1

Agriculture

INTRODUCTION

1.1 Although its share in Gross Domestic Product (GDP) has declined from over half at Independence to less than one-fifth currently, agriculture remains the predominant sector in terms of employment and livelihood with more than half of India's workforce engaged in it as the principal occupation. Agriculture still contributes significantly to export earnings and is an important source of raw materials as well as of demand for many industries.

1.2 India's agriculture sector has an impressive long-term record of taking the country out of serious food shortages despite rapid population increase. This was achieved through a favourable interplay of infrastructure, technology, extension, and policy support backed by strong political will. The main source of long-run growth was technological augmentation of yields per unit of cropped area. This resulted in tripling of foodgrain yields, and foodgrain production increased from 51 million tonnes in 1950–51 to 217 million tonnes in 2006–07. Production of oilseeds, sugarcane, and cotton have also increased more than four-fold over the period, reaching 24 million tonnes and 355 million tonnes and 23 million bales, respectively, in 2006–07.

1.3 But, although GDP from agriculture has more than quadrupled, from Rs 108374 crore in 1950–51 to Rs 485937 crore in 2006–07 (both at 1999–2000 price), the increase per worker has been rather modest. GDP per agricultural worker is currently around Rs 2000 per month, which is only about 75% higher in real terms than in 1950 compared to a four-fold increase in overall real per capita GDP. While slower growth of GDP in agriculture than non-agriculture is expected, the main failure has been the inability to reduce the dependence of the workforce on agriculture significantly by creating enough non-farm opportunities to absorb the labour surplus in rural areas and equipping those in agriculture to access such opportunities. Half of those engaged in agriculture are still illiterate and just 5% have completed Higher Secondary education. Incomes and education are of course least among agricultural labourers. Even families operating farms now suffer from much smaller holdings (70% below 1 hectare in 2003 compared to 56% in 1982), and farming members in such families are twice as likely to be illiterate as non-farming members. Ensuring food security and farmer welfare thus require support systems to extend technology and scale benefits in a sustainable manner to a huge existing workforce in agriculture that lacks non-farm skills and is also ageing and getting feminized.

RECENT TRENDS AND CONCERNS

1.4 The Mid-Term Appraisal (MTA) for the Tenth Five Year Plan had drawn attention to the loss of dynamism in agriculture and allied sectors after the mid-1990s. In fact, during the last decade or so Indian agriculture has faced a number of severe challenges, superimposed on the long-term demographics. Recent

trends that have raised concern regarding food security, farmers' income, and poverty are:

- Slowdown in growth.
- Widening economic disparities between irrigated and rain-fed areas.
- Increased vulnerability to world commodity price volatility following trade liberalization. This had an adverse effect on agricultural economies of regions growing crops such as cotton and oilseeds.
- Uneven and slow development of technology.
- Inefficient use of available technology and inputs.
- Lack of adequate incentives and appropriate institutions.
- Degradation of natural resource base.
- Rapid and widespread decline in groundwater table, with particularly adverse impact on small and marginal farmers.
- Increased non-agricultural demand for land and water as a result of the higher overall GDP growth and urbanization.
- Aggravation in social distress as a cumulative impact of the above, reflected in an upsurge in farmers' suicides.

1.5 Growth of agricultural GDP decelerated from over 3.5% per year during 1981–82 and 1996–97 to only around 2% during 1997–98 and 2004–05 (see Table 1.1). This deceleration, although most marked in rain-fed areas, occurred in almost all States and covered almost all major sub-sectors, including those such as horticulture, livestock, and fisheries where growth was expected to be high (see Table 1.3). Consequently, growth of agricultural GDP has been well below the target of 4% set in both Ninth and Tenth Plans. In fact, Tenth Plan growth averaged even less than that during

TABLE 1.1
Average GDP Growth Rates—Overall and in Agriculture
(% per Year at 1999–2000 Price)

Period	Total Economy	Agriculture and Allied Sectors	Crops and Livestock
1. Pre-green revolution 1951–52 to 1967–68	3.69	2.54	2.65
2. Green revolution period 1968–69 to 1980–81	3.52	2.44	2.72
3. Wider technology dissemination period 1981–82 to 1990–91	5.40	3.52	3.65
4. Early reforms period 1991–92 to 1996–97	5.69	3.66	3.68
5. Ninth Plan 1997–98 to 2001–02	5.52	2.50	2.49
6. Tenth Plan period 2002–03 to 2006–07	7.77	2.47	2.51
of which 2002–03 to 2004–05	6.60	0.89	0.89
2005–06 to 2006–07	9.51	4.84	4.96

Source: National Accounts Statistics 2008 (New Series), Central Statistical Organization, Ministry of Statistics and Programme Implementation, New Delhi.

TABLE 1.2
Growth Rates of National State Domestic Product (NSDP) from Agriculture
(States Ranked by % of Rainfed Area)

State	Growth Rate in NSDP Agriculture		Rainfed (%)	State	Growth Rate in NSDP Agriculture		Rainfed (%)
	1984–85 to 1995–96	1995–96 to 2004–05			1984–85 to 1995–96	1995–96 to 2004–05	
1	2	3	4	5	6	7	8
Punjab	4.00	2.16	3	Gujarat	5.09	0.48	64
Haryana	4.60	1.98	17	Rajasthan	5.52	0.30	70
Uttar Pradesh	2.82	1.87	32	Orissa	–1.18	0.11	73
Tamil Nadu	4.95	–1.36	49	Madhya Pradesh	3.63	–0.23	74
West Bengal	4.63	2.67	49	Karnataka	3.92	0.03	75
Bihar	–1.71	3.51	52	Maharashtra	6.66	0.10	83
Andhra Pradesh	3.18	2.69	59	Kerala	3.60	–3.54	85
All-India	3.62	1.85	60	Assam	1.65	0.95	86

Source: National Accounts Statistics, (State Series) Central Statistical Organization, Ministry of Statistics and Programme Implementation, New Delhi.

TABLE 1.3
Growth Rate in Output of Various Sub-sectors of Agriculture
(Gross Value of Output at 1999–2000 Price)

Period	Cereals	Pulses and Oilseeds	Fruits and Vegetables	Other Crops	All Crops	Livestock	Fishery
1951–52 to 1967–68	4.19	2.98	2.67	2.42	3.00	1.02	4.68
1968–69 to 1980–81	3.43	0.97	4.82	2.98	3.00	3.26	3.08
1981–82 to 1990–91	3.52	5.41	2.84	1.71	2.97	4.78	5.74
1991–92 to 1996–97	2.36	2.92	6.07	2.18	3.09	4.00	7.05
Ninth Plan 1997–98 to 2001–02	1.49	–1.43	4.11	3.82	2.25	3.53	2.63
Tenth Plan 2002–03 to 2006–07	1.28	4.29	2.97	3.58	2.46	3.69	3.23
of which 2002–03 to 2004–05	–1.27	5.95	0.30	1.57	0.42	3.32	1.77
2005–06 to 2006–07	3.52	1.61	6.97	6.59	5.53	4.23	5.49

Source: New Series of National Accounts Statistics, Central Statistical Organization, Ministry of Statistics and Programme Implementation, New Delhi.

Ninth Plan because, as was noted in the MTA, growth plummeted to below 1% during its first three years, that is from 2002–03 to 2004–05. There has been some upturn since then and growth has averaged more than 4% in the subsequent two years, with early indications that this is likely to be maintained in 2007–08 also. This revival gives hope that at least some of the causes of recent poor agricultural performance are being reversed and that the Eleventh Plan target, set at 4%, may actually be attainable.

1.6 The improved performance in the second half of Tenth Plan is a welcome development, but there is no reason for complacency. Not only is the period too short to reach firm judgment on trends, the prolonged deceleration over several years has meant that despite the improvements, per capita output of cereals, pulses, oilseeds, and also of some major vegetables and fruits (e.g., potatoes and bananas) in 2006–07 remained below 1996–97 levels. Moreover, despite significant imports, food prices flared up in 2006. This was unlike during 2000–05 when, although production was even lower, prices remained subdued because of low domestic demand and depressed world prices. Part of the recent production upturn is clearly price-led, following a marked hardening of world commodity prices and possibly also responding to the fact that domestic food demand has responded positively to higher overall GDP growth and the introduction of Rural Employment Guarantee. However, although important in the short-run, such price response alone cannot be the basis of sustained agricultural growth at 4%. The recent trend towards diversion of food crops for biofuels in surplus countries means that food security needs a stronger production response based on tackling supply side problems in the foodgrains sector.

1.7 The supply side performance of agriculture is affected by a large number of factors, several of which interact among each other. These factors are the natural resource base (including rainfall), technology, infrastructure (including irrigation), and the economic environment comprising price signals and institutions (Table 1.4). Analysis by the Steering Group for the Eleventh Plan has identified technological change (using yield potential of varieties of major crops released by the National Agricultural Research System [NARS] as a proxy), public investment (including investment on irrigation), and diversification (represented by area under fruits and vegetables) as the most important proximate determinants of growth. The Steering Group analysis shows (Table 1.4) that progress on first two of these factors slowed down from early 1990s. However, the negative effect in growth was offset by private investment, which was the fourth most important factor in the analysis, because the terms of trade, which affect profitability and thus private investment, improved during 1990–97. As a result, growth continued to be relatively high in this period. However, terms of trade turned against agriculture from 1999–2000 to 2004–05 and reduced profitability of farming quite sharply. This occurred partly because of low domestic food demand and partly because removal of quota

TABLE 1.4
Trend Growth Rate in Area, Input Use, Credit and Capital Stock in Agriculture—1980–81 to 2005–06

(% per Year)

Period	1980–81 to 1990–91	1990–91 to 1996–97	1996–97 to 2005–06
Technology#	3.3	2.81	0.00
Public sector net fixed capital stock	3.86	1.92	1.42*
Gross irrigated area	2.28	2.62	0.51*
Electricity consumed in agriculture	14.07	9.44	–0.53@
Area under fruits and vegetables	5.60	5.60	2.71@
Private sector net fixed capital stock	0.56	2.17	1.17*
Terms of trade	0.190	0.95	–1.69*
Total net fixed capital stock	2.00	2.06	1.28*
NPK use	8.17	2.45	2.30
Credit supply	3.72	7.51	14.37*
Total cropped area	0.43	0.43	–0.10
Net sown area	–0.08	0.04	–0.22
Cropping intensity	0.51	0.39	0.12

Note: # Yield potential of new varieties released of paddy, rapeseed/mustard, groundnut, wheat, maize, and cotton; * Upto 2003–04; @ Upto 2004–05.

restrictions under World Trade Organization (WTO) made Indian farm prices to become more aligned with corresponding international prices at a time when these were in decline. Private investment in agriculture stagnated as a result, the area cultivated fell, and diversification slowed down—all leading to deceleration. Moreover, public investment remained low and technology generation became negligible. Cutbacks following the Fifth Pay Commission in 1997 may have contributed to the problem as these cutbacks severely weakened the reach of critical support institutions—notably co-operatives, seed farms, and the extension system.

1.8 An important reason for recent farm distress was that after improving steadily from 1980 to 1997, terms of trade turned against agriculture from 1999 and, almost for the first time in post-independent India, farm prices actually fell at the same time that farm production decelerated. This not only depressed incomes, but also increased farm debt considerably. More generally, farmers are now subject to greater risk because variability of world prices is much higher than what Indian farmers have been used to in the past. There is need to evolve a clear policy on how to deal with this situation and some suggestions are made later in this chapter.

1.9 In the meantime, commodity futures markets that can potentially reduce price variability have grown massively in crop coverage and trading volume. At Rs 36.76 lakh crore in 2006–07, futures volumes now far exceed the volume of actual physical trade in agricultural commodities. But direct participation of farmers is negligible and price volatility does not appear to have reduced. A reason why futures markets are not being able to perform efficiently could be that these markets are very new and still in a learning phase. Quality specifications, delivery norms, margin, and lot size of most commodities traded at the bourses make it difficult for the average farmers to directly participate in exchange trading as hedgers. There is also a need to look at legal and regulatory regime and modify these to enable direct farmers' participation. For example, the passage of the Warehousing (Development and Regulation) Act 2006 makes possible the introduction of a regulated system of warehouse receipts which, along with investment in rural marketing infrastructure, can improve the effective reach of futures trading. Besides the poor direct participation of farmers, which is not unusual, available evidence is also that indirect benefit through reduced spot price volatility has been insignificant so far and the cash–future linkage is not very strong. However, futures markets do appear to have better integrated different spot market

prices with each other and with world prices. This can benefit farmers by reducing local monopsony power, but it can also be problematic if the policy objective is to insulate domestic prices from full variability of world prices. Unless trade policy is broadly predictable in advance, futures can too quickly transmit international price shocks leading to controversy and knee-jerk reactions.

1.10 Another important development of market institutions is the rise of modern food retailing which offers the prospect of lower marketing costs and reduced spoilage leading to lower prices for consumers and higher realization for farmers. Modern retailing has become controversial partly because those involved in existing trading mechanisms feel their vested interests threatened. However, although there is room for mutually beneficial modernization in this area and this will undoubtedly evolve, a legitimate area of concern is that if front-end investment outpaces the backward linkage with farmers, the immediate outcome may simply be higher imports and lower farm prices. Clearly, efforts must be made to ensure more efficient spot and futures markets and more rapid development of the backward farm linkages of retailing.

1.11 An unfortunate trend over the past two decades has been that expenditure control efforts following fiscal shocks such as the Pay Commissions awards have led to cutbacks in agricultural investment and extension, but not in subsidies. Budgetary subsidies to agriculture have increased from around 3% of agriculture GDP in 1976–80 to about 7% in 2001–03. During the same period, public investment in agriculture declined from over 4% of agriculture GDP to 2%. Most of the subsidies are on fertilizer, power, and irrigation water and these have actually contributed to the degradation of natural resources. Further, a considerable amount of Plan expenditure on agriculture is not on investment but on subsidies not accounted for in the above list. Simplistic fiscal rules such as protecting Plan expenditures more than non-Plan expenditures add to the problem. For example, although the Plan share in States' total expenditure on agricultural and allied sectors has improved considerably from a low just after Fifth Pay Commission, much of this represents increase in Plan subsidies at the cost of essential staff, particularly in the extension system and the co-operative sector. With hindsight, it appears that the policy of restraining new hiring may have been excessive, as is evident from the age composition and high vacancies among extension staff and reduced reach of co-operatives. Even a relatively small percentage reduction in subsidies can finance relatively large increase in public investment in crucial areas such as soil amelioration, watershed development, groundwater recharge, surface irrigation, and other infrastructure and can also allow substantial expansion in the reach of critical farm support systems.

1.12 Nonetheless, an important policy gain of recent years is the turnaround in public investment in later years of the Tenth Plan, reversing years of decline. Overall capital formation in the sector is now 12% of agricultural GDP, which is the highest in 25 years. This must have contributed to the recent upturn in growth. But figures in Table 1.5 also imply that Incremental Capital Output Ratio has risen from about 2.5 to around 4. Unless efficiency of investment is restored, investment would need to increase much further, to about 16% of agricultural GDP, to achieve the 4% agricultural growth target.

1.13 In light of the above, the Eleventh Plan certainly needs to increase public investment further, from 3% of agricultural GDP to about 4%. But it also needs to do much more to ensure that future growth is more efficient, sustainable, and inclusive. This can be achieved by focusing on the following:

- With availability of land and water fixed, growth in agriculture can be achieved only by increasing productivity per unit of these scarce natural resources through effective use of improved technology. The research system has so far focused mainly on breeding varieties that increase the yield potential of individual crops by enabling more intensive use of inputs. Although such research did increase potential yields substantially in the past, it put less emphasis on efficient and sustainable use of soil nutrients and water, or on identifying location-specific farming systems with proper mix of crops and livestock, especially for rain-fed areas. Besides, the potential yields of new varieties being released

TABLE 1.5
Investment in Agriculture
(Rs in Crore at 1999–2000 Price)

Year	GDP from Agriculture	Gross Capital Formation (GCF) in Agriculture			GCF in Agriculture as % of GDP from Agriculture		
		Public Sector	Private Sector	Total	Public Sector	Private Sector	Total
1980–81 to 1984–85	239678	12007	13132	25139	5.0	5.5	10.5
1985–86 to 1989–90	274034	9601	14370	23971	3.5	5.2	8.7
1990–91 to 1994–95	325957	7915	19348	27263	2.4	5.9	8.4
1995–96 to 1999–2000	383330	7724	22631	30354	2.0	5.9	7.9
2000–01	407176	7155	31872	39027	1.8	7.8	9.6
2001–02	433475	8746	39468	48215	2.0	9.1	11.1
2002–03	398206	7962	38861	46823	2.0	9.8	11.8
2003–04	441360	9376	35457	44833	2.1	8.0	10.2
2004–05	441183	12273	36835	49108	2.8	8.3	11.1
2005–06	468013	15006	39899	54905	3.2	8.5	11.7
2006–07	485939	17749	43013	60762	3.7	8.9	12.5

Source: National Accounts Statistics 2008 (New Series), Central Statistical Organization, Ministry of Statistics and Programme Implementation, New Delhi.

seem to have plateaued suggesting that the current system is no longer leading to adequate outcomes. This 'technology fatigue' has to be countered by changing research priorities suitably.

- At the same time, frontline trials of various research departments provide clear evidence of large gaps between what can be attained at the farmer's field with adoption of available technology as compared to what is obtained with existing practices. Exploiting this potential must be the main source of yield growth in the Eleventh Plan because overcoming technology fatigue will take time. Moreover, since yield gaps vary considerably from crop-to-crop and from region-to-region, the strategy must enable specific plans for each agro-climatic region. As Table 1.6 shows, constraints vary considerably even by very aggregate zones. This will also require much stronger links between research, extension, and farmers.
- The pressing need to accelerate agriculture growth should not be at the cost of sustainability of our natural resource base, which is starkly limited. Deforestation has affected both soils and water and this is compounded by soil degradation and overexploitation of groundwater. Besides watershed development in watersheds where agriculture is important, a concerted effort is needed to afforest upper catchments at higher elevations of river basins. In addition to erosion, salinity, and alkalinity, soils are losing soil carbon and micronutrients due to irrational and unbalanced fertilizer use (Table 1.6). This must be addressed urgently since this directly affects input use efficiency. The seriousness of the problem can be seen from the fact that nearly two-thirds of our farmlands are in some way either degraded or sick and only about one-third are in good health. Rapid expansion of groundwater use for irrigation was a key factor in the relatively rapid growth of agriculture between the mid-1960s and late 1980s. But further expansion should be strictly monitored, especially in regions where aquifer levels have dropped causing concern about future sustainability. Action on the environmental front cannot wait in face of a possibly looming adverse climate change due to global warming.

1.14 For growth to be at all inclusive, the agricultural strategy must focus on the 85% of farmers who are small and marginal, increasingly female, and who find it difficult to access inputs, credit, and extension or to market their output. While some of these farmers may ultimately exit from farming, the overwhelming majority will continue to remain in the sector and the objective of inclusiveness requires that their needs are attended to. For example, credit has grown at unprecedented rates (30% per annum) to other sectors but not to small and marginal land holders and women who lack collateral security. Besides issues such as rights to land (especially for women), it is now well recognized that the poor are best empowered if they function as a group rather than as individuals. Hence there

TABLE 1.6
Region-specific Factors Causing Low Productivity

Agro-climatic Region	States/Parts of States	Region-specific Constraints
Western Himalayan region-I	J&K, HP, Uttaranchal	Severe soil erosion, degradation due to heavy rainfall/floods and deforestation, low SRRs, poor road, poor input delivery, inadequate communication infrastructure and marketing
Eastern Himalayan region-II	Assam, NE States, Sikkim	Aluminium toxicity and soil acidity, soil erosion and floods, shifting cultivation, low SRRs, non-availability of electricity, poor road, poor input delivery system and communication infrastructure
Lower and middle gangetic plains regions-III and IV	West Bengal, Bihar, Eastern UP	Flood/water logging, improper drainage, salinity/alkalinity, arsenic contamination, low SRRs, non-availability of electricity, high population growth, poor road and communication infrastructure
Upper and trans-gangetic plains region-V and VI	Western UP, Punjab, Haryana	Groundwater depletion, decreasing total factor productivity, micronutrient deficiency, non-availability of electricity, and high population density
Eastern plateau and hills region-VII	Orissa, Jharkhand, Chhattisgarh	Moisture stress, drought, and soil acidity, iron toxicity, low SRRs, non-availability of electricity, high population growth, poor road, poor input delivery and communication infrastructure

Source: Cited in Report of the Working Group of Sub-Committee of National Development Council on Agriculture and Related Issues on Region/Crop Specific Productivity Analysis and Agro-Climatic Zones, Planning Commission, Government of India (February 2007).

is a need to encourage a 'group approach' for the poor and for women to reap economies of scale and be effective farmers. A group approach could also improve the bargaining power of small cultivators in contract farming. The few examples where small and marginal farmers have benefited from contract farming are those where they have entered into contracts collectively rather than individually. In Punjab, Mahindra Shubhlabh Services Ltd followed this approach for maize farming with a number of safeguards for risk protection, etc., built in. Again in South India, the United Planter's Association of South India signed contracts with women's self-help groups (SHGs) for tea cultivation. One way forward to encourage marginal farmers and women to form groups for purposes of farming would be to shift at least some of the current subsidies to be available only to groups of such farmers rather than to individuals.

TENTH PLAN OUTLAYS AND EXPENDITURE

1.15 Against the projected Tenth Plan outlay of Rs 58933 crore on agriculture and allied sectors, the utilization is about the same as outlay in current price but likely to be only around 84% at the 2001–02 price. The utilization in the case of irrigation and flood control sector is also of the same order, that is 85%. In both the cases, much larger shortfalls in the first two years of the Plan were made up in subsequent years. Plan outlays in agriculture and allied sectors and in irrigation and flood control for the Centre, States, and union territories (UTs) are presented in Annexure 1.1.

1.16 The progress of outlay and expenditure during the Plan period for the three departments of the Union Ministry of Agriculture (MoA), namely, the Department of Agriculture and Co-operation (DAC), the Department of Animal Husbandry, Dairying, and Fisheries (DAHDF), and the Department of Agricultural Research and Education (DARE) is given in Table 1.7.

1.17 As may be seen, a substantial increase in outlay was provided to the Ministry of Agriculture since 2004–05 taking the Central Government's share of total plan expenditure on agriculture and allied sectors (Centre and States) from 33% in 2002–03 to 44% in 2006–07. The Ministry has introduced several new programmes during Tenth Plan aimed at diversification of agriculture, strengthening technology validation, demonstration and dissemination, water saving, and development of infrastructure. These include:

- The National Horticulture Mission (NHM) approved by the Cabinet Committee on Economic

TABLE 1.7
Outlay and Expenditure of Ministry of Agriculture during the Tenth Five Year Plan

(Rs Crore)

S. No.		Current Price				2001–02 Price			
		DAC	DAHDF	DARE	TOTAL	DAC	DAHDF	DARE	TOTAL
1.	Tenth Plan outlay (2002–07)*	13200.00	2500.00	5368.00	21068.00	13200.00	2500.00	5368.00	21068.00
2.	2002–03 (Expenditure)#	1655.94	238.90	650.75	2536.95	1593.9	221.6	626.4	2441.9
3.	2003–04 (Expenditure)#	2050.34	271.76	748.98	3068.67	1901.4	249.8	694.6	2845.8
4.	2004–05 (Expenditure)#	2656.26	566.22	816.01	4035.72	2360.2	500.6	725.1	3585.9
5.	2005–06 (Expenditure)#	3817.46	589.37	1046.75	5453.37	3247.5	501.2	890.4	4639.2
6.	2006–07 (RE)#	4860.00	679.32	1430.00	7040	3909.1	603.2	1150.2	5662.5
7.	Total expenditure	15040.00	2345.57	4692.49	22134.71	13012.1	2076.5	4086.7	19175.4
8.	Total expenditure as % of Tenth Plan outlay	114%	94%	87%	105%	99%	83%	76%	91%
9.	2007–08 BE	5520.00	910.00	1600	8030	–	–	–	–

Note: RE = Revised Estimate, BE = Budget Estimate.
Sources: * Tenth Five Year Plan (2002–07), Planning Commission, Government of India; # Union Expenditure Budgets, Vol. I, Ministry of Finance, Government of India, from 2002–03 to 2007–08.

Affairs (CCEA) on 19 May 2005 became operational during 2005–06.

- The government approved a Centrally sponsored 'Micro Irrigation' programme to help spread the network of water-saving implements such as sprinkler and drip irrigation throughout the country.
- A National Gender Resource Centre in Agriculture was set up in the directorate of extension as a focal point for convergence and co-ordination of gender-related issues within the DAC.
- Jute Technology Mission was approved in June 2006.
- The National Agricultural Innovation Project was launched by the Indian Council for Agricultural Research in July 2006. A National Fund for Basic and Strategic Research in Agricultural Sciences has also been set up in 2005–06. Both these will support agricultural research in project mode.
- The National Fisheries Development Board (NFDB) was formally set up at Hyderabad in September 2006 with the main objectives of bringing major activities relating to fisheries and aquaculture for focused attention and professional management.
- A new Centrally sponsored scheme (CSS) 'National Mission on Bamboo Technology and Trade Development' was approved in October 2006.
- The government decided to set up a Krishi Vigyan Kendra (KVK) in each rural district (578) in the country. So far over 537 KVKs have been established. These Kendras disseminate farm technologies to farmers and provide training to enhance the productivity and hence the income earning capacity of the farmers.
- Technology dissemination efforts are being strengthened further by establishing Agriculture Technology Management Agencies (ATMAs), which are autonomous bodies for extension planning and reform, in 252 districts. These will be extended to all rural districts.
- The National Rainfed Area Authority (NRAA) was constituted as an expert body to bring technical focus to problems of rainfed agriculture and to advise on design and convergence of various watershed development schemes.
- The Constitution (106th) Amendment Bill 2006 in respect of co-operatives was introduced in Lok Sabha on 22 May 2006.
- The government approved a rehabilitation package amounting to Rs 16978.69 crore for the farmers in distress in 31 selected districts in the four States, namely, Andhra Pradesh, Karnataka, Kerala, and Maharashtra. The package comprises relief from the Prime Minister's Relief Fund, strengthening institutional credit support, irrigation development, promotion of micro irrigation, watershed development, extension services, enhancing seed replacement rate (SRR) and income augmentation through horticulture, livestock, and fishery in these districts.

AREAS OF CONCERN IN IMPORTANT EXISTING PLAN SCHEMES

1.18 Among major ongoing schemes of DAC, the largest is the Macro Management Scheme (MMA) which was initiated in 2000–01 by integrating 27 CSS so as to provide flexibility to the States to develop and pursue a mix of activities on the basis of their regional priorities. The approved pattern of assistance is in the ratio of 90:10 for the Centre and the States, respectively, except in the case of North Eastern States that get 100% Central assistance. With the launching of NHM in the year 2005–06, 10 schemes pertaining to horticulture development were taken out of the purview of this scheme. An evaluation of the scheme (in August 2004) by three institutions, namely, the Indian Institute of Management, Kolkata, the National Bank for Agriculture and Rural Development (NABARD) Consultancy Services Limited, and the Agricultural Finance Corp. Ltd brings out that the objective of flexibility was achieved but the work plans prepared by the States did not necessarily originate from the grass root level. These were generally prepared in a top-down process, and often did not reflect State priorities, thrust areas, and the initiatives for agricultural development. Further, there appeared to be lack of co-ordination among different departments. The funds were mainly retained by the nodal department, that is the Agriculture Department, resulting in neglect in some of the States of the schemes that were in the areas of Natural Resources Management and Co-operative Departments.

1.19 The Technology Mission on Oilseeds, Maize, Oil palm, and Pulses is being implemented for two decades for oilseeds. Pulses, oil palm, and maize were brought under the ambit of the mission in 1990–91, 1992, 1995–96. Although there has been a fairly substantial increase in production of oilseeds since its inception in 1986, domestic production of oilseed is short of the demand of edible oils in the country. The pulses production in the country has continued to be stagnant for decades suggesting that the pulses mission has not been effective.

1.20 Crop insurance was introduced in the country two decades ago. The present version, the National Agricultural Insurance Scheme (NAIS) has been available since 1999–2000. The Scheme's coverage is limited to a few States and a few crops only. If NAIS is to be retained, it is important to impart a measure of permanency to the Scheme by shifting it to non-Plan, with banks that are its principal beneficiaries contributing to the subsidy. If so, new additional actuarial schemes with subsidy on premia, involving larger number of service providers and wider menu of insurance products, can be considered for Plan financing. Some further details of agricultural insurance have been discussed later in the chapter.

1.21 The National Project on Cattle and Buffalo Breeding is the flagship scheme of DAHDF. Initiated in October 2000 for a period of 10 years, this envisages genetic upgradation of indigenous cattle and buffaloes, development and conservation of important indigenous breeds, and to evolve sustainable breeding policy. The project is being implemented by State Implementing Agencies (SIAs) in 26 States and 1 UT. This scheme suffers from many shortcomings, particularly quality of progeny bulls and inadequate attention to tagging and registry. Further, feed and fodder are a perennial problem for exotic breeds and efforts made during the Tenth Plan to improve feed and fodder resources for livestock were not very successful. The performance of the Central Fodder Development Organization was evaluated by The Centre for Management Development, Thiruvanthapuram and found to be unsatisfactory. Moreover, with the completion of 'Operation Flood' Project by National Dairy Development Board (NDDB), the pace of investment in dairy sector has slowed down. The allocation for dairy development by the Central and State Governments has also diminished over the last two plans. Assistance from Government of India under CSS, Intensive Dairy Development Programme, has gone to non-viable areas without conducting proper feasibility studies and has been implemented without proper technical supervision. Delicensing and the subsequent decision to do away with the concept of milk sheds were expected to boost private sector investment in dairying, but this has not happened. Furthermore, there appears to have been no concentrated efforts to invest in technology for development of value-added and innovative milk products. Consequently, in the first four years of the Tenth Five Year Plan, the growth rate of milk has been less than 3% per annum.

CHALLENGES FOR THE ELEVENTH PLAN

Agricultural Research

1.22 The major challenges facing us in formulating policy for the Eleventh Plan are discussed below.

1.23 The DARE has an extensive network comprising 48 Central Institutes, 5 National Bureaux, 12 Project Directorates, 32 National Research Centres (NRC), and 62 All-India Co-ordinated Research Projects (AICRP). It also supports research and education in 41 State Agriculture Universities, 5 Deemed Universities, and 1 Central Agriculture University. During Tenth Plan period 2 Indian Council of Agricultural Research (ICAR) institutes, 1 National Bureau, 3 Project Directorates, and 10 State Agricultural Universities (SAUs) have been established. Over the years, its co-ordinated trials have helped the nation improve varieties of sugarcane, rice, wheat, maize, sorghum, groundnut, mustard, etc., considering the ecological variations with respect to each crop. However, two glaring features are now obvious. First, the productivity achieved on farms has fallen short of those in the field trials. Clearly, the KVKs that have the mandate of technology validation and transfer have not delivered their full potential. Second, as observed earlier, there is some evidence of technological fatigue in terms of yields obtainable with the newest varieties being delivered by the NARS. Since access to international research is now much more circumscribed by intellectual property rights (IPRs), this will have to be addressed largely by toning up NARS capacity.

1.24 The following are critical research gaps:

- Integrating methods of traditional and modern biology giving attention to both yield and quality aspects.
- An orientation of public sector research in 'hybrid development with commercial viability' has to be reintroduced on a mission mode at least in crops like pigeon pea, soybean, and mustard.
- Indigenous plant types that inherently possess genes responsible for higher nutritive value (more protein, micronutrients, etc.) need to be identified and used for enriching nutrients in rainfed crops.
- The implications of climate change on agriculture and vice versa need to be studied and a dedicated research programme should be initiated to combat global warming.
- A major research thrust is warranted in areas of balanced and site-specific nutrient supply and efficient water management strategies.
- Integrated Pest Management (IPM) needs greater emphasis. The existing package of practices is not fully integrated between various plant protection sciences. This results in duplication, overlapping as well as unrealistic recommendations in the name of IPM. There is a need for interdisciplinary research in plant protection to elucidate basic issues of herbivory as well as to develop suitable mitigations.
- In horticulture, the research agenda needs to emphasize survey of indigenous biodiversity for resistance to various biotic and abiotic stresses for improvement in production, productivity, and quality of produce.
- In livestock, there is an urgent need to reorient research and assess the genetic potential of indigenous breeds. Intensive research work needs to be undertaken for genetic identification of traits of excellence in Indian breeds, such as Jaffarabadi buffalo, Black Bengal goat, Garole sheep, etc., and identify the functional genomics associated with their traits of excellence.
- With endemic shortage of animal feeds, research should explore technologies to augment feed resources, including genetic modification of micro-organism to utilize high lignin forage grasses.
- With large quantities of animal products now being produced, research on process technologies, value addition, packaging, storage, transportation, and marketing should receive high priority. In the absence of a proper slaughter regime, there is considerable wastage and an effective package of practices for management of slaughterage needs to be evolved. Prevention of animal losses due to disease should be the major area of focus with emphasis on development of diagnostic kits and vaccine. The health of the human population is intimately connected to the health of the animal with several fatal and debilitating diseases being common to both man and animal. Serious attention to animal health care, disease diagnosis, and

prophylactics will go a long way in ensuring human health also.
- Overall, there is a need to identify integrated farming systems in different agro-ecological regions, internalizing synergies of different components to enhance resource utilization, income, and livelihood generation and minimize environmental loading.

1.25 It is necessary to take a comprehensive view of the functioning of the agricultural research system and make systemic changes in the course of the Eleventh Plan. Thus far, research has tended to focus mostly on increasing the yield potential by more intensive use of water and bio-chemical inputs. Far too little attention has been given to the long-term environmental impact or on methods and practices for the efficient use of these inputs for sustainable agriculture. These features are widely known but efforts to correct them have not been adequate; at any rate they have not made much of a difference.

1.26 Agricultural research is underfunded but lack of resources is not the only problem. Available resources also have not been optimally utilized because of lack of a clearly stated strategy that assigns definite responsibilities, prioritizes the research agenda rationally, and recognizes that the research mode is not always best suited for product development and delivery:

- Dominance of commodity-based research and development (R&D), that is lack of a holistic approach involving a matrix of farm enterprises.
- Strict compartmentalization of R&D agencies, i.e., lack of effective bilateral flow of information among research, extension, and implementation departments.
- Lack of large-scale on-farm validation of techniques and feedback thereon, leading to practically no scope for their refinement.

1.27 As far as possible, ICAR institutes should mainly undertake basic, strategic, and anticipatory research in line with national priorities, while SAUs do applied and adaptive research addressing location-specific problems, with complementarities also found between the public and private sectors in product development. A distinction also needs to be made between basic research which has knowledge advancement and scientific curiosity as its major focus and strategic research which is aimed at well-defined researchable problems which are of high development priority and worthy of multi-discipline and multi-institution effect on a mission mode.

1.28 A major paradigm shift is needed to transform the present commodity-based research to a systems approach. Since farm-level problems are specific to agro-climatic zones (ACZs), what is needed is a convergence between R&D agencies within individual ACZs so as to bring region-specificity in technologies and their time-bound assessment. This requires a seven-step mechanism:

- Problem identification and prioritization;
- Convergence of existing technologies to match the need;
- Generation of need-based viable technologies using the holistic farming system approach;
- On-farm assessment and evaluation;
- Feedback on the technologies;
- Refinement of technologies, if necessary;
- Ensuring timely availability of inputs.

1.29 This kind of approach will help in establishing a research-development-technology transfer continuum involving all stakeholders.

1.30 SAUs are the key to regionally relevant research and for generating quality human resources. Unfortunately, SAUs are so poorly funded by their own State Governments that some are in chronic overdraft, only a quarter are accredited, and almost all rely mainly on ICAR funding for research. This situation, where States still provide salary and establishment costs but SAUs look to ICAR for other funds, not only affects their education function adversely but it also distances SAUs from State Agricultural Departments and reduces relevance of their research for local problems. Thus, although Central support for revamping SAUs is justified, this is likely to be effective only where States recognize the value of agricultural education and research. An important criterion for identifying SAUs for support from the Centre should be the investment that the State itself is making. Moreover,

the biggest problem with NARS remains that it is strictly governed by the same rules and regulations relating to expenditure and filling up of positions as operative in government departments of States and the Centre. This robs the system of flexibility and discretion which are essential for healthy functioning of scientific institutions.

Extension

1.31 Frontline demonstrations of various departments provide clinching evidence of large gaps between what can be attained at farmers' fields with the adoption of improved technology and what is obtained with the existing practices followed by the farmers. This is a clear pointer to the large potential for raising output through the effective dissemination of technology, especially in the eastern Gangetic plains. But this is not happening because of the absence or weak research–extension–farmer linkages. While technologies more adaptable to wider regional variations are required, effective extension remains vital for realization of demonstration trials yields at farmers' field on a large scale.

1.32 The challenge before extension agencies is how to deliver knowledge to all farmers, and especially how to involve and motivate the resource-poor farmers with a holding size below 1 hectare to take command of their situation and reduce the innovation adoption period. Given the meagre marketable surplus at individual farmer level for small farmers, there is need to organize the farmers around the commodity for getting them the benefits both mutually within the community and in interaction with external agencies supporting the development process. Developing farmer's organizations and federating them at block/district/State level and linking their economic activities with the market assumes special significance as it helps to attain the power of scale economies and collective bargaining to the advantage of farmers.

1.33 Public extension system has a key role in educating farmers and helping them to take right decisions. In this context, it is to be noted that extension should be treated as a service delivery mechanism and not be viewed as a revenue-generating programme. Hence, the principles governing business models of revenue-generating programmes should not be made applicable for extension services. Adequate fund allocation to reach large number of small and marginal farmers by extension agency is essential. Infrastructure below district level is needed to support capacity building of farmers. In view of the above, it is essential to upscale the ATMA to all 588 development districts by incorporating the modifications and taking consideration of all the pre-requisites to meet the emerging and imminent changes in the context of 'Wake up Call' given by the National Commission on Farmers and 'Regaining Agricultural Dynamism'. These provisions are expected to enhance the acceptability of the scheme by States and effective operationalization of the scheme in original spirits.

1.34 There are many extension service providers in the field, providing different kinds of useful services such as information and service support to farmers. They are State Government and Central Government agencies, agri-business companies, agripreneurs, input dealers, manufacturing firms, non-governmental organizations (NGOs), farmers' organizations, and progressive farmers. There is duplication of efforts with multiplicity of agents attending extension work without convergence. There should be co-ordinated attempt to synergize and converge these efforts at the district level and below to improve the performance of various stakeholders. It is essential to route all the State and Central Government extension funds through single agency like ATMA for effective utilization of crucial resources.

1.35 At zonal level, institutions like Zonal Research Stations and line departments need to prepare a zonal agricultural development strategy through consultative approach. At district/block/village level, the key institutions such as KVK, ATMA, and farmers' organizations need to have a close link with each other for technology assessment, refinement, and for creating a platform between farmers' organization and market opportunities. The research and extension agenda of the district needs to be set by multi-disciplinary team involving scientists, extension workers, farmers, and other stakeholders who would ensure research–farmer–extension–market linkage.

1.36 Public–private partnership (PPP) in extension has to be promoted for convergence and sharing of

resources. Horizontal expansion of private sector increases through partnership with the public extension system, while vertical expansion of public extension increases through partnership with the private sector. The potential private extension service providers could be identified and made partners in PPP mode for effective management of services and for nurturing a plurality of institutions. Under extension reform, minimum 10% of the fund allocation is made to undertake extension activities through private extension agencies. This needs to be continued and, where appropriate, even expanded by framing suitable guidelines.

Price Policy

1.37 Pricing policy concerns arising from the volatility of international prices need to be addressed. In periods of falling international prices, as for example in the case of edible oils after the East Asian crisis, farmers experience income losses although consumers benefit. In a period of rising international prices, as for example in the case of wheat at present, farmers stand to benefit but consumers lose. It is logical for government to want to balance producer and consumer interests and this can be done through careful calibration of import duties and minimum support prices (MSP) . Our policy has not been entirely consistent in this respect. For example, import duties on edible oils were lowered in the mid-1990s when international edible oil prices were high, but they were not adjusted when edible oil prices declined sharply after 1997. Domestic producers of oil seeds experienced a substantial price shock. The reaction to the recent increase in wheat prices has been different in the sense that farmers did not experience the full benefit of higher prices because efforts were made to protect consumer interests by wheat imports for the public distribution system (PDS) that were undertaken at what are implicitly subsidized rates.

1.38 A symmetric approach would be to moderate price fluctuation both for upswings and downswings. This requires a clear understanding of how to calibrate import tariffs and the MSP depending upon how international prices move. For downward movements in international prices beyond a certain level, import tariffs should be adjusted automatically to stabilize Cost, Insurance, and Freight prices. No change needs to be made in the MSP once announced, but persistence of high or low prices internationally should be taken into account by the Commission for Agricultural Costs and Prices (CACP) to adjust the MSP for the next year. As a general rule, we should not impose bans on exports but rely only on export taxes to ease domestic price pressure by moderating export if this is felt to be needed. In case international prices rise sharply, there is a case for lowering tariffs. In such situations, for food products supplied through the PDS, there is a case for offering a bonus on the MSP before the marketing season begins to ensure adequate supplies for the PDS. This could be supplemented by imports on the government account for meeting PDS requirements and/or rebuilding depleted stocks. This amounts to a targeted subsidy for PDS consumers. If high international prices continue, the CACP should take this into account in fixing the MSP for next year. An important feature of the system must be that increases in import tariffs in periods of low international prices must be accompanied by a simultaneous upward revision of duty drawback rates to ensure that exporters are not hurt. This is essential in cases such as cotton where the absence of such adjustment would hurt the competitiveness of our textile or garment export. A coherent policy along these lines would provide an internally consistent and predictable way for dealing with international price volatility in a manner which balances producer, consumer, and exporter interests.

Soil Health Management and Fertilizer Subsidy

1.39 Soil degradation through use of agro-chemicals is a serious issue that needs to be addressed on a priority basis during Eleventh Plan. Imbalanced use of chemical fertilizer has led to declining fertilizer response in the fertile irrigated regions. Excess use of some nutrients, driven in part by imbalanced subsidies, has led to depletion of other nutrients from the soil leading to deterioration of the soil health. The nature and extent of problem differ in different of parts of the country.

1.40 Lack of knowledge on the part of the farmers about the importance of soil health and information about the status of the soil on his particular farm is an

important constraint. Soil health cards, giving regularly updated information on major and micro nutrient, should be issued to all the farmers. This would require strengthening of soil testing labs in all parts of the country and expanding their testing capacity to cover micro-nutrients as well. Initial capital investment will have to be made by the government and subsequent maintenance may be funded out of the fee to be charged for the services rendered by these labs. The PPP mode can be explored wherever possible to expand reach and ensure accountability.

1.41 The present system of fertilizer subsidy is irrational and has become counter-productive. Fertilizer is sold at almost the same controlled price throughout the country. However, because nitrogenous fertilizers are subsidized more than potassic and phosphatic fertilizers, the subsidy tends to benefit more the crops and regions which require higher use of nitrogenous fertilizer as compared to the crops and regions which require higher application of potassic and phosphatic fertilizers. The imbalance in the use of nitrogen–phosphorus–potassium (NPK) brought about by distortions in prices ratio in favour of nitrogenous fertilizer is creating serious problem of soil degradation and adversely affecting productivity. Balanced use of fertilizer can be achieved either by redistributing the present amount of fertilizer subsidy over NPK in a manner which is nutrient neutral or by increasing subsidy on P and K in such a way that farmers are induced to use NPK in the right proportion. The price control system also discourages producers from adding micro-nutrients to standard fertilizer eligible for subsidy because the controlled price parameter for that fertilizer cannot be adjusted to cover the cost of micro-nutrient added. Immediate steps should be taken to allow the major producers to charge costs for adding micro-nutrients. Many of the micro-nutrients are also reserved for small-scale production. This segment should be dereserved in the interest of the agricultural community.

SEEDS

1.42 Seed management is a very crucial element for growth in productivity and the present situation is highly unsatisfactory. There is practically no change in the SRR in the States of Orissa, Bihar, Uttar Pradesh, Jharkhand, Assam, Madhya Pradesh, and Chhattisgarh. At present the SRRs in respect of various crops in different States are still relatively low and need to be raised. The desirable SRRs, without which it is not possible to achieve higher productivity, are 25% for self-pollinated crops, 35% for cross-pollinated crops, and 100% for hybrids.

1.43 Production of breeder seeds, foundation seeds, distribution of certified seeds for the year 2004–05 to 2006–07 as compared to those in the triennium ending 1996–97 and 2001–02 are given in Table 1.8. Although the production of breeder seeds has increased significantly, the production of foundation seeds has not. There is a large increase in the distribution of certified seeds but the quality of these seeds is often questioned by farmers.

1.44 There are missing links in the seed production system. There is very little focus on hybrid seed production in public sector. However the private sector has expanded to fill the gap. The private sector seed industry in India is growing appreciably and has made significant contributions to BT cotton, hybrids of maize, rice, sunflower, etc. As shown in Table 1.9, the share of private sector in seed production is increasing whereas that of public sector is decreasing.

TABLE 1.8
Production and Distribution of Seeds

Programme	Unit	Use/Production in Triennium Ending				
		1996–97	2000–01	2004–05	2005–06	2006–07
Production of breeder seeds	Thousand Qts	43.72	44.27	66.46	64.88	73.83
Production of foundation seeds	Lakh Qts	6.45	5.77	6.90	7.40	8.00
Distribution of certified/quality seeds	Lakh Qts	79.01	86.41	120.26	126.74	191.98

Source: Report of the Working Group on Crop Husbandry, Agricultural Inputs, Demand and Supply Projections and Agricultural Statistics for the Eleventh Five Year Plan (2007–12), Planning Commission, Government of India (December 2006).

TABLE 1.9
Changing Share of Private and Public Sector in Seeds Production

Year	Share in Seed Production	
	Private (%)	Public (%)
2004	49.11	50.89
2005	58.00	42.00
2006	57.75	42.25

Source: Report of the Working Group on Crop Husbandry, Agricultural Inputs, Demand and Supply Projections and Agricultural Statistics for the Eleventh Five Year Plan (2007–12), Planning Commission, Government of India (December 2006).

During the Tenth Plan the private seed supply had overtaken the seed sourcing from public sources. However, not surprisingly, the private sector remains absent in the production of seeds of self-pollinating varieties.

HORTICULTURE

1.45 While the first few Five Year Plans assigned priority to achieving self-sufficiency in foodgrain production, over the years, horticulture has emerged as an indispensable part of agriculture, offering a wide range of choices to the farmers for crop diversification. It also provides ample opportunities for sustaining large number of agro-industries which generate substantial employment opportunities. The horticulture sector contributes around 28% of the GDP in agriculture from about 13.08% of the area. It also provides 37% of the total exports of agricultural commodities. The sector encompasses a wide range of crops namely fruit crops, vegetables crops, potato and tuber crops, ornamental crops, medicinal and aromatic crops, spices, and plantation crops. New introductions such as mushroom, bamboo, and bee keeping (for improving the crop productivity) has further expanded the scope of horticulture.

1.46 India accounts for an area of 4.96 million hectares (MH) under fruit crops with a production of 49.29 million metric tonnes (mt). During the period 1991–92 to 2001–02 growth in area, production, and productivity of fruits was observed at the rate of 3.4%, 4.2%, and 0.7%. Area growth accelerated between 2001–02 and 2004–05 to 7.37% but with negligible acceleration in production growth. Among various States, Maharashtra ranks first and contributes 27% in area and 21.5% in production. Andhra Pradesh ranks second in area and production contributing 13% and 16% of fruits. The maximum productivity was observed in Madhya Pradesh (22.6 mt/hectare), followed by Tamil Nadu (19.9 mt/hectare), Gujarat (15.9 mt/ hectare), Karnataka (15.9 mt/hectare), and West Bengal (12.8 mt/hectare). The growth in productivity was maximum (5%) in Kerala from 1991–92 to 2001–02 while it was 10.2% in Uttar Pradesh from 2001–02 to 2004–05.

1.47 Total vegetable production in India before independence was 15 million mt and since Independence for decades the growth rate was stabilized around 0.5%. The impetus on vegetable research and policy intervention to promote vegetable crops witnessed a sudden spurt in growth rate of 2.5%, a hike of five times during the last decade. The potential technological interventions with improved gene pool and precise management can take growth rate to nearly 6% per annum. The area under vegetables increased from 5.59 MH in 1991–92 to 6.76 MH during 2004–05. The production in this period increased from 58.53 million mt to 101.43 million mt. During the period, productivity of vegetables increased from 10.5 mt/hectare to 15.0 mt/hectare. While West Bengal continues to be the leading State in area and production, the productivity is higher in Tamil Nadu followed by Uttar Pradesh and Bihar.

1.48 India is the second largest producer of flowers after China. The traditional flower sector registered an impressive growth during the Eighth, Ninth, and Tenth Plan periods and grew from 71000 hectares at the end of the Eighth Plan period to 106000 hectares by the end of the Ninth Plan. During the Tenth Plan an additional 10000 hectares has been brought under the traditional flowers sector by the end of 2004–05 to register an overall area of 115921 hectares. The productivity per hectare is the highest in Bihar (17.05 mt) followed by Haryana (11.55 mt). On the other hand, the productivity of flowers is the least in Rajasthan (0.59 mt). The overall productivity of the country during 2004–05 was recorded at 5.64 mt. Nearly 77% of area under floricultural crops is concentrated in seven States comprising Tamil Nadu, Karnataka, Andhra Pradesh, West Bengal, Maharashtra, Haryana, Uttar Pradesh, and Delhi. The production of cut flowers

increased over Plan periods to attain a production of 1952 million flowers during the Tenth Plan period from 615 million cut flowers during the end of Eighth Plan period.

1.49 The medicinal plants-based industry is growing at the rate of 7%–15% annually. According to a conservative estimate, the value of medicinal plants-related trade in India is to the tune of about Rs 5000 crore per annum while the world trade is about 62 billion US dollars and is expected to grow to the tune of 5 trillion US dollars by the year 2050. The Indian Systems of Medicine have identified 1500 medicinal plants, of which 500 species are mostly used in the preparation of drugs. At present different Medicinal and Aromatic Plant (MAP) species are under cultivation in the country out of which about 32 are listed in the priority list of the National Medicinal Plant Board, Ministry of Health and Family Welfare for commercial cultivation and processing in the country. However, unorganized collection from forest area has been banned in many states; the trade in this important sector is far from being organized and is also under private hands leading to distress sale by the growers and causing loss making ventures for new growers. Hence, in this sector it is important that only need-based cultivation of any medicinal and aromatic crops is taken up with assured buy back arrangements. Furthermore, in some Council of Scientific and Industrial Research (CSIR) institutes the plants are available but the costs are higher and not affordable for the growers. There is dearth of planting material in many key species and limited improved varieties are available. Hence, different institutions under public domain are required to multiply plants for supply to the growers. The centres to be entrusted with this task are NRC on MAP, Anand, Central Institute for Medicinal and Aromatic Plants, Lucknow, AICRP Centres of the network projects; Madhya Pradesh, West Bengal, Orissa, Jharkhand, Chhattisgarh, etc.

1.50 In the area of horticulture, a major beginning has been made with the NHM. Already the government is implementing Technology Mission for Integrated Development of Horticulture in North Eastern States, Sikkim, Jammu and Kashmir, Himachal Pradesh, and Uttaranchal. The most important constraints to establish the required linkages are in the area of agricultural marketing and processing. Since high-value agriculture is based on perishable commodities, large investments are required in modern methods of grading, post-harvest management (PHM), and development of cold chains. Such investment in turn requires that new players, including large corporate players, be able to enter existing markets and set up new marketing channels. The NHM therefore incentivizes the ongoing marketing reforms based on amending existing Agricultural Product Marketing Committee (APMC) Acts to allow this. This process has started in earnest, with many business houses investing in the area and with most States having already made APMC amendments. However, this must be taken to its logical conclusion. Many States have made APMC amendments but are yet to frame the necessary rules. This uncertainty needs to be removed as soon as possible.

1.51 Most States have also endorsed, and many have encouraged, contract farming. This can be a useful instrument for linking farmers to corporate buyers who can provide information and also inputs and extension tailored to the specific crops. It needs to be backed by ensuring effective mechanisms for contract registration and dispute resolution, along with adequate information and support so that small farmers are able to enter into collective contracts.

1.52 Planting material is the single most important factor around which the entire gamut of horticultural activities revolves. It is of special significance especially in perennial horticultural crops which have a long juvenile/gestation phase and any mistake committed by the grower in the initial stage will result in enormous loss in the later stages. Hence, genuineness, quality, and health of plant material are the major requirements of multiplication, sale, and adoption of any plant material. At present, farmers have to depend on private sources of which the majority of the units are not regulated or monitored in most of the States. Hence, farmers do not have access to genuine and disease-free elite to certified planting material in different crops and as a result suffer with respect to production, productivity, and quality of the produce. Most of the old

existing nurseries lack modern infrastructure such as greenhouses, mist propagation units, cold storage, mist irrigation systems, efficient nursery tools, implements, and machineries and even facilities for soil sterilization, etc. Ignorance of the farmers, acute shortage of mother plants of improved varieties, and absence of quality testing and monitoring mechanisms make the situation complex.

1.53 The situation is comparatively better in the case of vegetables with the private sector taking a major share of the production and supply of seeds of hybrids/improved varieties, and enforcement of the provision of Seed Act by the government agencies. However, the gap between the demand and supply of genuine quality material is too large to be met out of the present efforts. Therefore, in the Eleventh Plan it is envisaged that a massive programme on planting material be initiated so that a sound basis for further growth and development of this sector can be taken up. The government would also consider setting up a Central Certification Agency and a Planting Material Authority to take care of good quality planting material.

1.54 There are at present 10 Central institutes with 27 regional stations, 12 NRC, 9 multi-disciplinary institutes, 15 AICRPs with 223 centres, 1 full-fledged SAU on horticulture and forestry, 25 SAUs with horticulture discipline, 5 network projects, 330 ad hoc research projects, and 29 revolving fund schemes which are dealing with research on different horticultural crops. Besides the above, a large number of CSIR laboratories and centres aided by Department of Biotechnology (DBT), Bhabha Atomic Research Centre (BARC), and Indian Space Research Organization are also undertaking basic and strategic research on horticultural crops. In addition, the Ministry of Commerce has established one research institute each for coffee, rubber, and spices and two research institutes for tea which work on different aspects of these commodity crops. In spite of several research leads, there are still gaps that require focused attention. Development of improved varieties/hybrids of fruits, vegetables, plantation crops, medicinal and aromatic crops, flowers and ornamental crops, spices, cashew, oil palm with high production potential, biotic and abiotic stress resistance is the need of the hour. There is also need to evolve appropriate horticultural-based cropping systems for different agro-climatic areas. Although the private sector has emerged as a major supplier of new varieties, there is a need to evolve appropriate horticulture-based cropping systems for different agro-climatic areas.

1.55 Protected cultivation/greenhouse/low poly tunnels production techniques are now available for growing cut-flowers and vegetables. Crops, such as tomato, cucurbits, cabbage, cauliflower, cucumber, lettuce, onion, spinach, brinjal, pepper, turnip, radish, can be successfully grown achieving high quality under protected cultivation. It has enabled farmers to produce vegetables in places such as Leh and also off-season production of vegetables in north India. Technology for protected cultivation of flowers such as rose, chrysanthemum, gerbera, and carnation in polyhouse, shade net, etc., has been perfected. Low-cost greenhouse technology has also been developed for high quality flower production in hilly States of Jammu and Kashmir, Himachal Pradesh, Uttaranchal, and North Eastern States. These structures are now used commercially for export of quality flower production in plains of Maharashtra and Karnataka.

Plant Protection

1.56 IPM, inter alia, aims at employment of alternate methods of pest control like cultural, mechanical, and biological control in a compatible manner. Chemical control which has several ill-effects should be resorted to only when other control methods fail to provide desired results. IPM is economical and ecologically safe, an important consideration since food safety issues are an area of growing concern all over the world. To ensure ecologically safer food products, it is necessary to control pesticide residue contents by fixing maximum residue limits so as to bring them down to internationally accepted minimum tolerance levels. At present implementation of IPM itself is disintegrated as IPM component in different Plan schemes. These fragmented elements need to be co-ordinated.

1.57 The Plant Quarantine (Regulations of Import into India) Order 2003, made operational from 1 January 2004, contains adequate provisions to prevent the introduction of exotic pests, diseases, and weeds

into India. Other allied responsibilities are the issuance of a Phytosanitary Certificate as per the International Plant Protection Convention 1951, of the Food and Agricultural Organization (FAO), and to undertake the Post Entry Quarantine inspections in cases of imports of agricultural products. These functions should be enlarged with a view to facilitating international trade in agricultural products.

Agricultural Credit

1.58 Credit is an essential requirement for revitalizing agriculture and there have been some important positive developments in this area. The total credit to agriculture increased from Rs 62045 crore during 2001–02, the terminal year of the Ninth Five Year Plan, to Rs 200000 crore during 2006–07, the final year of the Tenth Five Year Plan. This was a more than threefold increase over five years. The share of commercial banks in total agricultural credit increased from 54% in 2001–02 to around 69% in 2005–06. The share of investment credit increased from 35% in 2001–02 to around 41% in 2004–05, despite the negative growth achieved by the long-term co-operative credit structure. As against a target of Rs 736570 crore, the total institutional credit flow to agriculture during the Tenth Five Year Plan is expected to be above Rs 650000 crore, that is, a likely compound annual growth rate (CAGR) of 26%. This is much better than the CAGR of 18% achieved during the Ninth Five Year Plan.

1.59 The growth of credit was especially impressive during the last two years of the Tenth Plan on account of the 'Farm Credit Package' announced by the Government of India (GoI). A Special 'Farm Credit Package' as enunciated by the GoI on 18 June 2005 for doubling the credit flow to agriculture, contained various innovative propositions for credit growth. As per provisional figures available for 2005–06, the ground-level credit flow to agriculture during 2005–06 was Rs 180446 crore; 128% of the target of Rs 141000 crore, and registering an annual growth of 44%. While commercial banks registered a growth of 54% during the year, co-operative banks recorded 25% growth, followed by regional rural banks (RRBs) at 22%.

1.60 However, although the total agricultural credit has increased during the Tenth Plan period, there are serious quantitative as well as qualitative concerns. The outreach of the formal institutional credit structure is very limited. The findings of the National Sample Survey Organization (NSSO) 59th Round (2003) revealed that only 27% of the total number of cultivator households received credit from formal sources while 22% received credit from informal sources. The remaining households, comprising mainly small and marginal farmers, had no credit outstanding. It is unlikely that the situation has changed much since 2003.

1.61 Comprehensive measures aimed at financial inclusion in terms of innovative products and services to increase access to institutional credit are urgently required. Issues such as credit flow to tenant farmers, oral lessees and women cultivators, complex documentation processes, high transaction costs, inadequate and ineffective risk mitigation arrangements, poor extension services, weak marketing links, and sectoral and regional issues in credit are also required to be addressed expeditiously. The agrarian crisis also led to default by many farmers, and a consequent freeze on their ability to access institutional credit. The overhang of such non-performing debt also needs to be reduced.

1.62 The share of direct accounts with a credit limit of less than Rs 25000 in total direct accounts declined from 97% in 1990 to 67% in 2005, while their share in direct credit has declined precipitously. The coverage of operational holdings needs to be increased significantly, with sub-targets for the less developed States and small and marginal farmers. Considering that for small and marginal farmers the only alternate sources of finance are expensive loans from moneylenders, the share of direct accounts with a credit limit of Rs 25000 in total direct finance may be targeted at a substantially higher level.

1.63 At present direct finance to agriculture under priority sector lending includes credit for the purchase of trucks, mini-trucks, jeeps, pick-up vans, bullock carts, and other transport equipment to assist the transport of agricultural inputs and farm produce. Direct finance also includes credit for the construction and running of cold storage facilities, warehouses,

and godowns. As alternate formal sources of finance are available for these activities, their inclusion under direct finance for agriculture needs to be reconsidered.

1.64 Special credit packages with varying and flexible repayment periods may be thought of for the agriculture sector to take care of mismatches of income and expenditure flows of farmers and the seasonal nature of agricultural income. Doorstep banking implemented through designated agent of commercial banks has now been facilitated by recent decision of the Reserve Bank of India (RBI) and provides an opportunity for farmers to interact with banks with timings suitable to the farming community. The banks are currently allowed to extend financial outreach by utilizing the services of civil society organizations, Farmers' clubs, NGOs, post offices, etc., as 'Business Facilitators' or as 'Business Correspondents'. NABARD could look into the reasons which are coming in the way of the banks using intermediaries as facilitators/correspondents and approach RBI for necessary changes/amendments in the instructions on the subject.

Co-operatives

1.65 The credit disbursal by commercial banks covers only 11.7% of operational holdings in the country. As may be seen from Table 1.10, credit growth by the co-operatives to the agriculture sector has gradually picked up during the course of the Tenth Five Year Plan. The number of loan accounts have, however, declined from 224.6 lakh in 2004–05 to 192.8 lakh in 2005–06. The most potent means *for widening and deepening access to institutional* credit to the innumerable small and marginal farmers are the co-operative credit societies that are autonomous and democratic. The revitalization of the co-operative credit structure in order to transform them into vibrant and viable democratic financial institutions is therefore vital. It is, therefore, extremely important, that the restructuring of co-operative credit now in progress, on the lines of the recommendations of the A. Vaidyanathan Committee are implemented speedily and rigorously. Memorandum of Understanding (MoU) has been signed by 13 State Governments and the process of auditing of accounts is under way. It is necessary to move quickly to take the next steps in depoliticizing the system.

TABLE 1.10
Credit Flow to Agriculture Sector by Co-operatives

Year	Credit (Rs in Crore)	Growth (%)	Number of Loan Accounts (Lakh)
2001–02	23604	–	–
2002–03	23716	–	–
2003–04	26959	14	–
2004–05	31424	17	224.6
2005–06	39404	25	192.8
2006–07	42480	8	188.7

Source: Various Issues of *Economic Survey*, Department of Economic Affairs, Ministry of Finance, and information provided by Department of Agriculture and Co-operation, Krishi Bhawan, New Delhi.

Risk Management

1.66 The frequency and severity of risks in agriculture particularly in last few decades have increased on account of climate variability. The principal evidence of climatic change has been rising temperatures, erratic rainfall pattern, and increase in the severity of droughts, floods, and cyclones which have caused huge losses in agricultural production and the livestock population. India has developed response mechanisms for primary (crop failures) and to some extent secondary (livestock deaths) consequences of climate variability. However, a tertiary mechanism which goes beyond resource transfer to resource assessment and management, through climate forecasting, climate information generation and dissemination, early warning system, mapping of agricultural losses through remote sensing technology, and a pre- and post-climate change response need to be put in place on a decentral-ized basis. Such a response mechanism must include putting in place a catastrophe protection insurance mechanism as also provision of bankruptcy legislation for the farmers.

1.67 Crop insurance was introduced in the country two decades ago. The present version, the NAIS is available since 1999–2000. Despite States' support for coverage of the NAIS being tardy, NAIS is a useful device, especially for farmers growing relatively risky crops. The main problem is that NAIS is not really actuarial insurance. Premiums for most important crops are fixed at all-India level irrespective of risk and the government pays for entire excess of claims over premium

received. Moreover, being compulsory for all borrowers from banks in States where it is in force, and with relatively few non-loanee farmers involved, it mainly insures banks against default following poor harvest. Further, its popularity with farmers is limited since it is based on crop-cutting experiments, which delays claims payments until well after harvest and the risk covered is only of yield shortfalls at the block level. There is a scope for improving the coverage of NAIS in terms of regions and crops, substitution of long-term yield rate as a benchmark, and ensuring prompt payment of the indemnities. Decision to devolve the area of damage assessment from blocks to smaller units may be done with care, as the costs of such decentralization and the moral hazards will be very high compared to the likely benefits. Other indicators, such as rainfall, could be used for assessing the damage due to natural factors. Some States are devising their own crop insurance policies including weather insurance, which can be supported in suitable ways. However, for the next few years they should not be treated as a substitute to NAIS.

1.68 An important lacuna, which many researchers have pointed out, is the rather indifferent attitude of the banks towards crop insurance. All commercial banks, RRBs, and the co-operative banks should make crop insurance mandatory for all agricultural loanees, especially because such insurance can indirectly contribute to the viability of rural banking. An equally important aspect is the need for much larger involvement of the States in the functioning of the scheme. The government needs to take up agricultural reinsurance more extensively with appropriate insurance products. Recently some of the successful insurance products like Weather based Insurance have been developed by Agriculture Insurance Company of India Ltd (AIC), ICICI-Lombard General Insurance Company, and by IFFCO-Tokyo General Insurance Company. Under the scheme, coverage for deviation in rainfall index is extended and compensations for economic losses due to the less or more than normal rainfall are paid. There is a lot of interest in private sector for insurance business. Necessary incentives should be devised for insurance companies to design suitable products for the agriculture sector.

Marketing

1.69 The agriculture sector needs well-functioning markets to drive growth, employment, and economic prosperity in rural areas. Currently agricultural markets are regulated under respective State Agricultural Produce Marketing (Regulation) Acts, generally known as APMC Act. Besides, there are other regulations, viz. Essential Commodities Act and various Control Orders issued thereunder. All these have created restrictive and monopolistic marketing structures, which have resulted in inefficient operation and high degree of marketing costs. They have also had an adverse impact upon agricultural production and system, inefficient flow of commodities, and lack of competitiveness.

1.70 The markets lack even basic infrastructure at many places. When the APMCs were first initiated there was significant gain in market infrastructure development. However, this infrastructure is now out of date, especially given the needs of a diversified agriculture. At present only one-fourth of the markets have common drying yards, trader modules, viz., shop, godown, and platform in front of shop exist in only 63% of the markets. Cold storage units are needed in the markets where perishable commodities are brought for sale. However they exist only in 9% of the markets at present and grading facilities exist in less than one-third of the markets. The basic facilities, viz., internal roads, boundary walls, electric lights, loading and unloading facilities, and weighing equipment are available in more than 80% of the markets. Farmers' rest houses exist in more than half of the regulated markets. Covered or open auction platforms exist in only two-thirds of regulated markets. It is evident from the above that there is considerable gap in the facilities available in the market yards. Also the farmers have to deal with non-transparent methods of price discovery and there is often lack of auction of graded items. Some modern markets with electronic auctioning have been introduced, but they are the exception. A major modernization of this aspect of the infrastructure is urgently needed.

1.71 On the basis of the recommendation of the Inter-Ministerial Task Force, Ministry of Agriculture drafted a model law on marketing which would allow

new markets to be established by private entities or co-operatives. Several State Governments have already amended their APMC Acts allowing varying degrees of flexibility. The present status of the amendment in the APMC Acts by the States is given at Table 1.11. However several States are yet to notify the relevant rules that would make the amendment fully operational. These steps should be speedily completed to provide a boost to promotion of direct marketing, contract farming, and setting up of markets in private and co-operative sectors. Some of the important issues relating to agricultural marketing which would be addressed during the Eleventh Plan include marketing system improvement and conducive policy environment; strengthening of marketing infrastructure and investment needs; improving market information system with the use of Information and Communication Technology (ICT); human resource development for agricultural marketing; and promotion of exports/external trade. We should move to a regime of professionally managed wholesale markets.

1.72 In the context of market regulation and development, all States and UT governments should:

- Hold regular elections of agricultural produce market committees and bring professionalism in the functioning of existing regulated markets.
- Plough back the market fee for development of marketing facilities and investments for creation and/or upgradation of infrastructure in market yards/sub-yards.
- Extend greater flexibility to stakeholders, sellers, as well as buyers to interact in the markets.
- Promote grading, standardization, packaging, and certification in the market area.
- Ensure transparency in auction system, penalization on arbitrary deductions from the farmers' realization, prompt payments to farmers, dissemination of market intelligence, and speedier and hassle free transactions in the market.
- Improve weighing systems by installing bulk weighment system and handling in a time-bound manner.

1.73 There are issues concerning legal framework and fiscal matters which will have to be attended to during the Eleventh Plan. Some of these include a need for bringing uniformity in the State-level tax structure in agricultural commodities for improving the market efficiencies; rationalizing taxes and fees on raw agricultural commodities, and removing de facto restrictions on movement of goods across State borders by harmonizing State-level taxes and providing for their hassle free collection at convenient points. Further, the country should be conceptualized as a unified

TABLE 1.11
Progress of Reforms in Agricultural Markets (APMC Act) as on March 2008

Stage of Reforms	Name of States/Union Territories (UTs)
1. States/UTs where reforms to APMC Act has been done for direct marketing, contract farming, and markets in private/co-operative sectors	Andhra Pradesh, Arunachal Pradesh, Assam, Chhattisgarh, Goa, Gujarat, Himachal Pradesh, Karnataka, Madhya Pradesh, Maharashtra, Nagaland, Orissa, Rajasthan, Sikkim and Tripura
2. States/UTs where reforms to APMC Act have been done partially	(i) *Direct Marketing:* National Capital Territory of Delhi (ii) *Contract Farming:* Haryana, Punjab, and Chandigarh (iii) *Markets in Private/Co-operative Sectors:* Punjab and Chandigarh
3. States/UTs where there is no APMC Act and hence not requiring reforms	Kerala, Manipur, Andaman and Nicobar Islands, Dadra and Nagar Haveli, Daman and Diu, and Lakshadweep. Bihar has recently repealed the APMC Act w.e.f. 1.9.2006
4. States/UTs where APMC Act already provides for the reforms	Tamil Nadu
5. States/UTs where administrative action is initiated for the reforms	Mizoram, Meghalaya, J&K, Uttarakhand, West Bengal, Pondicherry, Jharkhand, and Uttar Pradesh

Source: Information provided by Department of Agriculture and Co-operation, Krishi Bhawan, New Delhi.

integrated national market. Essential Commodities (Amendment) Act should be modified to provide for imposition of trade and marketing restrictions only during the exceptional situations of demand–supply dislocation, market aberration, and price volatility.

1.74 The rules and regulations under the Food Safety and Standards Act 2006, which has been passed by the Parliament, should be expeditiously formulated and notified. The Warehousing (Development and Regulation) Bill 2005 has been passed by the Parliament. This will facilitate early introduction of negotiable warehousing receipt system. There is need to set up an accreditation agency for certified warehouses and warehouse receipts; encourage private sector, co-operatives, and Panchayats to set up rural godowns and specify standards and permit warehousing receipt system.

Post-harvest Management (PHM)

1.75 At present, the post-harvest losses are about 20%–30% in different horticultural crops. This happens because of inadequate infrastructure development for PHM including pre-cooling. Packing materials like corrugated fibreboard boxes, perforated punnettes, cling films, sachets, wraps, etc., have been standardized for fresh horticultural produce. Tetra packs of different products are now household items.

Agro-processing

1.76 Demand for horticultural products will be sustained by developments in agro-processing. In fact there is a rising demand for new products such as dried powder fruit based milk mix, juice punches, banana chips and fingers, mango nectar, and fruit kernel derived cocoa substitute, essential oils from citrus, fruit wines, dehydrated products from grape, pomegranate, mango, apricot and coconut, grape wines, value-added coconut products like snowball tender coconut, milk powder, and pouched tender coconut water (Cocojal). Improved blending and packaging of tea and coffee have opened new markets. Consumer-friendly products such as frozen green peas, ready-to-use salad mixes, vegetable sprouts, ready-to-cook fresh cut vegetables are major retail items. The private corporate sector has a major role to play in developing this aspect in the agriculture–consumer linkage. Technology development has been in vogue but its adoption is far below the requirements.

Mechanization

1.77 To keep pace with improved production and productivity, different machines have been developed for effective cultivation, intercultural operations, harvesting, grading, packaging, and value-addition. Machines such as mango harvesters, kinnow clippers, potato diggers, coconut peelers, etc., are being adopted by the growers. Machines have also been developed/installed for different specialized uses such as cool sterilization (irradiation) for sprouting in potato and onion, dehydration of different produce, vapour heat treatment in major mango growing belts, packaging of coconut water, banana fig, and chip-making machine, etc.

Animal Husbandry, Dairying, and Fisheries

1.78 Livestock plays an important role in Indian economy and is an important sub-sector of Indian agriculture. The contribution of livestock to the GDP is about 4.5% and the sector employs about 5.5% of the workforce. Livestock provides stability to family income especially in the arid and semi-arid regions of the country and is an insurance against the vagaries of nature due to drought, famine, and other natural calamities. Major part of the livestock population is concentrated in the marginal and small size of holdings. Growth during the Tenth Plan has been at the rate of 3.6%.

1.79 The goals for the Eleventh Five Year Plan for the livestock sector would be (i) to achieve an overall growth between 6% and 7% per annum for the sector as a whole with milk group achieving a growth of 5.0% per annum and meat and poultry group achieving a growth of 10% per annum; (ii) the benefit of growth should be equitable, benefiting mainly the small and marginal farmers and landless labourers and should benefit poorly endowed areas like draught prone, arid, and semi-arid areas; (iii) to provide adequate animal health services for effective disease control; (iv) the sector should generate additional employment opportunity to people in the rural areas especially to the female population; (v) livestock should provide major source of income in the selected areas having potential for mixed crop-livestock farming system; and (vi) the

growth in the sector should result in the improvement of environment, specially in the rural areas. Market opportunities have opened up for the livestock sector following the economic liberalization. But the sector's ability to capitalize on new market opportunity is constrained by the availability and quality of support services which, at present, are mainly provided by the government. Moreover, these services are not available at the doorsteps of the producers. There is a need to restructure service delivery mechanism to become conducive to the requirement of the rural livestock producers. Lack of credit for livestock production has been a major problem. Public sector lending is very low. The strategy should be to correct these distortions and ensure timely availability of inputs and services including credit to livestock farmers.

1.80 Presently, fisheries and aquaculture contribute 1.04% to the national GDP of the country and 5.34% to agriculture and allied activities. The fisheries sector has been providing employment to over 9 lakh full time and 11 lakh part time fishermen whose occupation is highly prone to natural calamities. The projected exports from the fisheries sector by end of the Eleventh Plan is 1.06 million tonnes in quantity and Rs 15000 crore in value. The future of fisheries export would be influenced by the consistent compliance with food safety measures (Hazard analysis and Critical Control Point [HACCP] and Sanitary and Phytosanitary [SPS] standards).

1.81 Seed, being the critical input for successful culture practices, needs focused attention with regard to strengthening of the existing infrastructure for production and rearing, transport, and quality aspects. The projected requirement of seed of carps, in pond culture, wetland, and reservoir fisheries that are mostly carp-based, is to the tune of 34400 million annually. Sustainable fisheries can only be achieved through improvement of the quality, technical skills, and management of human resource managing fisheries in the country, in consonance with the rapidly changing needs. Raising a cadre of officers at various levels to plan and execute fishery development programmes is critically important. Fishes in waters, whether seas or inland waters, are impacted by a number of processes, both natural and anthropogenic. While fisheries is a State subject like agriculture, it is necessary to develop a broad framework for harmonizing the various acts under which fisheries is administered. This would enable addressing international issues.

Rainfed Agriculture

1.82 Rainfed areas in the country, which account for 60% of the cultivated area and are home to majority of our rural poor and marginal farmers, have suffered neglect in the past in not having received differentiated technological, institutional, infrastructural, and investment support. These areas are characterized by high incidence of poverty, low education and health status, high distress in the farming sector, distress migration, low employment opportunities, and vulnerability to a variety of high risks. Apart from these conditions, the population in these areas also suffers from various exploitative social structures and practices, poor attention by government departments, poor quality of service delivery, and so on. Repeated water scarcities leading to large-scale droughts have severely affected livelihoods of these rural poor. The challenge, therefore, is to improve rural livelihoods through participatory watershed development projects, reinforced by an integrated farming system approach that would increase productivity in a sustainable manner and contribute to livelihood security.

1.83 After a high growth in rainfed agriculture during 1985–96, the deceleration in its growth since 1996 was more than that of the irrigated sector partly due to liberated trade policies in vegetable oils and ineffective domestic support prices of rainfed crops. Therefore, stabilization of domestic support price is called upon for internalizing improved technology. Efforts will have to be made to fill up productivity gaps of the existing technologies and their scaling up through proper extension mechanisms, supply of inputs, institutions, and proper governance. The coarse cereals in these areas are being diversified into a better option of pulses crops which need to be promoted by providing improved seeds of pulses, availability of specific nutrients of sulphur and phosphorous, and better market linkages. Improving productivity of rainfed rice in eastern India would also help in ensuring food security in the country. Similarly, sweet sorghum for ethanol production could be more competitive in the

relatively dry regions of southern and western States. Crop residues could be used as fodder or feed stock to add more value to the cultivation of sweet sorghum. Risk moderation through in situ rain water conservation, rejuvenation of traditional water bodies, and improving efficiency of harvested water may be given high priority to reduce vulnerability to climatic variability. Livestock, agro-forestry, and dryland horticulture and value addition through processing, storage etc., of these commodities are significant coping mechanisms of managing risk and uncertainties. Diversification and expansion of predominantly rainfed crop of soybean by market linkage is an excellent example to be pursued in other commodities. There are some niche attribute crops like seed spices, guar, and medicinal crops which are very relevant at micro level in which contract farming needs to be promoted to avoid periodic crash in prices. Credit requirement of rainfed regions are also more specific. The repayment strategies should be planned to cover the risks; for example, total livelihood portfolio with extended repayment period would be more appropriate. Convergence with employment guarantee schemes, Backward Regions Grant Fund, Artificial Groundwater Recharge, as well as renovation of existing water bodies may be promoted to have complementarities of different programes. Upgradation of skills of the landless, assetless, artisans, and small and marginal farmers should be promoted keeping in view the new marketing demands. Intensification of biofuels in farming system in these areas can add significantly to livelihood security. Comprehensive District Agricultural Plans have been initiated on pilot basis to capture such variations and develop appropriate strategies.

1.84 Systematic reviews and appraisals conducted on watershed development projects by various organizations and departments have established the merits of the watershed-based approach. These are:

- Soil loss and surface runoff reduced by 52% to 58% respectively in completed watersheds.
- Area under irrigation increased from 34% to 100% in different watersheds.
- The area under sowing increased. The cropping intensity increased.
- Productivity/yields of crops increased and the net returns also increased (up to 63%).
- The Benefit Cost Ratio of watershed ranged from 1.10 to 15.72, depending on the above factors.
- The availability of drinking water and groundwater situation improved in all project villages.
- Other benefits such as fodder availability, employment opportunities (and also equal wages in limited number of cases), and income generation opportunities improved significantly in all villages where watershed projects were implemented.
- Human and cattle migration reduced significantly.

1.85 These findings suggest that there is a strong case for a massive expansion of the rainfed areas programme in the country.

1.86 The integrated watershed development projects implemented since 1994 have unique strengths in project management, project content, and processes which need to be reinforced (see Box 1.1).

1.87 The analysis of benefits/strengths and weaknesses of the watershed development projects implemented so far establish the following essential principles for guiding policy and its execution in the future. These are:

- Equity: Watershed Development Projects should be considered as instruments for increased land productivity and inclusiveness.
- Decentralization: Establishing suitable institutional arrangements within the overall framework of the Panchayati Raj Institutions (PRIs), professional and dedicated human resources, and operational flexibility in norms to suit varying local conditions will enhance decentralized decision making.
- Facilitating Agencies: Social mobilization, community organization, building capacities of communities in planning and implementation, ensuring equity arrangements, etc., need intensive facilitation by professional teams. They need to be provided financial support to perform the above specific functions.
- Centrality of Community Participation: The community organizations should be closely associated and accountable to the Gram Sabha in project

Box 1.1
Strengths and Weaknesses of Watershed Development Projects in India after 1994

Strengths

- Project Management Related:
  - All ministries issued guidelines.
  - Community-based Project Management including financial aspects.
  - Support for capacity building agenda (Community Organization and Training).
  - Provisions for maintenance of assets.
  - Formal role for NGO and partnerships between government and NGOs.
  - Several models emerged at operational level for project management at State/district level.
- Project Content Related:
  - Integrated NRM approach with a focus on area of micro watershed.
  - Bilateral projects joined the ongoing projects and diversified the scope of the projects.
- Process Related
  - Community-level decision making, planning, and execution of watershed projects.
  - Fund management at community level.
  - Specific roles of PRIs and other Community Based Organizations (CBOs).
  - Building block approach (user groups, SHGs form the building blocks of institutional arrangements).
  - Clear support and institutional arrangement for project facilitation (Project Implementation Agency [PIA] and Watershed Development Teams).

Weaknesses

- Project Management Related:
  - No dedicated project management teams at State/district levels.
  - Poor delivery of capacity building services.
  - Fluctuating partnerships between government organizations (GOs) and NGOs.
  - State/district level offices gave low priority to watershed projects.
  - Good experiences could not be up scaled effectively.
- Project Content Related:
  - Strong focus on engineering treatment at the cost of integrated approaches.
  - Little formal support to productivity and livelihoods related agenda.
  - Post-project sustainability is grossly neglected.
- Process Related:
  - Low level of internalization of participatory approaches by project teams.
  - Lip service to equity and gender concerns at operational level.
  - Weak institutional arrangements at community level and reducing role of CBOs.

implementation and get the support of the Gram Panchayat (GP) for convergence of all programmes in the area.

- Monitoring, Evaluation, and Learning: Laying specific milestones, institutionalizing the process of participatory evaluation and learning are important instruments. A participatory, outcome/impact-oriented and user-focused approach has to be instituted.
- Capacity Building and Software Support: Ensuring effective capacity building inputs to all key stakeholders at multiple levels (national to local) through long-term institutional arrangements with competent capacity building organizations and allocation of financial resource for the purpose are key instruments.
- Organizational Restructuring: Establishing appropriate technical and professional support structures

at national, State, district, and project levels and developing effective functional partnerships among project authorities, implementing agencies and support organizations is essential for ensuring effective project management.

1.88 Estimates of the extent of degraded land vary from 55 MH to 175 MH depending upon the definition of wasteland and also the source of information. As per the 25 year perspective plan of the Planning Commission (1997), 88.5 MH was to be developed under watershed programme by the end of Thirteenth Five Year Plan. Out of the above, 22.2 MH has already been developed during Ninth and Tenth Plan through a watershed approach. The latest attempt to harmonize the above data (ICAR–National Remote Sensing Agency [NRSA]–NRAA Expert Group 2007) has brought out that the degraded land which has the potential for development under watershed development projects amounts to a total of 64 MH consisting of 50 MH of water eroded, 5 MH of wind eroded, and 9 MH in notified forest. It is proposed to develop 36.6 MH during the Eleventh Plan through integrated watershed approach. The rest of the area, that is 29.7 MH, would be considered for development in the subsequent Five Year Plans.

1.89 The major thrust in the Eleventh Plan must be laid on developing the untreated area in Desert Development Plan (DDP) and Drought Prone Areas Programme (DPAP) blocks and watershed development projects of the Ministry of Agriculture. In addition, special attention is to be devoted to developing villages where groundwater is over exploited. For this purpose, priority would be laid to work in 425 blocks in 100 districts, where groundwater depletion is very high and the number of dug wells is also high. The priority for Integrated Watershed Development projects during the Eleventh Plan would be arid, semi-arid, and dry sub-humid areas.

1.90 In order to develop an integrated approach for rainfed areas a farming system approach would be emphasized. Common guidelines for watershed management programmes in different ministries are being prepared to be put before the newly created NRAA. The Authority will also work towards developing a watershed plus approach for improving agricultural productivity. This would involve an emphasis on integrating crop husbandry, livestock, horticultural, and other sub-systems appropriate to the agro-climatic conditions. A new programme on Rainfed Farming would be launched for the purpose of augmenting the existing programmes of Ministry of Rural Development (MoRD) and Ministry of Agriculture.

1.91 The investment requirement for treatment of 36.6 MH in Eleventh Plan is estimated at approximately Rs 36600 crore. Although only about Rs 23000 crore is likely to be available from concerned Central ministries (Rs 17000 crore from MoRD and Rs 6000 crore from Ministry of Agriculture), it is envisaged that substantial additional resources can became available through convergence with National Rural Employment Guarantee (NREGA) and Backward Regions Grant Fund (BRGF) programmes. The possibility of some additional funding by the State Governments would also be explored.

The Social Context: Need to Modernize Agrarian Relations for Equity and Efficiency

1.92 Land is the prime resource of the vast majority of the poor in India deriving livelihood from agriculture. The Land Administration is plagued by many infirmities. Unclear titles, informal tenancy arrangements, and other related problems have not only affected productivity of agriculture, they have also forced migration of people, both landless and marginal farmers, in search of employment to urban areas as well as of the landed gentry, giving rise to absentee landlordism, who do not lease out land for fear of losing the land titles. Therefore, an efficient and corruption free land administration, coupled with a dynamically adaptive land policy, has a vital role in increasing agriculture growth and poverty reduction. The key elements of an effective land policy are the following:

- Modernization of management of land records.
- Reforms relating to land ceiling.
- Security of homestead rights.
- Reforms relating to tenancy laws.
- Protection of the rights in land of tribals.
- Access to agricultural services.

Modernization of Management of Land Records and Titles

1.93 Correct and updated land records are crucial for the security of land rights and to encourage investment. These result in fewer disputes and conflicts, allow land to be used as collateral, lower transaction costs and corruption, ensure efficient land markets, and help in implementation of land reforms and planning for various development programmes.

1.94 Efforts thus far have remained focused on the system of computerization of textual land records. However, by itself it has limited benefits, unless the land records are accurate and updated in real time. The steps to be taken to put in place effective and modern land administration system are:

- The process of registration and mutation should be integrated into one function of registration of deeds. Before registering the deed, the concerned officer should check the legality of the transaction and competence of parties to take part in the transaction. Computerization should also be taken up of records of the previous 50 years, or such length of time as may be prescribed in this regard in the relevant State laws, so that the title being registered is clear and uncontested.
- The computerization of spatial records should be taken up in all the States and all the cadastral maps should be digitized.

1.95 Setting up a system on the above lines in all States and UTs would facilitate citizen services based on land data, such as providing records of rights with maps-to-scale; other land-based certificates such as caste certificates, income certificates (particularly in rural areas), domicile certificates, etc.; information for eligibility for development programmes; land passbooks with the relevant land information for access to agricultural credit; and access to the data to the co-operative banks and other credit institutions.

1.96 In addition to the above steps, it would also be desirable to integrate three layers of data: (i) forest summary maps, (ii) cadastral maps, and (iii) revenue records, and harmonize them on a Geographic Information System (GIS) pattern, so as to provide a comprehensive tool for planning developmental, regulatory, and disaster management activities and for any other purpose where location-specific information is needed.

1.97 The modernization of the land administration system through computerization of textual and spatial records and integration of the registration office should open the doors to exploring, by setting up a few pilot projects, the possibility of shifting to the 'Torrens' system which is 'title' based rather than the present 'deed' based system. This will ensure that the deed document is a proof of title and reflects reality; search costs for ascertaining title will thus reduce to negligible and title guarantee by the State would be feasible.

1.98 Two CSS currently under implementation are the computerization of land records and strengthening of Revenue Administration. These would be subsumed in the proposed National Land Records Management Programme, which would be launched shortly as a pilot project in one district in each State. After the validation of the proof of concept within the next two years, the scheme would be extended to the entire country. It is expected that digitization of land records after undertaking comprehensive land survey would be completed by the end Twelfth Plan period. It is expected that after availability of this basic record, the country could move towards the Torrens system in the Thirteenth Five Year Plan.

Reforms Related to Land Ceilings

1.99 One of the basic objectives of land reforms was to bring about a more equitable distribution of land. The main instrument for realizing this objective was the imposition of ceiling on land. In line with the prescription of the five year plans, laws on imposition of ceiling on agricultural holdings were enacted by several States during the 1950s and 1960s. These were implemented with varying degrees of effectiveness in different States. The quantum of land declared surplus is far short of land which was estimated to be surplus on the basis of various national surveys. Thus, it is clear that reform measures have not been able to achieve the desired impact. The total area declared surplus so far has been 73.5 lakh acres only, of which 53.9 lakh

acres have been distributed. The distribution of the remaining area of land declared surplus is held up mainly due to litigation.

1.100 There are also widespread complaints that lands allotted to the rural poor under the ceiling laws are not in their possession. In some cases, it has also been alleged that *patta*s were issued to the beneficiaries but possession was not delivered in respect of the lands shown in the pattas or corresponding changes in the records of rights were not made. It has also been the experience that rural poor allottees of ceiling surplus land are dragged into litigation by the erstwhile landowners and against which the allottees are unable to defend themselves. Besides, a number of *benami* and clandestine transactions have resulted in illegal possession of significant amounts of lands above ceiling limits. For all these reasons the results of implementation of the ceiling laws are far from satisfactory. The following measures can be taken up:

- Since large areas of good quality ceiling surplus land are unlikely to be available for distribution to the landless poor, efforts must be made to take steps to release and distribute the land locked in litigation through speedy disposal of court cases.
- In such cases where the land has been distributed but the beneficiary is not in a position to enjoy the land due to being dispossessed or not having a well-defined title to the land, these cases should be surveyed and reopened and such land be restored.
- A special squad of revenue functionaries and Gram Sabha members should be set up for identification of benami and fictitious transactions in a time-bound manner.
- There should be a survey of the government land encroached by ineligible persons and such land should be identified and distributed to the landless. An inventory of the government lands should be made and wherever surplus land is available, it should be distributed to the landless persons.
- Asset in the form of land can lead to poverty reduction. However, to the extent that distributing government lands is not an option, acquisition of land through purchase by the State and distribution to the poor as individuals or in a group may be considered.

Protection of Rights in Land of Tribal People

1.101 Land is the major tangible productive asset that members of scheduled tribes (STs) possess. Tribals also have very strong emotional attachment to their land. Some of the social practices and religious rituals of tribals are also connected with land, which occupies a pivotal place in their psyche. An important fact is that community ownership of tribal land continues to be the dominant mode in tribal societies and takes precedence over individual ownership.

1.102 The increase in extremist activities in many tribal districts can be linked to issues related to land including alienation of tribal land. These are:

- Sale and transfer of land by tribals to other tribals and non-tribals.
- Indebtedness and consequent sale of land.
- Forcible eviction of tribals from land or unauthorized occupation of tribal land by non-tribals or by public authorities.
- Conversion of land from communal ownership to individual ownership.
- Treating tribals traditionally occupying forest lands as encroachers.
- Government land allotted to tribals under various schemes but substantive possession not given.
- Large-scale displacement on account of development projects, such as multi-purpose irrigation and power projects, mining, industry, highways, and urbanization.
- Environment-disturbing developments taking place close to tribal habitats, forcing the tribals to move out, though there is no formal transfer and acquisition of land.

1.103 The following measures are necessary for preventing alienation of tribal land and restoration of alienated tribal land:

- Highest priority should be accorded to the preparation and updating of land records in tribal areas, and with active participation of tribal communities.
- The legal provisions prohibiting the alienation of tribal land in Schedule V areas and its restoration should be extended to the non-Scheduled areas also. A cut-off date should be prescribed while

extending these provisions to the non-Scheduled areas.
- A complete ban on all forms of transfers of tribal lands should be enforced.
- The district authorities should be empowered to take suo moto action for the detection and restoration of land belonging to the STs. It should be ensured that once order of restoration is passed by the competent authority, land is speedily restored to the tribal.
- At present Panchayat (Extension to the Scheduled Areas) Act 1996 (PESA) is applicable only to the Scheduled areas, but a large part of the tribal population lives outside the Scheduled areas. Therefore, provisions of PESA should be applicable mutatis mutandis to villages/areas where majority of the population consists of STs.
- Major alienation of tribal land in the scheduled areas has taken place through the means of compulsory acquisition using the government process of land acquisition. As provided under PESA, no acquisition should take place without the prior concurrence of the Gram Sabha.

1.104 The present arrangements of resettlement and rehabilitation are detrimental and prejudicial to the interests of the tribals. The process of erosion of corpus of tribal land continues at an accelerated pace under the new economic dispensation while the policy options are being debated. The proposed revisions to the Land Acquisition Act and to the current policy and practices relating to resettlement and rehabilitation would provide the much desired policies and packages for more humane and relevant approach in dealing with displacements. There is a strong need for enactment by Parliament of an enabling legislation (like PESA) regarding alienation of land belonging to STs. Incorporating the provisions of the enabling legislation should be mandatory in all laws/regulations made by the respective State Governments.

1.105 Implementation of the Scheduled Tribes and other Traditional Dwellers (Recognition of Forest Rights) Act 2006, passed by the Parliament, and rules framed under it, will provide the much needed protection and respite from exploitation for large numbers of those whose rights could not be recorded or recognized for generations.

Security of Homestead Rights

1.106 An estimated 13 to 18 million families in rural India today are reported to be landless, of which about 8 million lack homes of their own. They either live in a house constructed on the land of others or provided by landowners in return for some forced labour. Some of these persons do not have land to construct a house, while others may have small patches of land but no resources to build a hutment.

1.107 The right to a roof over one's head needs to be seen as a basic human right, along with the right to freedom from hunger and right to education. The Supreme Court, in *UP Avas Evam Vikash Parishad* vs *Friends Co-operative Housing Society* (List All India Reporter [AIR], 1997, Supreme Court [SC] 152), held that right to shelter is a fundamental right. The Eleventh Five Year Plan provides the opportunity to realize this vision.

1.108 Several State Governments have already taken steps to provide each family with a minimum size of land (10–15 cents), so that they have enough space to live and, also a little space extra for supplementary livelihood activities, such as growing fodder and keeping livestock, planting fruit trees or vegetables, or undertaking other land-based economic activities (farm or non-farm) to improve their food, nutrition, and livelihood security. Kerala has a scheme of providing 10 cents of land to each landless family and this has had a notable impact on poverty reduction in the State. Similarly, in 2005, the governments of Karnataka and West Bengal initiated schemes to give homestead-cum-garden plots to landless families. These experiments should be generalized across all States.

1.109 The following steps are needed to ensure this objective:

- All landless families with no homestead land as well as those without regularized homestead should be allotted 10–15 cents of land each. Female-headed families should have priority.
- Some of the required resources could be arranged

through reallocation of the resources from existing schemes, such as the Indira Awas Yojana, NREGA, etc. This must be completed during the Eleventh Five Year Plan.

- When regularizing the homesteads of families occupying irregular and insecure homesteads, the homesteads so regularized should be in the name of the wife.
- The beneficiaries should be given homestead land in a contiguous block, within 1 km or less of their existing village habitation, with proper roads and infrastructural connectivity. In such a consolidated block, essential facilities should also be provided, such as primary school, primary health centre, drinking water, etc.
- The beneficiaries of homestead-cum-garden plot should be assisted by Panchayats and line departments of government to develop plans and receive financial assistance for undertaking suitable economic activities, such as livestock rearing, fodder development, and planting of high-value trees if water is available.

Tenancy Reforms

1.110 Tenancy legislations were introduced after independence to confer ownership on the tenant and some measure of security of tenure, coupled with rent regulation to prevent exploitation of tenants and increase agricultural productivity in such farms. There is a need for giving a fresh look at the tenancy legislations to reflect changes that have occurred in a manner which balances the interest of the landowner and the tenant and improves access to land, its utilization and releases the forces of production leading to improved agricultural productivity.

1.111 Legislative provisions have been made in many States, providing for conferment of ownership rights on tenants or for allowing cultivating tenants to acquire ownership rights on payment of a reasonable compensation to the landowners. Some States have acquired ownership of land from the landowners and have transferred them to the tenants who have to pay a certain amount or premium to the State. The national policy, however, permits landowners who are members of the Defence Services, widows, unmarried women, minors, and persons suffering from physical and mental disability to lease out lands to tenants without loss of ownership. Provisions for security of tenure have been made even in States which do not provide for conferment of ownership rights on tenants, sub-tenants, and sharecroppers.

1.112 Although agricultural tenancies are banned in most States, the incidence of some type of tenancy, particularly in various forms of crop sharing, is still substantial in some regions. As tenancy is contracted orally, and in most cases in violation of law, the tiller's position is precarious and she/he has no incentive to cultivate land efficiently. In several regions, the existing provisions lead landowners to keep the land fallow for fear of losing their rights. It also restricts poor peoples' access to land through leasing in. Experience has shown that measures to ban tenancy are not usually effective and large amount of oral/concealed tenancy continues to exist among all categories of rural households. Thus decrease in lease market participation with economic growth indicates that tenancy restrictions are constraining the supply of land in the rental market. Tenancy legislation has also led to the demise of longer term contractual arrangements and led to even seasonal tenancy in some areas. This discourages the use of farm yard manure and investments which have a long-lasting effect.

1.113 In a majority of States landless and marginal farmers are net leasers in of land. On the other hand, in some of the States, large and medium farmers lease in land from smaller farmers, giving rise to 'reverse tenancy'. This indicates that the transactions for leasing in and leasing out pervade all along the farm size continuum and it appears that it is economic factors rather than power relationships which are defining these leasing arrangements.

1.114 Security of tenure is necessary for producers to have the incentive for investment for productivity and security of tenure should not be confused with ownership rights. Land tenure security should signify that legitimately held rights-to-use in land will not be disturbed without legitimate cause and without due process, and any such contested rights will be resolved by an appropriate dispute settlement mechanism. For protecting the interests of tenants and landowners

and also to increase agricultural productivity, the following reforms in tenancy legislation should be undertaken:

- Tenancy should be legalized in a 'limited' manner. It should provide security to the tenant for the contractual period, which could be long enough to encourage long-term investment by the tenant. It should also protect the rights to the land of the landowner so that he has an incentive to lease his land instead of keeping it fallow or underutilizing it. Long-term tenure arrangements should thus maximize agricultural production and increase the returns to both the farmer, the landlord, and the tenant.
- Instead of prescribed rentals, which are violated in informal tenancies, an upper and lower bound of rents may be prescribed at the State level. If these bands are wide enough, this will do away with the need for illegal arrangements, ensure that the rents are determined by market forces within the prescribed band, and thus increase efficiency and cooperation of both the willing parties.
- Legalizing of tenancy within the above framework will result in increasing the supply of land and will encourage all categories of rural households to participate in the lease market based upon resource endowment, education, employment prospects, prevailing wage levels, and the institutional backup available.
- As agrarian conditions vary across the States, a one-size fit-all prescription cannot be advocated. In cases where the landlords are dominant and there is strong likelihood that interests of tenants may not be safeguarded, special clauses could be necessary.
- Small land-owners who would otherwise have to operate small uneconomic holdings should have the opportunity to legally lease out land to other farmers with the assurance of being able to resume possession at the end of the stated period of tenancy.
- The marginal and small landowners should be assisted with adequate institutional support and rural development schemes, so that they are not compelled to lease out land to big farmers or corporate houses, thereby creating conditions for involuntary reverse tenancy. In the case of sharecroppers, they should have access to credit, once they enter into long-term contracts.

Access to Agricultural Services

1.115 Small and marginal farmers often lack access to major agricultural services, such as credit, extension, insurance, and markets. This is especially true of women farmers since there is pervasive male bias in provision of such services. With almost all sharecroppers and most marginal farmers unable to access credit from the formal system, a key issue relating to agricultural credit is the utter lack of financial inclusiveness. Recent suicides by farmers in many parts of India are linked with increase in indebtedness to non-institutional sources.

1.116 Small and marginal farmers, particularly women, have lower literacy levels compared to the bigger farmers. This limits their access to information sources like media, TV, etc. The government extension machinery also tends to focus on progressive or bigger farmers. Small and marginal farmers are also deprived of MSP because of low surpluses, and at times pledge of produce to moneylenders at less than market price.

1.117 Agricultural technology for enhancing efficiency should normally be scale neutral if markets exist for water and for rental use of lumpy machinery. In fact, small-sized farms actually have an advantage in using surplus family labour and saving monitoring costs, and this is the main argument for land reforms. But lack of access often results in significant yield gaps between bigger and smaller farmers. One solution is strong public intervention in favour of small producers, enabling them to access and benefit from the relevant markets and extension services. But while instructions from above can help, this is not a substitute for empowerment of the beneficiaries themselves.

1.118 The most potent vehicle that can empower the poor is group action. Among success stories, the Deccan Development Society has provided subsidized credit to landless scheduled caste (SC) women's groups for land purchase using an AP government scheme. Many groups have purchased land through this scheme and are farming it collectively. This has enhanced agricultural output, food security, and employment for poor women and their families. Many have brought uncultivated land into productive use. Another example

is a Government of India–United Nations Development Programme (GoI-UNDP) programme which covered 1357 villages and 50000 women in Andhra Pradesh, UP, and Orissa promoting group access to land and collective cultivation by women. This involved collective cultivation on land acquired in many ways: leasing in, releasing mortgaged land, etc. Undertaken in partnership with State Governments, women's groups, and NGOs, support for this programme has ended. It needs revising and extending.

THE WAY AHEAD

1.119 The strategy to accelerate agricultural growth to 4% per annum in the Eleventh Plan requires action in the following broad areas.

- Bringing technology to the farmers.
- Improving efficiency of investments, increasing systems support, and rationalizing subsidies.
- Diversifying, while also protecting food security concerns.
- Fostering inclusiveness through a group approach by which the poor will get better access to land, credit, and skills.

TECHNOLOGY

1.120 It is necessary to prepare a long-term vision envisaging synergy between SAU/ICAR institutions with other relevant research funded by CSIR, DBT, the Ministry of Earth Sciences, etc., especially to cope with longer climate change from global warming. It is also necessary to impart a strategic focus to adaptive research making it location-specific and aimed at identifying regionally relevant best practice.

1.121 Immediate action points are the following:

- Priority in agriculture research should be given to strategic research.
- Research priorities have to shift towards evolving cropping systems suited to various agro-climatic conditions and towards enhancing the yield potential in rainfed areas through development of drought- and pest-resistant varieties.
- The ICAR needs to restructure accordingly and to increase its accountability.
- SAUs also need to be made more accountable, and strengthened to develop, refine, and promote location-specific technologies. Their teaching capacity also requires to be strengthened.

1.122 Public expenditure (both Plan and non-Plan, Centre and States) on agriculture research will need to increase from around 0.7% of agriculture GDP at present to 1% by end of Eleventh Plan. Increased allocation by the Centre would take this to 0.9%. Additional investment by States would lead to public expenditure on agricultural research to 1% of agricultural GDP. To avoid business as usual, the additional resources should be conditional on:

- Improving the governance of the National Strategic Research Fund within the Ministry of Agriculture. An expert body independent of the NARS can assess potential and constraints, including climate change, and set the priorities for the much enhanced strategic research required.
- High-level expert committees at the Centre and in States should also be formed to oversee extended but incentivized SAUs to revitalize their teaching and location-specific research to enable stronger links with farmers. This, in turn, should have a demand-led component whereby States and districts could finance [from schemes such as Rashtriya Krishi Vikas Yojana (RKVY)] specific problem-oriented research arising from the district plans.

IRRIGATION

1.123 The scope for new large surface irrigation projects is getting smaller and the focus should be therefore on completing ongoing irrigation projects and on modernizing existing ones. In particular, much greater emphasis is required on investments in physical rehabilitation and on modernization of systems essential for improving the efficiency of water use. With these considerations in view, it is suggested:

- The allocation to Accelerated Irrigation Benefit Programme (AIBP) during Eleventh Plan should be increased but with much more effective monitoring using remote sensing data to incentivize the Central funds flow to the States.
- States should shift to 'fixed-time fixed-cost' contracts.

- One model modernization project should be in each State.
- More emphasis must be placed on Participatory Irrigation Management (PIM), including collection and retention of water rates by water user associations, to reduce the gap between potential created and the actual utilized.
- Comprehensive water balance accounts must be prepared of current use, both at the system level and at the level of water user associations, to highlight the extent of avoidable waste and identify possibilities of reducing this through better regulation of water deliveries and conjunctive use.
- The subsidy structure on micro-irrigation equipment must be restructured to enable promotion of community sprinkler systems by water user associations.
- National Rural Employment Guarantee (NREG)/ BRGF funds must be used to supplement Command Area Development.

1.124 As far as groundwater is concerned, the priority should be to exploit the abundant availability in Assam, Bihar, Chhattisgarh, Orissa and parts of Jharkhand, Uttar Pradesh, and West Bengal. The ongoing programme of rural electrification in this region under Bharat Nirman will help. The scope of Rajiv Gandhi Grameen Vidyutikaran Yojana (RGGVY) must be expanded to include energization of pump-sets by converging resources from BRGF and the newly formed RKVY.

1.125 However, it is vital to ensure both that adequate credit is available for pump-sets and that electricity rates are not reduced to the unsustainable levels reached elsewhere.

1.126 In other parts of the country where withdrawal currently exceeds recharge, the following are essential:

- There must be regular and accurate assessment of actual groundwater use in both rural and urban areas to correlate this with recharge and extraction.
- Separation of feeders for domestic and agricultural power and its timely but controlled supply for irrigation can help regulate water use.
- Ways must be explored to empower and entrust village communities with the right and responsibility to collect electricity charges and in dark blocks to regulate access through, for example, obligation on groundwater users to undertake rainwater harvesting and groundwater recharge.

Natural Resources Management and Watershed Development

1.127 Much of the country's agricultural area will remain rainfed even if we utilize irrigation potential fully. It is this area that has witnessed the largest deceleration although the untapped potential from existing yield gaps is high. Government has now constituted the NRAA to bring focus to the problems and potentials of these huge but hitherto neglected areas. The NRAA is expected to harmonize across the different Central Government efforts and offer expert advice to States on how to integrate these in their own agricultural plans.

1.128 The pace of watershed development must be accelerated to cover about 37 MH in the Eleventh Plan. To sustain people's participation, it is necessary to have longer treatment and inclusion of a farming systems component. With the higher unit costs envisaged, and including soil conservation measures, this would require a minimum investment of Rs 36000 crore on Natural Resource Management (NRM) during the Eleventh Plan. This magnitude of investment is feasible if the combined investment on irrigation and NRM increases at 12% per annum from their 2006–07 base, but only if the States progressively shift some of the resources currently expended on irrigation to NRM. States could utilize resources available from the RKVY for this purpose. At the same time, existing Central Sector NRM programmes under Macro Management and Sustainability of dry land farming will be linked to a new and larger programme for rainfed farming systems with a much wider focus so as to bring the watershed-plus element into programmes of the Ministry of Agriculture and of Rural Development. The National Rainfed Authority will provide guidelines and technical inputs.

Strengthening Input and Support Services and Rationalizing Subsidies

1.129 The present unbalanced and irrational system of fertilizer subsidy is an important cause of deteriorating soil quality. There is an urgent need to

rationalize subsidy across nutrients and also examine methods by which the delivery of some part of the presently huge subsidies can be transferred from fertilizer producers to farmers or a group of farmers directly.

1.130 Soil health awareness must be promoted through a credible system of soil testing and of advice on nutrient needs based on soil tests.

1.131 Agricultural extension is critical for narrowing the more general knowledge gaps that exists in our agriculture. States must begin by filling up field-level vacancies in extension and provide much better training, including at SAUs. At the same time, the Centre's plan to support the KVKs and ATMAs should be synergized and made part of a comprehensive and participatory district planning process. Alternate delivery channels spanning Rural Knowledge Centres, ICT-based extension, farmer-to-farmer extension, NGOs, and the private sector should also be promoted simultaneously. ATMAs capacity in relatively neglected areas, such as animal husbandry must be increased and the scope of Strategic Research Extension Plans (SREP) enlarged. The SREP and ATMAs will form a core part of agricultural district planning to be incentivized by the RKVY.

1.132 There is also a need to ensure adequate and timely supply of the quality inputs of which the supply of seed needs the most urgent attention. The seed production and distribution system must be revamped by strengthening public sector seed agencies and by involving private trade in seed multiplication and distribution system. States must simultaneously strengthen their systems to check quality of inputs since there is evidence that sale of spurious seed, fertilizer, and farm chemicals is on the rise.

1.133 An associated issue is that of credit outreach. In order to revamp the co-operative credit structure, all the States must act urgently to implement the Vaidyanathan Committee recommendations. Early reports are promising, but monitorable deadlines must be set to meet the required commitments.

1.134 Promoting financial inclusion should receive higher priority than the demand for lower interest rates. We need to move towards universal banking, including group lending and a rural credit information system aimed at smart Kisan Credit Cards (KCCs) for all. Although arbitrary debt waivers should be avoided, the present situation on farm debt requires that banks and State Governments act together to set up some appropriate formal mechanism to expedite one-time settlements.

1.135 The existing NAIS is a Plan Scheme with very limited coverage and there is strong demand to expand this massively and to reduce the basis of assessment from block to the village. This involves high cost if it is done in an actuarial basis and also raises issues of moral hazard. However, new insurance providers and products are emerging and could offer more choice than currently. Expansion of insurance should be a State initiative, which the Centre should support through an Additional Central Assistance (ACA)/CSS, while retaining the existing NAIS on the non-Plan side.

1.136 Another aspect of risk mitigation is to reduce price uncertainty. MSP exist, and farmers in every region need to be supported in at least one food and one non-food crop in each marketing season. The flexibility provided by our WTO bound tariffs should be used symmetrically to protect farmers from excessive international price volatility.

Food Security

1.137 Food security considerations remain an immediate priority. In view of this, and the large existing potential from yield gaps in eastern and central India, the Central Government has launched the National Food Security Mission as a Central sector scheme in mission-mode aimed at increasing foodgrains production by at least 20 million tonnes by the end of Eleventh Plan. This programme concentrates particularly on increasing seed replacement and the replacement of older varieties by newer ones. Adequate emphasis will also be given to better ground water utilization and linkage with RGGVY. A feature of this scheme is that it provides much more than earlier programmes on capacity building, monitoring, and planning and that the execution of the programme would be within the district planning framework.

Diversification

1.138 Available demand projections suggest that the demand for foodgrains, including for uses other than for direct human consumption, will grow at 2–2.5% per annum during Eleventh Plan, traditional cash crops such as oilseeds, fibres, and sugarcane at 3–4% per annum and livestock and horticulture at 4–6% per annum. Diversification towards horticulture and livestock therefore will have to be a very major element in the strategy for achieving 4% agricultural growth. Such diversification not only offers opportunity for raising farm incomes significantly, employment elasticity for these activities is quite high and these are also likely to put less pressure on natural resources.

1.139 The NHM is already the largest single scheme of the Union Ministry of Agriculture (MoA), with more allocation than for all other crops put together. However, this still largely excludes vegetable production and there is still a shortage of quality planting material. Moreover, horticulture statistics continue to be very weak so that there is inadequate benchmark to assess either the selections made regarding crop clusters or the Mission's overall impact. Although States have welcomed the NHM, their own efforts are still inadequate, for example, on possibilities of converging with other schemes such as integrating with watershed development, using the NREG to develop orchards or using the Mid-day Meals (MDM) scheme to provide a stable local source of demand. There is danger that full opportunities of horticulture may be missed if horticulture has less than full co-operation from other relevant departments. For this reason the district plans incentives by RKVY will put broad emphasis on such convergence.

1.140 Agricultural marketing is a critical element of the diversification strategy. Since high-value agriculture is based on perishable commodities, large investments are required in modern methods of grading, PHM, and development of cold chains. Such investment in turn requires that new players, including large corporate players, be able to enter existing markets and set up new marketing channels. The NHM therefore incentivizes the on-going marketing reforms based on amending existing APMC Acts to allow this. This process has started in earnest, with many business houses investing in the area and with most States having already made APMC amendments. However, this must be taken to its logical conclusion. Many States that have made APMC amendments are yet to frame the necessary rules. This uncertainty needs to be removed as soon as possible.

1.141 Contract farming is another mechanism whereby the private corporate sector can establish linkages between farmers and markets. This needs to be backed by ensuring effective mechanisms for contract registration and dispute resolution, along with adequate information and support so that small farmers are able to enter into collective contracts.

1.142 Food processing also needs to be strengthened to create demand for agricultural produce, cut down or eliminate post-production losses and provide value added products. Investment in food processing, especially in rural areas would lead to a higher realization to farmers as this would generate additional demand farm products as well as create employment opportunities in the non-farm sector crating a virtuous cycle in the process.

1.143 Livestock and fishery development need a major step-up in infrastructure and policy support. There is need to massively expand the breeding infrastructure for cattle and buffalo, utilizing scope for improvement through selective breeding using better quality indigenous stock. India needs a comprehensive disease control programme, including for small ruminants and poultry, and a definite policy to cope with the growing problem of surplus male cattle. New initiatives contemplated during Eleventh Plan include salvaging and rearing of male buffalo calves, entrepreneurial development for commercial rearing of small ruminants and pigs, a separate poultry capital venture fund to promote establishment of poultry estates, retail poultry outlets, and other poultry activities. During Eleventh Plan new initiatives are envisaged to provide infrastructure for deriving economic gains from the fallen animals and also for training of the primary producers to create awareness regarding acceptable level of food safety at various levels of animal husbandry. In fishery, there is need to establish more hatcheries and ensure stockable sizes of seed for ponds,

tanks, and reservoir sites. All this would require much more commitment from States than is indicated by their current annual plan (AP) allocation of only around Rs 2100 crore for all these activities, including dairy. The Centre, too, will require stepping up its efforts, especially in areas of feed/fodder supply, disease control, and in ensuring progeny testing and traceability.

1.144 The recently set up NFDB has huge potential and requires being up-scaled rapidly. It is also necessary to reduce the present duplication of efforts between the Department of Animal Husbandry and the NDDB and resolve the associated disagreements on a long-term strategy for dairy development. The NDDB has proposed a National Dairy Plan. This needs to be considered seriously by the States and their views incorporated in the Eleventh Plan.

EQUITY ISSUES

Small Farmers' Needs

1.145 Given that 80% of farmers are small and marginal, and, increasingly female, special steps will be needed to improve their effective access to inputs, credit, extension services, and output markets. It is now well recognized that the poor are best empowered if they function as a group rather than as individuals and that this is also the best way to secure economies of scale. Hence for the poor and for women to gain and be effective farmers we should encourage a 'group approach'. This could range from low levels of collective functioning such as joint investments in lumpy inputs such as tube wells or co-operatives for input purchase and marketing, to high levels of collective functioning such as land pooling or even joint purchase of leasing of land and joint farming. A group-oriented approach could benefit small farmers on many different fronts:

- Investment in irrigation and irrigation delivery systems.
- Information and input delivery.
- Product marketing.
- Promoting land access.
- Land pooling of owned land, or joint purchase or joint leasing in and group farming.
- Contract farming.

1.146 An important task in this context will be to examine the nature of subsidies in current schemes. There is a strong case to redesign these subsidies, giving greater benefits to PRIS/farmers groups than individuals, so as to incentivize group formation particularly amongst small, marginal, and female farmers.

1.147 Managing vulnerabilities and demographic change: All precaution must be taken to ensure that the poor do not get further excluded as a result of contingencies, whether natural or a part of the economic growth strategy. In particular, there should be no fear that they will lose their lands involuntarily to larger entities:

- Survey/settlement should be completed and land titles and their mutations issued and recorded properly. If this is done, modern IT/GIS technologies could be used to build an online registry of farmers and their land status. This would not only bring confidence but also enable better credit linkage and eventually allow subsidies to be passed on to farmers directly.
- There is no justification, at this stage, for encouraging corporate farming by relaxing the existing ceiling on land ownership. In fact, if the registry above is done properly, some ceiling-surplus land will be available for distribution. In any case, since many richer farmers are exiting agriculture voluntarily, small farmers should be assisted to buy land through the provision of institutional credit on long-term basis at a low rate of interest.
- At the same time, the land-lease market should be liberalized. The two major elements of such reform are: security of tenure for the tenants during the period of contract and the right of the land-owner to resume land after the period of contract is over. The right should be especially firmly available to small farmers.
- Special programmes need to be designed and implemented to enable small farmers to improve their capacity to go for high value commercial activities in crop production, dairy, poultry, fisheries, etc.

1.148 Gender equity: With the share of female workforce in agriculture increasing, and increased incidence of female-headed households, there is an urgent need

to ensure women's rights to land and infrastructure support:

- Women's names should be recorded as cultivators in revenue records on family farms where women operate the land having ownership in the name of male members.
- The gender bias in functioning of institutions for information, extension, credit, inputs, and marketing should be corrected by gender-sensitizing the existing infrastructure providers.
- Women's co-operatives and other forms of group effort should be promoted for the dissemination of agricultural technology and other inputs, as well as for marketing of produce.
- Wherever possible a group approach for investment and production among small scale women farmers, be it on purchased or leased land, should be promoted. Women farmers are typically unable to access inputs, information, and market produce on an individual basis. A group approach would empower them.

1.149 Regional balance: A problem, not peculiar to agriculture, is that poorer States that have poor infrastructure not only miss out on private investment but also cannot avail many Central government programmes. The Bharat Nirman initiative is attempting to rectify some of this so far as rural areas are concerned but two sources of bias in agriculture against poorer States need to be corrected:

- The Rural Infrastructure Development Fund (RIDF) recycles to States for infrastructure creation banks' shortfall in agricultural lending from priority lending norms. This should ideally go to those States and benefit those who have least access to credit. In fact, most RIDF funds go to States where rural credit–deposit ratios are relatively high. This should be corrected, along with RIDF allocations changed from being year-to-year to a longer allocation so that this can be built properly into State and district plans.
- Regions with poor market infrastructure are usually excluded from MSP operations by Central agencies. Since this leads to a double disadvantage for farmers in such regions, some arrangement needs to be made, for example a revolving price stabilization fund, so that short-term credit from this can be easily availed by PRIs to do their own MSP purchase which can then be delivered to the Central agencies involved.
- The new Eleventh Plan schemes will put special emphasis on regional balance. For example the RKVY gives special weightage to rainfed areas and the selection of districts under National Food Security Mission especially targets districts with currently low yields but high potential.

Restructuring Agriculture Planning

1.150 An important innovation during the Eleventh Plan is the new RKVY with an outlay of Rs 25000 crore, which is designed to give more flexibility to States, and incentivize them to spend more on agriculture on the basis of properly designed district and State plans. The RKVY provides a framework to achieve this objective since it requires that every district should draw up a district plan that fully utilizes an initial resource envelope available from all existing schemes, State or Central, including resources at district level from Central schemes such as those of Rural Development, Ministry of Panchayati Raj, Ministry of Water Resources (MoWR), and other ministries. The District Agricultural Plan should include livestock and fishing and be integrated with minor irrigation (MI) projects, rural development works, and with other schemes for water harvesting and conservation. The State agricultural plan should be based on these initial district plans, subject to reasonable resources from its own plan and adding those available from the Centre, aimed at achieving the State's agricultural growth objective, keeping in view the sustainable management of natural resources and technological possibilities in each agro-climatic region. This plan should then determine each district's final resource envelope, their production plan, and the associated input plan. Annual targets at the start of the fiscal year should be fixed and funds for relevant schemes ensured, with implementation reviewed every quarter both at district and State level.

1.151 Most agricultural activities figure in Schedule XI of the Constitution and form part of the domain of PRIs. The 74th Constitutional Amendment Act stipulates District Planning Committees at the district

level to integrate sectoral plans of a district which then get further integrated into the State plans. The Planning Commission has already issued detailed guidelines of Plan process which needs to be followed by the States while preparing District Agriculture Plan as well.

1.152 Unfortunately, State Agricultural Plans today are far from this ideal. In many cases these are only little more than an aggregation of the States' share of CSS whose guidelines are Centrally determined and whose release is often a problem. Moreover, since Central funds flow through different channels and to different levels, district plans are no more than a collection of proposals to different Central departments and since each Central department clears proposals on its own priorities, the resulting State and district plans lose the application of minds which can come up with better region-specific solutions. Things are, of course, somewhat better where the State plan component of total Plan expenditure on agriculture is high, but this is getting rare.

1.153 There is, therefore, a need to ensure that adequate resources are available for agriculture from both Centre and State and that this be known adequately in advance for meaningful planning at district and State levels. The RKVY is an attempt to address these issues. It is conditional on States adopting appropriate district planning and also on States maintaining a baseline share for agriculture in total Plan expenditure. The guidelines already issued strongly incentivize higher State expenditure on the sector and also stresses almost all the priorities outlined earlier in the chapter.

1.154 In this format, not only RKVY but also the work plans of existing schemes of macro-management and extension (including district-level SREPs) will be integrated into the district plans. On the basis of these, the State plan can be the basis for early discussion between the State, the Ministry of Agriculture, and the Planning Commission so that resource envelopes can accordingly be communicated to the districts. It would allow much more integration especially with NRM, on which the NRAA could advise and also provide incentives for States to maintain the share of agriculture in their own plans. The Planning Commission, along with Ministry of Agriculture and Panchayati Raj, has already started intensive consultation with States to put into effect adequate and comprehensive district agricultural planning. If this works, the Centre could consider, in consultation with States, decentralizing the administration of its CSS through empowered Regional Production Commissioners acting alongside ICAR regional co-ordinators so that the Central role in both R&D becomes more consistent, with the agro-economic requirements. However, the workability of this needs to be further discussed in detail with the State Government.

Financing of the Eleventh Plan

1.155 The Eleventh Plan strategy of inclusive growth rests upon substantial increase in public sector outlay. The Eleventh Plan allocation at 2006–07 price is projected at Rs 54801 crore as against a Tenth Plan outlay of Rs 20513 crore at 2001–02 price. The total projected Gross Budgetary Support (GBS) for the Eleventh Plan for Department of Agriculture and Cooperation is Rs 36549 crore (2006–07 price) and Rs 41337 crore (current price), for DAHDF is Rs 7121 crore (2006–07 price) and Rs 8054 crore (current price) and for Department of Agriculture Research and Education is Rs 11131 crore (2006–07 price) and Rs 12588 crore (current price). (Details at Annexure 1.3.)

As has been highlighted in the chapter, in addition to this, the government has already initiated measures to incentivize State Governments to increase investment in agriculture sector by provision of Rs 25000 crore ACA to States over the plan period through the RKVY. In addition to these budgetary supports provided to Ministry of Agriculture, Rs 17205 crore would be made available to MoRD for Natural Resource Management and support to the States for setting up an efficient Land Administration System. Investments in NREGA, BRGF, and Rural Infrastructure under Bharat Nirman would also strengthen the growth impulse in the agriculture sector. These measures are expected to create conditions for drawing in private investment as well which has been seen to be complementary to public investment in agricultural sector.

ANNEXURE 1.1
Plan Outlays for the Centre, States and UTs

(Rs Crore)

	Total Plan Outlay	Agriculture and Allied Sectors	Irrigation and Flood Control	Total (3) + (4)	Total Plan Outlay	Agriculture and Allied Sectors	Irrigation and Flood Control	Total (7) + (8)
		At Current Price				At 2001–02 Price		
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Eighth Plan (1992–97) outlay	434100.0	22467.2 (5.2%)	32525.3 (7.5%)	54992.5 (12.7%)	853898.25	44194.2 (5.2%)	639793.0 (7.5%)	108173.2 (12.7%)
Ninth Plan (1997–2002) outlay	859200.0	42462.0 (4.9%)	55420.0 (6.5%)	97882.0 (11.4%)	1094541.7	54092.7 (4.9%)	70599.9 (6.5%)	124692.7 (11.4%)
Tenth Plan (2002–07) outlay	1525639.0	58933.0 (3.9%)	103315.0 (6.8%)	162248.0 (10.6%)	1525639.0	58933.0 (3.9%)	103315.0 (6.8%)	162248.0 (10.6%)
Annual Plan 2002–03 (Actual)	210202.9	7655.1 (3.6%)	11964.8 (5.7%)	19620.3 (9.3%)	202333.92	7368.5 (3.6%)	11516.9 (5.7%)	18885.8 (9.3%)
Annual Plan 2003–04 (Actual)	224827.0	8776.0 (3.9%)	12900.3 (5.7%)	21676.3 (9.6%)	208497.1	8138.6 (3.9%)	11963.3 (5.7%)	20101.9 (9.6%)
Annual Plan 2004–05 (Actual))	263665.2	10962.6 (4.2%)	19024.5 (7.2%)	29987.1 (11.4%)	234279.1	9740.8 (4.2%)	16904.2 (7.2%)	26644.9 (11.4%)
Annual Plan 2005–06 (RE)	351629.5	13439.8 (3.8%)	25007.0 (7.1%)	38446.8 (11.2%)	299132.7	11433.3 (3.8%)	21273.6 (7.1%)	32706.8 (11.2%)
Annual Plan 2006–07	441285.2	16162.8 (3.7%)	33189.4 (7.5%)	49352.2 (11.2%)	354941.2	13000.3 (3.7%)	26695.4 (7.5%)	39695.7 (11.2%)
Total Tenth Plan expenditure	1491616.2	56996.3 (3.82%)	102086.00 (6.84%)	159082.7 (10.67%)	1299183.98	49681.5 (3.82%)	88353.3 (6.84%)	138035.2 (10.67%)
Tenth Plan expenditure as % of outlay	97.8%	96.7%	98.8%	98.1%	85.1%	84.3%	85.5%	85.1%

Note: Figures in brackets indicate % of total Plan outlay.

Source: Economic Survey 2006–07.

ANNEXURE 1.2
Degraded Lands Developed under Various Watershed Development Programmes—since Inception upto the Tenth Five Year Plan

(Area in Lakh Hectares and Expenditure in Rs Crore)

S. No.	Ministry/Scheme and Year of Start	Progress since Inception up to Ninth Plan		Progress in Tenth Plan* (2002–07)		Total since Inception up to Tenth Plan*	
		Area	Expr.	Area	Expr.	Area	Expr.
(A) Ministry of Agriculture (Department of Agriculture and Co-operation)							
	NWDPRA (1990–91)	69.79	1877.74	23.30	1147.82	93.09	3025.56
	RVP and FPR (1962 and 1981)	54.88	1516.26	9.98	727.98	64.86	2244.24
	WDPSCA (1974–75)	2.58	166.27	1.35	129.31	3.93	295.58
	RAS (1985–86)	5.81	76.39	1.30	45.35	7.11	121.74
	WDF (1999–2000)	0.00	0.00	0.59	26.02	0.59	26.02
	EAPs	13.35	2039.81	4.80	1927.54	18.15	3967.35
Subtotal		146.41	5676.47	41.32	4004.02	187.73	9680.49
(B) Ministry of Rural Development (Department of Land Resources)							
	DPAP(1973–74)	68.95	3284.74	68.32	1557.76	137.27	4842.50
	DDP(1977–78)	33.56	797.38	45.17	1152.50	78.73	1949.88
	IWDP(1988–89)	37.34	616.51	62.22	1821.64	99.56	2438.15
	EAPs	1.40	18.39	3.60	274.28	5.00	292.67
Subtotal		141.25	4717.02	179.31	4806.18	320.56	9523.20
(C) Ministry of Environment and Forests							
	NAEP(1989–90)	0.70	47.53	0.00	0.00	0.70	47.53
Total (A+B+C)		288.36	10441.02	220.63	8810.20	508.99	19251.22

Note: * Includes tentative achievement of 2006–07.
Source: Report of the Working Group on Natural Resources Management for the Eleventh Five Year Plan (2007–12), Planning Commission, Government of India (February 2007).

ANNEXURE 1.3
Projection for Central Sector GBS—Ministry-wise for the Eleventh Plan

(Rs Crore)

S. No.	Ministry/Department	Tenth Plan BE (2001–02) Price	Eleventh Plan Base Year 2006–07 BE	Eleventh Plan	
				Constant (2006–07)	Current Price
1.	Department of Agriculture and Co-operation	13883	4800	36549	41337
2.	Department of Agricultural Research and Education	4422	1350	11131	12588
3.	Department of Animal Husbandry, Dairying, and Fisheries	2208	777	7121	8054

Note: In addition, Rs 25000 crore will be provided as Central Assistance to States through RKVY, to be administered by DAC.