THE PHILIPPINE REVIEW OF ECONOMICS
VOL. XLIV NO. 2 DECEMBER 2007 P. 149-169

Challenges to Indian agriculture: future strategy

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This paper discusses production and productivity trends, and challenges to, and future strategy of, the Indian agricultural sector. The author suggests that there is a need to raise farm productivity, especially in the country's vast rain-fed areas. Priority should be given not just to crop farming but also to livestock farming, horticulture, fodder plantation, and grassland development. Improved seeds and fertilizers, and proper irrigation facilities can play a crucial role in raising productivity. The growth of the agricultural sector depends on the growth of infrastructure facilities like irrigation, rural roads, market, power, cold storage, etc. The study points out that the decline in public investment in agriculture is mainly due to the diversification of resources in the form of subsidies for food, fertilizers, electricity, irrigation, credit, etc. The study concludes that the diseconomies in cost, lack of quality of domestic products in foreign markets, and cutthroat competition from other agrarian economies are the major constraints to Indian agricultural exports. The author suggests contract farming to raise high-value crops on small farms and public-private partnership in agricultural research.

JEL classification: O, O10
Keywords: Capital formation, production and productivity trends, institutional credit, regulated marketing, infrastructural facilities

1. Introduction

Agriculture occupies a position of fundamental importance in the Indian economy. In 2001, according to the Indian National Sample Survey (NSS), 54.3 percent of the workforce was dependent on agriculture, 50.3 percent on crop production, and 4 percent on livestock production. In fact, the percentage of the workforce dependent on allied activities like livestock doubled between

1961 and 2001. The share of contribution of the agricultural and allied sector to gross domestic product (GDP) has been declining—from 52.13 percent in 1960-61, 45.79 percent in 1970-1971, 39.64 percent in 1980-1981, 32.91 percent in 1990-1991, 26.24 percent in 2000-2001 to 19.9 percent in 2005-2006. Economic reforms were introduced in India in 1991 in many sectors except in the agricultural sector. As a result, reforms failed to yield the desired progress in the overall development of the economy. Attempts were made to introduce reforms in the agriculture sector by some state governments in 1996. Moreover, many state governments in India are not keen on implementing reforms in the sector, hence policy changes in agriculture are slow in coming. The rate of structural changes in the sector was lower in the 1990s. The export growth of agricultural product was also slow and agricultural demand declined steeply after the East Asia crisis.

Agriculture is an occupation that requires financing. It is said that the average Indian farmer is poor and heavily dependent on borrowed finance. To make matters worse, rainfall has become irregular and inadequate in the last few years. Farmers' debts have thus been on the rise, as they have had to buy fertilizers and pay for irrigation and land development. Agricultural credit is absolutely an essential requirement for Indian farmers, and the government has taken various steps to improve the agricultural credit system by establishing credit cooperative societies, land development banks, regional rural banks (RRBs), the National Bank for Agriculture and Rural Development (NABARD), etc. But services with regard to agricultural credit remain unsatisfactory. Globally, India can compete in agriculture. But to make that happen, the country's agriculture sector should be given access to global services with regard to credit as well as marketing so that it can proactively compete with multinational companies

Agriculture's share in GDP is often taken as an indicator of economic development. Normally, developed economies are less dependent on agriculture than underdeveloped countries. Table 1 shows that only 1 percent of GDP is derived from agriculture in Japan and the United Kingdom, 2 percent in Australia, and 3 percent in France. The contribution of agriculture to GDP was high in developing economies like India, China, Bangladesh, Sri Lanka, Rwanda, Zambia, and Pakistan. The proportion of population engaged in agriculture in developed countries is much less than that in developing countries. Agriculture contributes 22 percent of the GDP in India, 15 percent in China, 17 percent in Sri Lanka, and 42 percent in Rwanda.

The paper is divided in five sections. Section 2 discusses the gross capital formation in the agricultural sector, section 3 covers the production and productivity trends in agriculture, section 4 discusses the challenges to Indian

agriculture, and section 5 deals with the agenda for reforms in Indian agricultural sector and draws conclusions.

Table 1. Percentage of GDP originating in agriculture in some selected countries

Country	*GDP (in million US$) 2004*	*Value added as percentage of GDP (agriculture) 2004*
Australia	290,109	2
France	2,002,582	3
Japan	4,623,398	1
United Kingdom	2,140,898	1
India	691,876	22
China	1,649,329	15
Bangladesh	56,844	21
Sri Lanka	20,055	17
Zambia	5,389	21
Rwanda	1,845	42
Pakistan	96,115	23

Source: World Bank [2006].

2. Capital formation in agriculture

Since independence, Indian agriculture has undergone several phases of growth. In the 1950s and 1960s, agriculture played a crucial role in India's industrialization by supplying cheap food to the market. The crisis in the mid-'60s brought the significance of food self-sufficiency to the center stage of India's political economy. Green Revolution was ushered in, whose objective was to make the country independent of imported food. While agriculture's nature and contribution to the Indian economy was changing, the fundamental characteristics of the economy as a whole remained the same till the early 1990s when major reforms started. Since the early 1990s no major attempts have been made to reform the Indian agricultural sector. The decline in public investment in agriculture is a serious cause of concern because of the potential negative impact on agricultural growth over the longer term. A 10 percent decrease in public investment (including irrigation and power) leads to a 2.4 percent annual reduction in agricultural GDP growth [Gulati and Batula 2002]. The public investment in agriculture declined from Rs 7,301 crore in 1980-1981 to Rs 4,395 crore in 1990-1991. In 2005-2006 it stood at Rs 13,219 crore. Private

investment in agriculture increased from Rs 6,932 crore in 1980-1981 to Rs 10,441 crore in 1990-1991 and further to Rs 41,320 crore in 2005-2006 (data are at 1990-2000 prices). Between 1990-1991 and 2001-2002, the average growth rate of agriculture was 2.95 percent. If we break this period into pre- and post-WTO (World Trade Organization), the growth rate of Indian agriculture in 1990-1991 and 1995-1996 was 3.16 percent; between 1996-1997 and 2001-2002 it was 1.75 percent. During the tenth five-year plan (2002-2007) the average growth in agriculture is estimated at 2.3 percent. If this trend continues, it will be impossible to achieve a 4 percent growth rate in agriculture as stated in the National Agriculture Policy.

Table 2. Gross capital formation in agriculture

	Investment in agriculture (Rs crore)			*Share in agricultural gross investment (%)*		*Investment in agriculture as a percentage of GDP at constant prices*
Period	*Total*	*Public*	*Private*	*Public*	*Private*	
1990-1991	14836	4395	10441	29.60	70.40	1.92
1995-1996	15690	4849	10841	30.90	69.10	1.57
1996-1997	16146	4668	11508	28.90	71.10	1.51
1997-1998	15942	3979	11963	25.00	75.00	1.43
1998-1999	14895	3870	11025	26.00	74.00	1.26
1999-2000	17304	4221	13083	24.40	75.60	1.37
New series (at 1999-2000 prices)						
1999-2000	43473	7716	35757	17.70	82.30	2.20
2000-2001	38736	7155	31580	18.50	81.50	1.90
2001-2002	47043	8746	38297	18.60	81.40	2.20
2002-2003	46823	7962	38861	17.00	83.00	2.10
2003-2004	45132	9376	35756	20.80	79.20	1.90
2004-2005	48576	10267	38309	21.10	78.90	1.90
2005-2006*	54539	13219	41320	24.20	75.80	1.90

Source: Central Statistical Organization (CSO), India.

*Quick estimates.

The decline in the share of the agricultural sector's capital formation in GDP from 2.2 percent in the late 1990s to 1.9 percent in 2005-2006 is a matter of concern. This declining share was mainly due to the stagnation or fall in public investment in irrigation, particularly since the mid-'90s. However, there is

indication of a reversal of this trend, with public sector in agriculture reaching its highest level of Rs 13,219 crore in 2005-2006 since the early 1990s. The share of public investment in gross investment increased by 7 percentage points to reach 24.2 percent in 2005-2006 relative to 1999-2000.

3. Production and productivity trends in agriculture

Trends in agricultural production is presented in Table 3. As far as food-grain output is concerned, the total production increased from 50.8 million tons in 1950-1951 to 155.0 million tons in the seventh plan (annual average) and further to 212.9 million tons in 2001-2002, but fell to only 174.80 million tons in 2002-2003 because of drought. According to advance estimates released in February 2007, food-grain production in 2006-2007 is expected to reach the level of 209.2 million tons.

In the non-food-grain group, the production of oilseeds rose considerably in the latter half of the 1980s. For instance, oilseed production increased from 6.2 million tons in 1950-1951 to 13.9 million tons in the seventh plan (1985-1990 annual average) and further to a record level of 28 million tons in 2005-2006. Production of cotton rose from 3.0 million bales in 1950-1951 to 8.4 million bales in the seventh plan (annual average) and further to 18.5 million bales in 2005-2006. In 2006-2007 the production of cotton is expected to reach 21.0 million bales. Sugarcane registered a more or less steady growth during the entire period from 1950-1951 to 2006-2007. The growth in jute production shows slow and halting progress for the entire period 1950-1951 to 2006-2007.

Agriculture, especially with respect to a variety of crops produced under diverse climatic situations in different cropping systems, supports 115.5 million farm families. The second advance estimates for commercial crops show an improved performance. Sugarcane production is estimated to go up to 315.5 million tons in 2006-2007 compared to 270.0 million tons in 2005-2006.

It is evident from Table 4 that acreage under horticulture—which includes fruits, vegetables, spices, floriculture, and plantations—is expected to reach 20 million hectares in 2006-2007. With production of 54 million tons and 113 million tons in 2005 and 2006, respectively, India was the second-largest producer of both fruits and vegetables in the world. India ranks first in the production of cauliflowers, second in onion, and third in cabbages [Ministry of External Affairs 2007].

The National Horticulture Mission (NHM) was launched in May 2005 as a major initiative toward diversification in agriculture and to augment income of farmers through cultivation of high-value horticultural crops. The NHM aims at doubling horticulture production by 2012.

Table 3. Trends in agricultural production, 1950-1951 to 2006-2007 (in million units)

Crop	*Unit*	*1950-1951*	*1961-1966 Average*	*1985-1990 Average*	*2001-2002*	*2002-2003*	*2003-2004*	*2004-2005*	*2005-2006*	*2006-2007*
Rice	ton	20.60	35.10	65.10	93.30	71.80	88.50	83.10	91.80	90.00
Wheat	ton	6.40	11.10	48.30	72.80	65.80	72.20	68.60	69.40	72.50
Coarse cereals	ton	15.90	23.70	29.10	33.40	26.10	37.60	33.50	34.10	32.00
Pulses	ton	8.40	11.10	12.50	13.40	11.10	14.90	13.10	13.40	14.50
Total food grains	ton	50.80	81.00	155.00	212.90	174.80	213.20	198.40	208.60	209.20
Oilseeds	ton	6.20	7.30	13.90	20.70	14.80	25.20	24.40	28.00	23.60
Sugarcane	ton	57.10	109.20	196.40	297.20	287.40	233.90	237.10	270.00	315.50
Cotton	bale**	3.00	5.40	8.40	10.00	8.60	13.70	16.40	18.50	21.00
Jute	bale**	3.30	5.70	8.90	11.70	11.30	11.20	10.30	10.80	11.40

** Bale: 170 kg

Sources:

(1) For columns 3-4, Sixth Five-Year Plan 1980-1985, Annexure 9.2: 140.

(2) For column 5, Economic Survey 1988-1989, Statement 1.10 PS-15.

(3) For columns 6-11, Economic Survey 2006-2007.

Table 4. Area and production of major horticulture crops

	2002-2003		2003-2004		2004-2005		2005-2006*	
Crops	*Area*	*Production*	*Area*	*Production*	*Area*	*Production*	*Area*	*Production*
Fruits	4.80	49.20	5.10	49.80	5.30	52.80	5.90	54.40
Vegetables	5.90	84.80	6.70	101.40	7.10	108.20	7.20	113.50
Spices	2.40	3.80	5.20	4.00	3.20	4.90	3.20	5.90
Plantation crops	3.10	13.10	3.30	9.40	3.10	10.40	3.20	9.80
Flowers	0.10	0.20	0.20	0.60	0.10	0.70	0.10	0.80
Others	0.09	0.90	0.10	0.30	0.40	0.40	0.40	0.50
Total	16.40	152.00	20.60	165.50	19.20	177.40	20.00	184.90

Area: in million hectares

Production: in million tons

* Estimated.

Source: National Horticulture Board.

A comparison of agricultural productivity levels in India with that in other countries shows low productivity in Indian agriculture. Table 5 compares the productivity of some crops in India with that in other countries. As is clear from this table, productivity of rice in India is about 29.59 percent of that in Egypt and 37.17 percent of that in the United States. As for wheat, productivity in India is 64.52 percent of that in China and 35.06 percent of that in the United Kingdom. Maize productivity in India is 12.08 percent of that in the United States and 22.44 percent of that in China. Productivity of cotton in India is about 41.44 percent of that in China and 60.52 percent of that in Pakistan. Major oilseeds productivity in India is 40 percent of that in China and 80.0 percent of that in Nigeria. Information on India's global rank in major agricultural crops is even more revealing. India happens to be one of the largest growers and producers of many agricultural crops, but ranks very low in terms of yield.

Table 6 covering the period 1966-1967 to 2006-2007 gives information about seasonwise area, production, and food-grain yield. With the introduction of economic planning in 1950-1951, with special emphasis on agricultural development particularly after 1962, there was steady increase in area under cultivation and there was a steady rise in average yield per hectare or rise in agricultural productivity. As a result of the increase in area and the increase in yield per hectare, total production of all crops recorded a rising trend. The area under food-grain production rose from 115.30 million hectares in 1966-1967 to 120.08 million hectares in 2004-2005. Total food-grain production rose from 74.23 million tons in 1966-1967 to 211.7 million tons in 2006-2007. Yield per hectare of all food grains has increased by about three times from 644 kg/ha in 1966-1967 to 1,652 kg/ha in 2004-2005.

The total exports of agriculture and allied products, as well as the share of agriculture exports to the country's total exports, are shown in Table 7. With economic progress and the consequent diversification of production base, the share of agricultural goods in total exports has consistently fallen. For instance, the share of agricultural exports in total exports was 44.2 percent in 1960-1961. This fell consistently to 30.7 percent in 1980-1981, 17.89 percent in 1991-1992, and further to 9.93 percent in 2005-2006. Diseconomies in cost, lack of quality, increasing domestic demand, declining demand for domestic products in foreign markets, and cutthroat competition from other agrarian economies are the major constraints to Indian agricultural exports. Government has to take some measures through its EXIM policy to protect the interests of exporters of agricultural products.

4. Challenges to Indian agriculture

Low yield per unit area across almost all crops has become a regular feature of Indian agriculture. For example, although India accounted for 21.8 percent of global paddy production, the estimated yield per hectare in 2004-2005 was less than that of Korea and Japan, and only about a third of that of Egypt, which had the highest yield level in the reference year. Similarly in wheat, although India accounted for 12 percent of global production, its average yield was slightly lower than the global average. It was less than a third of the highest level estimated for the United Kingdom in 2004-2005. For coarse grains and major oilseeds, Indian yields are about 33 percent and 46 percent, respectively, of the global average. In cotton, the situation is slightly better, with Indian yields at 63 percent of the global average. While agro-climatic conditions prevailing in countries may partly account for the differences in yield levels, for major food as well as commercial crops, there is nonetheless tremendous scope for increasing yield with technological breakthroughs [Economic Survey 2006-2007:159].

Table 5. International comparisons of yield of selected commodities, 2004-2005 (in metric tons/hectare)

Rice/paddy		*Wheat*		*Maize*	
Egypt	9.80	China	4.25	United States	9.15
India	2.90	France	7.58	France	7.56
Japan	6.42	India	2.71	India	1.18
Myanmar	2.43	Iran	2.06	Germany	6.69
Korea	6.73	Pakistan	2.37	Philippines	2.10
Thailand	2.63	UK	7.77	China	4.90
Unites States	7.83	Australia	1.64*	--	--
World	3.96	World	2.87	World	3.38

Cotton		*Major oilseeds*	
China	11.10	Argentina	2.51
Unites States	9.58	Brazil	2.48
Uzbekistan	7.98	China	2.05
India	4.64	India	0.86
Brazil	10.96	Germany	4.07
Pakistan	7.60	United States	2.61
		Nigeria	1.04
World	7.33	World	1.86

Source: Ministry of Agriculture and Co-operation.

Table 6. Seasonwise area, production, and yield of food grains (1966-1967 to 2006-2007)

Year	Kharif			Rabi			Total		
	A	P	Y	A	P	Y	A	P	Y
1	2	3	4	5	6	7	8	9	10
1966-1967	78.21	48.89	625	37.09	25.34	683	115.30	74.23	644
1967-1968	81.49	60.76	746	39.93	34.29	859	121.42	95.05	783
1968-1969	80.40	59.57	741	40.03	34.44	860	120.43	94.01	781
1969-1970	82.30	62.35	758	41.27	37.15	900	123.57	99.50	805
1970-1971	82.36	68.92	837	41.96	39.50	941	124.32	108.42	872
1971-1972	79.22	62.99	795	43.40	42.18	972	122.62	105.17	858
1972-1973	78.34	58.64	749	40.94	38.39	938	119.28	97.03	813
1973-1974	84.12	67.84	806	42.42	36.83	868	126.54	104.67	827
1974-1975	79.74	59.10	741	41.34	40.73	985	121.08	99.83	824
1975-1976	83.15	73.89	889	45.03	47.14	1,047	128.18	121.03	944
1976-1977	81.18	66.53	820	43.18	44.64	1,034	124.36	111.17	894
1977-1978	82.88	77.72	938	44.64	48.69	1,091	127.52	126.41	991
1978-1979	82.85	78.08	942	46.16	53.82	1,166	129.01	131.90	1,022
1979-1980	80.79	63.25	783	44.42	46.45	1,046	125.21	109.70	876
1980-1981	83.21	77.65	933	43.46	51.94	1,195	126.67	129.59	1,023
1981-1982	83.93	79.38	946	45.21	53.92	1,193	129.14	133.30	1,032
1982-1983	79.08	69.90	884	46.02	59.62	1,296	125.10	129.52	1,035
1983-1984	84.14	89.23	1,060	47.02	63.14	1,343	131.16	152.37	1,162

Table 6. Seasonwise area, production, and yield of food grains (1966-1967 to 2006-2007) (continued)

Year	Kharif			Rabi			Total		
	A	P	Y	A	P	Y	A	P	Y
1	2	3	4	5	6	7	8	9	10
1984-1985	81.18	84.52	1,041	45.49	61.02	1,341	126.67	145.54	1,149
1985-1986	81.80	85.25	1,042	46.22	65.19	1,410	128.02	150.44	1,175
1986-1987	81.46	80.20	985	45.74	63.22	1,382	127.20	143.42	1,128
1987-1988	74.89	74.56	996	44.80	65.79	1,469	119.69	140.35	1,173
1988-1989	82.03	95.64	1,166	45.64	74.28	1,628	127.67	169.92	1,331
1989-1990	81.40	100.99	1,241	45.37	70.05	1,544	126.77	171.04	1,349
1990-1991	80.78	99.44	1,231	47.06	76.95	1,635	127.84	176.39	1,380
1991-1992	78.02	91.59	1,174	43.85	76.79	1,751	121.87	168.38	1,382
1992-1993	77.92	101.47	1,302	45.23	78.01	1,725	123.15	179.48	1,457
1993-1994	75.81	100.40	1,324	46.94	83.86	1,787	122.75	184.26	1,501
1994-1995	75.19	101.09	1,344	48.67	90.41	1,858	123.86	191.50	1,546
1995-1996	73.60	95.12	1,292	47.42	85.30	1,799	121.02	180.42	1,491
1996-1997	75.34	103.92	1,379	48.24	95.52	1,980	123.58	199.44	1,614
1997-1998	74.15	101.58	1,370	49.70	90.68	1,825	123.85	192.26	1,552
1998-1999	73.99	102.91	1,391	51.18	100.69	1,967	125.17	203.60	1,627
1999-2000	73.24	105.51	1,441	49.87	104.29	2,091	123.11	209.80	1,704
2000-2001	75.22	102.09	1,357	45.83	94.73	2,067	121.05	196.81	1,626
2001-2002	74.23	112.07	1,510	48.55	100.78	2,076	122.78	212.85	1,734

Table 6. Seasonwise area, production, and yield of food grains (1966-1967 to 2006-2007) (continued)

Year	*Kharif*			*Rabi*			*Total*		
	A	*P*	*Y*	*A*	*P*	*Y*	*A*	*P*	*Y*
1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*
2002-2003	67.07	87.81	1,309	44.43	86.38	1,944	111.50	174.19	1,562
2003-2004	75.16	117.0	1,557	48.16	96.19	1,997	123.32	213.9	1,735
2004-2005	72.26	103.31	1,430	47.12	95.05	1,988	120.08	198.36	1,652
2005-2006	NA	109.87	NA	NA	98.73	NA	NA	208.6	NA
2006-2007	NA	108.36	NA	NA	103.42	NA	NA	211.7	NA

A: Area in million hectares

P: Production in million tons

Y: Yield in kg/ha

NA: Not available

Sources:

(1) From 1966-1967 to 2002-2003, Ministry of Agriculture and Co-operation.

(2) From 2003-2004 to 2006-2007, Business Beacon.

Table 7. Export value of agricultural and allied products (Rs crore)

Year	*Total exports*	*Value of agriculture and allied exports*	*Percentage share of agricultural exports in total exports*
March 1992	44,041.81	7,877.62	17.89
March 1993	53,688.26	9,081.93	16.92
March 1994	69,748.85	12,632.53	18.11
March 1995	82,673.40	13,269.42	16.05
March 1996	106,351.84	20,440.83	19.22
March 1997	118,817.32	24,362.57	20.05
March 1998	130,100.65	24,626.16	18.93
March 1999	139,751.77	25,387.33	18.17
March 2000	159,095.20	24,301.17	15.27
March 2001	201,356.45	27,288.19	13.55
March 2002	209,017.97	28,143.99	13.46
March 2003	255,137.28	32,473.34	12.73
March 2004	293,366.75	34,615.73	11.80
March 2005	375,339.53	38,078.11	10.14
March 2006	454,799.97	45,154.19	9.93

Source: CMIE Database, Business Beacon.

Table 8. Growth in the agricultural sector

Period	*Average annual growth of the agricultural sector*
1951-1961	3.3
1961-1971	2.2
1971-1981	1.7
1981-1991	3.9
1991-2001	2.8
2002-2007	2.3

Source: CMIE database, Business Beacon.

During the first decade of planning (1951-1961), the annual growth rate in agriculture was 3.3 percent. But during the second and third decades of planning (1961-1971 and 1971-1981), the annual average growth rate declined to 2.2 percent and 1.7 percent, respectively, mainly because of bad weather and poor monsoon conditions. The growth rate during the period 1981-1991 was 3.9 percent. But during the periods 1991-2001 and 2002-2007, the average annual growth rate declined to 2.8 percent and 2.3 percent, respectively. It shows that Indian agriculture remains in the vicious grip of unpredictable monsoons.

Agricultural producers cannot adjust production to the changing prices or demand as in the case of industrial products. Once a crop is raised, farmers have to allow the crop to grow and harvest it, regardless of changes in price levels. Even if prices fell, farm producers cannot think of stopping the growth of the crop in mid-cycle. Such an attempt would also result in loss. Since farm producers are not able to adjust production to the changing demand, they have no control over prices. Therefore, very often, farm producers are not able to get a fair price for their products. It is also very difficult to have a common understanding among a large number of farm producers in controlling the level of production and, in that way, in controlling supply and prices. In view of the special characteristics of agricultural products, marketing of agricultural produce is really a complex problem. Despite the phenomenal improvements in different aspects of rural marketing and credit, the rural poor still face some problems in both selling their products and also purchasing their requirements.

The working population of most underdeveloped countries exhibits heavy dependence on agriculture. In 1951, around 69.7 percent of the working population in India was employed in agriculture. In 1991, around 64.9 percent of the working population was absorbed in agricultural operations. This percentage decreased to about 60 percent in 1999. Hence, the dependence on agriculture seems to have declined only marginally. However, with rapid increase in population, the absolute number of people engaged in agriculture has become exceedingly large, while development of the other sectors of the economy has not been sufficient to provide employment to the increasing working populations. In 1999, 57 percent of the economically active population in Bangladesh, 68 percent in China, 48 percent in Pakistan, 4 percent in Japan and France, and 2 percent in the United States and the United Kingdom were engaged in agriculture. The size of India's population and the current rate of population growth will not allow this backward agrarian economy to be transformed into a modern industrial economy in the near future.

Table 9 makes it clear that from 1961 to 2001 there has been some decline in the average annual exponential growth rate of population. The rate of

population growth was 2.2 percent per annum in 1961-1971, which was still higher than that in the preceding decade. The 2001 census has shown that the rate of population growth remained as high as 1.93 percent per annum during the 1990s. According to the 1951 census, the country's rural population was 298.6 million. The rural population according to the 2001 census was 742.6 million. In a period of 50 years, the country's rural population increased by 444 million. In the same period, the cultivators have increased by 57.4 million. For the last 50 years, there has been a steady rise in the number of agricultural laborers—from 27.3 million in 1951 to 106.8 million in 2001.

Table 9. Population and agricultural workers (in millions)

Year	*Total population*	*Average annual exponential growth rate (%)*	*Rural population*	*Cultivators*	*Agricultural laborers*	*Total*
1	2	3	4	5	6	7
1951	361.10	1.25	298.60	69.90	27.30	97.20
			(-82.70)	(-71.90)	(-28.10)	(-100.00)
1961	439.20	1.96	360.30	99.60	31.50	131.10
			(-82.00)	(-76.00)	(-24.00)	(-100.00)
1971	548.20	2.22	439.00	78.20	47.50	125.70
			(-80.10)	(-62.20)	(-37.80)	(-100.00)
1981	683.30	2.20	523.90	92.50	55.50	148.00
			(-76.70)	(-62.50)	(-37.50)	(-100.00)
1991	846.40	2.14	628.90	110.70	74.60	185.30
			(-74.30)	(-59.70)	(-40.30)	(-100.00)
2001	1028.70	1.93	742.60	127.30	106.80	234.10
			(-72.20)	(-54.40)	(-45.60)	(-100.00)

Note: Figures in parentheses represent percentage to the total.

Source: Registrar General of India, New Delhi.

Since independence until the 1980s, the rate of increase in the output of food grains was a little higher than population growth rate. As against 2.2 percent per annum increase in population, food-grain production had increased at an average rate of 3.2 percent per annum. But there were years of crop failures and scarcities, and the food situation mostly remained grim. During the 1990s the rate of increase in food-grain production was 1.81 percent per annum as

against 1.93 percent per annum in population. Food-grain production lagged behind population growth during the 1990s. The very marginal increase in the per capita availability of food grains is largely attributable to the rapid rise of population. Increase in rural population also signifies that the share of family consumption in total food production will increase and much less will be left over as marketable surplus. Population projections show that India's total population is expected to touch 126.75 crore by 2016. Food-grain production is to be increased to 300 million tons before 2020 to balance the increase of population.

There is evidence that farmers face adverse demand conditions. Not only has agricultural growth been low in the last decade, the prices for agricultural products have also failed to keep pace with the cost or the general price levels, leading to decline in profitability. Several modeling exercises suggest that a 4 percent growth of agriculture will not be sustainable from the demand side unless aggregate GDP growth is much higher than 8 percent. The supply-side challenge of doubling agricultural growth is also formidable. This is especially so because no dramatic technological breakthrough comparable to the Green Revolution is in sight. In fact, most of the growth required in cereals, pulses, and oilseeds are possible merely through plausible yield increase in currently low yield regions. It is, however, necessary to identify the specific constraints and policy distortions that have produced these yield gaps.

The need for institutional credit arises from the weakness of private sources to supply credit to farmers. Private credit, particularly agricultural credit, is defective because it is based on a profit motive and is thus always exploitative; it is not related to land productivity and not available for a long period at lower rate of interest. Institutional credit is not exploitative and its basic motive is to help farmers raise productivity and maximize income. The rate of interest is not only relatively low but different for varying groups of farmers and purposes. The need for institutional credit exists on account of the failure of private agencies to supply adequate credit to farmers. The Tenth Five-year Plan (2002-2007) working group on agricultural credit estimates the requirement of credit at Rs 7,20,000 crore in five years ending 2007, or Rs 1,44,000 crore per annum on average. In 2001, the actual agricultural credit was Rs 60,000 crore. If the proposed 4 percent growth in agriculture is to be achieved, the agricultural credit system needs to be given high priority. The average growth in gross bank credit (GBC) in the sectoral deployment of credit (SDC) has been 17.9 percent per annum in 1996-1997 and in 2004-2005. The growth in credit was high in 2003-2004, and in 2004-2005 in most sectors. Priority sector credit has grown

by about 30 percent during both periods, with credit to agriculture recording growth rates of 26.4 percent and 35.2 percent, respectively [Roy 2006].

Table 10 shows that the institutional credit to agriculture (co-op banks, RRBs, and commercial banks combined) rose from Rs 69,560 crore in 2002-2003 to Rs 1,80,486 crore in 2005-2006, but it is expected to decline and touch the level of Rs 1,49,343 crore in 2006-2007. Besides substantial expansion in credit flow by RRBs and cooperative banks, commercial banks continue to be important institutional agencies for providing credit support to agriculture and allied activities. Commercial banks account for more than 60 percent in the credit flow for agriculture. Although institutional sources have increased their participation in rural credit, non-institutional sources of agricultural credit remain, and they offer credit at high rates of interest, especially in consumption credit and loans for unproductive purposes.

Table 10. Credit flow for agricultural and allied activities (Rs in crore)

Agency	*2002-2003*	*2003-2004*	*2004-2005*	*2005-2006*	*2006-2007**
Cooperative banks	23,716	26,959	31,424	39,404	33,174
RRBs	6,070	7,581	12,404	15,223	15,170
Commercial banks	39,774	52,441	81,481	1,25,859	1,00,999
Total	69,560	86,981	1,25,309	1,80,486	1,49,343

* Provisional

Source: NABARD.

The government's most important policy measures to curb the activities of moneylenders are the development of cooperative credit institutions and the greater participation of banks in rural credit. Rural indebtedness in India is a result of the social system or the relations of production prevailing in agriculture. The problem of farmer indebtedness persists in the post-independence period. The proportion of indebted farmers was 22.3 percent in 1981. It rose to 25.9 percent in 1991 and has now increased sharply to 57.2 percent.

Declaration in agricultural growth in the 1990s is regarded as one of the most important factors responsible for increasing indebtedness. Economic factors, like failure of commercial crops and failure of investment in bore wells, are responsible for farmers' heavy debts. The main reason for farmer suicides in many states is their overweening dependence on non-institutional sources of credit.

5. Future strategy

There is need to raise farm productivity, especially in the vast rain-fed areas. If India's GDP is to rise by 9 percent a year, agriculture must grow by at least 4 percent. Improved seeds can play an important role in increasing productivity. Use of improved seeds and fertilizers requires proper irrigation facilities. Farmers should be educated in the methods of sowing, manuring, and irrigating the new high-yield varieties of seeds. The government has to take steps toward a phased modernization of irrigation systems, efficient water management, adequate maintenance of canals and distribution systems, surveys and investigations for preparation of new projects, and developing a national grid system to ensure water supply from water-surplus areas to water-deficit areas, etc. As a policy initiative in the 2007-2008 budget, the Accelerated Irrigation Benefit Programme has been revamped in order to complete more irrigation projects in the quickest possible time. As against an outlay of Rs 7,121 crore in 2006-2007, the outlay for 2007-2008 has been increased to Rs 11,000 crore. It shows the high priority government is giving for the irrigation sector to raise farm productivity.

Besides crop farming, stress should be given to the promotion of livestock farming, horticulture, fodder plantation, and grassland development. A "multilayered approach" should be adopted, with proper financial and technical support so that the farmers are protected from the vagaries of nature and employment in rural areas. The national horticulture mission was launched in May 2005 as a major initiative to bring about diversification in agriculture and augment farmers' incomes through cultivation of high-value horticulture crops. The National Horticulture Mission aims at doubling horticulture production by 2012.

Acreage under horticulture—which includes fruits, vegetables, spices, floriculture, and plantations—is expected to reach 20 million hectares in 2006-2007 [Ministry of External Affairs 2007]. To correct the defects of rural marketing, the markets should be very near the villages, with adequate facilities for grading, weighing, and storage of all commodities. The regulated markets should be strengthened in terms of adequate market yard, market functionaries, warehousing and storage facilities, etc. Extension education in marketing should be improved through regulated markets, primary cooperative marketing societies, and farmers' servicing societies. An efficient marketing system helps increase the disposable incomes of rural people, which in turn generates markets for manufactured products. In 1951, there were more than 200 regulated markets in India; as of March 31, 2006, over 7,566 agricultural markets in the country had been regulated. The marketing of agricultural product through cooperatives

has registered a remarkable growth. In the course of cooperative marketing development, a three-tier cooperative marketing structure has emerged, with a network of nearly 6,000 primary marketing cooperatives, 29 state cooperative marketing federations, and 16 state-level commodity cooperative marketing federations, with the National Agricultural Cooperative Marketing Federation (NAFED) at the top. Several state/UT governments have initiated steps for amending the Agricultural Produce Marketing Committee (APMC) Act to benefit from market reforms.

Agricultural credit services have not fully reached the target group. The lack of coordination between different agencies operating in the same area has resulted in multiple financing, overfinancing in some areas, and underfinancing in others. Lending institutions face the major problem of unsatisfactory levels of overdues. Cooperative credit still forms a small portion of the total borrowing of the farmers, and these lending agencies are unable to ensure adequate and timely credit for the farmers due to their weak financial position. To make agricultural credit services more effective, there is need for coordination between various financial institutions to avoid multiple financing. The banks should educate the farmers and get them into the habit of regular repayment. The banks should develop a suitable set of rules and procedures to determine the circumstances in which defaults might be condoned on account of crop failures and the manner in which the farmer-borrower might be given relief. Banks should extend credit to small and poor farmers, i.e., the target group, and should cover more tribal areas. Credit at minimum rates of interest helps break the cycle of low investment, high cost, and low returns. In 2006 (until December 2006), 53.37 lakh new farmers were brought into the institutional credit system. A target of Rs 225,000 crore as farm credit and an addition of 50 lakh new farmers to the banking system have been fixed for 2007-2008. The 2 percent interest subvention scheme for short-term crop loans will persist in 2007-2008, and a provision of Rs 1,677 crore has been made for this purpose [Ministry of External Affairs 2007]. Government has to take necessary steps to make the cooperative sector vibrant once again.

Contract farming should be encouraged to raise high-value crops on small farms. The cost of procuring and distributing food grains should be lowered by decentralizing the food corporation of India and making the public distribution system the responsibility of state governments. Government has to take steps to facilitate greater private-sector investment in agriculture. Government is actively working toward this direction. The agricultural development strategy should aim at increasing the value added per hectare, improving the productivity of agricultural inputs and irrigation, preventing environmental and ecological

degradation, and supporting farmer self-help institutions. Providing free power to farmers may lead to overutilization of groundwater, resulting in decline of groundwater level.

With economic progress and the consequent diversification of the production base, the share of agricultural goods in total exports has consistently fallen. There is need to harmonize domestic standards with international standards, lay down standards for products where there are none but are necessary, and revise the current standards to meet the changing requirements. Toward this end, the revision of standards for spices and basmati rice is under way. Keeping the potential of this sector in view, there is considerable scope for increasing the share of agriculture and food products in total exports.

A new agricultural price policy shall ensure that minimum support prices cover only the variable cost of crop production and are to be applied only to high-risk crops. Minimum support price and procurement prices should be distinguished. Minimum support prices should be extended through crop insurance for crops of limited importance and all high-risk crops. Coordination between central government and state governments ensures greater coordination between agricultural price policy and agricultural trade policy.

Large investments in agriculture are required for the growth of infrastructural facilities like irrigation, rural roads, market, power, cold storages, etc. The share of public investment in total investment in agriculture was 29.60 percent in 1990-1991 (at 1993-1994 price). This share declined to 25 percent in 1997-1998 and further to 24.40 percent in 1999-2000. The share of public investment in total investment in agriculture was 17.7 percent in 1999-2000 (at 1990-2000 prices). This share increased to 20 percent in 2003-2004 and further to 24.2 percent in 2005-2006. Private investment in agriculture has been more than compensating for the decline in public investment. Private investment in agriculture increased from Rs 35,757 crore in 1999-2000 to Rs 41,320 crore in 2005-2006. Investment in agriculture as a percentage of GDP was 2.2 percent in 1999-2000. This fell to 1.9 percent in 2005-2006. Decline in public investment in agriculture is mainly due to the diversification of resources in the current expenditure in the forms of subsidies for food, fertilizers, electricity, irrigation, credit, and other agricultural inputs rather than on creation of assets. Reduction in subsidies will free up public funds that can be used for investment purposes. The fiscal compulsions for reform in the input sectors are already very strong and will become even more compelling in the future.

State governments have to take the initiative in computerizing land records, which helps reduce transaction costs and promote transparency. Public-private partnership in agricultural research must be encouraged.

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