

CHAPTER 5.1

AGRICULTURE

5.1.1 With a 24.2 per cent contribution (triennium ending 2001-02) to the gross domestic product (GDP), agriculture still provides livelihood support to about two-thirds of country's population. The sector provides employment to 56.7 per cent of country's work force and is the single largest private sector occupation. Agriculture accounts for about 14.7 per cent of the total export earnings and provides raw material to a large number of Industries (textiles, silk, sugar, rice, flour mills, milk products). Besides, the rural areas are the biggest markets for low-priced and middle-priced consumer goods, including consumer durables and rural domestic savings are an important source of resource mobilisation.

5.1.2 Any change in this sector, positive or negative, has a multiplier effect on the entire economy. A nation of more than a billion people cannot be dependent on imports for the basic item like foodgrains. The agriculture sector, therefore, acts as a bulwark in maintaining food security and, in the process, national security as well. The allied sectors like horticulture, animal husbandry, dairy and fisheries, have an important role in improving the overall economic conditions and health and nutrition of the rural masses. To maintain the ecological balance, there is need for sustainable and balanced development of agriculture and allied sectors. Recognising the crucial role played by the agriculture sector in enabling the widest

dispersal of economic benefits, the Approach Paper to the Tenth Plan has emphasised that agricultural development is central to economic development of country.

5.1.3 After remaining a food deficit country for about two decades after Independence, India has not only become self-sufficient in foodgrains but now has a surplus of foodgrains. The situation started improving gradually after the mid 1960s with the introduction of high yielding varieties (HYVs) of crops, and the development of agriculture infrastructure for irrigation, input supply, storage and marketing. The high production potential input responsive HYVs motivated farmers to adopt improved production technologies with the use of water, fertilisers and agrochemicals. Besides the public sector rural infrastructure, farmers developed their own 'on-farm' resources. The extension support for production technology and the marketing support through procurement operations encouraged farmers to step up production. The production of various crop commodities has increased substantially, over the various Plan periods (Table 5.1.1). The foodgrains production increased to a level of 211.32 mt in 2001-02 from 89.36 mt in 1964-65. The production of oilseeds, cotton, sugarcane, fruits, vegetables and milk also increased appreciably. The country demonstrated an all round development in the field of agriculture, including the livestock sub-sector.

¹ Excluding forestry & logging; Agricultural Statistics at a Glance-2002, Ministry of Agriculture.

² Report of the Special Group on Targetting Ten Million Employment Opportunities Per Year, 2002, Planning Commission.

³ Agricultural Statistics at a Glance-2002, Ministry of Agriculture.

Table - 5.1.1
Foodgrains Production during Various Five Year Plans.

(million tonnes)

Commodity	IV Plan (1973-74)	V Plan (1978-79)	VI Plan (1984-85)	VII Plan (1989-90)	VIII Plan (1996-97)	IX Plan (2001-02)
Rice	44.05	53.77	58.34	73.57	81.74	91.61
Wheat	21.78	35.51	44.07	49.85	69.35	71.47
Coarse Cereals	28.83	30.44	31.17	34.76	34.10	34.72
Pulses	10.01	12.18	11.96	12.86	14.24	13.52
Total Foodgrains	104.67	131.90	145.54	171.04	199.44	211.32

5.1.4 The last 55 years of agriculture development in the country could be divided into various phases :

- ☒ when the expansion of net sown area (NSA), irrigated area, development of rural infrastructure and land reforms played an important role;
- ☒ when high yielding dwarf varieties, agricultural inputs like fertilisers, pesticides and improved crop production technologies ushered in the Green Revolution';
- ☒ when minimum support prices (MSP) and procurement of agricultural commodities were ensured and the food grains storage and distribution system was expanded at the national level; and
- ☒ when the thrust was on liberalisation and globalisation with the establishment of the World Trade Organisation (WTO).

5.1.5 The main factors for the all-round success of agriculture have been: increase in net sown area; expansion of irrigation facilities; land reforms, especially consolidation of holdings; development and introduction of high yielding seeds, fertilisers, improved implements and farm machines, technology for pest management; price policy based on MSP and procurement operations; infrastructure for storage/cold storage; improvements in trade system; increase in investments, etc.

5.1.6 The era of all-round development on the agriculture front has been called the Green Revolution'. The country's achievements have been applauded the world over and the developing countries have started considering India their role model. However, in spite of the spectacular achievements, various constraints and disturbing trends continue to hamper the requisite growth of the agriculture sector.

5.1.7 During the 1990s (1989-90 to 1999-2000), the growth of agriculture decelerated as compared to the 1980s (1979-80 to 1989-90). - The overall growth rate of crop production declined from 3.72 per cent per annum to 2.29 per cent per annum and productivity from 2.99 per cent per annum to 1.21 per cent per annum. During the 1990s the growth rate of foodgrains production declined to 1.92 per cent per annum from 3.54 per cent per annum during 1980s. Similarly the growth rate of productivity in food grains decelerated to 1.32 per cent per annum as compared to 3.33 per cent per annum during the 1980s. The deceleration in the growth rate of foodgrains production was steep as compared to non foodgrain crops from 4.02 per cent per annum during the 1980s to 2.83 per cent per annum during the 1990s.

5.1.8 The per unit area productivity of our crop commodities is much lower as compared to that of the other major crop producing countries (Table.5.1.2). There is also a wide gap in the yield levels among and within States.

Table-5.1.2
Comparative Yield of Principal Crops in Various Countries (1999)

(Kg. per ha)

Country	Paddy	Wheat	Maize	Ground nut	Sugar cane
India	2929	2583	1667	913	68012
China	6321	3969	4880	2799	85294
Japan	6414			2336	
U.S.A	6622	2872	8398	3038	80787
Indonesia	4261		2646	1523	
Canada		2591	7974		
Vietnam	4105			1435	
World average	3845	2711	4313	1336	65689
Rank of India in production In the world	Second after China	Second after China	accounts for only little over 4% of world's production	Second after China	Second after China

Source : Agriculture at a glance, 2002, Ministry of Agriculture

5.1.9 As the Mid Term Appraisal (MTA) of the Ninth Plan pointed out, during the 1990s, the policy of various States has been to increase production through subsidies on inputs such as power, water and fertilisers, rather than by building new capital assets in irrigation and power. These problems are particularly severe in the poorer states. Although private investment in agriculture has grown rapidly, this is hardly a substitute for lower public investment and deteriorating quality of public services in agriculture. Macro-economic distortions are visible. For example, private investment in diesel run generating sets is increasing while power capacity is under-utilised because of poor distribution and maintenance. The poor base of rural productive assets and poorer technological base because of past public/private patterns of spending has been recognised as a serious constraint in increasing production and productivity.

5.1.10 Unsustainable practices like excessive use of water together with imbalanced use of fertilisers especially in the Green Revolution areas of northern and northwestern parts of the country have affected soil health and environment adversely. The organic matter content in the soil

has gone down because of less use of organic inputs and the micro nutrients deficiency has become alarming.

5.1.11 Natural resources like land and water have not received the attention they deserve. The sustainable development of land and water resources becomes all the more important for the nation like India, which shares about 16 per cent of the global population but has only 2.4 per cent of the total land and 4 per cent of the total water resource. Scarcity of water in rainfed areas is causing serious hardships. Ground water resources are dwindling fast due to poor water harvesting leading to excessive run off and poor recharging of ground water. This is accompanied by excessive drawal/ exploitation mainly to meet the household needs of growing population as also irrigation needs of new high yielding crops. The number of dark blocks/mandals where there is over exploitation of groundwater (over 85 per cent) is increasing in most of the States with large rainfed areas (Andhra Pradesh, Karnataka, Rajasthan, Madhya Pradesh, Chattisgarh etc.). Between 1984-85 and 1998-99 the number of dark blocks increased from 253 to 428. If this continues, the number of over exploited blocks will double over a period of every twelve and a half years⁴. The drinking water problem in some

⁴ Irrigation, Flood Control and Command Area Development, MTA 9th Plan, Planning Commission

of the areas has persisted largely due to the adoption of cropping patterns with high water demanding crops. The hydrological chain has been disrupted and needs to be restored on priority. Effective groundwater recharging measures as also regulations for sustainable exploitation need to be put in place on an urgent basis.

5.1.12 Out of the geographical area of 328.73 million ha (m ha), an area of about 107.4 m ha is estimated to be degraded⁵. Under the programmes of Department of Agriculture and Cooperation, Department of Land Resources and Ministry of Environment and Forests and other programmes, up to the end of the Eighth Plan, only 17.96 m ha had been covered/treated. A sizeable area of degraded/rainfed land needs soil conservation, water harvesting and vegetative cover.

5.1.13 The availability of inputs and their use in agriculture has remained sub-optimal. Only about 40 per cent of the net sown area of 142.8 m ha could be brought under irrigation and the remaining is dependent on rains. The larger dependence of crops on monsoon has adversely affected the use of inputs and adoption of improved crop production technologies, because of high risk involved in crop production and low/no profit margin.

5.1.14 Seed availability and seed replacement rates (SRRs) for most of the crops remained inadequate and below the desired levels. There is also a mismatch in availability and demand of seeds of different varieties, especially in case of crops/varieties specific to the problem areas. The average fertiliser consumption at 92 kg/ha remained low and imbalanced in terms of the use of {Nitrogen, Phosphorous and Potash (NP&K)} (6.69:2.59:1.0) (2001-02). The per hectare fertiliser use remained very low in some States, especially northeastern States, Himachal Pradesh (42 kg), Orissa (47 kg), Rajasthan (35 kg) and undivided Madhya Pradesh (29 kg). Besides, the increasing deficiency of micro nutrients, especially zinc, iron, etc. in the soil has been observed in recent years.

5.1.15 Though the consumption of pesticides seems to have declined, because of the propagation of the Integrated Pest Management (IPM) approach and the increasing awareness about the hazards of pesticides, the availability of quality pesticides remained a matter of concern. The infrastructure for enforcing the provisions of the Insecticide Act, 1968, also remained inadequate.

5.1.16 The availability of quality farm machines and implements has remained unsatisfactory. The reservation of the manufacture of agriculture machinery and implements for the small-scale industries (SSIs) seems to have also adversely affected the development of this sector. Although the use of tractors in agriculture has increased rapidly, the availability of the right type of machines and implements, which could help reduce drudgery, adoption of modern technologies and precision farming has remained grossly inadequate. Because of inefficient farming operations, the cost of production has also remained high as compared to the developed countries.

5.1.17 The agriculture extension machinery and information support in most States seems to have become outmoded. The staff created under the World Bank assisted Training and Visits (T&V) programme do not have much mobility. The need to revamp the extension services in the country by using print and electronic media and information technology along with the involvement of the private sector is being felt increasingly. The private sector, especially the input agencies and traders, are now one of the main sources of information for the farmers. Radio, television and the print media have become powerful means of education and technology dissemination.

5.1.18 Growth in Total Factor Productivity (TFP) seems to have declined suggesting a drop in the force of technology impact. Inadequate storage/cold storage facilities affected post-harvest handling, processing and value addition. On top of this, poor marketing support, delay in announcing MSP, non-realisation of MSP/remunerative prices affected the profitability of the farmers and diversification.

⁵ Committee set up by the Ministry of Agriculture, Govt. of India

5.1.19 The share of agriculture in GDP has declined from 61 per cent in 1950-51 to 24.2 per cent (TE 2001-02), whereas the dependence of population on agriculture has declined only marginally from 77 per cent to 69 per cent during the period. In all the developed countries, there has been a major shift of population from agriculture as an occupation to other sectors. However, this has not happened in India. Secondly, the average size of holdings has reduced from 2.28 ha in 1970-71 to 1.57 ha in 1990-91. So, the pressure on per unit of land has increased by about 2.25 times.

5.1.20 The terms of trade have generally remained unfavourable to agriculture. The Commission for Agricultural Costs and Prices (CACP) in its 'Report for the crops sown during 2000-2001 season' has made following observations:

"...in the period before 1975, the terms of trade fluctuated considerably with declines during 1952-63, a sharp upturn during the mid-sixties, a high average level during 1964-74 and sharp fall again in 1975-76. As compared to this, the trend has been much more stable after 1980, with a slow upward trend. It may be noted that since the terms of trade came into the Commission's terms of reference the stability it has shown is unusual by international standards and exhibits much less volatility than elsewhere. Also, the upward trend is counter to the general trend of international agricultural prices to fall relative to those of manufacture. According to the World Bank, the real international price of agricultural commodities (i.e. relative to manufactures) fell by 45 per cent between 1980 and 1998. Thus, the Indian price policy has ensured a much more stable price environment for farmers and has also protected them so far from the terms of trade losses being suffered by farmers elsewhere."

"As to recent developments, the index is provisionally estimated at 95.0 in 1999-2000, against 95.6 in 1998-99 which was the highest since 1974-75. This is, however, best analysed in terms of three year averages. In the TE 1999-2000, the index reached 94.1 from 93.4 in TE

1998-99 and 91.7 in TE 1997-98. Thus on the whole terms of trade have improved in recent years."

"The DES (Directorate of Economics and Statistics) is also bringing out an alternative index which is more comprehensive in coverage of commodities and also has a more recent base. However, the Commission continues with its index because the DES estimates are only available with a time lag. Also, there are certain conceptual differences between the two indices, particularly in the treatment of interest charges which the Commission is examining before a decision is taken to discontinue the existing series."

Table 5.1.3
Indices of Terms of Trade in Agriculture

year	CACP Base TE1971-72	DE&S Base TE1991-92
1981-82	82.9	88.7
1982-83	84.7	91.4
1983-84	86.3	91.6
1984-85	86.0	93.9
1985-86	82.4	93.6
1986-87	85.3	95.7
1987-88	86.9	97.4
1988-89	86.2	98.3
1989-90	86.5	99.4
1990-91	90.0	101.9
1991-92	92.7	105.6
1992-93	86.6	103.9
1993-94	90.9	103.6
1994-95	91.8	106.6
1995-96	90.3	105.3
1996-97	93.1	103.1
1997-98	91.7	105.6
1998-99	95.6	105.2
1999-00	95.0*	102.7*
2000-01		101.2*

* provisional

Source : CACP and Dte.Eco. & Statistics, MoAgri.

5.1.21 Data on terms of trade from CACP and the DES are given in table.5.1.3. On the whole, the terms of trade have improved in recent years.

5.1.22 Public sector investment has played a crucial role in the development of infrastructure like irrigation, electricity, agriculture research, roads, markets and communications. Investment in agriculture declined from 1.6 per cent of GDP in 1993-94 to 1.3 per cent in 1998-99 (Table - 5.1.4). This decline was due to a fall in public investment from Rs. 4,467 crore in 1993-94 to Rs. 3,869 crore in 1998-99. There has, in fact, been a continuous decline in public investment in agriculture from 1995-96 till 1998-99. Although, the declining trend in public investment was halted in 1999-2000, with the public sector capital

formation rising to Rs. 4,122 crore from Rs. 3,869 crore in the preceding year, there has not been any improvement in the share of investment in agriculture GDP from the preceding year's level of 1.3 per cent. This calls for a review of policies which led to the diversion of scarce resources away from the creation of productive assets to subsidies for fertilisers, rural electricity, irrigation, credit and other agricultural inputs.

5.1.23 The declining trend in public sector investment will need to be reversed by better targeting of subsidies, increasing investment in productive assets such as irrigation, power, credit and developing rural infrastructure. The trend of percentage share of agriculture in total GCF is given in Table 5.1.5.

TABLE - 5.1.4
Gross Capital Formation Agriculture (At 1993-94 Prices)

(Rs. crores)

Year	Agriculture	Gross Capital Formation			Percentage Share of			Investment in Agriculture as Percentage of GDP
		Total economy	Public Sector in agri.	Private Sector in agriculture	Public sector in Agriculture	Private sector in agriculture	Agri. to total	
1993-94	13,523	181,133	4,467	9,056	33.0	67.0	7.47	1.6
1994-95	14,969	229,879	4,947	10,022	33.0	67.0	6.51	1.6
1995-96	15,690	284,557	4,849	10,841	30.9	69.1	5.51	1.6
1996-97	16,176	248,631	4,668	11,508	28.9	71.1	6.51	1.5
1997-98	15,942	256,551	3,979	11,963	25.0	75.0	4.77	1.4
1998-99	14,895	243,697	3,869	11,026	26.0	74.0	6.11	1.3
1999-00	16,582	268,374	4,112	12,470	24.8	75.2	6.18	1.3
2000-01*	16,545	274,917	4,007	12,538	24.2	75.8	6.02	1.3

*Quick Estimates

Table - 5.1.5
Share of Agriculture & Allied Sector in Total GCF (%)

Year	Public Sector	Private Sector	Total
1970-71	13.8	14.6	14.3
1971-72	13.3	15.0	14.3
1972-73	13.7	16.2	15.0
1973-74	13.0	15.2	14.3
1974-75	12.8	12.8	12.7
1975-76	12.2	15.1	13.9
1976-77	14.5	20.4	17.6
1977-78	17.1	14.6	15.7
1978-79	16.3	18.9	17.8
1979-80	16.1	19.0	17.7
1980-81	17.7	13.6	15.4
1981-82	14.1	9.2	11.2
1982-83	13.1	12.3	12.7
1983-84	13.5	14.4	13.9
1984-85	11.8	11.5	11.7
1985-86	10.2	9.5	9.8
1986-87	8.9	10.1	9.6
1987-88	10.1	13.2	11.7
1988-89	8.8	9.7	9.3
1989-90	7.5	9.1	8.4
1990-91	7.1	11.9	9.9
1991-92	6.6	9.9	8.7
1992-93	6.7	10.5	9.1
1993-94	6.9	9.4	8.4
1994-95	6.7	7.7	7.3
1995-96	7.1	5.9	6.2
1996-97	7.0	7.5	7.4
1997-98	6.2	7.5	7.1
1998-99	5.7	7.8	7.2
1999-2000	5.1	8.2	7.2
2000-01*	4.9	8.2	7.1

* Quick Estimates.

Source : Central Statistical Organisation, New Delhi.

5.1.24 The percentage of Plan outlay in agriculture and allied sectors to total outlay varied in between 11.3 per cent to 14.9 per cent from the First Plan to the Fifth Plan. This sector includes animal husbandry, special area programme, rural development and forestry and

wildlife. From the Sixth to the Ninth Plans, the share of agriculture and allied sectors to total varies between 4.9 per cent and 5.9 per cent. Here, agriculture and allied sectors include animal husbandry and research and education only. Plan-wise position is given in Table 5.1.6:

Table - 5.1.6
Plan outlay in Agriculture and Allied Sectors

(Rs. crores)

Plans	Total Plan Outlay	Agriculture and Allied sectors	%age of Agriculture & Allied sectors to Total
I Plan (1951-56)*	2378	354	14.9
II Plan (1956-61)*	4500	501	11.3
III Plan (1961-66)	8577	1089	12.7
Annual Plans (1966-69)**	6625	1107	16.7
IV Plan (1969-74)**	15779	2320	14.7
V Plan (1974-79)	39426	4865	12.3
Annual Plan 1979-80	12177	1997	16.4
VI Plan (1980-85)	97500	5695	5.8
VII Plan (1985-90)	180000	10525	5.9
Annual Plan (1990-91)	58369	3405	5.8
Annual Plan (1991-92)	64751	3851	6.0
VIII Plan (1992-97)	434100	22467	5.2
IX Plan (1997-2002)	859200	42462	4.9
X Plan (2002-07)	398890	20668	5.2

* Includes Animal Husbandry, Special Area Programme, Rural Development and Forestry and Wildlife.

** Includes bufferstocks of Rs. 140 crore for 1968-69, Rs. 24 crore for 1969-70, Rs. 50 crore for 1971-72 and Rs. 25 crore for 1972-73 and Rs. 24 crore for 1973-73. Thus the figures for V Plan work out to Rs. 124 crore against the original Plan provision of Rs. 225 crore

5.1.25 During the Ninth Plan, total credit flow and achievement is as follows:

TABLE 5.1.7
Credit Flow and Achievement

(Rs. crores)

YEAR	Short Term		NABARD Refinance	Investment (MT/LT)		NABARD Refinance
	Working Group Projections	Ground level credit flow		Working Group Projections	Ground level credit flow	
1997-98	22500	20640	5270	10875	11316	3305
1998-99	25650	23903	5487	12995	12957	3867
1999-2000	29250	28862	5145	15530	15750	4377
2000-01	33500	34700		18608	18804	
2001-02	38500	42735		22342	24036	

Source: NABARD

Table - 5.1.8
Sectoral Deployment of Gross Bank Credit

(Rs. crores)

Sectors	1999-2000	2000-01	%age to total during	
			1999-2000	2000-01
Gross Bank Credit	58806	68335		
i) Public Food Procurement	8875	14300	15.1	20.9
ii) Non-Food Gross Bank Credit	49931	54035	84.9	79.1
A. Priority sector	17216	22587	34.5	41.8
i) Agriculture	4747	7541	9.5	14.0
ii) Small scale industries	4331	3188	8.7	5.9
iii) Other priority sectors	8138	11858	16.3	21.9
B. Industry (Medium & Large)	16803	15518	33.7	28.7
C. Wholesale Trade (other than food procurement)	2853	1027	5.7	1.9
D. Other Sectors*	13059	14903	26.2	27.6

* Housing, consumer durables, non-banking financial companies, loans to individuals, real estate loans, other non-priority sector personal loans, advances against fixed deposits, tourism and tourism related hotels.

Source : Report on Trend and Progress of Banking in India, RBI

5.1.26 The institutional credit agencies would need to support investments in land development structures, farm mechanisation, biotechnology, cold storages, value adding enterprises and marketing to improve productivity and profitability in agricultural. The number of all types of cooperative societies has increased from 1.81 lakh in 1950-51 to 5.04 lakh in 1998-99. These disbursed about 43 per cent of the total institutional credit.

5.1.27 The credit-deposit ratio is an important indicator of the degree of involvement of banks in lending. The rural credit-deposit ratio has declined

from 1.58 per cent in 1991 to 0.73 per cent in 2001, which shows that deposits mobilised from rural India are being utilised elsewhere. In other words, rural India is financing the other sectors of the economy. This decline in the rural credit-deposit ratio has a direct bearing on the decline of public sector capital formation in rural sector. The growth rate and incremental capital-output ratio (ICOR) in agriculture during the Ninth Plan were 2.1 per cent and 4.0 respectively against 4.7 and 1.6 per cent in the Eighth Plan. Table 5.1.9 shows the comparative statement of different sectors of the economy in this respect:

**Table - 5.1.9
Composition and Structure of Growth**

	Eighth Plan		Ninth Plan		Tenth Plan		Share of GDP (%)	
	Growth Rate(%)	ICOR	Growth Rate(%)	ICOR	Growth Rate(%)	ICOR	2001-02	2006-07
1 Agriculture & Allied activities	4.69	1.59	2.06	4.05	3.97	1.99	24.7	20.5
2 Mining & Quarrying	3.59	10.74	3.81	5.44	4.30	7.99	2.3	1.9
3 Manufacturing	9.77	6.67	3.68	18.37	9.82	7.77	15.3	16.7
4 Elect, Gas & Water Supply	5.50	18.00	6.46	15.43	7.99	14.97	2.8	2.8
5 Construction	3.56	1.74	6.82	1.00	8.34	0.99	6.0	6.1
6 Trade	9.06	0.54	5.86	1.09	9.44	0.91	12.7	13.6
7 Rail Transport	1.95	27.94	4.70	9.87	5.40	14.66	0.9	0.8
8 Oth Transport	8.42	4.41	5.63	6.09	7.54	5.37	4.9	4.8
9 Communica-tion	14.31	7.25	17.14	5.28	15.00	8.33	1.7	2.3
10 Financial Services	10.21	2.23	8.93	1.35	11.69	1.56	6.3	7.5
11 Public Administration	3.91	7.82	9.21	4.09	6.43	5.45	6.6	6.1
12 Other Services	6.22	4.19	8.19	3.70	9.26	3.53	15.8	16.8
Total	6.54	3.43	5.35	4.53	7.93	3.58	100.0	100.0

5.1.28 According to the Reserve Bank of India (RBI) report on Trends and Progress in Banking (1998-99), the target for priority sector lending by banks has been fixed at 40 per cent. Out of this, 18 per cent is for agriculture sector. As of March 2001, the total priority sector advances by public sector banks accounted for 43 per cent of their net bank credit, which was almost the same as the 43.5 per cent recorded in March 2000. Within the priority sector, the outstanding credit to agriculture from public sector banks accounted for 15.7 per cent of net bank credit on March 2001 compared with 15.8 per cent in 2000. Net bank credit would be enhanced to the desired level of 18 per cent by the end of the Tenth Plan. Besides, at the end of November 2000, Rs. 33,000 crore was also contributed to the total corpus of the Rural Infrastructure Development Fund (RIDF) under tranches I to VII. The contribution to RIDF is received by the National Bank of Agriculture and Rural Development (NABARD) from scheduled commercial banks against their shortfall in priority sector/agricultural lending during the preceding year. Total sanctions and disbursements under various tranches of RIDF

amounted to Rs. 20,344 crore and Rs. 10,409 crore respectively as on 30 November 2001.

5.1.29 The share of cooperative banks in the ground-level credit for agriculture and allied activities has declined to 41 per cent in 2000-2001 from 45 per cent in 1996-97. A major bottleneck in the smooth flow of credit is the worsening recovery position of the cooperative credit institutions and persistence of chronic over-dues. The commercial banks have improved their share of agricultural credit from 49 per cent of total credit in 1996-97 to an estimated 52 per cent in 2000-01. As on 31 March 2000, 196 rural regional banks (RRBs) were functioning in 476 districts with a network of 14,498 branches. The aggregate amount of Rs. 2,188.44 crore was provided as equity support to 187 RRBs till March 2000. The share of RRBs in agriculture credit increased from 6 per cent in 1996-97 to 7 per cent in 2000-01. Out of 196 RRBs, 187 RRBs have been taken up for recapitalisation under six phases of restructuring, details of which are given in Table 5.1.10.

Table - 5.1.10
Recapitalisation Support Provided to RRBs

RRBs under restructuring up for recapitalisation (Phase No.)	Number of RRBs taken	Of which fully recapitalised	Total amount (Rs.crore)
Phase I	49	49	495.97
Phase II	53	53	528.05
Phase III	34	33	588.73
Phase IV	15	15	176.17
Phase V	24	8	287.52
Phase VI	12		112.00
Total:	187	158	2188.44

5.1.30 NABARD has promoted the concept of self-help groups (SHGs) for financing the poor by formal institutions and encourages the non-formal institutions as well. A beginning was made in 1991-92 by linking self-help groups with the formal credit agencies. About 1,14,775 self-help groups were linked with formal banks by March 2000. The RBI has finalised the modalities of bank finance to self-help groups and reckoning it as priority sector lending in February 2000.

5.1.31 The scheme of Kisan Credit Card (KCC) was introduced in 1998-99 for timely, easy and flexible availability of production credit to farmers. Commercial banks, cooperative banks and RRBs are implementing this scheme. Each farmer is

provided with a Kisan Credit Card and a passbook for providing revolving cash credit facilities. The farmer is permitted any number of drawals and repayments within a stipulated date, which is fixed on the basis of land-holdings, cropping-pattern and scale of finance. A total of 249.07 lakh KCCs had been issued till 30 June 2002. The progress of the scheme is not uniform across States, and is dismal in the northeast. This is attributed to low level of loans issued to farmers availing of crop loans from banks; poor financial position of the cooperative banks and RRBs in the region; lack of infrastructure facilities which are a hurdle in the way of augmenting credit facilities, etc. Details of agency-wise KCCs issued are given in Table 5.1.11:

Table - 5.1.11
Agency-wise Year-wise KCCs issued up to 30th June, 2002

(lakh numbers)

Year	Cooperative Banks	RRBs	Commercial Banks*	Total
1998-99	1.55	0.06	4.45	6.06
1999-2000	35.95	1.73	13.66	51.34
2000-01	56.14	6.48	23.9	86.52
2001-02	54.36	8.34	30.71	93.41
2002-03 (up to 30 th June 2002)	10.99	0.73	NA	11.72
Total:	158.99	17.34	72.72	249.05
% Share	63.84	6.96	29.20	100.00

* Data in respect of commercial banks for the year 2002-03 for April-June 2002 is not available

5.1.32 The performance of credit institutions in northeastern region is very poor as compared to the rest of the country. The deposit mobilisation and credit disbursement in the northeastern region up to March 2000 was 3.66 per cent and 1.75 per cent respectively of total credit disbursement whereas in the western region it was 37.93 per cent and 33.54 per cent on the same date. Similarly, certain sectors like rainfed farming, horticulture, storage, processing have been starved of credit as compared to farm mechanisation, minor irrigation and animal husbandry.

5.1.33 The functioning of the cooperative banks with serious financial weaknesses is inconsistent with the objective of transforming them into strong, viable and self-sustaining institutions capable of channeling enhanced credit flow as envisaged for the Tenth Plan. The recapitalisation and revamping of the cooperative credit institutions is being considered and the Working Group on Credit, Cooperative and Crop Insurance for the Tenth Plan has estimated the recapitalisation requirement of cleansing up the balance sheet at Rs. 8,000 crore.

5.1.34 As agriculture has a major role in alleviating rural poverty, deceleration in its growth has affected the generation of income of rural population. This is evident from the paradox of a very substantial population below the poverty line in rural areas and mounting foodgrains stocks with public agencies. Access to entitlement of rural poor to foodgrain can only be assured by accelerating agriculture growth, especially in areas which have employment-generating potential.

5.1.35 There are region-specific causes for the decelerating growth in the agriculture sector during the 1990s. Some of these are:

- ☒ Low public investment in irrigation and poor maintenance.
- ☒ Poor maintenance of rural infrastructure, specially canals and roads.
- ☒ Decline in investments in rural electrification and in its availability. This has greatly affected production in eastern India,

where huge groundwater potential remains untapped.

- ☒ Rising level of subsidies for power, water, fertilisers and food are eating into public sector investments in agriculture, besides encouraging inefficient use of scarce resources such as water. This further aggravates environmental problems leading to loss of soil fertility and decline in groundwater, which reduces returns on capital. Farmers then demand further subsidies to maintain the same level of production.
- ☒ Inadequate credit support.
- ☒ Continuing imbalanced use of NP & K fertilisers, (6.69:2.59:1.0) in 2001-02 as against the desirable norm of 4:2:1) and increasing deficiency of micro nutrients in the soil.
- ☒ Stringent controls on movement, marketing, credit, stock and export of agri products that affect their profitability. In the face of pressure from the WTO, there is apprehension that without speedy domestic market reforms, an opportunity to capture world markets would be converted into a threat to the future growth of Indian agriculture. The classic case is that of sugar where imports were opened at zero duty when controls on domestic markets remained widespread.
- ☒ Growth in TFP, which is a measure of technical change, seems to be decelerating, suggesting a decline in the force of technology.
- ☒ Demand constraints (slow growth of the urban economy, restriction on exports, lack of land reforms, failure of poverty alleviation schemes, slow growth in rural wages).
- ☒ Controls on the agro-processing industry.
- ☒ Poor extension service.

CROP HUSBANDRY AND NATURAL RESOURCES MANAGEMENT

Performance in The Ninth Plan

5.1.36 The Ninth Plan envisaged a growth of 4.5 per cent per annum (3.9 per cent per annum in terms of value added) in the agriculture sector. In order to achieve this, a regionally differentiated strategy based on agro-climatic regional planning (ACRP) was envisaged to be implemented.

5.1.37 In recent years, several new initiatives have been taken which included :

- ☒ Announcement of National Agriculture Policy (2000).
- ☒ Kisan Credit Card (1998-1999).
- ☒ Introduction of macro-management concept in the implementation of agricultural development programmes instead of scheme approach (2000-01).
- ☒ Creation of a Watershed Development Fund (Rs. 200 crore) with NABARD(1999-2000).
- ☒ Technology Mission for Integrated Development of Horticulture in the North-Eastern region (2000-01).
- ☒ Technology Mission on Cotton (1999-2000).
- ☒ Centrally sponsored scheme 'On-farm Water Management' for increasing crop production in eastern India (2001-02).
- ☒ Legislation on Plant Variety Protection and Farmers' Rights and formulation of National Seed Policy to bring reforms in the seed sector(2002).
- ☒ Implementation of the National Agriculture Insurance Scheme/Rashtriya Krishi Bima Yojana (1999-2000).
- ☒ Credit linked Capital Subsidy Scheme for construction/ modernisation/ expansion of cold storage/storage infrastructure (2000-01).
- ☒ Introduction of Rural Godown Scheme(2001-02).
- ☒ Lifting some of the restrictions and controls on the movement and storage and exports of foodgrains/agri produce(2002).
- ☒ De-reservation of the manufacture of some farm implements/machines from the small-scale industries sector (2002).

5.1.38 Besides, the concept of zero-based budgeting has been introduced to bring in convergence among various Central sector and Centrally sponsored schemes of different departments so as to efficiently utilise the financial and manpower resources. With this exercise and the macro management concept, the number of schemes of the Department of Agriculture and Cooperation has been reduced from 147 to 81 in the Ninth Plan and to 30 in the beginning of the Tenth Plan. Similarly with the zero-based budgeting exercise, the number of schemes/projects of the Department of Agricultural Research and Education has been brought down from 235 to 72 and that of Department of Commerce (for Agriculture) from 78 to 70. It will be pursued with quarterly and yearly performance review of schemes/ projects.

5.1.39 The performance of the agriculture sector during the Ninth Plan has not been as envisaged. The average annual growth during the Plan is estimated to be only 2.06 per cent which is much below the targeted growth of 3.9 per cent. The average annual growth of foodgrains production has remained very low at 1.1 per cent. The average annual production of pulses during the Ninth Plan marginally declined to 13.3 mt from 13.41 mt during the Eighth Plan, mainly on account of area diversion though the productivity recorded some improvement. The oilseeds production fluctuated year to year between 18.4 mt and 24.75 mt.

⁶ Economic Survey, 2001-2002.

5.1.40 Although, during the Ninth Plan, the average annual production of 202.58 mt of food grains remained higher than the average annual production of 187.02 mt achieved during the Eighth Plan, the production targets of various foodgrain crops could not be achieved (Table.5.1.12). Nonetheless, the average annual production of food grains at 202.58 mt during the Ninth Plan was much higher than the average annual production of 187.02 mt achieved during the Eighth Plan (Table.5.1.13). Total foodgrains production increased from 199.44 mt in the Eighth Plan (1996-97) to 211.32 mt in the Ninth Plan (2001-02). Despite the fact that the growth of foodgrains production in recent years was lower than the increase in population during the same period, procurement has been going up.

5.1.41 The deceleration of growth and stagnation in productivity are matters of concern as the current production level of 202 mt of food grains seems to be just sufficient to meet the requirement. There are reports of hunger and malnutrition because of low purchasing capacity of a sizeable portion of households. Due to the high level of poverty, India has some of the highest levels of malnutrition, especially among women and children, in the world. Even though the infant mortality rate (infant deaths below age one per 1,000 live births) has declined from 78.5 during the 1988-1992 period as per the National Family Health Survey (NFHS-1) to 67.6 during 1994-98 as per NFHS-2, it is still on the high side. In the case of children below the age of five, the mortality rate as per NHFS-1 was 109.3 which

Table- 5.1.12
Ninth Plan Production Targets and Achievements of Foodgrains.

(million tonnes)

Crop	VIII Plan 1996-97	IX Plan 2001-02 Target	1997-98		1998-99		1999—2000		2000-01		2001-02	
			Tar.	Ach.	Tar.	Ach.	Tar.	Ach.	Tar.	Ach.	Tar.	Ach.
Rice	81.73	99.00	83.00	82.54	86.00	86.08	86.00	89.68	90.00	84.87	92.00	91.61
Wheat	69.35	83.00	70.00	66.35	74.00	71.29	74.00	76.37	74.00	68.76	78.00	71.47
Coarse Cereals	34.11	35.50	34.00	30.40	34.40	31.33	34.50	30.34	33.00	31.62	33.00	34.72
Pulses	14.25	16.50	15.00	12.97	15.50	14.91	15.50	13.41	15.00	11.67	15.00	13.52
Total Foodgrains	199.44	234.00	202.00	192.26	210.00	203.61	210.00	209.80	212.00	195.92	218.00	211.32

Source: Ministry of Agriculture / Planning Commission.

Table 5.1.13
Comparative Performance of Crops during 8th and 9th Five Year Plans

S.No	Crops	Average VIII Plan (1992-97)			Average IX Plan (1997-2002)		
		Area	Production	Yield	Area	Production	Yield
1	Rice	42.68	78.73	1845	44.50	86.97	1954
2	Wheat	25.24	62.79	2487	26.49	70.85	2674
3	Jowar	12.05	10.69	887	10.20	8.09	793
4	Bajra	9.91	7.87	794	9.30	7.11	764
5	Maize	6.06	9.75	1609	6.47	11.81	1825
	Total Coarse Cereals	32.48	32.17	991	29.93	31.67	1058
6	Gram	6.86	5.27	769	6.75	5.38	797
7	Arhar	3.47	2.42	698	3.45	2.38	688
	Total Pulses	22.78	13.41	589	21.13	13.30	601
	Total Foodgrains	122.87	187.02	1522	122.89	202.58	1648

Area= Million hectares, Production= million tonnes, yield= kg/hectare

declined to 94.9 during the NFHS-2 study. Almost half of the children (47 per cent) under three years of age are underweight, a measure of short and long term under-nutrition. NFHS-2 had shown that rural children are much more likely to be undernourished than urban children. Under-nutrition is lowest among children less than six months old, an age when children are mainly breastfed, and most widespread among children between 12 and 35 months old. The NFHS-2 has stated that at least half of the children in Madhya Pradesh, Bihar, Orissa, Uttar Pradesh and Rajasthan are underweight and at least 20 per cent of children are underweight in every state. Anaemia is widespread among both women and young children. Overall 52 per cent of women and 74 per cent of children in the age group of 6-35 months are anaemic. Anaemia during pregnancy increases the risk of maternal and infant death, premature delivery and low birth rate.

Tenth Plan Targets

5.1.42 The National Agriculture Policy (NAP), 2000 envisages a growth rate exceeding 4 per cent per annum in the agriculture sector. The Tenth Plan targets a 3.97 per cent growth. The NAP envisaged the following type of growth :

- ☒ Growth that is based on efficient use of resources and conserves our soil, water and bio-diversity.
- ☒ Growth with equity, i.e., growth which is widespread across regions and covers all farmers.
- ☒ Growth that is demand driven and caters to domestic markets as well as maximises benefits from exports of agricultural products in the face of the challenges arising from economic liberalisation and globalisation,
- ☒ Growth that is sustainable technologically, environmentally and economically.

5.1.43 For the Ninth Plan, the foodgrains production target was fixed at 234 mt which had to be revised downward to 218 mt considering the performance during the first four years of the Plan. The Working Group on 'Crop Husbandry, Demand and Supply Projections and Agricultural Inputs for the Tenth Plan

has estimated a foodgrains requirement of 230 mt at the end of the Plan (2006-2007). On the basis of normative requirement of foodgrains of 182.50 kg/cu/year (167.9 kg cereals and 14.6 kg pulses), as recommended by the National Institute of Nutrition, the demand works out to 221.4 mt considering the anticipated population level of 1135 Million (deflated by a factor 1.0696 to convert into consumption units). However, on the basis of behaviouristic approach, the demand of foodgrains estimated by the Working Group is 236 mt. On the other hand, the supply projection for foodgrains by the end of the terminal year of the Tenth Plan have been projected in the range of 225 mt to 243 mt.

5.1.44 An adequate thrust on maize cultivation could bring a substantial increase in foodgrains production as even with existing area of about 6.5 m ha, an additional production of about 10-13 mt could be achieved. This is on the assumption that 50 per cent of present potential (3.5 - 4 t/ha) of maize is realised. Considering the immense scope in maize, if the production of other coarse cereals (millets and barley) is maintained at the present level, the total coarse cereals production could be increased to about 43-48 mt by 2006-07. Thus, there is possibility to achieve a production level of food grains of about 245-248 mt by the end of the Tenth Plan, with adequate thrust on maize, especially the multiplication of high yielding seeds on a massive scale and adoption of improved production technology. In addition, thrust on commercialisation of hybrid rice on a large scale and application of improved technologies in wheat could further boost the foodgrains production. For the Tenth Plan allocation to the department of Agriculture and Cooperation has been stepped up to Rs. 13200 crore from Rs 9153.82 crore provided for the Ninth Plan and realization of Rs. 8308 crore. The schemewise break-up of the Tenth Plan outlay is given in the Appendix.

STRATEGY AND THRUST IN THE TENTH PLAN

Regionally Differentiated Strategy

5.1.45 The Regionally Differentiated Strategy based on agro-climatic conditions and natural resources envisaged for the Ninth Plan, for increasing the pace of growth in every region of the country, will be continued during the Tenth Plan.

The three-pronged strategy envisaged for the Ninth Plan to meet the basic food requirements for all will be continued. This strategy involved: (i) increase in overall employment and incomes by raising farm productivity and the growth of other economic activities in the rural areas; (ii) provision of gainful supplementary employment through poverty alleviation schemes; and (iii) distribution of food grains through the public distribution system at subsidised prices to those living below the poverty line.

Sustainable Development of Natural Resources

5.1.46 The biotic pressure on the natural resources, especially land, water and bio-diversity, is increasing resulting in their decrease in per capita availability. With the increasing population, the fragmentation of holdings has increased, resulting in smaller and unviable units of land holdings. To address the issue of fragmentation and small holdings, a clear policy with regard to transfer of agricultural land has to be formulated and implemented. The transfer of land has to be made easier to enable the farmers to augment their holdings to viable units. The rationalisation of stamp duty will facilitate the transaction of land. Besides, freedom in leasing of land, both 'leasing in' and 'leasing out' will help generate income for both lessee and lessor / contractor. A legislation needs to be enacted to facilitate the land utilisation by making land transactions easier and facilitating leasing and contract farming. Besides, to increase the productivity of small and marginal holdings, which constitute 78.2 per cent of all holdings and operate about 32.4 per cent of total area, the technologies suited for such holdings have to be developed.

5.1.47 Besides, consolidation of holdings has to be taken up on a priority basis and completed speedily by the States which have not yet taken up the work. The consolidation of holdings in the northern states has shown promising results in terms of per unit area productivity, adoption of production technologies and returns to the farmers. Preparation of land records would also be given emphasis. States would be asked and helped to take up computerisation of all land records.

5.1.48 Out of the estimated area of about 107 m ha of degraded land, 64 m ha are categorised as wastelands. These wastelands and other degraded areas are either un-utilised or under-utilised. Being a common property resource, individuals do not have the right to utilise these lands for any productive purposes. All such lands under the control of Government or panchayats, would be parceled out in viable units and allotted to landless, scheduled caste and scheduled tribe farmers, small and marginal farmers, retired defence personnel and educated rural youth for cultivation. A condition that a certain percentage of allotted land (say 40 or 50 per cent) must be utilised for tree cover can be stipulated so as to increase the crown area for improving the environmental and ecological conditions. The highly degraded wasteland could exclusively be used for forestry, tree cropping or agro forestry.

BOX 5.1.1

Thrust Areas for the Tenth Plan

- Utilisation of wastelands and un-utilised/ under-utilised lands.
- Reclamation/ development of problem soils/ lands.
- Rainwater harvesting and conservation for the development of rainfed areas.
- Development of irrigation, especially minor irrigation.
- Conservation and utilisation of biological resources.
- Diversification to high value crops/activities.
- Increasing cropping intensity.
- Timely and adequate availability of inputs.
- Strengthening of marketing, processing/value addition infrastructure.
- Revamping and modernising the extension systems and encouraging private sector to take up extension services.
- Bridging the gap between research and farmer's yields.
- Cost-effectiveness while increasing productivity.
- Promotion of farming systems approach.
- Promotion of organic farming and utilisation of organic waste.
- Development of eastern and northeastern regions, hill and coastal areas.
- Reforms to introduce proactive policies for the farm sector.

5.1.49 Besides the waste degraded lands, some of the areas under reserved forests are also unutilised or under-utilised. Moreover, the local community have no/limited access to non-timber forest produce or to utilise the under-utilised forest area for production purposes. It would be worthwhile to consider providing the local community access to grasses and fodder from the forest area and also allow them to produce grasses and fodder and medicinal and aromatics plants in the under-utilised areas or under the forest cover. Besides the resource poor, especially landless and marginal farmers, should have access to fuel wood and fodder from the common property resource under the control of the village panchayats/government. It is time that integrated bio-mass production systems are adopted by combining agriculture and forestry.

5.1.50 There is no scientific survey available in the country which identifies the extent and nature of land degradation correctly and periodically. Estimates prepared by different agencies vary considerably from 53 m ha to 239 m ha. Therefore, soil survey and land degradation mapping of the entire country would be conducted from the Tenth Plan onwards on a mission mode approach. This will be done in active coordination and sharing of costs with Department of Agriculture and Cooperation, Department of Land Resources, Department of Agricultural Research and Education, Ministry of Environment and Forests and National Remote Sensing Agency/Department of Space. As the natural resources are limited and their per capita availability is declining fast, a policy for its sustainable development and nurturing to achieve high productivity levels would be framed. Emphasis will be given to the programmes of reclamation/development of unutilised / under-utilised lands. The Central and State Governments will be encouraged to launch an ambitious programme for the utilisation of such lands for agricultural, forestry and other activities. Easy availability of credit through schematic lending and back-ended subsidy programmes will be ensured.

5.1.51 Rainwater harvesting and conservation will continue to get attention so as to increase productivity of rainfed farmlands. Besides, minor irrigation development, which is more cost-effective

will also be emphasised, especially in the eastern region where huge groundwater potential has remained unharnessed. Investments in the development of minor irrigation facilities will be enhanced. Besides, the utilisation of under-utilised irrigation potential will be improved by encouraging the conjunctive use of water, adoption of improved on-farm water management practices and also the use of water saving devices such as sprinkler irrigation system, drip irrigation system, etc., especially in the low rainfall areas.

5.1.52 Vast areas are in need of Watershed Development Programmes, which call for urgent attention. Both the Central and State Governments should provide maximum possible budgetary support for the development of degraded rainfed lands on a priority basis. In watershed development there is need to move from the conventional soil conservation approach of safe disposal of run-off to rainwater harvesting and conservation based on indigenous systems and practices. Rainwater conservation and harvesting hold the key for sustainable development of rainfed areas. The watershed development must ensure that the minimum basic water needs of the rural communities in the project areas are met. Therefore, the rainwater management should encompass the multiple uses of water namely, drinking water for people, livestock and wild life, domestic uses, life saving and pre-sowing irrigation of crops, natural regeneration of flora and other uses in this order of priority. The harvested water should be treated as a common pool resource by evolving suitable community practices which would ensure equitable distribution of the usufruct.

5.1.53 In watershed development, promotion of low-cost conservation measures/ strategy based on indigenous practices and devices with higher reliance on vegetative conservation measures and the use of plant species in reclamation and development of problem soils are required. With this approach, comparatively more areas can be treated with lesser amount of financial support.

5.1.54 Marginal farmers and landless households in the rural areas have composite livelihood support systems, which typically comprise of deriving fuel wood and fodder for their livestock, particularly for

small ruminants - piggery, goater, etc. They also collect raw material for biomass-based cottage industries like basket and mat weaving, broom binding, rope making etc. They also heavily depend on minor forest produce like mahua, chironji, honey, gum, tendu leaves etc. Thus wastelands and forest lands are inseparably linked to the livelihood of the rural poor. In addition, they also collect fuel wood for selling in the nearby towns exercising tremendous impact on the green cover. Typically, many families supplement their income through wage-earnings by working for richer farmers, local public works and seasonal migration to towns and cities. Unless their essential biomass needs are satisfied, the ecological management will continue to be vulnerable, as the poor exploit natural resources for their livelihood needs. Therefore, the Watershed Development Programme should focus on strengthening the livelihood support system of the rural poor, both for improving their social and economic status and for improving and preserving the ecological production environment. Thus, the basic biomass survival needs of poor and landless for fuel wood, for self-consumption and for the market, fodder for their livestock and raw material for cottage industries from the village wastelands and nearby forests should be ensured. Giving such lands on lease to the women and poorer sections of society is being attempted by several NGOs with success. Adequate credit-cum-subsidy and technology support needs to be provided for retrieving such lands for leasing to the target groups.

5.1.55 A perspective plan for the development of all degraded/rainfed lands will be formulated and implemented as has been recommended by the Committee on 25 Years Perspective Plan for the Development of Rainfed Areas constituted by the Planning Commission and by the Working Group on 'Watershed Development, Rainfed Farming and Natural Resources Management' for the Tenth Plan. The Committee on 25 Years Perspective Plan for the Development of Rainfed Areas suggested treating/development of 75 m ha arable and non-arable land by the end of the Thirteenth Plan with a total cost of Rs. 20,850 crore (Rs. 13,070 crore as people's contribution and Rs. 7,780 crore as Government support at 1994-95 prices). The Working Group on 'Watershed Development, Rainfed Farming and Natural Resources

Management' has suggested treating 88.5 m ha of rainfed/ degraded land by the end of the Thirteenth Plan with a total cost of Rs. 72,750 crore to be shared by the Centre, States and people/community in varying ratios during different Plan periods. The shares work out to Rs. 23,650 crore by the Centre, Rs. 19,950 crore by the States and Rs. 29,200 crore as contribution from the people/community.

5.1.56 The Watershed Development Programme would be made a peoples' movement and the outside funds would only be a supplement. The principles of cost-sharing would be enforced based on the direct benefit to the households and their capacity to pay. Thus, an appropriate ceiling of project benefit would be decided for different conditions/situations. This may be, on an average, equal to the assistance provided to the landless and marginal farmers' households. Beyond that, the better-off farmers should pay for the developmental cost on their holdings.

5.1.57 The principal source of funding should be the beneficiary household. However, depending upon their capacity and the need, integrated funding support system should be promoted which includes government financial support, credit from NABARD and commercial banks and funds provided by the private sector for specified activities like drinking water, cattle care etc. Thus, the integrated financial package will accelerate the coverage of area treatment and would bring in ecological and socio-economic benefits in the near future. In the implementation of watershed development programme, active involvement of panchayati raj institutions (PRIs) and NGOs would be encouraged.

5.1.58 There are vast areas which suffer from waterlogging due to congestion of drains and silting of village ponds. Waterlogging affects crop-production, hinders movement of the people and causes many human and livestock diseases. Shallow waterlogged lands can be put to productive use by digging fish and aquaculture ponds and raising the level of remaining land by filling it up for crop cultivation. Bankable projects of this type can be considered for financial support. Successful watershed development projects have demonstrated that waterlogging/flooding can be controlled by desilting and deepening of village

ponds, through vertical drainage with shallow tube wells and through bio-drainage. This improves the ecology of the area and promotes economic growth particularly for self-help groups of the rural poor through fish culture etc. Summer cropping improves socio-economic conditions. During the Tenth Plan, this approach and strategy would be expanded to similar areas with due modifications.

5.1.59 On the one hand, over exploitation of ground water has resulted in decline in the groundwater table-and, on the other hand, excessive use of canal water has resulted in waterlogged conditions. Rationalisation of water user charges to recover a part of the operation and maintenance cost of the canal irrigation system would help improve the intensity of irrigation and efficiency of water use in the command areas. Under major and medium irrigation projects there is gap of about 5.3 m ha between the irrigation potential created and utilised. Under minor irrigation system, there is a gap of 4.7 m ha between potential created and utilised⁷. Against the 95.4 m ha of total irrigation potential created, only 85.4 m ha is being utilised. However, according to the Ministry of Agriculture's Land Use Statistics, the gross irrigated area is only 75.55 m ha (1998-99). This calls for efficient on-farm water management practices. In areas with inadequate/less water availability, water saving devices such as sprinkler irrigation system, drip irrigation, diggjis would be encouraged. The proposal to do away with all taxes and levies on such systems as well subsidies is worth considering, as it will bring down the prices and encourage better service through competition. Rainwater harvesting for re-charging the ground water and efficient utilisation of water for crop production will be an important method to be encouraged through watershed development programmes. Besides, re-cycling of water by the industries and households has to be enforced

5.1.60 To check the over exploitation of ground water, which has resulted in many white areas being converted into black and gray, there is need to enact legislation so as to regulate groundwater use. However, in areas where there is abundance of groundwater, especially in the eastern and

northeastern regions, the potential would be exploited for increasing the agricultural productivity in the region. A Centrally sponsored scheme 'On-Farm Water Management for Increasing Crop Production in the Eastern Region' has already become operational. So far only about 40 per cent of the net sown area in the country has been covered under irrigation and the the rest is dependent on the monsoon and this adversely affects the adoption of improved production technologies and results in poor productivity. On the other hand, the irrigation potential created is not being utilised fully and a number of major and medium irrigation projects started several years back are yet to be completed. A policy decision is required to be taken not to start the work on any new major and medium irrigation project unless all the uncompleted projects are completed. To complete the unfinished projects, work has to be taken up speedily. Besides all these measures, there must be emphasis on research for conservation and efficient utilisation of water.

51.61 Current land and water use practices in the country are unsustainable, less productive and impact adversely on regeneration of natural resources. For sustainable development of natural resources a regionally differentiated strategy based on agro-climatic conditions and land and water availability will be pursued. The promotion of suitable cropping patterns will be the essential component thereof.

51.62 These measures, along with utilisation of full irrigation potential already created under major and medium irrigation systems, will help increase the cropping intensity. The Ninth Plan started with a base of 132.7 per cent cropping intensity and targeted to achieve 143 per cent cropping intensity. The data show that hardly 136 per cent cropping intensity might have been attained. Progress thus is extremely slow as even during 1990-91, the cropping intensity was 129.9 per cent. Data shows that whereas area under irrigation is about 57 m ha, the double-cropped area is just about 50 m ha⁸. Thus, not all the irrigated area is being double cropped. Efforts will be made to increase the cropping intensity and also crop area coverage by

⁷ As per data compiled by Water Resources Division, Planning Commission

⁸ Ministry of Agriculture

utilising under-utilised/unutilised waste/degraded lands, especially for horticulture and agro-forestry.

Crop diversification

5.1.63 Though Indian agriculture is moving rapidly towards commercialisation, most farmers, especially small and marginal farmers, tend to give a prime place to the cereals in the cropping system. This could be on considerations of food security, low risk and the easy market access to such farm produce. But this production system has not helped in increasing farmers' incomes though it has resulted in huge stocks of foodgrains in the central reserve pool. This has happened in the face of shortage of commodities like pulses, oilseeds, timber and some other items because of faulty policies, forcing the country to import these on a large scale. The MSP system has so far favoured only three crops, namely, sugarcane, paddy and wheat and a few States. This has encouraged monocropping and over exploitation of natural resources in some areas, adversely affecting crop diversification and resulted in low returns/profits in other areas especially those having poor infrastructure - irrigation, power, roads, etc. Now the thrust would be on diversification towards high value/more remunerative crops considering the agro-climatic conditions, endowment of land and water resources and the market demand both within the country and outside. Emphasis would be on production of fruits, vegetables, flowers, agro-forestry, tree farming, animal husbandry, dairying, aquaculture, etc. Besides, production for the niche market (both domestic and external), which has so far not been undertaken, would also be encouraged. To encourage such activities support would be provided to develop requisite infrastructure for post-harvest handling processing, storage, marketing, besides proactive production policies to motivate farmers/entrepreneurs. Restrictions on felling of agro-forestry trees will have to be removed for encouraging agro-forestry.

Blending Traditional and Frontier Technologies

5.1.64 Frontier technologies like tissue culture, genetic engineering have tremendous scope for the development of agriculture by providing very high productivity potential material/organisms. However,

traditional practices cannot be abandoned/given up and will still remain relevant. Traditional technologies in the field of rainwater harvesting and management, recycling of organic waste for plant nutrient supply, grain storage, preservation of fruits and other commodities, pest management, etc. have been found to be useful and relevant. In order to bring a synergistic impact, such technologies would be blended with the modern frontier technologies.

AGRICULTURAL INPUTS

Seeds

5.1.65 Seed is a vital and basic input for attaining higher yields. To a certain extent, the efficiency of other agricultural inputs like fertilisers, irrigation, pesticides, etc. is dependent on the quality of seeds. Although the production of certified / quality seeds have increased, however, the matching increase in production or productivity has not been observed. To overcome the mismatch between the demand and supply of seeds, especially of problem area specific crops/varieties, emphasis would be given to increase the supply of seeds of such varieties. The seed multiplication and supply plan would be made effectively operational. Besides the Indian Council for Agricultural Research (ICAR) and State Agricultural Universities (SAUs) research system would be activated to produce required quantities of breeder seed of different crops/varieties. Adequate thrust would be given to develop the infrastructure for the development of biotechnology and its application for the development of high yielding seeds.

5.1.66 The seed replacement rate (SRR) for crops would be increased to gradually bring it to the recommended level. The system of subsidy will be reviewed, which has led to the public sector mainly producing seeds of self-pollinated crops. The private sector will be encouraged to meet the requirements of seeds. The seed production by the Government agencies would be limited to the production of breeder and foundation seeds and the production of certified seeds could be left to the private sector. The private sector is already doing good job but is restricted to production of high value and low volume seeds, especially that of hybrids and that too mainly of vegetables, oil seeds, maize, pearl millet, etc.

5.1.67 The national seed producing agencies, namely, the National Seeds Corporation of India (NSC) and State Farms Corporation of India (SFCI) and also ICAR will be given specific targets for the production of seeds. Similarly States will be asked to prepare the seed production plans and assign the production targets to the States Seeds Corporations. As a contingency measure to meet the seed requirement in case of natural calamity such as droughts, floods, cyclones. etc. the Seed Grid/Seed Bank system would be strengthened. Reorganisation and restructuring of NSC and SFCI will be done to ensure better utilisation of resources, especially the available land and the manpower.

5.1.68 The National Seed Policy has been formulated and the Plant Variety Protection and Farmers' Rights Act, 2001 will be enforced strictly. Besides, the present Seed Act, 1966 will be replaced with the new Act so as to enforce quality control and regulate the entry of germ plasms into the country in the national interest for ensuring the supply of quality seed to farmers, the seed testing facilities/ infrastructure will be strengthened. Production of traditional native cultivars, which are known to be sturdy, resistant, more nutritious and need low inputs, would be encouraged. The example of durum wheat, which has 14-15 per cent protein, very high gluten content and has a good export potential, is to serve as the lead. This is significant from the point of conserving bio-diversity.

Fertilisers/ Plant nutrition

5.1.69 Besides the good seed/planting material, proper nutrition to crops plays a very vital role in exploiting the production potential of a crop variety and in achieving higher output. The present consumption of fertilisers in terms of NP&K nutrients in the country is about 92 kg/ ha (2001-02). The low fertility status of soil with respect to NP&K and increasing deficiency of micro nutrients is affecting the productivity adversely. The deficiency of carbon in soil has also become widespread especially in the green revolution areas. Efforts would be made to increase fertiliser use, especially in the States where its consumption is low, by providing adequate marketing infrastructure, besides encouraging the balanced use in comparatively high consumption areas and increasing fertiliser use efficiency. The

policy on fertiliser subsidy which is leading to the imbalanced NP&K use ratio will be reviewed.

5.1.70 To increase the fertiliser use, efficiency the extension machinery will be geared to propagate the adoption of technologies already developed / available, especially under unfavourable conditions. The ICAR-SAUs research system will pay special attention to enhancing fertiliser use efficiency besides the development of suitable varieties for adverse situations like the drought-prone rainfed areas and the lowland flood-prone water stagnant areas.

5.1.71 In the areas where fertiliser consumption is comparatively high the response ratio, the fertiliser input and grain output, seems to be declining. This is evident from the fact that in these areas the crop productivity has not increased in proportion to the increases in the use of fertilisers. In fact, though the fertiliser consumption in such areas has increased, of late the crop yields seem to have reached a plateau. The factors for this are: (i) imbalance in the use of NP&K, mainly on account of their price variations; (ii) increasing deficiency of micro nutrients, which affects the growth of plants and interferes in proper uptake by the crop of applied NP&K ; and (iii) decreasing carbon / organic matter content in soil. These serious issues would be addressed through a holistic approach with adequate thrust on adoption of Integrated Nutrient Management (INM)/Integrated Plant Nutrient Supply (IPNS). Under this approach, the use of organics including manures and bio-fertilisers would be promoted. Use of fertilisers with irrigation (fertigation) will also be promoted to ensure higher use efficiency.

Organic Farm Waste and Municipal Solid Waste

5.1.72 A sizeable quantity of organic farm waste is generated, which could be utilised for providing nutrition to the crops after converting it into compost/ manure. The Report of the Task Force On Organic Farming 2001, constituted by the Department of Agriculture and Cooperation, has estimated that about 356 mt crop residue is available annually. Out of this, about 170 mt is soil incorporated and about 136 mt is available for manuring. Besides the crop residue, a sizeable quantity of municipal solid waste

is also available, which could be utilised for generating energy and making manure. Technologies for pelletisation and bio-methanisation are available for using the municipal solid waste to generate energy and manure. Alternatively, the entire municipal solid waste could be used for making compost, for which technologies are already available. Vermi-compost, which is rich in nutrients, could also be made from the organic farm waste.

5.1.73 The conversion of farm waste and municipal solid waste into compost / manure can supplement the use of fertilisers in crop production. Use of such composts will also improve the health of soil by providing organic matter for the required biological activities in addition to improving the physical condition of the soil. As organic matter also contains micro nutrients, the increasing deficiency of micro nutrients in soil could also be corrected. Therefore, thrust will be given for using organics in agriculture by converting farm waste and municipal solid waste into good quality compost/ manure/ vermi compost.

5.1.74 The realisation of the importance of organically produced food is growing all over the world and the demand for such food items is increasing. Prices of such products are several times higher. Being a low chemical fertiliser consuming country especially in the rainfed areas, northeastern and hill States, India has good opportunity to take up production of organic foods for exports and domestic use. Considering this, organic farming would be encouraged and facilities developed for testing and certification of organically produced foods.

Soil Testing

5.1.75 The 530 soil testing laboratories, including 118 mobile soil-testing vans, have a total capacity of testing eight million samples annually. Considering that there are over 106 million operational farm holdings, the existing soil testing facilities seems to be grossly inadequate. Besides, most of the laboratories are equipped to test only NP&K and there are hardly adequate facilities for testing the micro nutrient status of soils. On one hand, there are inadequate soil testing facilities and, on the other, the utilisation of existing facilities is

very unsatisfactory. Therefore, besides creation of additional soil testing infrastructure, the existing facilities, which are under-utilised, in terms of laboratory facilities, chemicals and equipment and trained manpower, would be strengthened. This work will be taken up by involving the private sector. The scheme of agri-clinics is a right step in this direction.

Farm Implements

5.1.76 Development of energy and time saving efficient machines and implements and their adequate production and supply would be given special attention. Post-harvest equipment and machines, which could help in reducing crop losses and value addition of agro-produce, improved storage structures to conserve and reduce post harvest losses, especially of horticultural produce, will be made available by encouraging their mass multiplication / production. Implements and machinery used in countries like Japan which are specially suited to small farms will be adapted for use in India.

5.1.77 Some more agricultural implements / machines have recently been de-reserved from the small scale sector, but 25 items still remain reserved. These include items like animal drawn implements, cultivators, disc harrows, harvesters, rice and dal mill machinery, diesel engines up to 15 HP, etc. This will affect on the availability of efficient implements/ machines for agricultural activities. Therefore, all the implements / machines used for the agricultural operations need to be de-reserved. Miniaturisation of processing machinery as in the case of dal mill by the Central Food Technology Research Institute (CFTRI), Mysore, would be promoted.

Integrated Pest Management

5.1.78 Concern about the adverse effects of chemical pesticides due to their indiscriminate use is growing. Pesticides residues are being found increasingly in our farm produce posing a threat to human health. The integrated pest management (IPM) approach, being promoted since 1985, is an eco-friendly strategy of pest containment by exploiting the role of natural agents /forces in harmony with other pest management tactics and

with the sole aim to effect minimum disturbance to environment. Cultural control, use of natural enemies and plant resistance are basically compatible and supportive tactics in the IPM strategy. Strengthening of IPM infrastructure, especially for surveillance and forecasting the outbreak of pests and diseases and production/multiplication of bio-control agents for field use, would be given adequate attention. Besides, reliable methods of forecasting would be developed and efforts would be made to make bio-control agents available on demand to farmers to help them adopt IPM in the true spirit by encouraging the private sector, ICAR and SAUs in providing such support services. The Government's efforts would be to provide new, safer and efficacious quality pesticide products to the farmers and encourage the use of bio-pesticides and bio-control agents.

5.1.79 In view of the WTO and Sanitary and Phytosanitary (SPS) agreements, international trade is likely to increase and pesticides residue certificate on agricultural commodities would become unavoidable. Therefore, emphasis would be given to establish facilities for pesticides residue testing in agricultural commodities being imported or exported and also for the regular monitoring in all agricultural commodities marketed within the country. Besides, the infrastructure/ facilities for pesticide quality testing would be developed and strengthened to enforce the quality concept for manufacture and marketing of pesticides.

5.1.80 Plant quarantine is a regulatory function under the Destructive Insect Pests (DIP) Act, 1914 and the Plants, Fruits and Seeds (Regulation of Imports into India) Order, 1989. Being a signatory to WTO-SPS agreement, it is obligatory upon India to provide quarantine services. Plant quarantine is bound to assume greater significance in future as this plays an important role in regulating import and export. Quarantine services will be required to be provided in all the international airports and seaports. Therefore, there is need to strengthen and modernise the plant quarantine facilities in the country to keep pace with the increased volume of trade of agricultural products. Recognising the importance of the plant quarantine services, the Planning Commission recommended the establishment of a National Plant Quarantine

Authority while reviewing the schemes of Department of Agriculture and Cooperation.

Agriculture Extension

5.1.81 The extension services in the States would be reformed to make these demand driven. The role of the non-government sector in agriculture extension would be encouraged and an innovative approach in the field of television/ radio broadcast including specific channels in an interactive mode would be developed. With far-reaching changes in the communication technology and breakthrough in space technology, remote sensing, satellite broadcasting and the media revolution, extension workers will be reoriented and retrained to adapt themselves to those developments and make full use of emerging opportunities. With the private sector, communication networking will be encouraged to have backward linkages. Besides, private sector would also be encouraged to provide extension services, both information and services including input supply and testing facilities for soil and inputs. The Department of Agriculture and Cooperation, along with NABARD, has already introduced a scheme for establishment of agri-clinics / agri-business centres / ventures by the agricultural graduates.

5.1.82 The ICAR is also associated in agriculture extension activities through its 314 KVKs, Institute Village Linkage Programme (IVLP) and also its institutes / centres all over the country. The interaction of KVKs activities with the State / district extension machinery will be strengthened. It is planned to strengthen linkages between research and extension to improve quality and effectiveness of research and extension system. The extension system will be revitalised and broad based through KVKs, NGOs, farmers' organisations, cooperatives, the corporate sector and agri-clinics / agri-business centres. KVKs and ICAR/SAUs units will be designated nodal agencies for quality certification including organic products, bio-fertilisers, and bio-pesticides. The supply of inputs, agro-processing and trade through such cooperatives / companies will be encouraged through the availability of credit with the help of NABARD. Every institute / research centre of ICAR will have IVLP as one of its mandates for testing,

refinement and dissemination of improved farm technologies in nearby / adopted villages.

Investment

5.1.83 There is shortage of basic infrastructure for agriculture, irrigation, roads, electricity, storage facilities and marketing. The Tenth Plan must aim at a major revival of public investment in infrastructure. The Accelerated Irrigation Benefit Programme (AIBP) is a potentially important instrument for providing resources to State Governments in support of on-going irrigation schemes. Greater attention will also have to be paid to rainwater harvesting and irrigation potential through scientific watershed development.

Credit

5.1.84 Continued emphasis will be placed on progressive institutionalisation for providing timely and adequate credit support to farmers with particular focus on small/ marginal farmers and weaker sections of society to enable them to adopt modern technology and improved practices for increasing agriculture production and productivity. An amount of Rs. 3,59,701 crore is estimated as production credit for distribution through intuitional sources and Rs. 3,76,869 crore investment credit; making a total of Rs. 7,36,570 crore for the Tenth Plan.

5.1.85 Thrust areas for increasing the flow of bank credit will include:

- i) The present flow of bank credit will be enhanced.
- ii) Kisan Credit Card and schematic lending will be promoted and Kisan Credit Cards would be issued to all entitled farmers.
- iii) States will be asked to consider warehousing receipts for grant of credit. Self-help groups will be encouraged.
- iv) The Multi State Cooperatives Act, 2002 has been passed. States will be persuaded to also take follow up action.
- v) Recommendations received for revamping of cooperative credit structure would be examined and appropriate policy formulated.

- vi) Reform in the sector will be made a condition for getting assistance from departments and the National Cooperative Development Corporation (NCDC).

Insurance

5.1.86 The Comprehensive Crop Insurance Scheme (CCIS) has been in operation since 1985. It was based on an area approach and was linked to short-term credit and was implemented only in 19 States and three Union Territories. For improving the scope and content of CCIS, a broad based 'National Agriculture Insurance Scheme' (NAIS), or Rashtriya Krishi Bima Yojana was introduced in the country from the rabi season of 1999-2000. The scheme is available to all States/Union Territories. It covers food crops, horticultural crops, oilseed crops and commercial crops. All farmers, loanee and non-loanee, are entitled for insurance. All yield losses due to natural, non-preventable risks are covered. Premium rates vary from 1.5 per cent to 3.5 per cent on the sum insured on food grain crops and oilseed crops on actual basis for annual commercial/horticultural crops. Small and marginal farmers will be entitled for premium subsidy of 50 per cent which is to be phased out on over five years. The General Insurance Corporation (GIC) is the implementing agency. To meet claims beyond liability of GIC, a corpus fund is created with contribution from the Government of India and participating States on 1:1 basis. During the Tenth Plan, it is proposed to set up a National Crop Insurance Corporation. This corporation will take over all the crop insurance functions of the GIC.

5.1.87 The National Agriculture Insurance Scheme (NAIS) would be further strengthened during the Tenth Plan. Its coverage in terms of farmers, crops and risk commitments have been enlarged and premium structure rationalised. But actuarial rates for food and oilseeds crops are yet to be made applicable. In order to operate the scheme on commercial lines, it is necessary that actuarial rates should be charged and implementation of the scheme be made effectively by an exclusive agency, which is specialised in the areas of agricultural insurance. The proposed Agriculture Insurance Corporation must be set up at the earliest.

HORTICULTURE

5.1.88 Vast areas of India have tropical and agro-climatic conditions which are well suited for cultivation of horticulture and plantation crops. They are also ideal substitutes for marginal and degraded lands, which are unsuitable for crop husbandry. They can help in diversification of agriculture. The horticulture sector contributes about 24.5 per cent towards agriculture GDP from only about 8 per cent of the cultivated area. Besides, providing nutritional and livelihood security and helping poverty alleviation and employment generation, this sub-sector sustains a large number of agro-Industries, which generate huge additional non-farming employment opportunities. The range of horticultural products includes fruits, vegetables, spices, coconut, medicinal and aromatic plants, mushrooms, cashew, cocoa etc. India accounts for 10 per cent of the world production of fruits and stands second after Brazil and is second largest producer of vegetables after China, contributing 13.4 per cent of the world vegetables production.

5.1.89 A tremendous boost was given to the development of the horticulture sector during the Eighth and Ninth Plans. The Ninth Plan allocation was raised to Rs. 1,400 crore from Rs. 1,000 crore in the Eighth Plan. This sector has had impressive impact in the wake of economic liberalisation. The high level of land productivity

in many parts of the country can be largely attributed to the growing of high value horticulture crops.

Review of the Ninth Plan

5.1.90 A number of constraints to the growth of the horticulture sector were identified during the Ninth Plan. These were in the form of various technological and infrastructure constraints, small size of land holdings, preponderance of old and senile trees and poor management practices. There was acute shortage of good quality, disease-free, high yielding seed and planting materials. The crop specific disorders such as disease of vegetables, root-wilt in coconut etc. were also prevalent. Processing infrastructure was weak and research and development support inadequate. Therefore, the horticulture sector was brought to the forefront in the overall food production strategy and was treated as an extreme focus area for the provision of strong support for its overall development.

5.1.91 During the Ninth Plan, various Centrally sponsored schemes were implemented to overcome constraints and improve productivity of the crops. These related to the integrated development of (i) tropical, temperate and arid fruits; (ii) vegetables including root and tuber crops and mushrooms; (iii) commercial floriculture; (iv) medicinal and aromatic plants; (v) cashew and cocoa; (vi) spices; (vii) coconut; and (viii) bee-keeping for improving crop productivity etc.

5.1.92 In addition, a separate scheme for horticulture development through plasti-culture intervention was implemented during the Ninth Plan, aimed at promotion of protected cultivation through greenhouse technology and increasing micro-irrigation facilities through drip and sprinkler systems. Considering the phenomenal potential for cultivation of various horticultural crops in the northeast region, a Technology Mission for Integrated Development of Horticulture was also introduced towards the end of 1999-2000. A Central sector scheme for development of infrastructure for post-harvest management and commercial horticulture was

Table-5.1.14

India's position in the international ranking in production of various fruits and vegetables (1999)

Crop	Rank	Crop	Rank
Apple	10	Brinjal	2
Banana	1	Cabbage	2
Mango	1	Cauliflower	1
Papaya	2	Peas	1
Pine apple	4	Onion	2
Grapes	10	Potato	3
total fruits	2	total vegetables	2
Coconut	3	Cashew	1

Source : Indian Horticulture Data Base-2001

also in operation through the National Horticulture Board.

5.1.93 The development strategy during the Ninth Plan was focused on improving productivity and the quality of the horticulture crops through upgradation of production and farming technologies, supply of quality seeds and planting materials, technology transfer through demonstrations, reducing post harvest losses and improving marketability of produce, developing a strong base for supply of other critical inputs and human resource development.

5.1.94 There has been considerable expansion in area under various horticultural crops and increase in their production during first four years

of the Ninth Plan. The area under fruit crops increased from 35.80 lakh ha in 1996-97 to 37.97 lakh ha in 1999-2000, representing an increase of over 6 per cent. The area under vegetable crops also increased to 59.93 lakh ha in 1999-2000 from 55.15 lakh ha in 1996-97. The increase was 8.67 per cent over four years. The achievement of major horticultural crops during 1996-97 to 1999-2000 is given in Tables 5.1.15 and 5.1.16 :

5.1.95 The Ninth Plan target for production of fruits and vegetables was kept at 179 mt. The recorded achievement up to 1999-2000 was 136.33 mt. Production of fruits and vegetable in the final year of the Ninth Plan is expected to improve further. However, the Ninth Plan target was far too ambitious and could not be fully achieved.

Table-5.1.15
Area, production and productivity of major horticulture crops

(Area in '000' ha / Production in '000' tonnes
/Productivity tonnes/ha)

Crop	1996-97			1999-2000		
	Area	Production	Productivity	Area	Production	Productivity
Fruits	3,580	40,458	11.3	3,797 (6.06)	45,496 (12.45)	12.0 (6.20)
Vegetables	5,515	75,074	13.6	5,993 (8.67)	90,831 (20.99)	15.2 (11.76)
Flowers	71	367+615*	-	89	509 +6,806* (25.35)	
Coconut	1,891	13,061**	6,907	1,778 (-5.98)	12,252** (-6.19)	6,892@ (-0.22)
Cashew-nut	659	430	0.65	686 (4.10)	520 (20.93)	0.76 (16.92)
Mushroom	-	8	-	-	40 (400.00)	-
Honey (Bee colonies)	-	796	11.42	-	764 (-4.02)	13.22 (15.76)
Spices	2,372	2,805	1.2	2517 (6.11)	2911 (3.78)	1.2 -

Source : Indian Horticulture Data Base-2001

Note : Figures in bracket indicate percentage change in 1999-2000 over 1996-97.

* Lakh numbers, ** Million nuts @ nuts per ha

Table-5.1.16
Area, Production and Productivity of Major Horticulture Crops

(Area in 000 ha / Production in 000 tonnes / Productivity tonnes/ha)

Crop	1996-97			1999-2000		
	Area	Production	Productivity	Area	Production	Productivity
Apple	222.7	1,308.4	5.9	238.3 (7.05)	1,047.4 (-19.95)	4.4 (-25.42)
Banana	424.5	12,439.6	20.3	490.7 (15.60)	16,813.5 (35.16)	34.3 (68.47)
Citrus Fruits	474.7	4,456.2	9.4	526.9 (11.00)	4,650.6 (4.36)	8.8 (-6.38)
Grapes	42.9	1,134.6	26.4	44.3 (3.26)	1,137.8 (2.82)	25.7 (-2.65)
Mango	1,344.9	9,981.2	7.4	1486.9 (10.56)	10,503.5 (5.23)	7.1 (-4.05)
Papaya	63.0	1,299.3	3.2	60.5 (-3.97)	1,666.2 (28.24)	27.5 (759.38)
Pineapple	68.7	924.6	13.5	75.5 (9.90)	1,025.4 (10.90)	13.6 (0.74)
Sapota	45.7	588.5	12.9	64.4 (40.92)	800.3 (35.99)	12.4 (-3.88)
Litchi	51.2	377.6	7.9	56.4 (10.16)	433.2 (14.73)	7.7 (-2.53)

Source : Indian Horticulture Data Base-2001

Note : Figures in bracket indicate percentage change in 1999-2000 over 1996-97.

Table-5.1.17
Area, Production and Productivity of Major Horticulture Crops

(Area in 000 ha / Production in 000 tonnes / Productivity tonnes/ha)

Crop	1996-97			1999-2000		
	Area	Production	Productivity	Area	Production	Productivity
Brinjal	464.0	6,585.6	14.2	258.3 (-44.33)	8,117.2 (23.26)	16.2 (14.08)
Cabbage	210.2	3,613.4	17.2	248.3 (18.13)	5,909.4 (63.54)	22.9 (33.14)
Cauliflower	233.9	3,419.0	14.6	348.8 (49.12)	4,717.8 (37.49)	19.0 (30.14)
Okra	323.2	3,040.1	9.4	493.3 (52.63)	3,419.1 (12.47)	9.8 (4.26)
Onion	410.0	4,180.0	10.2	272.6 (-33.51)	4,899.5 (17.21)	9.9 (-2.94)
Peas	254.4	2,339.2	9.2	456.5 (79.44)	2,712.0 (15.94)	9.9 (7.61)
Tomato	391.2	5,787.8	14.8	456.5 (16.69)	7,426.8 (28.32)	16.3 (10.14)
Potato	1,228.8	24,215.9	19.4	1,340.9 (9.12)	25,000.1 (3.24)	18.6 (-4.12)

Source : Indian Horticulture Data Base-2001

Note : Figures in bracket indicate percentage change in 1999-2000 over 1996-97.

Thrust For Horticulture Development In Tenth Plan

5.1.96 The Tenth Plan envisages a 4 per cent annual growth rate in the agriculture sector. The achievement of this growth rate would be possible, if the annual growth rate of horticulture is maintained at 6-8 per cent. This is feasible and achievable. Being prominent crops after foodgrains and oil seeds, horticulture will be treated as a lead sector in agriculture and rural development. There is vast potential across the country in all types of areas such as wasteland, degraded land, saline and coastal land, hilly regions, dry land and semi-arid land, island eco-systems etc. The thrust areas for providing boost to the horticulture sector will be as follows:

- Area Expansion
- Improving production
- Improving productivity
- Reducing cost of production
- Improving quality of products
- Value addition
- Promotion of marketing and exports
- Strengthening of credit and organisational support
- Human resource development
- Addressing relevant policy issues
- Cold chains.

Strategy For Development

5.1.97 The overall emphasis will be on creation of synergy and convergence of various programmes for horticulture development to achieve horizontal and vertical integration.

Seed And Planting Materials

5.1.98 Availability of good quality, disease-free and high yielding seed and planting material is a *sine qua non* for enhancing the productivity and increasing the production of the horticulture crops. The foremost strategy, therefore, will be to ensure availability of and access to these critical inputs on a large scale, across the country. A network of nurseries and seed farms will be promoted, depending upon the agro-climatic conditions and crop specific requirements of

various areas. While nurseries are useful for meeting the usual demand, large-scale production will be possible by micro propagation technology through tissue culture practices, wherever feasible. Seed farms will also be promoted on a large scale. A massive seed production and distribution programme will be organised on the national level with suitable linkages with ICAR institutes and SAUs. In the initial stages, the focus will be on breeder seed production. Efforts will be made for production of recommended varieties of vegetable seeds under protected conditions and preference will be given to activities taken up on a community basis, by group of growers in a cluster of villages etc.

5.1.99 At present, there is no regulatory regime to ensure the supply of quality planting material. Efforts are, therefore, needed to establish some institutional arrangement to assess and recommend a guaranteed quality of seed and planting materials. A mechanism to ensure the quality of planting material through a self-accreditation system having a clause to compensate losses would also be essential.

Productivity Improvement

5.1.100 A wide gap exists between the potential achieved through improved technologies and yields obtained. Efforts will, therefore, be made to reduce this gap by improved productivity. To do this, it would be necessary to take up re-plantation and rejuvenation of old and senile orchards and plantations through high yielding varieties. Use of frontier technologies (hi-tech horticulture) covering micro irrigation, fertigation, integrated nutrient and pest management, protected/greenhouse cultivation and precision farming techniques in horticulture will be promoted. Besides, high density planting will be promoted for relevant crops.

Improving Production And Area Expansion

5.1.101 Horticulture is an important means of diversification and income generation. A focused attention to dry land horticulture through efficient use of resources would benefit a large farming community. Farmers are generally responsive towards remunerative economic signals. Efforts

are, therefore, required to promote area expansion of horticultural crops by the farmers in different agro-climatic conditions. Apart from productivity improvement, measures will include judicious utilisation of land and water resources, adoption of Mission Mode approach in regions of high potential, such as the northeastern region, promotion of inter-cropping, promotion of off-season production of vegetables in temperate regions through poly houses etc., raised bed and vertical multi-storey cultivation. A framework of support system will be essential with credit linked subsidy pattern through financial institutions. NABARD will be asked to evolve a suitable framework and provide refinance to the grassroot level lending institutions like commercial banks, RRBs, cooperative banks etc.

5.1.102 Hilly regions with a majority of tribal population will be given adequate support in terms of research, extension, production technologies for post harvest management practices and marketing support.

Reducing Cost Of Production And Value Addition

5.1.103 Increasing global competition in the era of liberalised trade under the WTO regime will require the Indian production system to be competitive in terms of quality as well as price. Efforts for achieving this goal will be to reduce post-harvest losses by proper crop management and post-harvest handling, packaging and creating suitable infrastructure for post-harvest management. Besides, infrastructure facilities like quality control labs will be promoted. All value-added items, including beverages (alcoholic and non-alcoholic), are now allowed to be imported freely, but cannot be manufactured from our own agricultural products. Efforts will be made to promote value-addition of products for deriving better returns by the farmers. Primary processing facilities would be promoted near the production areas. Emphasis will be laid on organic farming by using natural manures, bio-fertilisers, bio-pesticides etc.

Box 5.1.2

Constraints for development of horticulture products

General

1. Poor quality of seeds and planting materials and their weak assessment mechanism.
2. Preponderance of old and senile orchards and their poor management practices.
3. Small and uneconomic average farm size of the orchards.
4. High order of perishability of horticulture produce, leading to high degree of losses.
5. Lack of modern and efficient infrastructure facilities, poor technological support and poor post harvest management practices.
6. Under developed and exploitative marketing structures.
7. Absence of adequate standards for quality produce.
8. Inadequate research and extension support to address specific problems of horticulture crops and their linkages with farming community and industry.
9. Large scale variations in credit support and tax structures for diverse commodities.
10. Instability of prices.
11. Poor risk management, lack of authentic up-to-date data base and poor data collection and information system.

Contd.....

.....Contd		Crop Specific Constraints
1. Fruits		Long gestation period, high incidence of pest and diseases, absence of specific technologies, poor crop management practices and soil health techniques
2. Vegetables		High cost of production due to labour-intensive technologies, high cost of hybrid seeds, risk intensive production system, considerable imbalance in supply and demand for products during the year and across the regions in the country, non-availability of production technologies for rainfed and semi-arid areas.
3. Potato		Lack of varieties for diverse processing, low seed multiplication rate, rapid deterioration of varieties due to viral complexes, lack of awareness of True Potato Seed (TPS) technologies. Not much value addition.
4. Mushroom		Non-availability of cost-effective technology, lack of design of low cost houses, inadequate availability of quality spawn of different strains
5. Floriculture		Lack of indigenous techniques, inadequate exploitation of hybrids, narrow product range, high rates of fiscal levies, lack of organised market, packaging and field to market infrastructure.
6. Medicinal and aromatic Plants		Lack of transparency in trade of plants, absence of regulatory mechanism, development and production confined only to 20-30 plants as against 4,000 identified plants, marketing / value addition / export infrastructure.
7. Spices		Lack of variability for host resistance to biotic and abiotic stresses, severe crop losses due to disease and pests, vulnerability of productivity and production due to vagaries of the monsoon.
8. Coconut		Large area under old and senile plantation, mostly under rainfed conditions. Prevalence of disease and pests. Inadequate facilities for farm level processing
9. Arecanut		Incidence of yellow leaf disease.
10. Cashew nut		Increasing level of senility of existing plantations. Incidence of pests like tea mosquito, stem borer. Inadequate farm-level processing facilities
11. Cocoa		Large areas under old and senile plantation.

Technology Transfer

5.1.104 Horticulture crops are technology driven. Therefore, capacity building and enhancement of the knowledge base of farmers and other functionaries has become increasingly essential. The ICAR and SAUs will provide thrust to propagating improved farm practices. Application of latest technologies will be introduced through demonstrations, preferably on the farmers' field. Special efforts will be made for the promotion of organic farming to catch up with the global market trend for these products. Emphasis will have to be laid on promoting the use of bio-fertilisers, bio-pesticides and demonstration on the farmers' field in the well-identified compact areas. Farm demonstrations on horticulture crops would include

application of frontier technologies such as high-density planting, mixed and multi-storey plantation, use of latest seed and planting materials, micro irrigation practices, fertigation, integrated nutrient, pests and disease management etc. Evaluation and preparation of well-focused manuals and product profiles for horticulture crops for the practices, starting from seeds and plants till their sales would be prepared.

Human Resource Development

5.1.105 The horticulture sector can absorb a high level of well trained literate and skilled manpower for employment. Moreover, horticulture is becoming a high technology activity. Therefore, trained manpower is essential, not only to economise upon

the scarce land, water resources and other inputs but also for improving the quality of the produce. The range of horticulture products is also increasing with the entry of floriculture, medicinal and aromatic plants, tissue culture practices, landscaping etc. Therefore, human resource development has acquired higher significance.

5.1.106 Efforts will, therefore, be made for capacity building of manpower at different levels such as gardeners, supervisors, managers and entrepreneurs through specialised training programmes to be implemented through ICAR Institutions, KVKs, SAUs, NGOs and institution like the Indian Institutes of Management (IIMs), National Institute of Agriculture Extension Management (MANAGE) etc. The knowledge of personnel employed in State Government departments will also be upgraded periodically through structured training modules and programmes.

Micro-Irrigation

5.1.107 Micro-irrigation has been an important system for enhancing water-use efficiency and improving fertiliser-use efficiency. Considering the fact that doubling of irrigation area is possible with same quantity of water, applied through drip irrigation, accompanied by energy efficiency, enhanced productivity, improved quality of produce, less disease and pest problem, it is pertinent that high investments are made both for technological support and expansion of area under drip irrigation. The micro-irrigation systems need to be given the status of infrastructure, because it saves water for irrigation and consequently reduces investment in irrigation systems. Taxes and subsidies on micro-irrigation/components of micro-irrigation system need to be removed so as to encourage competition in the market.

Medicinal And Aromatic Plants

5.1.108 India has a rich diversity of medicinal and aromatic plants, occurring in diverse eco-systems. A resurgence in the study and usage of medicinal plants has been observed in the recent past. Production, consumption and international trade in medicinal plants and phyto-medicines are growing. India has a good opportunity in expanding trade of

these products. However, there are many constraints on the growth and systematic exploitation of this important sub-sector. These include : (i) absence of a scientific system of collection; (ii) unorganised trade, manipulative and exploitative practices; (iii) Indian industry's focus is mainly on primary processing; (iv) problem of availability of adequate and timely raw material; and (v) limited industrial research and clinical trials.

5.1.109 Since there is tremendous demand, both internally and internationally, more focused attention is required to be given to these groups of plants. A long-term plan is also essential for fuller utilisation of potential and expansion on a large scale. Special attention will be given to organising and promoting commercial and systematic cultivation practices and processing in the country. Efforts will be made for strengthening planting material and seed production systems to meet growing needs of the farmers in high potential well identified areas. It will also be necessary to focus on the following broad aspects:

- (i) developing plant-specific educational CD-RoMs, cultivation practices, post harvest protocols;
- (ii) undertake clinical trials and formation of a national level association of practitioners;
- (iii) selection of locations of plantation, research in high yielding and short duration varieties;
- (iv) development of nurseries, promotion of tissue culture practices, training and extension support to the farmers;
- (v) promotion of community level processing, standardisation, grading and marketing through regulated markets;
- (vi) providing fiscal incentives in terms of lower or zero taxes of all types and subsidising various programmes;
- (vii) improvement of database with regard to area, production, usage, export, import etc.; and
- (viii) a system of quality and elemental analysis and standardisation.

Bee-Keeping

5.1.110 Bee-keeping needs promotion on a large scale. Honeybees are extremely useful agents of pollination and increase crop productivity. Apart from this useful role, bee-keeping has become an important supplementary income source to the farmers and honey is a healthy/nutritious sweetener, which is also used as medicine. Therefore, systematic efforts will be made to promote bee-keeping in the country.

PLANTATION CROPS

5.1.111 Tea, coffee and rubber are traditional plantation crops in the country. These are mostly grown in the southern and northeastern states. Apart from meeting indigenous consumption demand, these crops also make significant

Table-5.1.18
Rank of India in Area, Production, Yield and Exports of Plantation Crops in the World

Crops	Rank			
	Area	Production	Productivity	Export
Tea	2	1	2	4
Coffee	7	6	3	6
Rubber	5	3	1	Neg.

Source : Indian Horticulture Data Base -2001

contribution to the country's export basket. India's international ranking in plantation crops is given in Table.5.1.18.

Tea

5.1.112 The tea industry provides direct employment to more than one million people, of whom a sizeable number are women. More than two million persons derive their livelihood from ancillary activities of production, processing, marketing etc. Preservation of biosphere and soil conservation are some of the other important environmental benefits of tea cultivation.

5.1.113 During the Ninth Plan, an outlay of Rs. 139 crore was provided for (i)plantation development; (ii) processing and packaging development; (iii) new area development; (iv) market development and export promotion; (v) research and development activities; and (vi) human resource development in the tea industry. Special attention was given to small growers, non-traditional areas of tea cultivation and in the northeastern states to control jhum cultivation. Expenditure on developmental schemes during 1997-98 to 2000-01 was of the order of Rs 118 crore, which comes to about 85 per cent of the Ninth Plan outlay. Area, production, productivity and export performance during the Ninth Plan are given in Table.5.1.19.

Table-5.1.19
Area, Production, Productivity and Export Performance of Tea during Ninth Plan

Year	Area (000 ha)	Production (million kgs)	Producti- vity (kg/ha)	Export performance*		
				Quantity (million kgs)	Value of export (Rs crores)	Unit Value Realization (Rs per kg)
1996-97	431.25	786.53	1,896	139.50 (1996-97)	1,037.00	74.34
1999-2000	490.75	833.35	1,985	202.58 (2000-01)	1,976.75	97.54
% age ncrease	13.80	5.95	4.69	45.22	90.62	31.21

Source : Tea Board Reports

* DGCI&S Kolkata Reports

5.1.114 The major constraints in the case of tea crops are (i) old age of bushes and slower pace of re-plantation (0.4 per cent as against desired level of 2 per cent); (ii) poor drainage and lack of adequate irrigation; (iii) high land:labour ratio; and (iv) high incidence of fiscal levies, both at Central and State levels.

Coffee

5.1.115 Coffee is the second most important commodity in international trade, next to petroleum products. Coffee cultivation and harvesting is labour intensive. Therefore, it is an important source of livelihood.

5.1.116 Coffee is cultivated mainly in southern states of Karnataka, Kerala and Tamil Nadu, which form the traditional tracts. It is also being promoted in non-traditional area such as Andhra Pradesh, Orissa, and the northeastern states. Commercial coffee cultivation constitutes mainly two varieties: arabica and robusta.

5.1.117 During the Ninth Plan, an outlay of Rs 125 crore was provided for various developmental schemes such as plantation improvement, crop management, maintenance of research farms, crop

protection, market promotion and development and human resource development. Efforts were made to promote coffee plantation in the northeast region. Expenditure during the first four years of the Ninth Plan at Rs. 97 crore represents about 78 per cent of the outlay. Research and development efforts aimed at evolving protocols for micro-propagation and management, high density plantation etc. were undertaken to improve quality and productivity of coffee. Area, production and productivity of coffee during the Ninth Plan are given in Table.5.1.20.

5.1.118 Earnings from the export of coffee suffered a setback during the Ninth Plan as a consequence of over production and accumulation of stocks in many competing countries and steep fall in prices in the international markets. The export performance is given in Table.5.1.21.

5.1.119 Although India produces the best robusta coffee in the world, it is facing stiff competition from Vietnam in this field. Study shows that India could be more cost competitive in arabica. The main problems are: (i) predominance of tiny coffee growers with less than two hectares plantation holding size, (ii) reluctance of coffee planters to undertake re-plantation with new improved varieties and (iii) existence of old and moribund plant material.

Table-5.1.20
Area, Production and Productivity of Coffee during Ninth Plan

Year	Area (000 ha)			Production (000 tonnes)			Productivity (Kg/ha)
	Arabica	Robusta	Total	Arabica	Robusta	Total	
1996-97	143.24 (125.02)	160.58 (126.27)	303.82 (251.29)	90.45	114.55	205.00	815.79
1999-2000	168.45 (146.05)	171.85 (162.38)	340.30 (308.43)	119.00	173.00	292.00	946.73
% age Increase	17.60 (16.82)	7.02 (28.60)	12.01 (22.74)	31.56	51.03	42.44	16.05

Source : Coffee Board Reports

Note : Figures in bracket pertain to Coffee Bearing area.

Table 5.1.21
The Export Performance of Coffee

Year	Quantity (000 tonnes)	Value (Rs in crore)	Unit price (Rs per kg)
1996-97	181.30	1,467.08	80.92
2000-01	246.81	1,376.56	55.77
% age increase	36.12	-6.17	-31.08

Source : DGCI&S, Kolkata, Reports

Rubber

5.1.120 India has the distinction in achieving the highest average rubber yield of 1,576 kg per hectare. Traditional rubber growing areas are Kerala and the Kanyakumari district of Tamil Nadu. Rubber plantation has been successfully introduced in non-traditional areas like Karnataka, Andaman and Nicobar Islands, Goa, Maharashtra, Assam, Meghalaya and Tripura. Rubber plantation has been introduced in Orissa as well.

5.1.121 The Ninth Plan outlay for the rubber sector was Rs. 373.19 crore. Various schemes for plantation development, research, extension and training and processing and marketing were successfully implemented during the Plan period. During the four years from 1997-98 to 2000-01, an expenditure of Rs. 286.56 crore was incurred. This was 76.79 per cent of the Plan outlay.

5.1.122 The research and development efforts in the rubber sector have been successful in achieving the following results:

- Five high-yielding clones of rubber have been introduced.
- Protocols have been evolved for somatic embryogenesis.
- Genetic transformation of Hevea has been attempted using genes conferring tolerance to drought and tapping panel dryness.
- Biogas generation using rubber latex serum has been perfected and the technique has been widely accepted.
- A semi-automatic cleaning machine for upgradation of low quality sheet rubber has been developed.

- Integrated drying systems incorporating solar, biogas and smoke drying have been developed.

5.1.123 Indigenous production of natural rubber was insufficient to meet domestic consumption. The export of value-added rubber products has been a recent development. Area, production and productivity of rubber is given in Table-5.1.22.

5.1.124 Small holders own a majority of the rubber plantations. Currently, they account for 88 per cent of planted area and production. Their average size of holding is less than half a hectare.

5.1.125 Broadly, the constraints on full-scale development of the natural rubber sector include inadequate financial support and incentives to the planters for undertaking scientific plantation. Low price realisation in the wake of a glut in the international market and steep fall in prices are other disincentives. The infrastructure like pulpers, drying yards for primary processing is also insufficient. Quality awareness among the planters and their willingness to adopt the latest technology has been far from satisfactory.

STRATEGY FOR DEVELOPMENT OF PLANTATION CROPS IN THE TENTH PLAN

Tea

5.1.126 During the Tenth Plan, the programmes/ activities undertaken in the Ninth Plan will be continued. A schematic lending pattern will be evolved for encouraging investment in tea plantation and processing. This will include reasonable contribution by the promoters, subsidies

Table – 5.1.22
The Area, Production and Productivity of Rubber

Year	Total planted Area (000 ha)	Tappable area (000 ha)	Production (tonnes)	Productivity (kg/ha)
1996-97	533.25	356.44	549.43	1,503
1999-2000	562.67	399.90	630.40	1,576
% age increase	5.52	9.38	14.73	4.86

Source : Rubber Board Reports

components from the Tea Board and term loan from the financial institutions. NABARD will be fully involved in preparing the schematic lending pattern and providing re-finance facilities to the financial institutions located in traditional and non-traditional potential tea growing areas.

Coffee

5.1.127 Programmes of the Ninth Plan in the coffee sector will be continued in the Tenth Plan. Small growers and non-traditional areas will be provided necessary support for plantation development, processing and marketing, besides upgrading human skills in related activities. A schematic pattern of term lending to the planters and processors, as in the case of the tea sector will also be worked out with the active involvement of NABARD, commercial and cooperative banks.

Rubber

5.1.128 The Ninth Plan programmes for development of the rubber sector will be continued in the Tenth Plan. Economic viability of rubber plantations is possible by promoting rubber wood as an eco-friendly timber. Efforts therefore, will be made for processing rubber wood and marketing its products. Efforts will also be made to strengthen community development and a participatory approach in development and extension.

5.1.129 A schematic pattern for financing the required investment in the rubber sector will also be worked out as proposed for the tea and coffee sectors. NABARD and commercial and cooperative

banking channels will evolve region and location specific modalities for investment in plantation development, processing and marketing needs.

AGRICULTURAL INFRASTRUCTURE, WAREHOUSING, GODOWNS AND COLD STORAGE

Storage Of Foodgrains

5.1.130 Adequate, well-dispersed and efficient handling, storage and transportation infrastructure for agriculture commodities is essential for reducing post-harvest losses, maintaining food quality and for promoting export. With increase in production and productivity, the marketable surplus has increased. Therefore, infrastructure for post-harvest management, logistic support from the farm gate up to the retail marketing level to serve the consumers has to be adequate, efficient and economical. At present, the price spread from the farm-gate to the consumer is very high on account of deficiencies and inadequacy in existing infrastructure.

Review Of Schemes On Storage Of Foodgrains During The Ninth Plan

5.1.131 A plan for creation of additional storage capacity was undertaken by the public sector institutions such as Food Corporation of India (FCI), Central Warehousing Corporation (CWC) and State Warehousing Corporations (SWCs). The progress made during Ninth plan is given in Table.5.1.23.

Table - 5.1.23
Progress of Construction of Storage Capacity during Ninth Plan

Organization	Outlay (Rs. crore)	Storage (lakh tonnes)	
		Target	Achievement (Actual & Anticipated)
FCI	184.00	7.00	4.67
CWC	356.40	8.20	9.16
SWCs	N.A.	11.00	14.16
Cooperatives through NCDC	178.21	8.00	4.40
Total	718.61	34.20	32.39

Source : Working Group Report on Agricultural Infrastructure / Warehousing / Rural Godowns / Marketing / Post Harvest Management / Processing and Coldstorage, Trade and Export Promotion.

5.1.132 The Mid-Term Review of the Ninth Five Year Plan had observed that at macro level there is no shortage of capacity for food grains storage under the Central pool account. However, there is a mismatch at the micro level, especially for the rural public distribution system, hilly and remote and inaccessible areas. The National Agriculture Policy also lays emphasis on strengthening rural infrastructure to support faster agricultural development, promote value addition, accelerate growth of agri-business, and create employment in rural areas, which will ultimately improve the living standard of the farmers and agricultural workers.

5.1.133 NABARD had provided financial assistance to cooperatives as well as the private sector for the construction of godowns/warehouses through commercial and cooperatives banks at normal interest rate (18 per cent approx.). Storage capacity of 134.89 lakh tonnes was created through 2,227 schemes involving financial assistance of Rs. 561.78 crore. A majority of the schemes were implemented by commercial banks (1,787 schemes). Twenty-seven per cent of the total storage capacity was created in the northern region and 35 per cent in western region. The cumulative storage capacity constructed by the various organisations is given in Table 5.1.24.

5.1.134 There is need for making continuous changes/modifications in the bulk storage systems. It is necessary to make the structures rodent and insect free, moistureproof, waterproof etc. The Structural Engineering Research Centre, Roorkee has developed chicken mesh cement concrete bins and the Indian Plywood Industries Institute, Bangalore has developed plywood bins of 25 tonnes capacity for storing food grains. These bins are suitable for rural storages in the country. Kharif crops are generally stored in high humidity conditions. Coarse cereals are prone to fungal infestation as a result of delayed harvesting and untimely rains and there is a strong possibility of its aflatoxin contamination. Besides, the food grains can be contaminated with uric acid and faecal matters. In view of this, there is a need to evaluate the current warehouse design and make modifications that are cost effective, could be easily built and play a multiple role. The moisture migration and localisation at different pockets are largely responsible for spoilage because of fungal attack. Therefore, pneumatic or other mechanical feeding and discharging are required. Besides, thermal gradients and aeration arrangements for turning the grain from one bin to other is essential. India is a tropical country and has large variations in

Table – 5.1.24
The Cumulative Storage Capacity Constructed by the Various Organizations

(Capacity in lakh tonnes)

Organization	Capacity constructed	CAP/Open Capacity	Total Capacity (as on date)	
FCI	125.965	24.477	150.442	(30.11.2000)
CWC	55.529	8.538	64.067	(01.12.2000)
SWC	83.820	27.570	111.390	(30.11.2000)
Coops. Through NCDC	137.360	-	137.360	(31.03.2000)
Deptt. of Rural Dev.	21.260	-	21.260	(31.03.1997)
Various agencies through NABARD	134.980	-	134.980	(31.03.1997)
Other agencies	82.100	-	82.100	(30.06.1996)
Total	641.014	60.585	701.599	

Source : Working Group Report on Agriculture Infrastructure etc.

Note : CAP : Covered and plinth

climate, temperature, weather conditions, humidity levels etc. Therefore, a lot of research needs to be undertaken for designing storage structures that are standardised and suitable for all the conditions.

Tenth Plan Strategy

5.1.135 The Government of India has approved a National Policy on Handling, Storage and Transportation of Foodgrain. This policy broadly envisages: (i) reduction in storage and transit losses at the farm level; (ii) encouragement to farmers to adopt scientific storage methods; (iii) modernisation of the system of handling, storage and transportation of the food grains procured by the FCI; (iv) harnessing the efforts and resources of both the public and private sector (including foreign companies), to build and operate infrastructure for bulk handling, storage and transportation of food grains. Fiscal incentives are available to the entrepreneurs in the form of tax concessions on profits, custom duty exemption for items not manufactured in India, etc. This policy will continue in the Tenth Plan.

5.1.136 Towards the end of the Ninth Plan, the Ministry of Agriculture operationalised a scheme for the construction of rural godowns in order to create scientific storage capacity for agriculture produce and inputs and prevention of distress sales by small farmers immediately after the harvest. The scheme aims at encouraging individuals, firms, NGOs, cooperatives/corporations, Agricultural Produce Marketing Committees (APMCs) and others to take up viable and bankable projects for constructing rural godowns. Efforts will also be made to expand the coverage of rural godowns in the country.

Storage Of Horticulture Produce And Plantation Crops

5.1.137 Horticulture crops are highly perishable and improper handling can lead to heavy losses. The potato crop takes up 88 per cent of the country's total cold storage capacity. Other fruits and vegetables account for 10.4 per cent, whereas fish and marine products account for 1 per cent of the total cold storage capacity. There are 3,886 cold storages with an installed capacity

of 13.62 mt and about 150 units are in the process of construction. Thus, by the end of the Ninth Plan the total cold storage capacity was of the order of about 14.37 mt. There are very few multi-purpose cold storages.

5.1.138 Efforts will be made to increase storage capacity at production areas with a realistic transportation system and cold chains from the production to the distribution centres. The private sector will be encouraged to play a major role in this sector.

5.1.139 The onion storage system is different from the conventional cold storage. During the Ninth Plan, National Agricultural Cooperative Marketing Federation (NAFED) was entrusted the task of conducting an experiment for establishing an efficient onion storage system. The Ninth Plan target of 0.45 mt onion storage capacity could not be achieved. Efforts would be made to increase the storage capacity in the Tenth Plan.

5.1.140 Plantation crops like tea, coffee, spices, coconut, cashew, cocoa, marine products, dairy products, sugar etc. require different storage facilities. Efforts will be made to generate appropriate product-specific storage capacity.

Research And Development In Oil Extraction, Milling Of Pulses, Storage And Transportation Systems

5.1.141 A number of institutions are engaged in research and development in post-harvest handling, packaging, storage, transportation and value-addition in many agricultural/livestock products. These are the CFTRI, Regional Research Laboratories at Jammu and Trivandrum, the Indian Agriculture Research Institute, Indian Veterinary Research Institute, Central Institute of Fishery, Central Institute of Post Harvest Engineering and Technology, G.B. Pant Agriculture University, Punjab Agriculture University, Marathwada Agriculture University, Indian Grain Storage Management and Research Institute, National Horticulture Research and Development Foundation, Structural Engineering Research Centre, Roorkee etc. Efforts will be made to popularise available technologies.

Incentive Regime For Agricultural Infrastructure

5.1.142 Apart from providing a policy framework for the expansion of agriculture infrastructure, there is need to substantially reduce levies such as excise, customs, central sales tax etc. State Governments will have to consider rationalising sales tax and other local levies, wherever these are applicable. As agricultural infrastructure is seasonal, concessional credit requirements need to be considered. There are a number of other statutory controls, either arising from Essential Commodities Act, 1955 or other statutes, which discourage the private sector from taking up various infrastructure ventures. The stock and storage limits, restrictions on inter-state and inter-district movement of food grains, controls on blending and processing of oilseeds, Prevention of Food Adulteration Act (PFA), 1954 FPO etc. are responsible for the slow growth of infrastructure and marketing development. This has adversely affected the potential of private sector initiatives and consequently, agricultural development. Therefore, steps would be taken for dispensing with major control measures or reforming many of them, coupled with the removal of high fiscal levies.

AGRICULTURE MARKETING

5.1.143 An efficient agriculture marketing system is indispensable for the overall development of the country's economy. It requires a healthy environment, smooth channels for the transfer of produce, physical infrastructure to support marketing activities, easy cash support to the widely scattered community of producers and also promotion of a sense of market orientation among the farmers. However, currently, there is a multiplicity of market functionaries/intermediaries with conflicting interests.

5.1.144 The current market system is dominated by traders. Appropriate and effective linkages between the producers and sellers continue to be weak. The absence of rural road connectivity and other infrastructure, combined with improper management, lack of market intelligence and inadequate credit support has resulted in a system that is unfavourable to the farmers. The

adverse impact of all these is more pronounced in the case of the small and marginal farmers who constitute about 78 per cent of the entire farming community.

5.1.145 The overall position of types and number of agricultural markets is given in Table.5.1.25:

Table - 5.1.25
The position as on August 2001

Markets	Type	Number
Agricultural Markets	Wholesale Markets	7,304
	Primary Rural Markets	27,294
	Total	34,598
Regulated Markets	Principal Markets	2,355
	Sub-yards	4,822
	Total	7,177

Source: Directorate of Marketing and Inspection, Faridabad

5.1.146 The primary rural markets are the first contact point for the rural producers and sellers. There are over 27,000 primary rural markets, scattered across the country. These are, however not equipped with basic facilities like platforms for sale and auction, electricity, drinking water, link roads, traders premises, facilities for post harvest management etc. These markets, therefore, require attention for price competitive marketing to attract more buyers. The crop-wise estimated percentages of marketable surplus in the overall production is given in Table.5.1.26.

5.1.147 The basic objective of setting up a network of markets is to ensure reasonable profits to the farmers by creating a conducive environment for the free and fair play of supply and demand forces, regulate market practices and ensure transparency in transactions. Apart from dealing with current imperfections and shortcomings, the Government has recognised the importance of liberalising agriculture marketing in the wake of the WTO-SPS Agreement. Several initiatives have been taken to develop agricultural markets. An Expert Committee was constituted under the chairmanship of Shri Shankarlal Guru for recommending the development and strengthening of the country's agriculture marketing system. The Committee's Report contains a large number of observations and

recommendations for reforming the current market structures and the practices.

Tenth Plan Strategy

5.1.148 The recommendations made by the Guru committee cover the entire gamut of marketing structures and policy deficiencies, regulatory framework and infrastructure requirements. The

Table – 5.1.26
Crop-Wise Estimated Marketable Surplus As Percentages of Production

Commodity	Marketable Surplus Ratio %
Rice	43.0
Wheat	51.5
Coarse Cereals	43.1
Pulses	72.4
Oilseeds	79.6
Groundnut	68.3
Mustard & Rape	84.3
Other Oilseeds	86.3
Sugarcane	92.9
Cotton	100.0
Vegetables	83.0
Fruits	97.0

Source : Sub-Group on Estimation of Marketed Surplus Ratio, Constituted by GOI.

suggested package provides the basis for introducing necessary policy changes and modalities for the development of required infrastructure, which will be promoted.

5.1.149 APMCs and the marketing boards have accumulated substantial amount of savings in the form of market development funds which were supposed to be ploughed back into the development of infrastructure and services in the regulated market. However, the development has been unsatisfactory. Infrastructure facilities and services in these markets are essential. Efforts, therefore, are needed to involve these agencies for the upgradation of infrastructure facilities with their resources.

5.1.150 The quantum of market arrivals of agricultural products and trade volume in and around cities have been increasing enormously. Therefore, it is time now to promote alternate and mega markets, especially near big cities and metropolises. These markets should be encouraged and allowed to function outside the purview of APMCs.

5.1.151 Efforts would be made to involve PRIs, Primary Agriculture Cooperative Societies and Consumer Cooperative Societies in agriculture marketing outside the purview of the Government sphere. For better access to markets, emphasis will be given on developing infrastructure such as roads and communication/information services.

Box 5.1.3

Observations and Recommendations of the Guru Committee

1. Physical markets with facilities and services would attract the farmers and the buyers which will create a competitive trade environment and result in offering the best prices to producers and sellers.
2. The institution of regulated markets has had limited success and acted more as a restrictive influence.
3. Marketing liberalisation and overcoming the constraints faced by the various organisations, including private sector ones, is necessary.
4. There is a need to establish vibrant, dynamic and assimilative marketing structures and systems in the wake of the liberalised economic scenario.

Contd.....

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5. There is a need for a thorough overhaul of existing policies, rules, regulations, legal provisions which inhibit a free marketing system.
6. Private sector and joint ventures in setting up markets need to be encouraged with suitable policies and incentives for free and competitive trade.
7. Modernisation of infrastructure is essential for the development and operational efficiency of the markets.
8. Commodity exchanges have to be institutionalised and their scope increased to instill confidence and awareness among market players.
9. Managerially competent and administratively viable organisations are required to administer marketing structures. Functions of APMCs and Marketing Boards have to be remodelled towards this end.
10. Regulations such as registration/licensing, traded commodity coverage, control on packaging and labeling, laws affecting market places and controls on the movement of produce, volume of commodities traded, laws relating to access to credit and capital, dispute resolution mechanisms etc. need to be reviewed and a framework evolved, keeping the current domestic and global scenario in view.
11. Direct marketing is one of the alternative marketing structures that needs to be promoted. This will economise upon transportation cost and improve price realisation. The role of the private sector may be encouraged outside the purview of the APMCs.
12. Cooperatives will have to be freed from the control of politicians and bureaucrats.
13. Information dissemination systems — websites, databases, information packages and other generic as well as customised software on agriculture marketing has become indispensable. All these need to be upgraded and promoted.
14. The number of commodities under forward contracts may be enlarged to facilitate a competitive marketing system, which will also minimise price fluctuations across the regions and across seasons.
15. Pledge financing enables the usage of inventories of graded produce as collateral. Existing limits on priority sector credit should be revised upwards. A full-fledged agriculture marketing credit policy needs to be re-designed. All financial institutions — RBI, NABARD, commercial and cooperative banks — may work out a detailed exercise.
16. Public sector is to play important role in marketing efforts in remote and difficult areas.
17. Specialised markets for fruits, vegetables and other horticulture products may be promoted with comprehensive and efficient infrastructure facilities.
18. Mega markets and/or alternate marketing structures with the involvement of private, public, cooperative or joint ventures may be promoted on a large scale for efficient marketing of perishable and other agriculture products. These need to be encouraged outside the purview of APMCs.
19. Professionalisation of the personnel in the marketing structures is necessary and their training modules and facilities need improvement.
20. Infrastructure for quality assurance, specially for perishables, standardisation, grading and quality control infrastructure needs to be promoted with Government support.

AGRICULTURAL EXPORTS

5.1.152 Agricultural exports are a major component in the country's merchandise export basket. The range of the products is diverse, covering cereals, oil, oilseeds and oil meals, pulses, horticulture-based products, both fresh and in processed forms, jute and cotton, dairy products, poultry, meat and products etc. The most significant point about agricultural exports is that a majority of these items are net foreign exchange earners, since the import content is either nil or negligible, unlike many manufactured and industrial products, where import content is very high. The WTO has opened up new opportunities for developing countries and India can hope to achieve substantial growth of exports in the coming years. The country's strength lies in its rich bio-diversity, diversity in agro-climatic conditions, a large labour force, the low use of agro-chemicals etc. All these can provide a boost to the exports.

Review Of Ninth The Plan

5.1.153 The relative share of agricultural exports in the country's total exports has been declining over the years (Table 5.1.27). The share of agricultural exports declined from 20.40 per cent in 1996-97 to 13.54 per cent in 2000-01. Such a situation is unavoidable as the share of non-agricultural export has grown faster. Moreover, the export earnings per unit of product have also been declining in the case of agriculture in recent years. The value of

agricultural exports during 1996-97 was Rs. 24,239 crore. There was, however, a set back in 1999-2000 and agriculture exports declined by more than 9 per cent over previous years. During 2000-01 exports stood at Rs. 27,423 crore. There was thus a rise of 13.14 per cent in four years.

Major Constraints In Agricultural Exports

5.1.154 Although the export performance of agriculture products has been constantly increasing, it is still hampered by a number of constraints (Box 5.1.4).

Tenth Plan Strategy

5.1.155 A product-specific export strategy will be necessary, keeping in view the potential and international requirement for each product or its derivatives. Besides removing restrictions on the export of agriculture products, there is need for establishing a single window system to deal with the requirements of farmers for promotion of plant and animal products, incentives for research to deal with plant protection and quarantine regulations in line with the WTO regime, etc. Therefore, export inspection systems and sanitary and phyto sanitary measures require enhanced support and adequate strengthening. Interventions are needed for educating farmers, upgradation of their skills and intensive training which would enable them not only to increase production, but improve the quality of

Table-5.1.27
Agricultural Exports and Share in Country's Total Export

(Rs. crores/\$ Million)

Year	Value of Agri-Export	Country's Total Export	Percentage of Agri-Export in Total Export	% age change over previous year Agri. exports	Country's total exports
1996-97	24,239 (6,828)	1,18,817 (33,470)	20.40	-	-
1997-98	25,419 (6,840)	1,30,101 (35,006)	19.54	4.87	9.50
1998-99	26,104 (6,205)	1,39,753 (33,218)	18.68	2.70	7.42
1999-2000	24,576 (5,671)	1,62,925 (37,599)	15.08	- 9.06	16.58
2000-01	27,423	2,02,509	13.54	11.59	24.30

Source : Economic Surveys (Figures in parenthesis indicate the value in \$ Million)

Box 5.1.4
Common Constraints on Exports of
Agricultural Products

1. Restrictive and ad hoc trade policy towards agricultural products.
2. High cost of production and export transactions.
3. Lack of sound and efficient infrastructure for post-harvest management such as storage, cold storage and bottlenecks at mandis.
4. Insufficient and inadequate storage and handling facilities at ports.
5. Absence of adequate and timely market intelligence for the producers and exporters.
6. Poor quality of products and absence of standards, presence of a high level of pesticide residues.
7. Poor quality assurance system and absence of certification system to conform to international requirements.
8. Lack of modern and technologically sound certification agencies and laboratories.
9. Absence of appropriate technology protocols for handling, storage, transportation
10. Inadequate efforts in market development and brand building.
11. Over-dependence on a few markets.
12. Poor packaging and gradation.
13. Lack of organised production.

the products. A comprehensive strategy for the development of international market intelligence for specific agriculture products, with a focus on potential in importing countries, quality standards, competitive price scenario etc. is called for. All these will be useful for working out a comprehensive strategy for promoting the agriculture exports. With quantitative restrictions on imports of agricultural commodities having been removed, there is no rationale of continuing restrictions on such exports. Promotion of multilateral trade and trade among countries of the South Asian Association for Regional Cooperation (SAARC) would need focused attention.

5.1.156 The Export and Import (EXIM) Policy valid for the April 2002-March 2007 period contains several measures to encourage agricultural exports. Agri-export Zones (AEZ) are proposed to be set

up for end-to-end development for the export of specific products from a geographically contiguous area. The Policy also includes a number of market access initiatives.

5.1.157 There is a vast potential for the export of organic food, cereals, oil seeds, fresh and processed fruits, vegetables, floriculture, spices, cashew, guar gum, products derived from medicinal and aromatic plants, dairy products, meat and poultry products, marine products, etc. Concerted efforts will be made to integrate various activities relating to R&D, production, post-harvest management, processing and value addition and marketing. All these efforts will be tailored to fit into the provisions of the market access initiatives in the EXIM Policy.

AGRICULTURE STATISTICS

5.1.158 Agriculture statistics are characterised by major data gaps, besides considerable time lag in collection, compilation and analysis of basic agricultural data. This adversely affects its timeliness. Scientific methods prescribed for assessing yield rates are often ignored. Area, production and yield statistics of minor crops, horticulture crops including floriculture, medicinal and aromatic plants, mushroom etc are not available, although their contribution to the agriculture GDP has increased by more than 24 per cent in recent years. The traditional patwari agency and girdawari has proved to be cost effective and efficient. The system requires to be modernised, with the use of new tools of information technology etc.

5.1.159 The Government has appointed the National Statistical Commission to go into the entire gamut of problems of the statistical system and suggest remedial action. The Commission has made major recommendations for improving agriculture statistics.

Tenth Plan Strategy

5.1.160 The implementation of recommendations of the National Statistical Commission will remain the basis for the overall strategy of improving agriculture statistics in the Tenth Plan.

Box 5.1.5**Recommendations of the National Statistical Commission (NSC) on Agriculture Statistics**

1. Timely Reporting Scheme (TRS) and Establishment of an Agency for Reporting Agricultural Statistics (EARAS) should be regarded as programmes of national importance. Crop area forecast and final area estimates should be based on TRS in the temporarily settled states while EARAS should continue in the permanently settled states. These estimates should be based on 20 per cent random sample of the villages.
2. Patwaris and their supervisors should be mandated to accord highest priority to girdwari
3. Systematic training for patwaris and primary staff should be arranged.
4. States should take necessary measure to generate reliable estimates under General Crop Estimation Surveys (GCES).
5. Improvement of Crop Statistics (ICS) should be strengthened and its survey design modified for providing alternative all India estimates.
6. The two series of experiments conducted under National Agriculture Insurance Scheme (NAIS) and GCES should not be combined.
7. National Centre for Crop Forecasting (NCCF) should be adequately strengthened.
8. Forecasting Agricultural Output using Space, Agro-meteorology and Land based observations (FASAL) should be actively pursued.
9. Crop Estimation Surveys (CES) on fruits and vegetables including floriculture, herbs and mushroom, should be reviewed and an alternate methodology for estimation of horticulture crops developed.
10. The nine-fold classification of land use should be enlarged to cover social forestry, marshy and waterlogged land and land under still waters.
11. The divergence between irrigation statistics generated by the Ministry of Agriculture, Ministry of Water Resources and by State Governments should be reduced to the maximum extent possible
12. Agriculture census should be on sample basis and conducted in 20 per cent sample villages. There should be an element of household enquiry in the temporarily settled states.
13. Computerisation of land record should be expedited
14. Manual of instructions on the collection of wholesale prices may be prepared by the Ministry of Agriculture
15. Agriculture market intelligence units may be re-evaluated and their functions streamlined
16. Cost of Cultivations Studies (CCS) should be continued. A review of the number of centres, methodology, sample size etc. should be undertaken.
17. The quinquennial livestock census should be undertaken in 20 per cent sample of villages. The census should include minimum information about households.
18. The basic unit of enumeration in the agriculture census is an operational holding, whereas in the livestock census, it is a household. Both of these should be integrated and taken together.
19. The Indian Agricultural Statistics Research Institute (IASRI) should be entrusted with the task of developing appropriate methodologies for filling up data gaps in the estimation of meat, pork, poultry etc.
20. The survey design for the estimation of marine production should be modified. IASRI and Central Inland Fisheries Research Institute (CIFRI) should be provided adequate support to develop programme on priority
21. Remote sensing techniques should be extensively used to improve forest statistics, including timber and non-timber forest products. The State forest departments should be given adequate support in the collection and compilation of forest statistics from diverse sources.
22. Training support should be provided to all concerned in the collection and compilation of statistics.

Agricultural Development In the Northeastern And Eastern Region And Other Eco-Fragile Regions

5.1.161 The northeastern region, hill areas, coastal areas and the rainfed areas in the country have lagged behind in agricultural development. In the Tenth Plan, the emphasis would be on facilitating the development of the potential and bridging yield gaps so as to have an impact on the overall development of such regions. The major emphasis would be on sustainable development of natural resources through soil and water conservation, watershed development and the development of minor irrigation facilities together with rainwater harvesting and conservation. The farming system's approach based on the agro-climatic conditions and endowment of the regions with land and water resources would be adopted for the development of agriculture.

5.1.162 In the eastern region, which is endowed with immense ground water potential, minor irrigation infrastructure would be developed which will help adopt improved crop production technologies, crop diversification and multiple cropping resulting in higher productivity and returns. A centrally sponsored scheme 'On-Farm Water Management' has already become operational for developing the groundwater potential. However, in other areas where water availability is inadequate, rain water harvesting and conservation through watershed development approach would be promoted. To economise on water use and improve water use efficiency, water saving technologies and water saving devices such as sprinkler irrigation, drip irrigation etc. would be promoted, besides area-specific cropping systems being encouraged.

5.1.163 The low input use in the northeastern region and other eco-fragile regions gives it a natural advantage in the production of organic food, bio-products, etc. In order to tap this inherent advantage, emphasis will be laid on organic farming systems with special focus on rural-urban compost, crop residue utilisation, cultivation of legumes and use of bio-fertilisers/ INM and bio-control of insect-pests and diseases/ IPM.

5.1.164 To take the advantage of agro-climatic conditions favourable for the development of fruits, vegetables, tree cropping, agro forestry, emphasis will be given for the development of post-harvest handling infrastructure and creating conditions conducive to development of such activities. Post-harvest management, storage, processing and value-addition infrastructure will be developed besides the development of marketing infrastructure. The Technology Mission on Horticulture for the North Eastern States has already become operational.

5.1.165 Special attention will be given to creating requisite infrastructure for the development of off-farm production activities. The flow of credit in these regions will be given special attention and extension reforms will be introduced to make the system demand driven and motivate the diversification of agriculture, besides encouraging the effective transfer of technologies, dissemination of information and input support services.

AGRICULTURAL RESEARCH AND EDUCATION

5.1.166 The ICAR is the nodal agency at the national level for the promotion of science and technology in the areas of agricultural research and education and demonstration of new technologies as frontline extension activities. The ICAR has developed a national grid comprising 46 institutes including four deemed universities, four national bureaux, nine project directorates, 31 National Research Centres, 158 regional stations and 81 All India Coordinated Research Project (AICRPs) in different parts of the country. The educational programmes are carried out by 31 SAUs and the Central Agriculture University (CAU). The National Bureau of Animal Genetic Resources (NBAGR - Karnal), National Bureau of Fish Genetic Resources (NBFGR - Lucknow), National Bureau of Plant Genetic Resources (NBPGR- New Delhi) and Horticulture Gene Bank, Lucknow have been further strengthened to enhance their work capacity in respect of collection, acquisition, quarantine, characterisation, evaluation, maintenance, documentation, conservation and awareness generation. Establishment of a National Bureau of Agriculturally Important Microbes has also

been taken up in the Ninth Plan, which will be completed and further strengthened.

5.1.167 The emphasis in the Tenth Plan would be on demand-driven research besides adequate thrust on modern biotechnologies like development of transgenics and space technology and on sustainable development of natural resources together with preservation and exploitation of our rich bio-diversity. Besides, the ICAR-SAUs research system would also be encouraged to produce the breeder seed of different crops/varieties in required quantities so as to increase the availability of certified/quality seeds. The ICAR would also take up the transfer of technology through its Institutes/centres to bridge the gap between the research yields and farmers yields. The research strategies would include:

- ☒ Strategic research involving frontier technologies, such as bio information, space, nuclear and renewable energy technologies needs considerable intensification.
- ☒ Participatory research with farmers in order to develop location-specific technologies which are environmentally sustainable and socially acceptable.
- ☒ Cooperative research with private sector R&D institutions.

5.1.168 Important areas of focus for research would be the following:

Bio-technology

Application of bio-technology to evolve new genetically engineered strains of plants, animals, birds and fishes has to be given due priority. Proper testing of transgenic products and bio-safety will have to be addressed effectively. Intensified research efforts are also needed in the application of bio-technology for increasing shelf life and converting food stuff into more palatable, nutritious and stable forms.

With technological advancement, a very valuable tool in the form of 'genetic engineering' has

become available for mankind. The seed technology/ genetic engineering are to play a major role in evolving high potential material to meet the future requirement of food, feed and fibre and the raw material to various industries. Whereas these technologies are required to be developed and adopted, the country has to be careful about the likely adverse impacts of Genetically Modified Organisms (GMOs). While research activities relating to this need to be intensified, the commercial utilisation of GMOs must be allowed only after thorough testing.

The other development in bio-technology is the 'terminator technology' which has been patented by 14 multinational companies. There is apprehension that the use of terminator seeds may affect the natural bio-diversity and also the commercial plants/ crops. Therefore, the country has to be very vigilant. In the Indian context, incorporation of such genes in varieties being propagated for mass cultivation would be extremely detrimental. The technology to identify the terminator seeds needs to be developed so as to prevent the entry of such seeds into the country.

Farming Systems Approach

For efficient and sustainable agriculture, it will be essential to change over from a commodity-centric approach to a 'farming systems' approach. This will call for multi-disciplinary and inter-institutional efforts. The judicious utilisation of available agro-biodiversity should receive the highest priority. Hence, germ plasm collection conservation, optimum utilisation and enhancement have to receive greater attention.

Protection of Environment through Soil Health Care and Balanced Nutrition

The necessity to cater to the food, fibre and fuel needs of the country has put the primary natural resources like soil, water and vegetation under severe stress. Protection of environment and sustainability of resources are the high priority areas for research in agriculture. Balanced nutrition and restoration of soil health would receive due attention. Suitable technology and modules for integrated pest management, blending all appropriate control

methods would be evolved, at least for major crops where pests and diseases inflict huge losses.

Trade Opportunities

Changing consumption and demand patterns and new trade opportunities have brought about greater diversification of farming systems through enhanced emphasis on horticulture, animal husbandry, milk, poultry, fish and other animal products, non-food crops and agro-forestry. Scientific land use planning and resource optimisation would be emphasised. Special attention will be paid to reorient our research agenda in the context of diversified agriculture, value-addition, post-production technology and agri-business.

Cost Reduction And Quality Improvement

To capitalise on increased market access and remain competitive globally, adopting cost-effective crop technology, continuous upgradation of post-production technology becomes imperative. Post-production technology upgradation with emphasis on on-farm handling and storage systems for different commodities, minimising losses, covering sanitary and phyto sanitary measures, packaging, transport, marketing, value addition, both for domestic and export market would be given due consideration.

Exploiting The Rich Terrestrial And Marine Fauna/ Flora

Besides human food, the rich terrestrial and marine fauna/ flora should also be exploited for extracting rare chemicals, drugs, enzymes and hormones of pharmaceutical, medicinal and nutritional importance. Utilisation of crop residues and by products for food, feed and industrial products through value addition is another area which would be strengthened.

Mechanisation For Small Farms, Hill Agriculture, Horticulture And Energy Management

Agricultural engineering research during the Tenth Plan will lay greater emphasis on small farm mechanisation by developing appropriate technologies for timeliness, precision, maximising

input utilisation efficiency, reducing losses, value-addition and post-harvest technology and conserving energy and natural resources of soil and water. It will also lay greater emphasis on mechanisation of hill agriculture, horticulture, energy management and greater use of renewable sources of energy in agriculture, human comfort and safety and gender issues to reduce drudgery in farm operations and agro-processing.

New Technology To Increase Fisheries Production

The fishery sector has been growing at the rate of 6 per cent per annum during the last decade but the growth rate of aqua-culture is about 10 to 12 per cent. In this sector, the intensification of research efforts in the field of bio-technology, selective breeding of cultivable fishes and prawns for increase production are needed. Location-specific technology will be developed for brackish water aqua-culture to utilise inland saline land/ water. Immuno-pathological researches have to be oriented towards disease diagnosis, prevention and control of viral and bacterial disease of shrimps and fishes. More emphasis will be given on quality of fish products, harvest and post-harvest technology.

Promotion Of Excellence In Agriculture And Education

Continuous efforts have to be made to ensure improved standards of education and capacity building through human resource development. A strong educational infrastructure is required for the on-going programme and for new initiatives. The manpower engaged in research will have to be continuously trained to maximise its output. Excellence in agriculture and education in different streams would be promoted and supported. Similarly, efficient human resource utilisation through appropriate programmes would also be given due emphasis. During the Tenth Plan, agriculture research and education in the States shall be strengthened by earmarking funds for agricultural research and education in State Plans.

5.1.169 In order to harness science to achieve food and nutritional security, alleviation of poverty and

unemployment, natural resource management and globalisation, research focus would be on:

- ☒ Conservation and enhancement of the ecological foundations of farming (land, water, biodiversity, forests, oceans and the atmosphere), through an integrated natural resources management strategy involving PRIs and NGOs.
- ☒ Organisation of multi-disciplinary monsoon and climate management in different agro-climatic zones in order to help in maximising the benefits of good monsoons and minimising the adverse impact of aberrant monsoons. The other aim would be to take proactive action against potential adverse changes in temperature, precipitation and sea levels as a result of global warming.
- ☒ Dry land farming through appropriate land use and water conservation measures.
- ☒ Special attention to the northeastern region, hill areas, coastal regions and islands.
- ☒ Diversification of cropping and farming systems and greater attention to crop-livestock integration, taking note of the current trends and changes in the relative consumption of cereals and other food products. Also, livestock and livelihoods are intimately intertwined in dry farming and arid and semi-arid areas.
- ☒ Intensification of research on under-utilised crops, thereby expanding the food basket; changing the nomenclature 'coarse cereals' into 'nutritious cereals'.

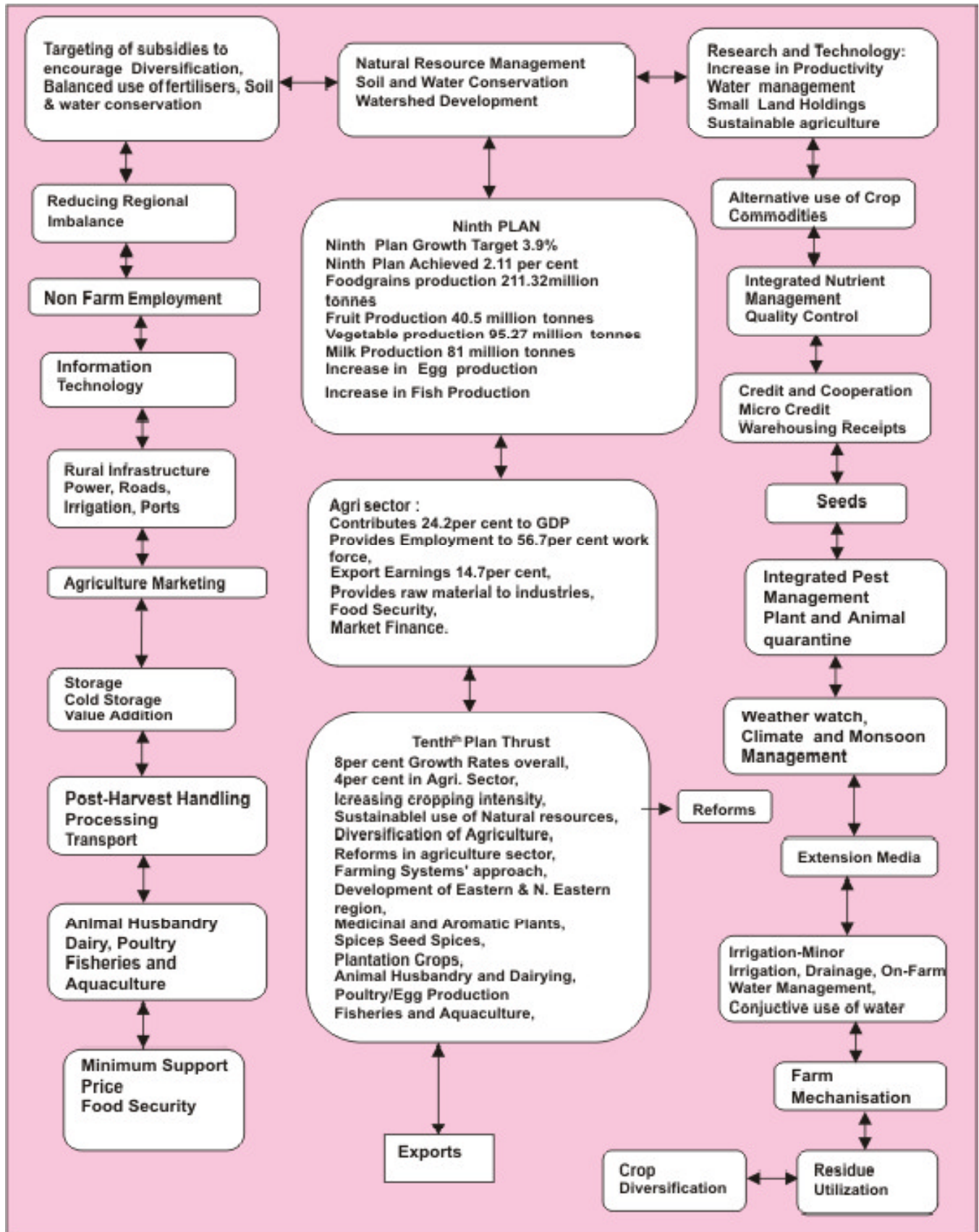
- ☒ Intensification of research on sustainable capture and culture fisheries and development of a strategy for the optimum utilisation of two million sq km of sea surface area available under the Exclusive Economic Zone (EEZ).

5.1.170 A major research thrust is required to achieve a breakthrough in pulses and oilseeds, seed spices, medicinal and aromatics plants and the management of diseases like coconut wilt. The force of technology in increasing productivity seems to have declined, which calls for re-orientation of research by the ICAR - SAUs research system. The organisational structure of this system also needs to be reviewed by an independent agency or a group of eminent persons drawn from the fields of science, industry and exports and other stakeholders including farmers, so that research could be re-oriented to sustainable development, water conservation, input management, soil conservation, processing, organic farming, IPM, nutrient management, residue management etc.

5.1.171 So far, research in agriculture has been largely confined to the public sector. Private sector research has generally been confined to agro chemicals and seeds. In the coming years, the environment is to be made conducive to encourage research in partnership with private sector.

5.1.172 Allocation to DARE/ICAR for agricultural research and education, for the Tenth Plan has been increased to Rs. 5368 crore as compared to Ninth Plan allocation of Rs. 3376.95 crore and realization of Rs. 2673 crore. The schemewise break up of the Tenth Plan are given in Appendix.

Strengthening Linkages and Policy Support:



THE PATH AHEAD

Opportunities in Agriculture

5.1.173 The Tenth Plan is being formulated at a time when agriculture faces challenges from both domestic and external sources. The challenge before policy makers is not only to reverse the slowdown of agricultural growth in the 1990s but to ensure that the gains of agriculture in alleviating rural poverty are not lost and the estimated 200 million under-nourished population get access to food.

5.1.174 Agriculture strategies and policies will have to be redefined to benefit all regions by increasing investments and maintenance in irrigation, power, roads, post harvest, handling, processing and marketing infrastructure.

5.1.175 Forward and backward linkages will have to be established and strengthened to give a better deal to farmers.

5.1.176 The Tenth Plan envisages an overall GDP growth rate of 8 per cent per annum. The National Agricultural Policy has envisaged:

- ☒ Growth that is based on efficient use of resources and conserves our soil, water and bio-diversity;
- ☒ growth with equity, i.e., growth which is widespread across regions and benefits all farmers;
- ☒ growth that is demand-driven and caters to domestic markets as well as maximises benefits from exports; and
- ☒ growth that is sustainable technologically, environmentally and economically;
- ☒ growth rate in excess of 4 per cent.

5.1.177 The strategy to achieve the envisaged growth rate of 3.97 per cent in the sector during the Tenth Plan, would be a regionally differentiated one based on agro climatic conditions and land and water resources of different regions.

5.1.178 Thrust would be given for the development of the eastern and northeastern regions together with other eco-fragile regions - hill areas, coastal areas, etc. -- by further expanding the On-Farm Water Management scheme which has been introduced to exploit the rich ground water potential. The Technology Mission on Horticulture has become operational in the northeastern region and backward and forward linkages will be ensured.

5.1.179 States where there is stagnation/ deceleration of growth due to environmentally unsustainable practices, will be encouraged to improve management practices and diversify to crops which will restore soil health.

5.1.180 The thrust areas during the Tenth Plan would include

- ☒ Increasing cropping intensity;
- ☒ diversification to high value crops/ activities;
- ☒ development of minor irrigation and utilisation of created irrigation potential;
- ☒ rainwater harvesting and conservation for the development of rainfed areas - watershed approach;
- ☒ reclamation/ development of problem soils/ lands;
- ☒ utilisation of unutilised/under-utilised wastelands and degraded lands by allocation/leasing;
- ☒ timely and adequate availability of inputs like seeds, fertilisers, implements;
- ☒ thrust on seed production - breeder, foundation and certified -- to achieve the desired seed replacement rate;
- ☒ bridging the gap between research and farmer's yields;
- ☒ encouragement to the private sector for effective extension and input support services;
- ☒ promotion of a farming system approach;
- ☒ cost effectiveness while increasing productivity;

- ☒ promotion of organic farming, with the use of organic waste, IPM and INM;
- ☒ strengthening of marketing, processing and value-addition infrastructure;
- ☒ upgradation of indigenous cattle and buffalo using certified semen/high quality pedigreed bulls and providing services at farmer's door;
- ☒ conservation of threatened breeds of livestock and improvement of breeds used for draught and pack;
- ☒ creation of disease-free zones and a national immunisation programme against most prevalent animal diseases;
- ☒ adequate availability of fodder seeds and improvement of pasture lands;
- ☒ increase in fish production from both culture and capture resources; and
- ☒ emphasising the quality and safety aspects of produce in agriculture, animal husbandry, and the dairy and fisheries sector.

5.1.181 With increasing population, land holdings are getting fragmented and becoming unviable. The average size of holdings has decreased from 2.28 ha in 1970-71 to 1.57 ha in 1990-91. To deal with problems of fragmented and small holdings:

- ☒ A clear policy regarding transfer of agricultural land has to be implemented.
- ☒ Transfer of land has to be made easy to enable the farmers to augment their holdings to viable size units.
- ☒ Stamp duty on transactions of land for agriculture to be rationalised.
- ☒ Leasing of land and contract farming to be allowed/promoted and made easy which will help generate income for both lessee and lessor/ contractor.
- ☒ Legislation needs to be enacted to facilitate land utilisation - transfer, leasing contract farming.

- ☒ Technologies suited for small holdings have to be developed to increase the productivity and returns of small holdings.
- ☒ States would be asked to take up the consolidation of holdings and computerisation of land records.

5.1.182 While, on the one hand, the per capita availability of land has declined, there are vast areas which are unutilised or under-utilised. If such lands are put to productive uses, the production will increase and millions of farm families will get livelihood support and their income will increase. For utilisation of unutilised/under-utilised degraded/wastelands, States would be persuaded to consider the following:

- ☒ Allotment/leasing of Government/panchayat lands for production purposes to landless and weaker sections.
- ☒ Providing access to grasses and fodder from forest area and allowing growing of grasses/ fodder and medicinal and aromatic plants.
- ☒ Wastelands which require huge financial resources for development will be earmarked and used for generating raw material for industry in partnership with the private sector

5.1.183 Sustainable development of natural resources would be given a major thrust through watershed approach and appropriate measures like:

- ☒ Formulation of a perspective plan for the development of rainfed/degraded land;
- ☒ implementation of watershed development programme as a single national initiative;
- ☒ thrust on people's participation in planning and execution of field activities in the implementation of the watershed development programme;
- ☒ emphasis on rain water harvesting and conservation;
- ☒ development of minor irrigation, especially in the eastern region having abundance of ground water;

- ☒ promotion of on-farm water management, water-saving technologies and devices for increasing water use efficiency;
- ☒ increasing forest/tree cover to facilitate recharge of ground water;
- ☒ completing irrigation projects expeditiously and ensuring maintenance of canals and other irrigation projects;
- ☒ setting up of water user associations and recovery of water charges so that there is better maintenance; ensuring that there is sufficient water for drinking, agriculture and other uses. Enaction of legislation on use of ground water will be followed up with the States;
- ☒ as electricity is an important input for agriculture, effort will be made to link pricing/tariff as a policy reform for providing adequate power;
- ☒ special thrust on research for efficient water utilisation and conservation - promotion of water saving methods and devices such as diggi, drip/ sprinkler irrigation;
- ☒ encouraging water conservation and recycling of water by households, urban local bodies and industry.

5.1.184 The strategies for the development of horticulture and plantation crops would include:

- ☒ Improving production, productivity, reducing cost of production, supply of good quality, disease-free, high yielding seeds and planting material and promotion of inter-cropping/multi story cropping;
- ☒ value addition and quality improvement through propagation of latest technologies and improved farm practices (micro-irrigation, fertigation, integrated nutrient/ pest management and promotion of protected/green house cultivation, precision farming, etc.);
- ☒ strengthening of organisational support, promotion of human resource development, capacity building and enhancement of the knowledge base of

farmers and other functionaries engaged in the horticulture/plantation sector;

- ☒ promotion of bee-keeping and medicinal and aromatic plants on a large scale;
- ☒ promotion of re-plantation, gap filling, rejuvenation, and expansion of coverage in new areas;
- ☒ encouragement for processing and product diversification with adequate financial incentives;
- ☒ shift towards credit linked subsidy regime in favour of planters and processors through commodity boards, NABARD, commercial/ cooperative banks;
- ☒ market development and export promotion by way of improving international market intelligence and promotion of Indian brands abroad.

5.1.185 Measures to increase the availability of quality agricultural inputs in adequate quantities would include ;

- ☒ Thrust on seed production and distribution to achieve higher seed replacement rate (SRR).
- ☒ Emphasis on bio-technology for development of high yielding seeds.
- ☒ Restructuring of the NSC and SFCI to operate as a single agency.
- ☒ Replacement of the Seed Act, 1966 for development of the seed sector.
- ☒ Promotion of the balanced use of fertilisers and INM with emphasis on the use of organics together with management/ utilisation of crop residues.
- ☒ Encouragement to organic farming.
- ☒ Strengthening of testing facilities for seeds, fertilisers, soil, water, pesticides, pesticides residues, etc.
- ☒ Emphasis on adoption of IPM with emphasis on natural controls, need-based use of pesticides and strengthening of pest surveillance and forecasting facilities for the promotion of the IPM concept.

- ☒ Creation and strengthening of plant quarantine facilities at all entry points to check the entry of exotic pests and diseases.
- ☒ Promotion of efficient and energy saving implements and machines through involvement of the private sector in mass production of quality implements.
- ☒ Development of facilities to import agri machines/implements and study these for the development of models suited to Indian conditions.

5.1.186 Over the years the established credit infrastructure has provided a valuable support to the farmers in adopting improved production technologies. But, of late, the system has been under strain and the availability of credit to the farm sector has remained inadequate. Against the recommended 18 per cent share of agriculture in priority sector lending by banks, the relative share in the net bank credit stood at 15.8 per cent in March 2000 and 15.7 per cent in March 2001. The following efforts will be made to increase the flow of agricultural credit.

- ☒ Ensuring that Kisan Credit Cards are issued to all entitled farmers by the end of the Tenth Plan.
- ☒ States would not be eligible for funding by cooperative sector/ NCDC till they adopt the Multi-State Cooperative Act for providing more functional and financial autonomy.
- ☒ Cooperative banks will be strengthened through recapitalisation.
- ☒ Micro financing would be encouraged through self-help groups/women's groups.

5.1.187 The present agriculture extension system has become outmoded and ineffective. It is not able to effectively meet the present-day demands of farmers. Therefore, the following steps will be taken:

- ☒ Agricultural extension will be reformed and strengthened to make it demand driven, using the print and electronic media to disseminate information;

- ☒ private sector involvement will be encouraged in extension and services support such as agri-clinics;
- ☒ IT and the print media will be used to reach information to farmers;
- ☒ linkages between KVKs of ICAR and State/district extension services will be strengthened together with that of private sector /NGOs involved in agriculture extension;
- ☒ utilisation of infrastructure available with KVKs/ICAR Institutes and SAUs for providing input support services to the farmers, including testing and certification of inputs and farm produce.

5.1.188 Efforts to create and strengthen storage/cold storage infrastructure would include:

- ☒ Enhanced back-ended credit-linked financial incentives for taking up storage/cold storage, post-harvest processing and value-addition infrastructure;
- ☒ encouragement to the private sector in the creation of agriculture infrastructure by way of reduction in fiscal levies (excise, custom, central sales tax levied by the Central Government and reduction/rationalisation of sales tax and other local levies by the State Governments) on equipment, machinery, etc.; and
- ☒ review and abolition of statutory controls to the extent possible to attract private sector and investment.

5.1.189 Indian agriculture has undergone a change from subsistence farming to commercial production. Marketing infrastructure and prices play a very important role in the development of a crop commodity and the development of a particular area or region. No appreciable growth can be visualised without adequate marketing support. States will, therefore, be persuaded to amend their respective APMC Acts to provide for:

- ☒ Phasing out of all the remaining restrictions on movement, stocks, credit, exports and processing;

- ☒ development of integrated agricultural markets in private and cooperative sectors;
- ☒ direct marketing of agricultural produce by setting up farmers' markets;
- ☒ contract farming involving a commitment on the part of the farmers to produce a specific commodity and commitment on the part of the contractor to purchase the produce at a pre-determined price;
- ☒ abolishing all restrictions in various Acts which impinge on free trade of agriculture commodities; and
- ☒ enlargement of commodity coverage under forward contracts/future trading.

5.1.190 Besides the development of domestic markets for agri- commodities, adequate thrust will also be given for export promotion through:

- ☒ Formulation of a product-wise strategy;
- ☒ phasing out all restrictions on exports;
- ☒ promotion and setting up of with adequate financial incentives and facilities;
- ☒ incentives for modernisation of processing facilities and promotion of value-added products;
- ☒ rationalisation and improvement of the export inspection system, sanitary and phyto-sanitary measures with adequate strengthening and appropriate interventions in terms of education, training, upgradation of skills, knowledge, etc.;
- ☒ undertaking comprehensive international market intelligence and development of product profiles for identified agricultural products, having potential in different countries, keeping in view quality standards, price competitiveness, etc.; and
- ☒ promotion of Indian brands abroad for identified products.

Food Security and Diversification of Agriculture

5.1.191 As on 1 April 2002, there was 55.95 mt of foodgrains stock with Government agencies (24.91

mt of rice and 26.04 mt of wheat). The Expenditure Reforms Commission has recommended a buffer stock of 10 mt (4 mt of wheat and 6 mt of rice). Keeping in view environmental considerations and consumer demand, it would be necessary to encourage horticulture, livestock/dairy products. This would require a holistic approach to issues relating to:

- ☒ targetting food subsidies properly and providing access of food to the poor in an efficient manner;
- ☒ review of pricing and procurement operations under MSP to make them more effective;
- ☒ integration of marketing, value-addition and exports to deal with marketable surplus of cereals, fruits, vegetables and livestock products.

Research For Increasing Productivity and Quality

5.1.192 The growth in total factor productivity seems to be decelerating, suggesting a decline in the force of technology. In some areas like that of pulses and some other crops, there has not been any research breakthrough. The thrust and strategies for research would include:

- ☒ Thrust on modern technologies like development of transgenics, space technology and sustainable development of natural resources together with preservation and exploitation of rich biodiversity;
- ☒ reorientation of research in the context of diversified agriculture, value addition, agri-business;
- ☒ thrust on technologies for sustainable development of natural resources and cost reduction and quality improvement technologies;
- ☒ emphasis on research on mechanisation of small farms, hill agriculture, energy management and use of renewable sources of energy in agriculture;

- ☒ thrust on research to achieve a breakthrough in pulses and oilseeds, management of coconut wilt, seed spices, medicinal and aromatic plants etc.;
- ☒ review of ICAR/agriculture research.

Reforms And Opportunities In Agriculture

5.1.193 There will be a fresh look at agricultural subsidies, pricing and procurement operation under MSP for:

- ☒ Rationalisation of agricultural subsidies, especially those adversely affecting natural resources;

- ☒ utilising MSP and procurement operations as a tool to bring in desired diversification in the cropping/farming system;
- ☒ quality control of inputs and produce;
- ☒ encouraging crop production for alternative use - ethanol, feed, starch etc.;
- ☒ Convergence of Central sector and Centrally sponsored schemes of various departments and also in schemes being implemented under State Plans for the efficient utilisation of financial and manpower resources.