal standards of genetic and physical purity is suitable for certification.

through processing, distribution and marketing. The industry has been sorely troubled, especially in 1969/70 when the states withdrew from direct contracting and curtailed their own seed production. Presently, in addition to some private groups and and corporations, and State agriculture departments, the bulk of certified seed production is accounted for by the public sector National Seeds Corporation (50%) and the World Bank assisted Tarai Development Corporation (25%). Expansion of these two institutions is limited by lack of land and increasing managerial and logistic problems associated with expansion.

The Fifth Plan proposed that State Seed Corporations be established to produce seeds. The World Bank believes these would not be sufficient and has proposed that a private/ cooperative seed industry be developed with public credit and that an effective certification system be developed by the NSC. Only a few states have agencies to enforce certification standards, and they are largely understaffed. Likewise, staff, funds, and physical facilities at State universities are inadequate to produce breeder seed without curtailing development of new varieties.

Weather Patterns

India's foodgrain output will no doubt continue to be highly irregular because of variations in the weather.

Nevertheless, output projections for even one year must be made with the assumption of normal or average weather, because there is no reliable methodology for predicting weather patterns. Yet some climatologists agree that the favorable world climate of the last 50 years seems to be ending and that disasterous consequences may be in store for world agricultural output. Moreover, one popular climatologist, Dr. Reid Bryson of the University of Wisonsin, includes the drier parts of India among the northern hemisphere areas that are undergoing rapid and long range deterioration in climate. His findings might warrant a somewhat pessimistic shading in long range estimates of Indian agricultural performance.

V. Foodgrain Shortfall

During the period 1950 to 1973, Indian foodgrain production grew at an annual trend rate of 2.7%.* The growth rate slowed during this period -- from 4.2% during 1950-1960 to 2.3% during 1960-1973.

For reasons already mentioned, growth over the next decade will be more difficult to achieve than in the past. Although weather conditions are the most important factor in foodgrain production in any one year, projections of production over the long term can with impunity assume a normal distribution of weather variations over the years. Changes in government policy, however, can have a significant effect on the growth of the agricultural sector. Therefore, two alternative growth rates for foodgrain production are used -- 2.0% and 2.5%. We believe that both estimates are within India's capability, and that government actions will determine which estimate proves more accurate.

In estimating demand for foodgrains in 1985, the growth in population and the change in per capita income are employed. Using an estimated population growth rate of 2.2%, India's population in 1985 would be 736.9 million. Change in per

*All trend growth rates are calculated by fitting an exponential regression curve and are therefore estimates of the trend of production rather than absolute production growth rates. By emphasizing the trend of production instead of the magnitude of increase, the rates presented are more relevant to future projections.

capita income is estimated from two sets of data. First, to estimate future change in net national product (NNP), the past growth rates of real NNP for India during several periods were examined. During 1950-1973, the growth trend rate of real NNP was 3.4%. Unlike foodgrain production, real NNP growth has slowed only marginally, from 3.4% during the 1950s to 3.2% since 1960. Second, in recognition that the projected growth of foodgrain production is one of the determinants of future NNP, a linear correlation was made to determine the influence that changes in foodgrain production had on changes in NNP.* The rates of real NNP that correspond to assumed growth rates of foodgrain production of 2.0% and 2.5% are 2.97% and 3.11%, respectively. The growth rates of real NNP were then adjusted for population growth to yield estimated growth rates for real per capita NNP, which, in turn, were combined with the estimated income elasticity of demand for foodgrains -- 0.35 -- to give the change in demand due to per capita income change.

A projected growth rate of 2.0% yields foodgrain production of 130.6 million tons in 1985 and 2.5% yields 138.5 million tons. The growth in demand, considering both population growth and change in real NNP, ranges from 146.2 million tons to 147.3

*The resulting regression line was $Y = 2.41557 + 0.27795\ X$, where Y represents the annual percentage change in real NNP and X represents the annual percentage change in foodgrain production. $R^2 = 0.776725$, which was considered high in this context where numerous other factors also affect NNP. For projection, these other factors are assumed to be random.

million tons. These projections yield an estimated gap between demand and domestic production ranging from 8.8 million tons to 15.6 million tons in 1985.

VI. Financing Development and Grain Imports

India's economic development plan is in trouble. Development allocations in all sectors have been greatly reduced by inflation -- now running at a 40% annual rate. New Delhi also is having difficulty raising additional revenue. Farm income, the major potential source of new revenue, remains virtually untaxed. States -- who have constitutional authority for imposing agricultural taxes -- have refused to do so and New Delhi has not forced the issue. Meanwhile, non-development expenditures are increasing faster than revenues and the country faces a record budget deficit. Funds for agricultural development will remain scarce.

Worldwide increases in petroleum, fertilizer and food-grain prices have greatly aggravated India's chronic balance of payment problems. These three imports will take about 80% of this year's expected export earnings of $3.5 billion.

Massive foreign aid inflows -- which until recently bailed India out of its foreign exchange difficulties -- have been drained by debt servicing charges ($718 million in 1974) that will take about 60¢ of every economic aid dollar in 1974. Prospects for substantially increased economic aid are not good. And New Delhi's estimated $1.6 billion in foreign exchange reserves will be drawn down sharply to pay for this year's purchases abroad.

Raw materials and spare part imports are needed to increase industrial production and exports. Exports, however, cannot finance increased import costs as export prices are increasing much more slowly than import prices. Chronic balance of payments strictures are likely to worsen. India will be unable to pay for increased foodgrain imports without increased foreign aid.

TABLE 1

India: Foodgrain Production, 1949-74

Million Metric Tons

Crop Year[a]	Rice (Milled)	Wheat	Coarse Grains[b]	Pulses	Total[c]
1949/51	23.54	6.39	16.82	8.16	54.92
1950/51	20.58	6.46	15.38	8.41	50.82
1951/52	21.30	6.18	16.09	8.42	52.00
1952/53	22.90	7.50	19.61	9.19	59.20
1953/54	28.21	8.02	22.97	10.62	69.82
1954/55	25.22	9.04	22.82	10.95	68.04
1955/56	27.56	8.76	19.49	11.04	66.85
1956/57	29.04	9.40	19.86	11.55	69.86
1957/58	25.52	8.00	21.23	9.56	64.31
1958/59	30.85	9.96	23.19	13.15	77.14
1959/60	31.68	10.32	22.87	11.80	76.67
1960/61	34.57	11.00	23.74	12.70	82.02
1961/62	35.66	12.07	23.22	11.76	82.71
1962/63	33.22	10.78	24.63	11.53	80.15
1963/64	37.00	9.85	23.72	10.07	80.64
1964/65	39.31	12.26	25.37	12.42	89.36
1965/66	30.59	10.39	20.92	9.94	72.35
1966/67	30.44	11.39	24.05	8.35	74.23
1967/68	37.61	16.54	28.80	12.10	95.05
1968/69	39.76	18.65	25.18	10.42	94.01
1969/70	40.43	20.09	27.29	11.69	99.50
1970/71	42.23	23.83	30.55	11.82	108.42
1971/72	43.07	26.41	24.60	11.09	105.17
1972/73	38.63	24.92	22.16	9.49	95.20
1973/74[d]	43.5	22.5	27.5	9.5	105.0

a. 1 July - 30 June
b. Including grain sorghum, millets, corn, and barley
c. Because of rounding, components may not add to the totals shown
d. Preliminary

Table 2

India: Foodgrain Area, 1949-74 a/

Million Hectares

Crop Year b/	Rice (Milled)	Wheat	Coarse Grains c/	Pulses	Total
1949/50	30.52	9.76	38.84	20.32	99.28
1950/51	30.81	9.75	37.67	18.68	97.32
1951/52	29.83	9.47	38.88	18.81	96.96
1952/53	29.97	9.83	42.45	19.89	102.09
1953/54	31.29	10.68	45.37	21.77	109.06
1954/55	30.76	11.26	43.92	21.95	107.86
1955/56	31.52	12.37	[illegible].46	23.25	110.56
1956/57	32.28	13.52	[illegible].02	23.35	111.14
1957/58	32.30	11.73	[illegible].91	22.58	109.48
1958/59	33.17	12.62	44.66	24.35	114.76
1959/60	33.82	13.38	43.79	24.88	115.82
1960/61	34.13	12.93	44.96	23.56	115.58
1961/62	34.69	13.57	44.73	24.24	117.23
1962/63	35.70	13.59	44.29	24.27	117.84
1963/64	35.81	13.50	43.93	24.19	117.42
1964/65	36.46	13.42	44.35	23.79	118.11
1965/66	35.27	12.66	43.16	22.08	113.17
1966/67	35.25	12.84	45.09	22.26	115.30
1967/68	36.44	15.00	47.34	22.65	121.42
1968/69	36.97	15.96	46.24	21.26	120.43
1969/70	37.68	16.63	47.24	22.02	123.57
1970/71	37.59	18.24	45.96	22.53	124.32
1971/72	37.76	19.14	43.57	22.15	122.62
1972/73	36.02	19.88	41.12	20.40	117.43
1973/74 d/	38.50	20.00	39.50	22.50	114.70

a. Data as reported in official statistics. The differences between the sum of the components and the totals are unexplained in Indian statistics.
b. 1 July - 30 June.
c. Including grain sorghum, millets, corn, and barley.
d. Preliminary.

Table 3

India: Foodgrain Yields, 1949-74 a/

Crop Year b/	Rice (Milled)	Wheat	Coarse Grains c/	Pulses	Total
	Kilograms Per Hectare				
1949/50	771	655	433	405	553
1950/51	668	633	408	441	522
1951/52	714	653	414	448	536
1952/53	764	763	462	463	580
1953/54	902	750	506	489	640
1954/55	820	803	520	500	631
1955/56	874	708	448	476	605
1956/57	900	695	473	495	629
1957/58	790	682	495	424	587
1958/59	930	789	519	541	672
1959/60	937	772	522	475	662
1960/61	1,013	851	528	539	710
1961/62	1,028	890	519	485	705
1962/63	931	793	556	475	680
1963/64	1,033	730	540	416	687
1964/65	1,078	913	572	520	757
1965/66	869	824	490	444	636
1966/67	863	887	533	377	644
1967/68	1,032	1,103	608	534	783
1968/69	1,076	1,169	545	490	781
1969/70	1,073	1,209	578	531	805
1970/71	1,123	1,307	664	524	872
1971/72	1,141	1,380	565	501	858
1972/73	1,072	1,254	539	465	811
1973/74 d/	1,130	1,125	696	422	828

a. All yields computed using unrounded data for production and area. Because of rounding, components may not add to the totals shown.
b. 1 July - 30 June.
c. Including grain sorghum, millets, corn, and barley.
d. Preliminary.

Table 4

India: Foodgrain Imports

Thousand Metric Tons

Calendar Year	Wheat	Milled Rice	Coarse Grains	Total
1947-50[a]	1,467	628	701	2,796
1951	3,064	761	976	4,801
1952	2,551	734	641	3,926
1953	1,711	178	146	2,035
1954	200	635	8	843
1955	442	269	--	711
1956	1,113	330	[illegible]	1,443
1957	2,898	748	--	3,646
1958	2,716	397	111	3,224
1959	3,553	295	143	3,868
1960	4,386	699	143	5,137
1961	3,092	384	134	3,495
1962	3,250	390	87	3,640
1963	4,073	483	61	4,556
1964	5,621	645	113	6,266
1965	6,583	783	229	7,462
1966	7,832	787	1,739	10,358
1967	6,400	453	1,819	8,672
1968	4,166	446	482	5,694
1969	3,090	487	295	3,872
1970	3,425	206	--	3,631
1971	1,814	240	--	2,054
1972	NA	NA	NA	320
1973	NA	NA	NA	4,200
1974[b]	NA	NA	NA	5,000

a. Annual average
b. Estimated.

Table 5

India: Public Sector Investment

(By Percent of Total)

	Agricultural Sector						Total	
	Agriculture a/	Irrigation and Flood Control	Total	Industry	Power	Other	Percent	Billion Rupees
Second Plan (1956-60)	11.0	9.0	20	24	10	46	100.0	
Third Plan (1961-65)	12.7	7.8	20.5	20.1	14.6	44.8	100.0	85.8
Annual Plan (1966-68)	14.9	7.3	22.2	23.3	18.7	35.8	100.0	64.6
1969	14.1	8.8	22.9	20.4	21.5	35.2	100.0	21.8
1970	14.9	8.3	23.2	18.4	20.4	38.0	100.0	25.2
1971	14.1	8.0	22.1	19.2	19.7	39.0	100.0	30.8
1972 Plan	17.2	6.8	24.0	19.0	15.6	41.4	100.0	39.5
1973 Plan	15.8	6.9	22.7	17.6	16.1	43.6	100.0	42.6
Anticipated Fourth Plan (1969-73)	15.4	7.6	23.0	18.8	18.1	39.8	100.0	159.0
Original Fourth Plan (1969-73)	15.5	6.9	22.4	21.3	15.6	40.7	100.0	156.5
Fifth Plan (1974-78)	12.8	7.2	20.0	24.0	16.3	39.7	100.0	372.5

a. India counts grain purchases for the public distribution system as public sector investment. Such purchases are excluded from this tabulation.

Table 6

India: Agricultural Taxes1/

Million Rs.

Plan Period	Land	Income	Total	Total State Taxes	Agricultural Taxes as a % of Total
First Plan (1951-55)	653.4	48.2	701.6	2,514.2	27.9
Second Plan (1956-60)	910.0	85.0	995.0	3,795.8	26.0
Third Plan (1961-65)	1,140.6	97.8	1,238.4	6,679.8	18.4
Plan Holiday (1966-68)	1,023.6	109.7	1,133.3	10,744.4	10.7
Fourth Plan (1969-73)	1,076.8	124.9	1,201.7	16,937.8	7.0

1. Annual average.

Table 7

India: Trends in Government Procurement and Wholesale Grain Prices, 1968-74
(1968 = 100)

Year	Wheat		Rice	
	Procurement[1]	Wholesale[2]	Procurement	Wholesale[2]
1968/69	100	100	100	100
1969/70	100	105	101	100
1970/71	100	102	103	103
1971/72	100	102	102	104
1972/73	100	109	105	118
1973/74 (1st Half)	100	104	105	137
1973/74 (2nd Half)	100	118	140	151
1974/75 April/May	138	170[3]	140	174[3]

1. Mexican/Common White Procurement
2. Average of Fiscal Year
3. Week of 4 May 1974.

Table 8

Increase in Gross Area Irrigated, Planned and Achieved

1968-79

	Fourth Plan Period (1968/69 - 1973/74)		Draft Fifth Plan Period (1973/74 - 1978/79)
	Planned	Reported Achievement[a]	Planned
Canals[b]	3.9	2.6	5.2
Minor surface water schemes	3.2	0.5	1.5
Groundwater		4.0	4.5
TOTAL	7.1	7.1	11.2

a. Preliminary

b. Includes only major and medium surface water schemes costing over Rs 2.5 million each.

Table 89

India: Projected Foodgrain Situation in 1985

Assumed Annual Growth Rates (%)				Results (million metric tons)		
Population	Foodgrain Production	Real NNP	Real NNP Per Capita	Foodgrain Demand	Foodgrain Production	Gap
2.2	2.0	2.97	0.75	146.2	130.6	15.6
2.2	2.5	3.11	0.89	147.3	138.5	8.8

Chart 1

India: Foodgrain Production, Imports, and Per Capita Availability, 1950-74

Year[a]	Population[b] (Million)	(Million Metric Tons) Production	Imports[c]	Total Available	Per Capita Availability (Kilogram Per Capita)	Index of Per Capita Foodgrain Availability
1950/51	363.4	50.82	4.8	55.62	153	100
1951/52	369.6	52.00	3.93	55.93	151	98.7
1952/53	376.1	59.20	2.04	61.24	163	106.5
1953/54	382.9	69.82	0.84	70.66	184	120.3
1954/55	390.2	68.04	0.71	68.75	176	115.9
1955/56	397.8	66.85	1.44	68.29	172	112.4
1956/57	405.8	69.86	3.65	73.51	181	118.3
1957/58	414.3	64.31	3.22	67.53	163	106.5
1958/59	423.3	77.14	3.87	81.01	191	124.8
1959/60	432.7	76.67	5.14	81.81	189	123.5
1960/61	442.4	82.02	3.49	85.51	193	126.1
1961/62	452.2	82.71	3.64	86.35	191	124.8
1962/63	462.0	80.15	4.55	84.70	183	119.6
1963/64	472.1	80.64	6.26	86.90	184	120.3
1964/65	482.5	89.36	7.45	96.81	201	131.4
1965/66	493.2	72.35	10.34	82.69	168	109.8
1966/67	504.2	74.23	8.66	82.89	164	107.2
1967/68	515.4	95.05	5.69	100.74	196	128.1
1968/69	527.0	94.01	3.85	97.86	186	121.6
1969/70	538.9	99.50	3.58	103.02	191	124.8
1970/71	550.8	108.4	2.03	110.43	200	130.7
1971/72	562.5	105.17	0.48	105.65	188	122.9
1972/73	574.2	95.20	3.7	98.90	172	112.4
1973/74 est.	586.3	103.0	5.0	108.00	184	120.3

a. Crop year, 1 July - 30 June.
b. As of 1 July of the second year stated.
c. Imports for January - December of second year stated.

Chart 2

India: Ratio of Agricultural to Industrial Prices, 1952-74

Year	Finished Manufactured Goods Wholesale Price Index	Foodgrain Wholesale Price Index	Ratio
1952-53	100	100	100
1955-56	100	73	73
1960-61	123	102	83
1961-62	125	100	80
1962-63	127	106	83
1963-64	130	116	89
1964-65	135	144	107
1965-66	145	150	103
1966-67	156	178	114
1967-68	158	223	141
1968-69	162	195	120
1969-70	174	202	116
1970-71	186	201	108
1971-72	199	209	105
1972-73	209	240	115
1973-74	237	287	121