TFYP WORKING GROUP Sr. No. 43/**2001**

REPORT OF
THE WORKING GROUP ON

CROP HUSBANDRY, DEMAND & SUPPLY PROJECTIONS AND AGRICULTURAL INPUTS

FOR
THE TENTH FIVE YEAR PLAN

सत्यमेव जयते

GOVERNMENT OF INDIA
PLANNING COMMISSION
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CONTENTS

S.No.	Chapter/Subject	Page No.
1.	Chapter-I- Constitution of Working Group and its terms of reference.	1-6
2.	Chapter-2- Production Scenario and Input Availability	7-10
3.	Chapter-3- Programmes and their Impact on Production and Input Supply & Use.	11-42
4.	Chapter-4- Demand and Supply Projections for Foodgrains for 10th Five Year Plan	43-52
5.	Chapter-5- Summary: Major Issues and Recommendations.	53-63

Annexures

I	Annexure-1.I- The Composition of the Working Group and its terms of reference	3-6
II	Annexure-3.I- List of Schemes under implementation during 2001-02.	40-41
III	Annexure-3.II- Projected requirement of breeder, foundation and certified seeds by 2006-07.	42
IV	Annexure-4.I- Demand Projections of Foodgrains for the X Plan.	50
V	Annexure-4.II-I-Projected demand for foodgrains on the behaviouristic approach based on the assumptions that entire per capita income goes towards expenditure.	51
VI	Annexure-4.II.II- Projected Demand for Foodgrain on Behviouristic Approach-based on the savings taken out of per capita consumptions.	51
VII	Annexure-4.III- Demand Projections of foodgrains based on the behaviouristic approach with assumption that the per capita income will double in next ten years.	52

CHAPTER -1

CONSTITUTION OF WORKING GROUP AND ITS TERMS OF REFERENCE

1.1 Planning Commission vide their order No. M-12043/10/2000-Agri dated 15th November, 2000 constituted the Working Group on "Crop Husbandry Demand & Supply Projections and Agricultural Inputs" for the formulation of the 10th Five Year Plan under the Chairmanship of Shri K Rajan, Former Secretary, Department of Agriculture & Cooperation (DAC), Government of India. Under the main Working Group, two sub groups (i) on Demand and Supply Projections and; (ii) on Agricultural Inputs were also constituted under the Chairmanship of Dr. G.S. Bhalla, Prof. Emeritus, Centre for Regional Development, School of Social Sciences, Jawaharlal Nehru University and Shri K. Rajan, Former Secretary, DAC respectively. The composition of the Working Group and its terms of reference etc. are given at Annexure- 1.I.

1.2 The Working Group was given responsibility to review the performance of various ongoing schemes of the Department of Agriculture and Cooperation (DAC), assess their impact and suggest measures/programmes to effectively address the issues relating to use of inputs and over exploitation of natural resources. Among other issues, the Group was also given the responsibility to work out requirement of foodgrains and also make the supply projections for the terminal year of the 10th Five Year Plan (2006-2007), besides suggesting the measures for increasing the production of foodgrains and other agricultural commodities so as to maintain self sufficiency.

1.3 The Working Group held two meetings on 16/2/2001 and 1/5/2001 to discuss the issues in Agricultural Sector within framework of the terms of reference assigned.

1.4 During the first meeting of the Working Group held on 16/2/2001, it was decided that it would not be necessary to have discussions separately by the two sub groups, instead all the issues relating to Demand & Supply Projections and also Crop Husbandry and Input Use could be discussed together in a larger group where all the members of the main Working Group and Sub Working Groups are present.

1.5 The Working Group had a very elaborate discussion on various issues relating to Agriculture. With regard to the fertilizer the discussions were limited to its use as a separate Working Group on Fertilizer has also been constituted. Similarly, with regard to Organic and Bio-dynamic farming a separate group was to address the various related issues and submit its report. Therefore, the issues relating to fertilizer demand and status and measures for promoting the organic

and bio-dynamic farming have not been covered in the report of this Working Group.

1.6 The report of the Working Group is based on the discussions held in the meetings on 16/2/2001 and 1/5/2001 and valuable suggestions given by the members of the Working Group.

Annexure. 1.I

No.M-12043/ 10 /2000-Agri.
Government of India
Planning Commission
(Agriculture Division)

Yojana Bhavan, Sansad Marg,
New Delhi, November 15th, 2000.

O R D E R

Subject: Constitution of the Working Group on "Crop Husbandry, Demand and Supply Projections and Agricultural Inputs" for the formulation of the Tenth Five Year Plan.

It has been decided to set up a Working Group on "Crop Husbandry, Demand and Supply Projections and Agricultural Inputs" for the formulation of the Tenth Five Year Plan under the chairmanship of Shri K.Rajan, former Secretary (A&C) , Department of Agriculture and Cooperation, Government of India.

2. The composition of Working Group and also Sub Working Groups on' Demand and Supply Projections' and on 'Agricultural Inputs' is given at Annexure. The Working Group may co-opt any other official/ non-official expert / representative of other agency as member (s), of the Group or Sub-groups, if required.

3. 1. The Terms of Reference of the Working Group will be as under:-

(i) To review the performance of various Central Sector and Centrally Sponsored Schemes being implemented by Department of Agriculture & Cooperation during the Ninth Plan with reference to their objectives and targets set both in terms of physical and financial aspects and to suggest modifications so as to make these programmes, if continued, more effective with regard to raising productivity and input supply /use.

(ii) To assess the impact of various programmes on the increased /adequate availability and the optimum use of agricultural inputs, especially seeds, water, fertilizers & bio-fertilizers, farm implements & machinery, bio-control agents & bio-pesticides, information/ extension support and suggest measures to further improve their supply/ availability.

(iii) To suggest measures / programmes to effectively address issues relating to adverse impact of imbalanced/ excessive use of inputs and over exploitation of natural resources on sustainable development of agriculture, especially in the green revolution and intensive cultivation areas..

(iv). To suggest the ways / programmes for increased use / wider adoption of organic waste, Integrated Nutrient Management (INM) System and Integrated Pest Management (IPM) System.

(v). To suggest measures/ programmes for better management of inputs especially water, fertilizers and pesticides to achieve higher use efficiency and minimize their adverse impact on land and water resources, environment and human & animals.

(vi). To assess the requirement of improved seeds of foodgrain crops, oilseeds, commercial crops and horticulture crops during the Tenth Five Year Plan and suggest the measures to adequately meet the demand.

(vii). To study the progress of agricultural mechanization during Ninth Five Year Plan and to suggest measures/ programmes to encourage mechanization, including the development / fabrication of implements & machines and propagation of the same for efficient and quick farm

operations, minimizing the wastage of time & energy and post harvest losses so as to improve efficiency and reduce the cost of production.

(viii) To review the programmes of extension/ transfer of technology and suggest measures to make them more effective and meaningful under the fast changing needs and empower the farming community with access to information.

(ix) To work out requirements of foodgrains, sugarcane, cotton, oilseeds, jute and other crop commodities, including their likely demand for export and make the supply projections for the terminal year of the Tenth Five Year Plan for the purpose of working out physical targets of agricultural production.

(x) To suggest the measures / programmes for substantially increasing the production of foodgrains and other agricultural commodities ,especially that of pulses and oilseeds so as to maintain self sufficiency and to achieve a reasonable degree of self sufficiency in pulses and oilseeds.

3.2. The Terms of Reference indicated above (para 3.1) at Sl. No.(ii) to (viii) are for the sub group on "Agricultural Inputs" and Sl. No. (ix) for the sub group on "Demand and Supply Projections".

4. The Chairman of the Working Group may set up task forces, if necessary, for undertaking in-depth studies and formulation of Plan proposals.

5. The Working Group may co-opt non-official experts/ representatives of other agencies, if required.

6. The expenditure of the members on T.A./ D.A. in connection with the meeting of the Working Group will be borne by the parent-department / Ministry / organization. The expenditure, if any, in respect of non-official members will be borne by the Planning Commission as per rules and regulations of T.A/D.A. applicable to Grade-I officers of Government of India.

7. The Working Group will submit its final report to the Planning Commission by 31st March,2001. The report will be a consolidated one considering the findings, suggestions and recommendations of the two Sub-Working Groups referred to in this order.

(T. R. Meena)
Deputy Secretary (GA)

Copy forwarded to the Chairman and Members of Working Group.

<u>Copy also forwarded to</u> :

P.S to Deputy Chairman
P.S. to MOS (P&PI)/P.S. to Member (SP)
Sr. PPS to Secretary
PS to Pr. Adviser (Agri.)
PS to Adviser (PC)
Joint Adviser (Agri.) / Joint Adviser (APS)/ Directors(agri.)/Dy. Advisers / SROs / ROs in the Agriculture Division
Pr. Advisers/ Advisers of all Divisions
PA to Deputy Secretary / SO (Admn.I)

Annexure

Composition of Working Group on Crop Husbandry, Demand and Supply Projections and agriculture Inputs for the formulation of the Tenth Plan.

1. **Shri K. Rajan** - Chairman
   Former Secretary (A&C), Govt. Of India
   2 F/2, Kamat Khera Miramar, Panaji, Goa - 403002.

2. Dr. G.S. Bhalla, Professor Emeritus, - Member
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   JNU, New Delhi-110067

3. Dr. G.S. Kalkat,Vice Chancellor, - Member
   Punjab Agriculture University, Ludhiana, Punjab

4. Special Secretary (A&C) - Member
   Department of Agriculture & Cooperation ,
   Krishi Bhawan, New Delhi-110001.

5. Addl. Secretary - Member
   Ministry of Water Resources,
   Sharam Shakti Bhavan, New Delhi-1

6. Agriculture Commissioner, - Member
   Department of Agriculture & Cooperation,
   Krishi Bhawan , New Delhi -110001

7. Economic & Statistical Adviser - Member
   Directorate of Economic & Statistics,
   Department of Agriculture & Cooperation, Krishi Bhavan, New Delhi-1

8. Deputy Director General (NRM) - Member
   Indian Council of Agricultural Research,
   Krishi Bhavan, New Delhi-1

9. Director (Agriculture) - Member
   Government of Uttar Pradesh, Lucknow.

10. Director (Agriculture) - Member
    Government of Andhra Pradesh, Hyderabad.

11. Director (Agriculture) - Member
    Government of Rajasthan, Jaipur,

12. Director of Agriculture - Member
    Government of West Bengal, Calcutta.

13. Director of Agriculture - Member
    Government of Haryana, Chandigarh.

14. Director of Agriculture - Member
    Government of Punjab, Chandigarh.

15. **Joint Adviser (Agri.) (Shri M. Lall)** - Member-Secretary
    Planning Commission, Yojana Bhavan, New Delhi-1

a) Composition of Sub-Group on Demand and Supply Projections

1. Dr. G.S. Bhalla, -Chairman
Professor Emeritus,
Centre for Regional Development School of Social Sciences,
Jawahar Lal Nehru University,New Delhi-110067.

2. Dr. Abhijit Sen - Member
Chairman
Commission for Agricultural Cost and Prices,
Krishi Bhawan, New Delhi-1

3. Dr. Ravi Srivastava - Member
Centre for the Study of Regions Development,
Jawahar Lal Nehru University,New Delhi-110067.

4. Economic & Statistical Adviser (Dr. D.K. Trehan) - Member Secretary
Directorate of Economic & Statistics,
Department of Agriculture & Cooperation,
Krishi Bhavan, New Delhi -110001.

b) Composition of Sub-Group on Agriculture Inputs (Seeds, Engineering, Extension, Plant Protection, Water Management)

1. Shri K. Rajan - Chairman
Former Secretary (A&C), Govt. Of India
2 F/2, Kamat Khera Miramar, Panaji, Goa - 403002.

2. Dr. G.S. Kalkat,Vice Chancellor, - Member
Punjab Agriculture University, Ludhiana, Punjab.

3. Dr. K. Kanoongo - Member
241A, Aerodrome Area, Bhubaneswar - 751026, Orissa.

4. Dr. C.R. Hazra, Agriculture Commissioner , -Member
Department of Agriculture & Cooperation, Krishi Bhawan, New Delhi -1

5. Dr. Gyanendra Singh -Member
Director, Central Institute of Agriculture Engineering,
Bhopal - 462003, Madhya Pradesh.

6. Dr. G.K. Patil -Member
Ajinkya, Bhist Bagh Road,Savedi,
Distt. Ahmednagar, Maharashtra.

7. Dr. B.D. Dhawan -Member
Prof. Institute of Economic Growth
University Enclave, Delhi-110007.

8. Joint Secretary (Seeds), (Shri Govindan Nair) - Member Secretary
Ministry of Agriculture,
Department of Agriculture & Cooperation,
Krishi Bhavan, New Delhi - 10001.

CHAPTER - 2

PRODUCTION SCENARIO AND INPUT AVAILABILITY

2.1 After Independence, for a long time India remained a food deficit country and had to depend on large imports from outside. Situation remained so, mainly because of poor rural infrastructure and larger dependence of crops on monsoon rains. Besides, the production potential of the traditional varieties, which were less responsive to inputs use like irrigation and fertilizer, was low. After the introduction of high yielding varieties in mid 60s the agriculture received a momentum. The high potential and highly input responsive varieties, especially that of wheat and rice, attracted the attention of farmers and their area increased substantially. Besides, the infrastructure development, especially in terms of irrigation, rural roads, rural electrification with support of credit helped the farmers to achieve higher production and productivity. The ICAR-SAUs (Indian Council and Agricultural Research and State Agricultural Universities) Research System contributed immensely in evolving such high yielding varieties by incorporating desirable traits and developing appropriate production technologies. The introduction of high potential new varieties, technology generation and infrastructural development ushered in Green Revolution which resulted in multifold increase in production of foodgrains and other crop commodities. India achieved self sufficiency in foodgrains production. The Foodgrains Production increased to a record level of 208.87 million tonnes in 1999-2000. The production of oilseeds, sugarcane, vegetables and fruits etc. also increased substantially.

2.2 However, during the 90's (1989-90 to 1999-2000) a deceleration in growth[1] of agriculture has been observed as compared to the previous decade, 80s (1979-80 to 1989-90), as has also been brought out in the Mid Term Appraisal (MTA) of 9th Plan of the Planning Commission. As compared to the 80s, in the 90s, the overall growth rate of crop production declined from 3.72% per annum (p.a.) to 2.29% p.a. and the productivity from 2.99% p.a. to 1.21% p.a. During the 90s the growth rate in production of foodgrains declined to 1.92% p.a. as compared to 3.54 % p.a. during 80s. Similarly the growth rate of productivity decelerated to 1.32% p.a. as compared to 3.33 % p.a. during 80s. The deceleration in growth rate of foodgrains was steep as compared to other non foodgrain crops which declined from 4.02% p.a. during 80s to 2.83% p.a. during 90s.

2.3 States of Gujarat, Karnakata, Manipur, Meghalaya, Nagaland, Rajasthan and Goa recorded better growth in foodgrains production during the 90s as compared to 80s. However, in Punjab, Uttar Pradesh, West Bengal, Arunachal Pradesh and Mizoram where the

[1] Ministry of Agriculture, GOI

foodgrains production growth rate was higher during the 80s, a decline was observed during the 90s. Mizoram, though recorded a higher growth rate of 5.6% p.a. in foodgrains production during the 90s, it was less than that of 10.0% per annum achieved during the 80s.

2.4 The deceleration in the growth rate of production of rice and wheat, which have declined because of lower growth in productivity, although there has been some expansion in area, is a matter of concern. The plateauing of yield of rice and wheat in high productivity areas under rice-wheat cropping system and low yield levels in central and north-eastern parts of the country have affected the growth of production. The coarse cereals production recorded a negative growth rate (-0.52% p.a) during the 90's because of diversion of area by about 8 million hectares to other more remunerative crops.

2.5 The unsustainable practices like excessive use of water together with imbalanced use of fertilizers especially in the Green Revolution areas of northern and northwestern parts of the country have affected the soil health adversely. The organic matter content in the soil has gone down because of inadequate use of organics and the micro nutrient deficiency became wide spread. As the MTA of the 9th Plan brought out, it seems that the policy of the government during 90s has been to secure additional production by providing subsidised agricultural inputs. This has affected agricultural infrastructure development in general and in poorer states in particular. The subsidies seem to have affected adversely the public agricultural investment in irrigation and roads and expenditure on technological upgradation. Poor maintenance of canals and roads contributed to poor services. Besides these, the inadequate credit support, stringent market controls on foodgrains and other crop commodities have also affected the growth in agriculture.

2.6 On one hand the modern agriculture has become capital intensive and on the other hand the profits to farmers are declining. A review [2] by the Central Institute on Agricultural Engineering (CIAE), ICAR, has brought out that the percentage share of profit over total cost of cultivation, has gone down. As compared to in 1995-96 the percentage of profit in 1997-98 in paddy has declined from 5.7% to 3.84%, in wheat from 8.04% to 0.64% and in gram from 8.08% to (-) 6.42%. Share of profit in Coarse Cereals, pigeonpea, groundnut and soybean remained negative. It seems that farmers have no other alternative but to continue grow these crops in marginal and rainfed areas to gain some remuneration for their labour and land which is included in the cost of cultivation (opportunity cost).

2.7 As agriculture has a major role in alleviating the rural poverty, deceleration in its growth has affected the generation of income of rural

[2] The paradox of Declining Agricultural Output Growth co-existing with declining prices of agricultural commodities (2001), by Dr. Gyanendra Singh and Hukum Chandra.

population. This is evident from the fact that on one hand poor people specially those below the poverty line have no access to food and on the other hand foodgrains stocks in the reserve pool has been increasing.

2.8 The current level of foodgrains production of about 200 million tonnes seems to be just sufficient to meet the requirement. However, the stocks of foodgrains are overflowing which indicate that a sizeable population has no access to required foodgrains. According to the National Family Health Survey 2 (NFHS-2) of 1998-99, 42.1% of the boys and 40.8% of the girls between one and five years are moderately or severely under nourished. About 74.3% children under 3 years and 51.8% of the married women between 15-45 years suffer from anemia. The percentage of children under 3 years classified as under nourished on anthropometric indices of nutritional status ranges from 62% to 65%. The per capita net availability of cereals and pulses the only source of protein for majority of Indians at 470.4 grams per day also leaves much to the desired. All these figures indicate that although we have a surplus stock of foodgrains in our reserve pool everything is not well and people are not getting required quantity of foodgrains. Besides, there also seems less availability of other food items like fruits and vegetables. This is evident by the rampant malnutrition figures, especially in children and women.

2.9 The inputs availability and their use in agriculture has remained limited. Only about 39-40% of the net sown area of 142.8 million ha could be brought under irrigation and the remaining is dependent on rains. The larger dependence of crops on monsoon have adversely affected on the use of inputs and adoption of improved crop production technologies, because of high risk involved in crop production and low/no margin of profits. As the CIAE study has brought out the crop production under marginal lands/rainfed areas remained a business of loss in most of the crops.

2.10 The seed availability and Seed Replacement Rates (SRRs) for most of the crops remained inadequate and below the desired levels. There has also remained a varietal mismatch in seed availability and demand, especially in case of the crops / varieties specific to the problem areas. The average fertilizer consumption at 95.3 kg/ha remained low and imbalanced in terms of use of NP&K nutrients. The nutrient use remained very low in some of the States, especially in the North Eastern States and in the States like Himachal Pradesh (39 kg), Orissa(44 kg), Rajasthan (40 kg) and Madhya Pradesh (47 kg). There remained a negative balance of about 6 million tonnes in supply and nutrient removal from the soil by the crops. Besides, a increasing deficiency of micro-nutrients in the soil have been observed in recent years. Soils have become widely deficient in some micro-nutrients like zinc, iron,etc.

2.11 With the propagation of Integrated Pest Management (IPM) approach though the consumption of pesticides in agriculture has

declined the availability of quality pesticides remained a matter of concern. The infrastructure for enforcing the provisions of Insecticide Act, 1968, also remained inadequate. Failure of crops like cotton and red-gram in some areas/states has been attributed to the spurious pesticides in the markets and hence the ineffectiveness in controlling the pests by the farmers, resulting their being put to severe financial distress.

2.12 Availability of quality farm machines and implements has been found to be very unsatisfactory. The reservation for the manufacture of agriculture machinery and implements by the Small-Scale Industries seems to have also effected adversely the development of this sector. For the adoption of modern technologies and precision farming right type of machines and implements with high efficiency are required. The use of such machines and implements will also assist in conducting the required agricultural operations in a timely manner and improve the returns by assisting the lowering the cost of cultivation/production.

2.13 Agriculture extension machinery and information support in most of the states, seems to have become ineffective. The staff created under the World Bank assisted T&V programme do not have much mobility because of the resource constraints faced by the states. The need to revamp the extension in the country with the involvement of private sector is being felt increasingly. The private sector especially the input agencies and traders are now the main sources of information for the farmers.

2.14 The issues relating to inputs supply and their use are discussed in Chapter-3.

CHAPTER – 3

PROGRAMMES AND THEIR IMPACT ON PRODUCTION AND INPUT SUPPLY & USE.

3.1 The Government of India had taken up several initiatives to accelerate agricultural production and in the process decided to implement several schemes to assist the states in their efforts. The Central Sector (CS) and Centrally Sponsored Schemes (CSSs) are designed to essentially supplement and augment the state governments' efforts, agriculture being in the State List of the Constitution. The schemes were also expected to assist in the realisation of several national objectives where the role of the Centre could be considered primary and direct. Broadly the schemes, a majority of which were initiated in the early eighties have been both expanded in scope and have also undergone transformation from time to time keeping in view the emerging areas of concern, such as the need to push up production growth rates in areas where the growth rates were relatively tardier in the seventies, or in the rain-fed areas so as to bring about a better balance in growth of different regions of the country. Another major facet of these developments has been the launch of Technology Mission on Oilseeds in the mid-to late eighties in the face of very large quantities of imports of vegetable oils and sky-rocketing prices in the second half of eighties. The Technology Mission has since then been expanded to cover pulses and maize. Apart from assisting the state governments many of the Central Sector schemes were designed to enable the central sector organisations to play an effective part in the functions devolving upon them such as in the area of Plant quarantine on our borders, the role of the Central Insecticides Laboratory in the enforcement of the Insecticides Act, the overall supervisory role in ensuring quality control of inputs, enabling central public sector organisations to play role assigned to them in the area of seed production and processing, etc. For increasing production and productivity of foodgrains, commercial crops and horticultural crops several Central Sector and Centrally Sponsored Schemes, in addition to the state plan schemes, are being implemented. A list of schemes currently under implementation is given at Annexure-3.I

3.2 The Department of Agriculture and Co-operation (DAC) has during the last year decided to move away from specific scheme administration and implementation in respect of each individual scheme to what has been called by them as a Macro Management approach. Under what is termed as the Macro Management the funds provided under individual schemes are pooled together and the state governments informed of the likely allocations. The state governments are expected to prepare a detailed work plans to accelerate agricultural growth rate and deploy both the funds provided as part of the state plan schemes and the central assistance being provided as allocations from the macro-management approach adopted in respect of identified

CSSs. It is the intention of the DAC and the Government of India that this could provide a greater degree of flexibility to the state government to identify the specific constraints impeding achieving a higher growth rate and take measures to assist the farmers to address these and overcome the constraints. Thus instead of being limited by the provisions under each scheme which may not be relevant or applicable in the particular circumstances of any individual state the concerned state government could make slight modifications to suit the prevailing situation in the state and render meaningful assistance to the producers. The approach is founded on the premise that it may be the lack of a clear understanding of the micro-level problems of any individual area and hence the inability of the scheme to address these problems as may have come in the way of successful implementation of the schemes and hence realising the goals set before.

3.3 This approach casts a serious responsibility on the states to carefully assess the critical factors responsible for the current levels of productivity and particularly in those crops or areas where these are far below the genetic potential of the varieties being recommended for cultivation or in the adoption of recommended technologies of improved productivity and production. Key to this whole process of Macro-Management is how well the Work Plans are prepared by different states and getting these approved by the DAC for implementation. Following this approach 26 Centrally Sponsored / Central sector schemes have been subsumed under the Macro Management. The allocation to the states for various activities, covered under the different schemes hitherto implemented separately is now based on their Work Plans. There is also provision under the Macro Management that some additional activities could be taken up if considered necessary, by the State Governments.

3.4 Although the objective of the DAC in giving the freedom and flexibility to the states for taking up need based programmes may be realised, it is apprehended that some specific activities like development of natural resources, measures for alleviating the deficiency of macro nutrients, Integrated Pest Management (IPM) system or some other similar activities may not be given due weightage by the states, as envisaged originally under the various schemes. It is true that while agriculture is a state subject yet the Government of India is principally responsible for overall food management and to ensure the food security. Rice and Wheat are the two major cereal crops constituting about 43% and 35% of total foodgrains output respectively. Although at present there are overflowing foodgrains stocks it is felt that the foodgrains output in the country could, at best, be considered just about sufficient if every individual in the country had the required purchasing power to access his minimal requirements of foodgrains on the normative basis. Given the skew in distribution of incomes and hence the effective demand for the cereals, there appears to be a well considered need to maintain and reinforce continued emphasis on increasing the production and productivity of these two

major cereals. The State Government on their own may not be able to give required thrust and address the various emerging issues because of resource crunch with them.

3.5 Therefore, appropriate actions required to improve the productivity and production of rice and wheat over the entire country continue to merit the full attention of the DAC, working jointly with the ICAR who are responsible for the generation of improved production technologies. The DAC needs to examine closely based on the experience, albeit of very small duration, as to whether the objectives of the schemes to promote the enhancement of productivity and production of rice and wheat and the new approach adopted would not result in compromising one set of goals for the other. Clearly the improved productivity of rice and wheat could be considered as dominant objectives of agricultural plans, for a large country like India cannot be expected to meet its major cereal requirements through the global trading mechanism, without achieving the self-sufficiency in respect of these two crops in most years except when the climatic conditions turn out to be extremely unfavourable in rare years. Our group attempted to get the copies of the Work Plans prepared by the state governments and the approval accorded to the plans by the DAC to assess how far these deviated from the manner in which these CSSs were implemented in the past. We have not been successful in getting the plans and to undertake a critical evaluation. State representatives in our Working group, however, welcomed the new approach of the DAC. Since the approach has been very recently implemented that is, from the *Rabi* season of 1999-2000 they were also not able to categorically comment on how the new approach has marked a departure from the past and how these will reflect on productivity enhancement efforts in the coming years.

3.6 Besides schemes taken up to promote productivity and production of rice and wheat activities, the rain-fed area development programme which was covered under the National Watershed Development Project for Rain-fed Area (NWDPRA) has also been subsumed under the Macro Management. The programme seeks to address several major concerns with the maintenance of the soil health and in situ water/ moisture conservation as the predominant considerations. Prevention of further soil erosion, conservation of water from the available precipitation, adoption of a scientific and optimal cropping system could have salutary effect on not only maintaining the natural resources in a better state of health but even increase the productive potential of lands. All this could result in enhancing the farmers' income levels apart from stabilising the productivity and incomes. These call for large investment given the extent of rain-fed lands subject to deterioration.. Even with the focused attention on such activities and with the support of the Centre, by the end of 9th Five Year Plan only about 27.6 million hectares of rain-fed/ degraded land out of the total estimated 107 million hectares have been covered,

under all the programmes implemented by 3 ministries namely, Ministry of Agriculture (MoA), Ministry of Rural Development (MoRD) and Ministry of Environment and Forest (MoE&F). Thus, the inclusion of the watershed development programme under Macro Management mode of implementation could adversely affect the programme implementation at the field level and desired objectives may not be achieved. Therefore, the natural resources development programmes such as Development of Watershed, Reclamation of Problem Soils etc. should also be taken out of the Macro Management. This has also been recommended by the Working Group on 'Watershed Development, Rainfed Farming and Natural Resources Management' constituted by the Planning Commission for the formulation of the X Five Year Plan.

3.7 The crop production oriented schemes of the DAC are being implemented by the Crops Division and the Technology Mission on Oilseeds & Pulses (TMOP). Implementation of such programmes has helped in increasing the production and productivity during the 7th and 8th Five Year Plan. Though the output of foodgrains, oilseeds, cotton reached a record level during 1999-2000, there has been a decline thereafter. If we consider the first four years of the 9th Plan the performance of production of various crop commodities does not seem to be satisfactory as is evident from the data given in following table 3.1.

Table-3.1. IX Plan Production Targets and Achievements of Foodgrains and Commercial Crops.

(million tonnes)

crop	8th Plan 1996-97 achiev.	9th Plan (2001-02) Target	1997-98		1998-99		1999--2000		2000-01		2001-02
			Tar.	Achi.	Tar.	Achi.	Target	Ach.	Target	Ach.	Tarrget
Rice	81.73	99.00	83.00	82.54	86.00`	86.00	86.00	89.48	90.00	85.30	92.00
Wheat	69.35	83.00	70.00	66.35	74.00	70.78	74.00	75.57	74.00	68.46	78.00
Coarse Cereals	34.11	35.50	34.00	30.40	34.50	31.46	34.50	30.47	33.00	30.25	33.00
Pulses	14.25	16.50	15.00	12.97	15.50	14.80	15.50	13.35	15.00	11.06	15.00
Total **Foodgrains**	**199.44**	**234.00**	**202.00**	**192.26**	**210.00**	**203.04**	**210.00**	**208.88**	**212.00**	**196.07**	**218.00**
Oilseeds	24.38	30.00	25.50	21.32	27.00	25.21	28.00	20.87	28.00	18.20	28.00
Sugarcane	277.56	336.00	280.00	279.54	300.00	295.73	305.00	299.23	325.00	300.32	325.00
Cotton *	14.23	15.70	14.80	10.85	14.80	12.18	15.00	11.64	14.50	9.39	14.50

* Million bales

Source: Ministry of Agriculture / Planning Commission.

3.8 The Ninth Five Year Plan (2001-02) production target for foodgrains was fixed at 234 million tonnes. Against this the achievement during the year 1999-2000 was 208.88 million tones. But in the next year the foodgrains production declined to 196.07 million tonnes. Considering the poor performance during the first four years of the Ninth Plan, the foodgrains production targets for the terminal year (2001-02) had been revised downwards to 218 million tonnes. The production target of foodgrains fixed in view of Governments plan to double the food production by 2007-08 were quite ambitious and

seemed to be unrealistic to achieve.

3.9 The production of pulses remained very unsatisfactory at about 13.04 million tonnes per year during the first four years of the IX Plan against the average annual production of 13.35 million tonnes during the VIII Plan, and the IX Plan terminal year target of 16.50 million tonnes. A record production of 14.80 million tonnes of pulses was achieved in 1998-99. But, in subsequent years during 1999-2000 and 2000-01, it declined to 13.35 million tonnes and 11.06 million tonnes respectively. The production target for the terminal year of the Ninth Plan had to be revised downwards to 15.00 million tonnes, considering the poor performance during the first four years of the Plan. Inspite of the creation of a Technology Mission on Pulses, the pulses production have remained low and unsatisfactory. It seems that creation of Technology Mission on Pulses has not made any impact as production remained almost stagnant with wide year to year fluctuations. This calls for review of the Technology Mission on Pulses.

3.10 The average growth rate of production of foodgrains during first four years of the IX Plan has been observed to be negative at (–) 1.25% p.a. Wheat (-0.07% p.a.) and coarse cereals (-2.81% p.a.) also registered a negative growth rate. However, the rice registered a growth rate of 1.14% p.a. The major set back was observed in case of pulses which recorded a negative growth rate of (–)5.45% p. a..

3.11 Similarly, the oilseeds sector has also performed poorly at an average annual growth of (-) 6.08%. The oilseeds production reached a record level of 25.21 million tonnes in 1998-99, thereafter, it has declined. During the year 2000-01, the oilseeds production declined drastically to 18.20 million tonnes. The average annual production of oilseeds during the first four years of the IX Plan remained at about 21.4 million tonnes. The average annual production of oilseed during the VIII Plan was high at 21.89 million tonnes. Considering the poor performance of oilseeds also, the Ninth Plan terminal year production target have been revised downwards to 28 million tonnes from 30 million tonnes fixed initially.

3.12 The production of cotton also remained low at an average of 11.01 million bales per annum during the first four years of the Ninth Plan, with a negative growth rate of (-) 8.81% p.a. Considering the unlikelihood of achieving the Ninth Plan production target of 15.70 million bales, the target had to be revised downwards to 14.50 million bales. Performance of sugarcane though remained better at an average annual growth rate of 2.01 % during the first four years of the Plan, but the production target could not be achieved. The target for the terminal year of the Ninth Plan were revised downwards to 325 million tonnes as against 336 million tonnes fixed initially.

3.13 The performance of inputs activities related programme and issues concerned are summarized as under:

3.14 Seeds

3.14.1 Seed is a vital and basic input for attaining the higher yields. To an extent the efficiency of other agricultural inputs like fertilizers, irrigation, pesticides, etc. is dependent on the quality of seeds. A sustained increase in agricultural production and productivity has thus become dependent on the development of new and improved varieties of crops and supply of quality seeds to farmers.

3.14.2 The required infrastructure for seed production, processing, packaging and storage have been created with the help of World Bank supported National Seed Project (NSP). National Agriculture Research System and private seed companies have also benefited from the NSP-III, by getting re-finance loan from NABARD. Similarly, under NPVD Scheme and Establishment and Maintenance of Seed Bank Scheme financial support has been provided to State Seed Corporations (SSCs), National Seeds Corporation (NSC), State Farms Corporation of India (SFCI) and State Seed Certification Agencies (SSCs). Fifty four breeder seed production centers have been strengthened for the production of nucleus and breeder seed through the revolving funds out of A.P. Cess Fund of the ICAR. ICAR has also proposed to take up seed production programme of maize in a big way. Besides, under various crop development programmes, funds have been provided to the States for production and distribution of certified/quality seeds to the farmers.

3.14.3 Indian seed industry involves the participation of Central and State Governments, ICAR-SAUs system and public sector, cooperative sector and private sector institutions. Seed sector in India consists of two national level seed corporations i.e. National Seeds Corporation (NSC) and State Farms Corporation of India (SFCI), 13 State Seeds Corporations (SSCs) and about 150 prominent private sector seed companies. Out of this, 24 have collaboration with Multi-National Companies (MNCs). For quality control and certification, there are 22 State Seeds Certification Agencies (SSCAs), 101 State Seed Testing Laboratories (SSTLs) and one Central Seed Testing Laboratory.

3.14.4 Various reforms in the seed sector like making the imports of germ plasms easier has encouraged the private sector to set up the Seed Industries. Though the private sector has started to play a significant role in the production and distribution of seeds, particularly after the introduction of the new Seed Policy of 1988, the organized seed sector particularly for food crops and cereals continues to be dominated by public sector.

3.14.5 However, the organized sector including both private and public sectors, accounts for only 15 to 20% of the total seed distributed in the

country. The remaining requirement is met by the unorganized sector and the seed saved by farmers. This clearly brings out the potential which exists for increasing production and distribution of quality seeds in the country. In addition significant opportunities have also opened up for export of seeds of several varieties of crops, for which India has a comparative advantage.

3.14.6 The production of seeds, by the private sector has increased substantially. However, their efforts have been limited to high value and low volume seeds especially hybrids. There has been substantial development in case of seeds of vegetables also. A high proportion of hybrid seeds of maize, bajra, jowar, and paddy are being produced by the private sector. But, in case of low value and high volume crops like paddy and wheat, where the seed rate is high, the seed production is being taken up largely in the public sector. This trend is likely to continue and vigorous efforts will be required by the public sector to meet the seed demand of the farmer, especially of the varieties specific to the problem areas.

3.14.7 Indian seed programme largely adheres to the limited generations system for seed multiplication in a phased manner. The system recognises three generations of multiplication beyond the nucleus seeds supplied by the breeder of the variety and institution responsible for the release of the variety for mass cultivation, namely breeder, foundation and certified seeds and provides adequate safeguards for quality assurance in the seed multiplication chain to maintain the purity of the variety as it flows from the breeder to the farmer. The breeder seed production is the responsibility of ICAR-SAU research system. The breeder seed produced by ICAR-SAUs is allotted to the States and other seed producing agencies based on their indents and availability, for further multiplication into foundation and certified/quality seeds. From the ICAR- SAU Research System about 2800 varieties have been released and notified, of which about 600 varieties are in seed production chain.

3.14.8 Although the production of certified/ quality seeds have increased substantially from 90.72 lakh quintals in 1996-97 to 112.89 lakh quintals in 2000-01(Table-3.2), there remained mismatches between demand and supply of some specific crops and varieties. The target of seed production of 109.66 lakh quintals fixed for the terminal year of the 9th Plan (2001-02) has already been exceeded but the Seed Replacement Rate (SRR) of various crops have remained much below the desired level. Against the recommended SRR of 20% per annum in paddy and wheat the level achieved is only about 9% per annum. In case of open pollinated crops like pulses where the recommended level of SRR is 30% the achieved level during 1999-2000 was only about 2% in case of gram, 3.3%, in lentil, 4.8% in peas, and 3% in redgram. In case of high seed rate oilseeds crops, like groundnut and soybean, the SRR is only 6.2% and 11.2% respectively. In case of mustard, however, the SRR is higher at 26.4% . Even in case of crops where hybrids have

done better the SRR is much below the desired level. This suggests that either F2 seeds are being used or the area under hybrids have not increased substantially. The level of seed production/ availability for breeder, foundation and certified seeds since 1997-98 is given below:-

Table- 3.2. Production /availability of seeds .

(lakh quintals)

Class of Seed	1997-98	1998-99	1999-2000	2000-01
1. Breeder Seed	0.46135	0.38994	0.51131	0.43717*
2. Foundation Seed	5.96	5.30	5.60	5.30
3. Certified/Quality	99.74	104.38	104.95	112.89

*Indent placed with ICAR

3.14.9 As said above, there seems a mismatch between Demand and Supply of seeds especially of problem area varieties, and to overcome this emphasis has to be given to increase the supply of seeds of such varieties. Seed Supply Plan for the 'breeder foundation' and 'certified' seeds have already been prepared by the Department of Agriculture and Cooperation for the major crops and some states have also prepared such plans. However, implementation of such plans in achieving the objectives have met with a limited success and certified seeds of pulses, groundnut etc. have remained in short supply. The seed multiplication and supply plan has to be made effectively operational by persuading the seed production agencies and states to place timely indent for the supply of breeder seeds. Besides the ICAR & SAU Research System has also to be activated to produce required quantities of breeder seed of different crops/ varieties.

3.14.10 With regards to SRR a debate has been going on since long that what should be the required SRR for various crops? Generally, 20% SRR in case of self pollinated crops and 30% or 33.3% for cross pollinated crops have been considered adequate. Obviously, in case of hybrids the seed replacement is 100% as beyond F1 generation there is loss of vigour and quality traits. In general, it has been observed that in the States where there is higher SRR the productivity is better. But this is not so universally and in some cases the facts are contrary. For example, in Punjab where SRR of paddy and wheat are lower than the national average productivity is one of the highest among the States. This perhaps points to the fact that the higher SRR, in relation to certified seeds only, is not a necessity and farmers could economise on cost of production if they use the good planting material, which could be their own farm produced seeds. Very often, certified seed is produced by using the certified seeds only and not necessarily the foundation seeds. The other factor for higher productivity in low SRR areas could be the horizontal spread of seed, from farmer to farmer. This is the practice generally adopted even by the good farmers. This reduces the cost of cultivation and also the burden of purchasing the seeds in large quantity from outside and

transporting it to the sowing site. The Working Group tried to obtain the findings about the utility of certified seeds over the farm produced good planting material of the same variety but, it seems that such information is not available with the national seed producing agencies; NSC and SFCI.

3.14.11 It appears that whereas the replacement of seed is desirable after every 5 years in case of self pollinated crops and every 3 years in case of cross pollinated crops it should not necessarily be the company produced certified seeds. Just good planting material from a genuine source should be enough to get good production. Although it may be desirable that only certified/quality seeds are used, with 100% SRR, it will not be possible unless the market prices of such seeds are only marginally higher compared to the farm produce of the same variety or the returns to the farmers with the use of certified seeds are significantly higher as in case of hybrids.

3.14.12 With the technological advancement a very valuable tool in the form of 'genetic engineering' has become available in the hands of mankind. The seed technology/ genetic engineering are to play a major role in evolving the high potential materials to meet the future requirement of food, feed & fiber and the raw material to various industries. Whereas these technologies are required to be developed and adopted we have to be careful about the likely adverse impacts of Genetically Modified Organisms (GMOs). Whereas the research activities on this aspect need to be intensified, the commercial utilisation of GMOs has to be allowed only after thorough testing. With the operationalisation of TRIPs under the World Trade Organisation (WTO) and the involvement of private sector and Multi National Companies (MNCs) in seed sector the new materials are likely to become more costlier, besides their limited accessibility. The Government of India through "Plant Variety Protection and Farmers Rights Bill" has ensured the rights of breeders on his material and freedom to farmers to plant, sell and exchange any such material produced by using the patented varieties/ material.

3.14.13 The other development in bio-technology is the 'terminator technology' which has been patented by about 14 MNCs in World. Recently the United States of America has also granted approval to the MNC 'Delta & Pines Company' to commercialise the 'terminator technology'. It is apprehended that the use of seeds impregnated with terminator technology 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. Effective steps will have to be taken to prevent the entry of materials incorporating such genes as make the produce subsequently unfit for being used as planting material.

3.14.14 There are several schemes being implemented to develop the seed sector and increase the availability of quality/ certified seeds. Almost every crop production oriented scheme, including the schemes of Technology Mission on Oilseeds and Pulses also have the provision for incentives/ funding for production of breeder seed, production of foundation seed and production of certified seeds, besides the subsidy on distribution of certified seeds of cereals, pulses, oilseeds, fiber crops and horticulture and vegetable crops.

3.14.15 In addition there is also provision for providing support to ICAR, National Seed Producing Agencies and State Seed Producing Agencies, in the form of revolving funds. However, the impact of such revolving funds on additional production of certified/quality seeds of identified crops/ varieties is not visible. Earlier revolving funds were provided to the ICAR to facilitate the production of breeder seeds when it used to provide breeder seeds free of cost, to the seed producing agencies. Later on the system has gone a change and now though the ICAR is charging a price for the breeder seeds produced by its institutions and SAUs, the system of providing revolving funds to support breeder seeds production has continued. Under the 'Maize Aid Programme' of USA about Rs.13.00 crore were provided to the NSC, SFCI and to some State Seeds Corporations for production of seeds of crops/ varieties specific to the drought prone areas, but the progress seems to has remained a dismal.

3.14.16 A new component of Crash Seed Programme for quality seed production of pulses under the ongoing scheme of "National Pulses Development Programme (NPDP)" has been launched in 2000-01. The measures proposed under the programme are expected to help increase the availability of quality/improved seeds of pulses, facilitate in improving the Seed Replacement Rate (SRR) and in turn contribute in raising the productivity/ production of pulses which are still in short supply. The achievements under the programme are yet to become available. Nevertheless, the review of such progrmames reveals that the utilisation of revolving fund has not been on expected lines and results are not encouraging. Therefore, Department has to monitor the utilisation of such funds to ensure the envisaged outcome/ benefits.

3.14.17 Department of Agriculture & Cooperation (DAC) has established Seed Bank at National and State level in order to ensure that this basic input of agriculture is all the time available to the farmers in all situations. The scheme is being implemented and operated through National Seed Corporation (NSC), Seed Farm Corporation of India (SFCI) and State Seed Corporations (SSCs). The short duration location specific varieties of 17 specified major crops have been identified and are proposed to be kept in the seed bank for meeting the demand of seeds in a contingent situation. Under the Scheme assistance is being provided to NSC, SFCI and SSCs to keep stocks of foundation and certified seeds to meet demands. *Inter alia* the

scheme provides that 50% of the procurement value of the seeds maintained in the Bank would be provided to these organisations, in the form of revolving funds, apart from meeting the cost on account of (a) revalidation charges; (b)transportation charges; and (c) processing and packaging charges in respect of seeds remaining in the Bank undisposed off, subject to a limit of Rs.100/qtl in each case and storage charges at the rate of Rs.8 /qtl./ month or actual costs incurred. This apart storage losses to the extent of 0.25% of the total quantity are to be provided and in the event any quantity is finally required to be disposed off as other than seed, compensating these organisations by meeting the price differential between the seeds and the final price realised on sale other than as seed.

3.14.18 It is true, that a seed company stands to incur substantial losses if it is required to carry over seeds in a significant manner at the end of the season for which production and distribution programme is organised. Since the validity of the seed in terms of germination is supposed to be only 8 months, all foundation and certified seeds are required to be revalidated under the provisions of the Seeds Act if the stocks are held beyond the validity period. If such revalidation also entails reprocessing then a number of operations undertaken in getting raw seed lot processed and packed to conform to certification standards would require to be repeated. It is also true that several bodies including the National Commission of Agriculture who have examined the Indian seed scenario have recommended that it is necessary to provide some assistance to the seed growers to overcome the cycles of gluts and shortages. This would be particularly so when the Central or State governments would require that their PSUs dealing with seeds seek to produce and bring into markets quantities of seeds of any given quantum even if these organisations were to have reservations on the possibility of marketing the kind of volumes stipulated by the governments. Often the governments expect the PSUs to produce seeds based on their perception of demand or in order that quantities of seeds being marketed in their area will ensure the targeted level of Seed Replacement Ratio will be attained. Unless the state governments or the central governments working with the state governments have been successful in persuading farmers the desirability of replacing seeds as frequently as is targeted or the demand worked out found to be close reality, the PSUs in taking action to produce and market the kind of volume considered appropriate by the governments could find that they are holding stocks in excess of the effective demand and are required to carry over seeds.

3.14.19 While the features of the Seed Bank Scheme seem to address some of these issues, the nomenclature appears somewhat at variance from the intent. Any concept of trying to build buffer stocks of seeds and that in terms of certified seeds may not be sound. Building buffer stocks of seeds can be thought of in two types of contingencies that is where there is an unexpected demand or where the productivity of seed crop has been affected and despite planning for adequate area to be brought

under the seed production programme output has been less than anticipated. Clearly the shortages arising from the second kind of situations which can be addressed or where the state or central governments expect the seed companies to produce in excess of their market assessment of the likely demand. The first type of contingency cannot be met through certified seeds, which is the impression one gets from the Nomenclature of the Scheme. There has also to be some pressure on the seed companies to make all out efforts to sell seeds and hence assistance has to be related to quantities remaining unsold only in excess of the quantities sold in the previous seasons.

3.14.20 From the structure it appears that the scheme may end up by paying the storage charges, storage losses etc. for the seed procured and stored in the Seed Banks without much of its utilization in case of exegencies. It may be pointed out that in case of losses due to floods or droughts, farmers take up planting / replanting as a contingency measures with any type of seed material. Here the role of such a scheme is to make available the planting material of shorter duration crops/ varieties whether it is certified or not, in time. This purpose could be well served simply by contracting the farm produce of known sources of such crops/ varieties available with the local farmers on the assurance that the stock will be procured by the government on a predetermined price if a contingency arises otherwise the farmer will be compensated for the storage (charges) and storage losses to a minimum prescribed limit. This will not only ensure the availability of right type of material for unforeseen situations but also save lot of funds which are proposed to be provided to the Seed Banks for procurement, storage, storage losses etc. Therefore the Scheme needs to consider its modifications on the system suggested above.

3.14.21 For the introduction and spread of new varieties the Seed Minikit Programme was started in 1970 and to begin with the programme for paddy was launched. Later on the programme was extended to almost all the crops including the vegetables. Earlier the programme was started with the objective to test and introduce the varieties identified in various Crop Research Workers Workshops before these are released for commercial cultivation. The objective was two fold: one to test the identified/pre-released varieties under farmers condition and get the feed back for the researchers about its performance, quality parameters, susceptibility to prevailing insect pests and diseases and the farmers reaction on the variety; and two to build up the seed stock with the farmers for area expansion if the variety is found suitable/ acceptable by the farmer. But, off late the programme got distorted and the Seed Minikit Programme became a way/ means to dispose off unsold stock by some of the Seed Corporations as seed minikits. This had been due to the fact that under the Seed Minikit Programme the distribution of all kinds of varieties irrespective of their age/ notification (year of release) had been allowed. Although there has been some modification in the programme of Cereals Minikits

wherein varieties released upto 5 or 7 years back are to be included but in the programme of Technology Mission on Oilseeds and Pulses, some older varieties, which have already become popular with the farmers and are being commercially cultivated, are also included in the Seed Minikit Programme. Such policies have affected the programme adversely and its utility/ continuity is now being questioned. This is considering the fact that the spread of knowledge through electronic and print media has become very fast and farmers, if they need the seeds of new varieties, can obtain it directly from the concerned institute/ SAU. This is true to the some extent but there has to be a system in place to introduce and popularise the newly developed varieties. Therefore, whereas the Working Group recommends that the seed minikit programme may continue, to make it more effective and meaningful only identified/ pre-released varieties are included in the programme. No any flexibility is allowed as this may lead to distribution of varieties which have already been commercialized and the Seed Minikit Programme may become a way to dispose of the unsold seed stock by some of the Seed Corporations rather than a tool for introduction of new varieties.

3.14.22 The Seed Crop Insurance Scheme was started during 2000-01, with the objective to motivate the farmers to take up the Seed Production Programme thereby increasing the availability of certified seeds. The seed growers/seed producing organizations have to pay 1.8% of the sum insured towards premium amount to GIC. However, in case of seed growers who would be growing the seed for the seed producing agencies will have to pay 1.6% of the sum insured as the premium amount and the remaining 0.2% will be paid by the seed producing agencies/state governments/private companies. In the initial stage however, during the Ninth Plan period 0.2% of the sum insured is to be paid as premium amount by the Govt. of India. Besides, the Govt. of India will also reimburse the cost of expenditure incurred by the GIC on publicity etc. This will be reduced to 70% and 60% of the expenditure incurred and finally to the 50% of the expenditure incurred by the GIC. Under the scheme, there is provision to compensate farmers in case of damage to crop/loss of production and also loss/deterioration in the quality of seeds at harvest and post-harvest stage. The results of the scheme are not yet known. However, it is expected that Seed Crop Insurance Scheme will give a push to seed production in the country.

3.14.23 In order to meet the need of nation's food and nutritional security, it is essential that we ensure availability of seeds of superior quality in adequate quantity on a timely basis as envisaged in our National Agriculture Policy. The production/multiplication of hybrid seeds needs to be given a thrust. The DAC has finalised the Seed Plan Vision-2020. Seeds Document for preparation of Perspective Plan for seed development and production of certified/quality seeds to meet atleast 25% of the total

seed requirement by the year 2020. This will provide basic information and direction to the planners, plant breeders, seed development agencies, seed producing and distribution agencies in planning for necessary infrastructure including manpower for production of nucleus, breeder, foundation and certified/quality seeds to make available to the farmers. Many states have prepared medium and long term Perspective Plans for improving the Seed Replacement Rate (SRR) and have drawn up innovative strategies/ programmes such as Seed Village Programme for increasing the seed production and distribution. The States like Madhya Pradesh has launched the *"Surajdhara"* for pulses and oilseeds crops and *"Annapurna"* for production of certified seeds of cereal at village level. Similarly, Rajasthan, Uttar Pradesh, Assam and Andhra Pradesh have also introduced the Seed Village Programme wherein foundation seed is provided to the farmers for further multiplication into certified/quality seeds.

3.14.24 The Seed Plan Vision 2020 prepared by the DAC indicate a total seed requirement of 130.09 lakh quintals by the end of Tenth Five Year Plan (2006-07), comprising 89.09 lakh quintals of cereals, 7.94 lakh quintals of pulses, 22.16 lakh quintals of oilseeds, etc. However, the Working Group estimates a requirement of 148.75 lakh quintals considering the SRR which could be achieved by the end of the Tenth Five Year Plan (Annexure 3.II). But, considering the trend in the growth of seed distribution the requirement of certified/quality seeds, of all crops together, comes to about 124 lakh quintals; comprising 41 lakh quintals of wheat, 44 lakh quintals of paddy, 6 lakh quintals of pulses, 19 lakh quintals of oilseeds and 14 lakh quintals of other crops.

3.14.25 To achieve desired level of seed production and distribution of any specific varieties the role of the state has to be very pro-active. One cannot expect the PSUs of either the GOI or the States to produce and distribute seeds desired at the government level without support in the event if the seeds are not sold. While in marketing of seeds the Seed Development Corporation (SDCs) are expected to play an aggressive role, yet these corporations cannot be expected to fen for themselves if they produce seeds to the extent stipulated by the Agriculture Department but no financial help is available if the demand fails to materialize. If with subsidies the picture is a dismal situation it could be far worse if the actual costs are to be paid by the farmers. Clearly there has to be effective demands for seeds which the R&D and Extension Machinery has to create, not merely by spreading the message but by providing the high productivity potential material with adequate supply backup. R&D and the extension can only be considered successful if the farmers are willing to pay for the seeds and other inputs. Alternatively the state government will have to support the seed producing organizations, in the carry over of the stocks if seeds as expected could not be sold. It is possible to lay down thresholds for SDCs own marketing efforts beyond which the state will provide support. The Government could consider even private

sector to play a role apart from the kind of crops they are currently dealing with by providing them a level playing field in seed distribution subsidies, subject to their confirming to the framework worked out by the State Governments. The enforcement of Seed Laws must be far more rigorous in checking the sale of sub-standard seeds.

3.15 Fertilizers and Crop Nutrition

3.15.1 Besides the good planting material, the proper nutrition to the crop plays a very vital role in exploiting the production potential of a crop variety and in achieving the higher output of a crop commodity. In India most of the soils have low fertility status, especially with respect to Nitrogen (N). In the intensive cropping system areas where multiple cropping is being practiced the deficiency of Phosphorus (P) and Potash (K) is also being experienced increasingly. In such areas the deficiency of Sulphur (S) and micro nutrients like zinc (Zn), iron (Fe), boron (Bo), manganese (Mn) is increasing. The deficiency of some of these micro nutrients has become wide spread. Now, the application of S and Zn has become essential in many areas.

3.15.2 The low fertility status of soil with respect to N P & K and increasing deficiency of micro nutrients is affecting the productivity adversely. The deficiency of organic/ carbon (C) in soil has also become evident, especially in the green revolution areas. At the present level of production it is estimated that over 28 million tonnes of three major nutrients, N P & K, are being removed annually by the crops. But, addition of these nutrients to the soil, in form of fertilizers, is only to the extent of 18 million tonnes (1999-2000). Therefore, there is gap of over 10 million tonnes in the supply of plant nutrients to the soil. Organic manures and bio-fertlizers contribute another 4 million tonnes of these nutrients, which means that about 6 million tonnes negative balance exists.

3.15.3 At present chemical fertilizers are considered to be the main source of the plant nutrition. But their availability and application is limited. Only about 59% of gross cropped area is treated with fertilizers. The use of Farm Yard Manure (FYM)/ compost is done only in 31% of the gross cropped area at about 5 tonnes/ ha. The present consumption of fertilizers in terms of NP&K nutrients in the country is about 95.3 kg/ ha (1999-2000). The consumption (NP&K) also varies widely from state to state and crop to crop depending on edaphic, biotic and agro-climatic conditions. In South Zone the fertilizer consumption has reached 132.4 kg/ ha. In North Zone also the consumption is fairly high at 94.0 kg/ha, but in East Zone the fertilizer consumption is low, at 26.0 kg/ha . In the NE Region, barring the states of Manipur (92.0 kg/ha,) and Assam(27.7 kg/ha), the consumption is below 20 kg/ha. In Sikkim it is 6 kg/ha. In Nagaland 3.6 kg/ha and in Arunchal Pradesh it is as low as 2.6 kg/ha. Consumption of fertilizer in the States like Madhya Pradesh(47 kg/ ha), Rajasthan (40 kg/ ha),

Himachal Pradesh (39 kg/ ha) and in Orissa (44 kg/ ha) is also low[3]. It has been observed that fertilizer consumption is low in the states where the irrigation resources are not developed and/ or the states are frequently affected due to natural calamities such as droughts and floods. Besides, the fertilizer consumption is also governed with the types of crops grown/ cropping systems followed in a region/ State (Table-3.3). Efforts are required to increase the fertilizer consumption, especially, in the states where it is low by providing adequate marketing infrastructure and ensuring the stocking of fertilizers well before the start of the crop season.

Table-3.3 Salient information on irrigation, fertiliser use, etc.

				Credit Flow(Rs/ha) *					'000' ha **		Kg/ha **
State	GCA (1992-93)	Gross Irrigated area	%age of irrigated area	1996-97	1997-98	1998-99	1999-2000	Growth % per annum	Paddy	Wheat	Fertiliser use(1999-2000)
AP	13192	5085	42.5	2016	2411	2879	3428	19.4	3700	8.7	157.99
Bihar	9416	4040	46.6	164	135	135	155	-1.7	5067	2080	97.19
Gujarat	10502	3227	34.3	1159	1394	1479	185	15.8	672	694	87.77
Haryana	5852	4472	78.6	2117	2486	3137	4198	25.7	910	2064	148.47
HP	972	174	18.1	236	294	386	398	20.1	86	357	39.43
Karnataka	12411	2802	24.9	1070	1477	1714	2091	24.1	1378	250	103.11
Kerala	3046	376	14.9	3100	3670	4452	6235	25.7	404		69.99
MP	23807	4918	25.0	369	402	415	476	8.2	5403	4519	47.19
Maharashtra	21170	3235	14.5	705	867	1011	1057	14.7	1476	747	88.87
Orissa	9416	2471	26.8	276	310	479	578	30.3	4469		43.83
Punjab	7551	7142	91.7	1865	2372	3153	3806	27.4	2279	3310	184.57
Rajasthan	20167	5486	29.9	294	390	482	562	24	163	2679	39.50
Tamil Nadu	7067	3385	53.7	3605	3908	4390	5502	14.9	2361		162.91
Uttar Pradesh	25672	15996	65.9	505	697	663	873	17.2	5663	9221	125.38
West Bengal	8540	1911	27.1	324	345	348	432	9.1	5900	367	135.97
All-India	*185609*	66144	38.2						*43420*	*26685*	95.33

- Source: Report of Expert Committee on Rural Credit (Chairman Shri V.S.Vyas), NABARD, 2001

** Agricultural Statistics at a Glance, 2001, Ministry of Agriculture,GOI

3.15.4 It has been observed that the marketing infrastructure for fertilizer in North Eastern Region is very poor. In Mizoram there are only 8 fertilizer retail outlets per 100 villages, the average for Nagaland is only 3, Arunachal Pradesh 7 and in Meghalaya 9 retail outlets per 100 villages. At all India level, on an average, there are 44 fertilizer retail outlets per 100 villages[4]. The intensity of fertilizer retail outlets is very poor in North Eastern States and in some other areas having difficult terrain. The high fertilizer consuming States have more fertilizer retail outlets. In kerala there are 306 outlets per 100 villages, whereas in Tamil Nadu the average number comes to 101 and in Haryana 106 outlets per 100 villages.

3.15.5 One of the major factors , besides socio-economic factors, in low fertilizer use is the very low use efficiency of applied fertilizers in want of adequate soil moisture in low rainfall/unirrigated areas and

[3] Agricultural Statistics at a Glance, 2001, Ministry of Agriculture,GOI.

[4] Directorate of Plant Protection Quarantine & Storage-Ministry of Agriculture, GOI.

under excess/ stagnant water situation in high rainfall and low land flood prone areas. Under these situations crops are grown with a very heavy risk factor, with low input use as the success of a crop is not assured. Even if fertilizers are applied their efficiency and response ratio remains very low. Under excess water/ and flooded conditions slow release material is required. The ICAR has developed technologies by coating the fertilizers with other materials, like lac, coaltar, mussouriphos, neem cake etc. and altering the nature by curing the urea with soil, making the mud balls of urea etc. But, these technologies have not found much favour with the farmers. Besides, technologies with respect to placement of fertilizers have also been developed which too have not become popular, although the research claims a substantial increase in the use efficiency and in crop productivity with adoption of such technologies. The Extension machinery should propagate the adoption of technologies already developed/ available as the adoption of improved production technologies under unfavourable conditions has remained very poor. It is necessary that the ICAR-SAU research system intensify the research on enhancing the fertilizer use efficiency besides the development of suitable varieties for adverse situations like the drought prone rainfed areas and the low land flood prone water stagnant areas.

3.15.6 In the areas where the fertilizer consumption is comparatively high the response ratio, the fertilizer input and grain output, is seems to be declining. This is evident from the fact that the crop productivity has not increased in proportion to the increases in the use of fertilizers. In fact, though the fertilizer consumption in such areas has increased, off late the crop yields seem to be plateauing. The factors for this seem to be: one- imbalance in the use of NP & K, mainly on account of their price variations; two- increasing deficiency of micro nutrients, which affects the growth of plants and interferes in proper uptake of applied NP&K by the crop; and three- decreasing carbon (C)/ organic matter content in soil. These are very serious issues and need to be addressed through a holistic approach with adequate thrust on adoption of Integrated Nutrient Management (INM) or Integrated Plant Nutrient Supply (IPNS). The approach is well tested, but its adoption at farmers level has remained very poor. A lot of Farm Waste and City Organic Waste is not being utilized for the crop nutrition purpose. The Bio-fertilizers can also play an important role in supplementing the use of fertilizers, but this area too has remained less exploited. In the country only 265 million tonnes of Farm Yard Manure/ compost is being used. In Punjab and Haryana where machine power is being used increasingly, which has replaced the animal power, a sort of crisis is being experienced in crop residue management. The crop residue, instead of utilizing it as fodder or manure, is being destroyed by burning. Whereas this practice is likely to affect the soil health which is already poor in carbon and micro-nutrient contents there will be also be pollution of environment. Therefore, a way has to be find out to utilize the crop residues and farm

waste in a better way so as to improve the soil health for sustainable crop production. At present the use of bio-fertilizers is only 10,000 tonnes against the potential of 2.3 lakh tonnes as estimated by the DAC. It may be noted that the capacity utilization in the production of biofertilizers is only about 54% of the installed capacity of 18500 tonnes. As there is a separate Working Group on ' Organic and Biodynamic Farming' this group does not intent to discuss these issues in detail . Nevertheless, the Working Group recommends for giving an adequate thrust on INM and production and use of organic manures, vermi compost and bio-fertilizers.

3.15.7 As has been said above, there are wide variations in the levels of fertilizer use, which vary area to area and State to State depending on agro-climatic conditions, rainfall and irrigation resources and the crops or cropping/ farming systems followed. In some areas / States the consumption is negligible (Arunachal Pradesh, Nagaland, Sikkim), whereas in some others it is very high(Pondicherry, Delhi, Punjab). Besides in high consumption areas there seems an imbalance in use of NP&K and inadequacy in use of micro-nutrients and organics. In some cases the fertilizer use is much higher than it is required / recommended in a particular crop. This seems to be because of; one-lack of awareness about the proper use of fertilizers; and two-inadequacy in soil testing facilities.

3.15.8 Soil testing in one reliable diagnostic tool which helps in assessments of nutrient status of soils. It also determine specific soil conditions i.e. alkalinity/ salinity and acidity and the need for soil amendments and other management practices. The soil testing progrmame was started in India during the year 1955-56. Since then, several State Governments and fertilizer industries has set up soil testing laboratories including the mobile soil testing vans. There are a total 514 soil testing labs in the country which include 133 mobile soil testing vans. These soil testing labs cover the most districts in the country. The total capacity of soil testing laboratories is 6.5 million samples annually. Considering that we have over 106 million operational farm holdings, the existing soil testing facilities seems to be grossly inadequate. Besides, most of the labs are equipped to test only NP&K and there are hardly adequate facilities for testing the micro-nutrient status of soils.

3.15.9 On one hand the soil testing infrastructure is inadequate and on the other the existing facilities are not being utilized fully by the States. In 1997-98 capacity utilisation was of the order of about 79 per cent which varied from State to State. Orissa and Goa have achieved more than 100% capacity utilisation. States like Andhra Pradesh, Karnataka, Gujarat, Marashtra, Haryana, Punjab and UP have shown utilisation above 80%. In the case of Assam it is 37.77%. Bihar has the poorest utilisation only at 7.86%. In the Ninth Five Year Plan, there is a proposal to establish 70 new soil testing laboratories in the country and strengthen 200 existing laboratories for NPK testing.

Besides, 30 laboratories are to be strengthened for micro nutrients testing. Unfortunately, the progress seems to has been very slow.

3.15.10 There seems less awareness among the farmers about the importance of balanced fertilizer use in obtaining higher yields and maintaining the soil fertility. Generally, the use of nitrogenous fertilizers is preferred by the farmers because of the quick response by the crop which becomes visible in the form of the change of crop colour. But, there is no immediate visible effect of phosphatic and potassic fertilizers on the crop. This seems to give a feeling to the farmers that application of nitrogenous fertilizers is more effective. Besides, the cost of various nutrients also determine their uses and preference of a common farmer to use less expensive material / fertiliser.

3.15.11 In the East Zone comprising Eastern and North Eastern States the NP&K use ratio is 6.9:2.9:1. It is very wide in North Zone at 28:9:1 and in the West Zone it is 8:4:1. In case of Southern Zone, however, NP&K use ratio seems to be better at 3.4:1.6:10. The desirable use ratio of 4:2:1 for NP&K, which is considered to be balanced is just a rough yard stick. Therefore, to judge the fertilizer use whether it is balanced or not the yard stick has to be different for different regions/ areas depending on the crops/ cropping system/ farming system followed and the inherent capacity of soil to supply the plant nutrients. In areas where fertilizer consumption is very low the first priority should to increase the use of fertilizer irrespective of the condition whether it is balanced in terms of NP&K use or only nitrogenous fertilizers are being used. The question of balanced use of fertilizer would actually arise when the consumption reaches a certain level.

3.16 Farm Mechanisation

3.16.1 Draught animals continue to provide the major traction power in India for field operations due to small land holdings. Traditionally India has been using the animal and human power for agriculture operations. However, off late the machine power is being used increasingly. Although, there has been some improvement in availability of farm power, it has remained inadequate. The lack of farm power has affected the field operations which leads to inadequate preparations of fields. Not only the availability of power is inadequate but also the availability of improved farm implements has also remained much to the desired. This could be concluded from the 'Input Survey Data (1991)' that the availability of plough which is a basic implement for carrying out field operations was only 583 per thousand operational holdings in case of marginal farmers and 957 per thousand holdings in case of small farmers. Although , the availability of plough per holding was higher in case of other categories of farm holdings but on their operational area is bigger. In case of other machines, like tractors, the availability was only 24 tractors per thousand hectares.

3.16.2 Besides the inadequate availability of farm power, the quality and adequacy of farm implements is also poor. Still, most of the field operations are done with old and inefficient machines and tools. The use of seed drills which is a very important machine is not yet prevalent and seeding is mostly done either behind the plough or through broadcasting. Even with tractor use the seeding is commonly done as broadcast. This results in poor and uneven germination of the seeds and poor vigour of the crop because of improper placement of seeds. Though the tractor use in the country has been increasing very fast and is replacing the animal power. However, due to lack of awareness/resources for using proper implements the full benefits of mechanization are not being reaped. The use of tractors in the country has been increasing fast and is replacing the animal power. However, due to the lack of awareness and resources for using proper implements / machines the full benefits of mechanization are not being reaped. The facilities for post harvest operations; harvesting and threshing of crops are also very much limited and these operations are mostly done with human and animal power. This results in considerable post harvest losses and delay in completing the operations. Even very important implement/ machines like paddy transplanter, harvester are not available to the Indian farmers. The manual paddy transplanter developed a few years back has not performed well and there are no self propelled or tractor or power tiller drawn paddy transplanters or harvesters available. This is resulting in inefficient and delayed planting operations because of which the rice productivity is affected. Because of lack of transplanters the manual planting of rice in northern part of the country, especially in Punjab and Haryana, is done much before the commencement of optimum time. This is because of availability of labour immediately after the harvesting of wheat as the labourers migrate to their own place in the eastern part of the country. Therefore, development of energy and time saving efficient machines and their adequate production and supply is very necessary.

3.16.3 Unfortunately, the scheme 'Productionising of Industrial Design of Agricultural Implements (PIDAI)' being implemented by DAC has not proved useful in encouraging the development of improved and efficient farm machines. The other scheme on mechanization under which subsidy is being provided on tractors has also proved to be of limited utility because of its size as only just a few thousand tractors are being financed annually. The scheme seems to have lost its relevance and as commercial financing is already available for the purchase of tractors which have been found to be of a good success and useful. Financial incentives provided by the Government, through the crop production oriented schemes of the crops Division and Technology Mission on Pulses and Oilseeds of DAC has encouraged the farmers to use improved farm machinery. Farmers have also adopted sprinkler and drip irrigation system in commercial crops. The resource poor farmers could get the benefit of improved machinery through custom hiring.

3.16.4 From subsistence farming the India agriculture is transforming to commercial farming where the precision is very crucial. Right type of field operations for right placement of seeds and other inputs is very crucial in reducing the cost of production. India is one of the countries where the cost of production is very high on account of which it has not been able to export its agriculture commodities and there are over-flowing food stocks. The development of efficient, energy and cost saving agricultural machines will certainly help in reducing the cost of production.

3.16.5 The zero till seed drill developed a few years back has demonstrated the utility of efficient machines in agricultural operations. With the adoption of zero till seed drill farmers have been able to economise on the cost of ploughing and tilling besides avoiding delay in planting of wheat which otherwise affects the productivity. The other countries where mechanisation has progressed well have developed very efficient machines and tools of which the Indian farmers are still deprived of.

3.16.6 Ecological conservation, improving inputs use efficiency to save energy, reduce the cost of cultivation and enhancing agricultural productivity, besides gender friendly, should be the major policy to promote introduction of improved farm machinery. Energy conservation and time saving devices such as zero-till drill and precision planting/ transplanting machines need greater thrusts. More emphasis needs to be given to promote use of improved farm machinery particularly in less mechanized areas and location specific mechanization technology needs to be promoted through micro-management planning.

3.16.7 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, are needed. Decentralized agro-processing in rural area will increase income and much needed employment to the people and should, therefore, be promoted by strengthening rural infrastructure and providing financial incentives to promote agri-entrepreneurs and agri-business.

3.17 Plant Protection

3.17.1 On the recommendation of the Indian Famine Inquiry Commission (1945), which investigated the reason for the death of lakhs of people in Bengal famine in 1941-42, the Government of India in 1946 established, the Central Plant Protection organization, now called 'Directorate of Plant Protection, Quarantine and Storage (DPPQ&S)'. The Commission had concluded that *"If full benefits of irrigation, manuring and improved varieties are to be assured, effective action must be taken to deal with diseases, pests, vermins and weeds and hence crop protection is an important factor in increasing*

production." It was the beginning of an organised scientific Plant Protection effort in the country to deal with various aspects of plant protection. Since then the plant protection infrastructure in the country in terms of facilities and manpower support has been developed considerably.

3.17.2 The Dte. PPQ&S is implementing various schemes with regards to pest control, plant quarantine, locust control and human resource development. Besides, the crop production oriented schemes of the Crops Division, Technology Mission on Oilseed, Pulses and Technology Mission on Cotton also have components of Plant Protection in their schemes.

Promotion of Integrated Pest Management (IPM)

3.17.3 Modern agricultural technologies laid major emphasis on the use of high yielding varieties/hybrids, fertilizers, assured irrigation and plant protection umbrella. However, such intensive farming has also increased the dependence on pesticides, the use of which increased from 14630 tonnes in 1965-66 to 75033 tonnes (technical grade) in 1990-91. The increased and indiscriminate use of pesticides has resulted in resurgence of some non-target pests and resistance in some others to certain insecticides. The IPM approach promoted by the GOI, 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. The Government of India is also a signatory to the Agenda 1 of United Nations Conference on Environment Development (UNCED) 1992, which has also approved and accepted IPM to reduce the use of pesticides in agriculture.

3.17.4 The Integrated Pest Management (IPM) concept is being promoted through 26 Central Integrated Pest Management Centres (CIPMCs) located in 22 States and one UT. Aiming at human resource development, these centres are imparting trainings to extension functionaries and farmers in IPM skills by conducting Farmers' Field Schools (FFSs) and IPM demonstrations. In addition, these centres are engaged in mass-production and field releases of bio-control agents. Besides, the monitoring of pests and diseases is also being done by these centres for forewarning and undertaking timely control measures.

3.17.5 Since the inception of IPM programme, during 1994 to 2001, 6,733 Farmer's Field Schools (FFSs) reported to have been conducted thereby training 28,459 Agriculture Extension Officers and 2,03,032 farmers in IPM skills. About 1100 Master Trainers in IPM have also been trained by conducting 33 Season Long Trainings on cotton, rice, vegetables, pulses, oilseeds etc. The field based trainings to farmers

have created an awareness about the IPM concept and empowered them for taking their own decision in adopting the plant protection methods with need based pesticide use considering the increasing degradation of environment and pesticidal residues in farm produce. As a result of implementation of IPM programmes, there has been a significant reduction in the consumption of pesticides from 67,357 tonnes during 1994-95 to 46,196 tonnes (tech. grade) during 1999-2000[5]. However, there seems no effective and strong mechanism at place to provide a regular services to the farmers, on day to day basis, in terms of forecasting / forewarning the likely outbreak / infestation of pests and suggesting them to take appropriate preventive and control measures, with adequate back up to supply the biocontrol agents for field use. Strengthening of IPM infrastructure especially for surveillance and forecasting the out break of pests and diseases and production/multiplication of bio-control agents for field use is need to be given adequate attention. Besides, unless the reliable methods of forecasting are developed and bio-control agents are made available on demand farmers would not adopt IPM in true spirit.

Implementation of Insecticides Act, 1968

3.17.6 The import, manufacture, sale, transport, use etc. of pesticides is being regulated under a comprehensive statute- the 'Insecticides Act, 1968' under which necessary Rules have been framed. The scheme implemented during the IX Plan include: strengthening of Central Insecticides Laboratory (CIL); strengthening of Secretariat of Central Insecticides Board and Registration Committee (CIB & RC); setting-up and strengthening of Regional Pesticides Testing Laboratories (RPTLs); Strengthening of Coordination Cell (CC) at Headquarters; and Grants-in-aid to States/ UTs for strengthening/ setting-up of State Pesticides Testing Laboratories (SPTLs).

3.17.7 Achievements with respect to toxicological studies, bio-efficacy, chemistry and packaging and labeling under the scheme have exceeded the targets for the first four years of the plan. Against the IX Plan target of testing of 9000 samples, the Regional Pesticide Testing Laboratories (RPTLs) tested 7565 samples(76%) during the first four years of the Plan. The central Insecticide Board received 13743 applications for the registration of pesticides out of which 10042 were registered.. Beside the CIL has also reviewed 28 pesticides for continuation of their use or otherwise in the country and has also developed database on pesticide poisoning in India in collaboration with WHO in Andhra Pradesh, Gujrat, haryana, Karnataka and Punjab and trained 586 doctors from various organizations on management, diagnosis and treatment of pesticide poisoning cases.

[5] D.P.P.O&S, Ministry of Agriculture, GOI.

3.17.8 Despite banning of DDT, BHC, etc., in agriculture the present annual consumption of pesticides is about 46,000 tonnes. Considering that there are more than a thousand pesticides formulators manufacturing different formulations which are being distributed through more than 1.25 lakh sale points the existing analysing capacity of 45 SPTLs and 2 RPTLs, which is just above 57,800 samples per annum, is far short of requirement. This calls for setting up of more pesticide testing laboratories and strengthening the infrastructure, especially with the States.

3.17.9 There is a growing concern about the adverse effects of chemical pesticides due to their indiscriminate use. Pesticides residues are being found increasingly in our farm produce posing a threat to human health. Our efforts should be to provide new safer and efficacious quality pesticidal products to the farmers and the use of bio-pesticides, bio-control agents need to be encouraged. For this, the CIB & RC will have to be geared up to undertake expeditious scrutiny of data and the CIL to verify the claims of the applicants. Since there is sufficient installed capacity for manufacture of pesticides, the policy of granting registration should be reviewed so as to encourage export of pesticides, thus earning foreign exchange for the country. For this purpose, the Secretariat of CIB & RC is required to be adequately strengthened

3.17.10 The technology is improving very fast and newer molecules are being developed. With the recognition of IPR under the WTO there is likelihood that the research on pesticides will get a boost and the inflow of certain new molecules, existing molecules and intermediates may get increased. At present the customs laboratories do not seem to be well equipped to check the quality of imported pesticides as a result of which the entry of misbranded pesticidal products into the country can not be ruled out. Therefore, cent-percent checking on imported pesticides before their clearance by customs, seems to be a necessity. Besides, facilities for testing of bio-pesticides are also required to be created. There is, therefore, imminent need to strengthen the Quality Control facilities for Insecticides in India by providing necessary infrastructure and manpower support.

3.17.11 In view of the WTO and SPS Agreements, the trade among the countries is likely to increase as a result of which pesticides residue certificate on agricultural commodities would become unavoidable. The pesticides residues are required to be monitored and certified both before export and before allowing import. Though the All India Coordinated Project (ICAR) on pesticides residues coordinate analysis of pesticide residues on agriculture crops, yet there is no programme for certification of pesticide residues on agricultural commodities. Similarly, pesticides residues are to be covered by the Ministry of Health under PFA Act. However, their activity in this regard has not been very encouraging. Also, it would not be possible for them to do the certification of pesticides residues on agricultural commodities

which are exported or imported through the offices of Ministry of Agriculture. Therefore, there is a need to establish the facilities for pesticides residue testing in agricultural commodities being imported into India or meant for export and also for the regular monitoring of pesticides residues in all agricultural commodities being domestically marketed.

3.17.12 In compliance to the provisions of IPPC, 1951 of FAO all the requisite arrangement are required to be made in the country for export certification and issuance of phyto-sanitary certificate in respect of exportable plants/plant material as India is signatory to the said convention. This aspect has become more significant under WTO/SPS Agreements and it would be necessary that plant quarantine facilities in the country are strengthened so as to facilitate the export and also check on the material imported from outside for its contamination with insect-pest and diseases. The Ministry of Agriculture has proposed for establishing a Plant Quarantine Regulatory Authority for strengthening the plant quarantine facilities in the country which needs to be considered.

Locust Control & Research

3.17.13 The desert locust is a formidable and highly migratory pest, which may cause severe damage to almost all types of vegetation including crops. The invasion area of the locust during plagues covers about 30 million sq. km which is about 20% of the world land surface and include whole or part of nearly 60 countries. India is subject to periodical invasion of exotic locust swarms from time immemorial.

3.17.14 The locust warning organization (LWO) unique in the nation was established during 1939 with the aim to monitor the locust activities over scheduled desert area of Rajasthan, Gujarat and parts of Haryana. Over the years the LWO has been strengthened in terms of manpower and their mobility to monitor the locust buildup with in the borders and also to keep vigil on likely invasion of swarms from outside. Several, locust plagues /outbreaks were controlled reporting negligible loss. However, there seems a need for strengthening the set up and the facilities for effective monitoring of swarm movement, infestation and control of locusts in the bordering districts of Gujarat and Rajasthan.

3.18 Agriculture Extension

3.18.1 Public sector extension has undergone several changes since the country gained independence in 1947. Beginning with the Community Development Programme in 1952 through the National Extension Service in 1953, the focus of extension was on human and community development, but there has been a steady progression towards technology transfer, within the policy framework of food

security with the Intensive Agriculture District Programme started in 1961-62, the Intensive Agriculture Area Programme in 1964-65, the High Yielding Varieties Programme 1966-67, the Farmers Training and Education Programme 1966-67 and the Small and Marginal Farmers Development Programme initiated in 1969-70.

3.18.2 The private sector has also been associated with the agriculture extension system especially after the introduction of high yielding varieties during the mid-sixties. The input industry, especially, the seed pesticide and fertilizer industry have played a very vital role in increasing the use of agricultural inputs and adoption of improved crop production technologies. However, their main concern has been to increase the use of inputs in agriculture which is obvious.

3.18.3 The extension machinery in the country was strengthened with the support of World Bank aided project on Training & Visit (T&V). The States currently employ over 1 lakh extension functionaries. In most of the crop production oriented schemes of DAC there is an element of transfer of technology (TOT) which consists of field demonstrations on crop production technologies; trainings for extension workers and farmers; information support; etc. The T&V system profoundly influenced extension practices and registered impressive gains in irrigated areas, because of the similarity between the agro-ecological conditions where technologies were generated and where they were ultimately used, and the favourable socio-economic situations and developmental infrastructure for their wider uptake. T&V system was well suited to the rapid dissemination of pre-set agronomic practices for the high yielding wheat and rice varieties and the use of modern inputs which ushered in the Green Revolution. The transfer of technology to rainfed farming areas where fundamentally different production systems predominate and more importantly, local conditions vary widely, resulted in serious limitations and failures. Similarly, extending the system to programmes for natural resource management, sustainable agricultural practices such as IPM & INM and to diversified agriculture such as high value horticulture, livestock activities and fisheries did not meet with success. Nor could the T&V system adapt to the more holistic Farming Systems Approach towards which the new thrust of both research and extension have begun to focus.

3.18.4 The T&V village level worker (VLW) and community development block based manual extension system which initially has served well seems to has become out moded and has got to be replaced with a more vibrant system using modern modes like print and electronic media. More interaction between research, education and extension agencies. The role of non-Government sector has also to be increased and an innovative approach in the field of TV broadcast including specific channel with an interactive model has to be developed. With far reaching changes in the

communication technology and breakthrough in space technology, remote sensing, satellite broadcasting and media spread revolution extension workers will have to be reoriented and retrained to adopt themselves to those developments and make full use of emerging opportunities as has been emphasised upon by the Planning Commission in their IX Plan MTA.

3.18.5 It is becoming increasingly evident that public extension by itself can no longer respond to the multifarious demands of farming systems. There is need for reappraisal of the capacity of agricultural extension to address contemporary farmer requirements effectively. Public funding for sustaining the vast extension infrastructure is also under considerable strain. In response to market demand the existing public extension network is being complemented, supplemented and being replaced by private extension. As the nature and scope of agricultural extension undergoes fundamental changes, the outlook is for a whole new policy mix nurturing a plurality of institutions.

3.18.6 Now the private sector has also entered directly in agriculture extension where they are providing information to the farmers and also arranging the supply of inputs. A few such extension ventures have been set up in States like Andhra Pradesh and Madhya Pradesh. These centres are making use of information technology in providing information to the farmers on weather, market prices, recommended package of practices for crop production, etc. If the private extension system is found to be serving well, the Government may consider for establishing such extension service centres on self sustaining basis (by charging the service fee from the farmers) by providing the credit/ support for necessary infrastructure and equipment.

3.18.7 The ICAR is also associated in agriculture extension activities through its 261 KVKs, Institute Village Linkage Programme (IVLP) and also its institutes / centres in the local areas. It has proposed to set up 66 new KVKs and some Trainers Training Centres. The ultimate plan is to have one KVK in every district. However, there seems hardly any interaction of its KVKs activities with the State/district extension machinery. Efforts were made towards the end of the 8th Plan to transfer the financial and administrative responsibilities of KVKs to their respective state governments, which could not materialize because of the severe resource constraints faced by the states. The ICAR's mandate though include for the refinement of technologies developed through the involvement of farmers, they do not seem to be responsible for providing direct extension services to the entire farming community. Therefore, there seems a need to review the role of KVKs in direct extension support and to forge the strong linkages with district/state extension machinery, if not, bringing them under the direct control of DAC or States.

3.18.8 Information technology revolution is unfolding, and has very high visibility. However, its benefits have remained confined primarily

to the urban areas. Rural communities, have not been able to gain to the same extent from IT. As a means of agricultural technology transfer to farmers, information technology, has had a limited impact. Even the vast potential of the broadcasting network has been tapped only minimally for extension. Harnessing information technology for agricultural extension should receive high priority in the X Plan. Extensive use of modern information technology should be promoted for communication between researchers, extension workers and their farmer clients to transfer technologies and information more cost effectively. Information technology should be made more available to those with specific inquiries to guide them in adopting the more knowledge intensive forms of agriculture which will expand in future.

3.18.9 Radio and TV have vastly increased their reach, as also reception facilities. "Local" radio and new FM transmitters open up possibilities of area-specific broadcasts. In communicating with an audience with low literacy skills, an audio-visual medium like TV has advantages. Today Doordarshan almost covers the entire population. Much wider and creative use of the mass media-All India Radio, private FM, Door Darshan, private cable network should be promoted for more rapid and effective dissemination of general information and advice to farming communities. This should also include market information and intelligence. Central government may also support states in their effort to make fuller use of electronic media and consider for supporting an exclusive agriculture channel on television.

3.18.10 The DAC is experimenting with a new model of extension ATMA (Agriculture Technology Management Agency) involving multidisciplinary approach in 24 districts under a World Bank assisted NATP Project. The results seems to be encouraging and if the model is found to be effective in meeting the present day needs of the farmers, the Centre may consider for replicating it in other areas.

3.19 Agricultural Credit

3.19.1 Agricultural credit is disbursed through the network of cooperatives, commercial banks and RRBs. Cooperatives cover 48 per cent of disbursement, commercial banks 46 per cent and RRBs about 6 per cent. The cooperative credit system has played a very important role till a few years back. However, the system seems to have collapsed due to heavy overdues and it has affected the resources poor farmers badly. Commercial Banks do not seem to be much interested in providing credit to farmers as is evident from shortfall in priority lending. Against the target of 18% of the Net Bank Credit the priority sector lending amounted to only 15.7% (2000-01). The flow of credit from the Commercial Banks and the RRBs is not adequate. Apart from the question of the quantum of credit, there is the question of specific targetting of the small and marginal farmers. As there is a separate Working Group on Agriculture Credit, this Working Group do not intent to make any recommendations, however, it emphasises that

unless credit needs of the farmers are adequately met the productivity enhancement programme will suffer as farmers would not be able to adopt improved technologies and develop their on-farm infrastructure. This is more so when the public share in capital formation in agriculture is declining.

3.20 Procurement and Minimum Support Prices.

3.20.1 The Price Policy of the Government has been implemented largely through the Minimum Support Price (MSP) Scheme. The MSP has been so implemented as to favour certain crops so as to encourage farmers to grow these crops. The Policy is supported through market intervention by SFCI and NAFED who intervene in the market and procure the crop commodities. This has worked very well till recent past and results are quite apparent and as per expectations. But in the changed environment of globalization and opening of the economy, the model does not seem to be working effectively. Firstly, the procurement operations are not implemented country-wide and are confined to certain states and areas. For example, in case of paddy and wheat, procurement operations are concentrated in the Northern States whereas in some other states the operation of MSP is negligible. Because of the lack of procurement operations the farmers are resorting to distress sale. Therefore, there is need to strengthen the procurement operations all over the country even in the areas where surpluses are less. This will enable the farmers to avail remunerative prices for their produce and will also bring in stability in the prices of agricultural commodities.

3.20.2 However, there is other side of picture of MSP operation . Under the procurement operation a large quantity of foodgrains have been purchased by the Government. Now the rice and wheat stocks have reached over 60 million tonnes. On one hand, the off take of the foodgrains from the FCI godowns is unsatisfactory and on the other hand the country is not able to export the same because of being incompetitive in the international market as the domestic prices are very high and the MSP operation is also adding to the already high market prices of agriculture commodities. This calls for a review to chalk out a cost effective strategy and alternatives.

Annexure-3.I

List of the Schemes under implementation during 2001-02

S.NO. **Division/** Scheme

CROPS

1 Technology Mission On Cotton
2 Mini-kit Programme of Rice, Wheat & Coarse Cerelas
3 Directorate of Commercial crops
4 On farm Water Management for increasing crop productivity in Eastern India (new)

TECHNOLOGY MISSION ON OILSEEDS, PULSES & MAIZE

5 Oilseeds Production Programme (OPP)
6 National Pulses Development Project (NPDP)
7 R&D in Post Harvest Technology in Oilseeds, Pulses & Maize
8 Oil Palm Development Programme (OPDP)
9 National Oilseeds & Vegetable Oils Development Board
10 Accelerated Maize Development Programme (AMDP)
11 TMOP Headquarter & Directorate of Oilseeds and Pulses

HORTICULTURE

12 NHB Including Capital Investment Subsidy Scheme
13 Coconut Development Board
14 Human Resource Development
15 Tribal Area Development
16 Technology Mission on Horticulture for North East

SEEDS AND FARMS

17 Transport subsidy on Seeds
18 Pilot Scheme for Seed Crop Insurance
19 Implementation of PVP legislation
20 Establishment and Maintenance of Seed Bank
21 Setting up of NSTC with Modern STL's Strengthening of Seed Quality Control organisation.
22 Loan to SFCI

FERTILIZERS AND MANURES

23 National Project on Development of Bio-fertilisers
24 Strengthening of Central Fertiliser Quality Testing and Training and its Regional Labs

PLANT PROTECTION

25 Promotion of Integrated Pest Management
26 Expansion of Plant Quarantine Facilities in India
27 Implementation of Insecticides Act'1968
28 Locust Control and Research
29 Training in Plant Protection

AGRICULTURAL IMPLEMENTS AND FARM MACHINERY

30 Strengthening of Farm Machinery Testing and Training Institutes.
31 Productionising of Industrial Designs of Agricultural Implements
32 Conducting study and formulating long term mechenisation strategies for each Agro Climatic Zone

RAINFED FARMING

33 Watershed Development Council

NATURAL RESOURCES MANAGEMENT

34 All India Soil and Land use Survey and application of Remote Sensing technology for Soil Survey and land use Planning.
35 National Land Use and Conservation Board (NLCB)

CREDIT

36 Investment in Debenture of State Land Development Banks
37 Comprehensive Crop Insurance Scheme & National Agri Insurance Scheme

38 Centre for International Cooperation & Training in Agri Banking (CICTAB)
39 Credit Planning and Monitoring

COOPERATION

40 Co-operative Education & Training
41 Assistance to National Co-operative Federation
42 Development of Multi State Cooperatives and Strengthing of Co-operation Division (Direction in admn)
43 Integrated Cooperative Development Project in selected districts
44 Assistance for Cooperative marketing procesing, storage programme in Cooperatively under developed states & UTs
45 Share capital particpation in Cooperative Sugar Mills
46 Share capital particpation in growers Cooperative Spinning Mills

EXTENSION

47 National Agricultural Extension Project-I
48 Training of Women in Agriculture
49 Strengthening of Agricultural Extension Services
50 Human Resource Development
51 Information Support / Management Information System

DIRECTORATE OF ECONOMICS AND STATISTICS

52 Comprehensive Scheme on Cost of Cultivation of Crops
53 Regional Centres of Agro-Economic Research
54 Timely Reporting Scheme(TRS) of Area & Production of Crops
55 Improvement of Crop Statistics (ICS)
56 Establishment of an Agency for Reporting Statistics (EARAS)
57 Crop Estimatiom Survey on Fruits ,Vegetables & Minor Crops (CES)
58 Studies on Inputs for Agricultural Policy Formulation
59 Assisting the States/ U.Ts in Conduct of Live Stock Census
60 Crop Acreage & Production Estimation (CAPE) including Remote Sensing Techniques etc.
61 Evaluation & Research Studies of CACP (CACP)
62 Special Data Dissemination Scheme
63 National centre for Forecasting of Crops
64 Agriculture Census

MARKETING

65 Market Survey, Investigation and Research Grants*
66 Strengthening of Agmark Grading Facilities and Export Quality Control**
67 Market Information Network
68 Grants to National Institute of Agricultural Marketing, Jaipur

INFORMATION TECHNOLOGY

69 Strengthening of IT & Creation of Data Base & Information Network in DAC
70 Network of Horizontal and vertically of field units of DAC
71 Natural Disaster Management Programme

SFAC

72 Small Farmers Agri-Business Consortium

POLICY AND PLANNING

73 Planning and Management of Agriculture
74 Macro Management
75 Secretariat Economic Service

Externally Aided Projects

76 UNDP programme for Food Security in India
77 UNDP Sub-programme on Maize Based Cropping System for Food Security in India
78 EEC assisted Alkali Land Reclamation and development Programme
79 Rural Growth Centre Project in Bihar (EEC assisted)
80 Coconut Development Project in Kerala (EEC Assisted)
81 National Agricultural Technology Project (NATP) (World Bank Aided)

Special Central Assisted State Plan scheme

82. Prevention of shifting cultivation in North East

Annexure-3.II

Projected Requirement of breeder, foundation and certified seeds by 2006-07

S.No.	Crop	Area (Lakh ha)	Seed rate (kg/ha)	SMR	SRR Projected	Breeder (quintals)	Foundation (quintals)	Certified (quintals)
CEREALS								
1	**Paddy**	450.0				2359.44	82333.3	3362500
	Hybrid	10.0	15.0	100	100	15.00	1500.0	150000
	V(Transplant)	250.0	35.0	75	15	233.33	17500.0	1312500
	V(Broadcast)	190.0	100.0	30	10	2111.11	63333.3	1900000
2	**Wheat**	275.0	120.0	20	12	9900.00	198000.0	3960000
3	**Maize**	65.5				99.31	9525.0	920000
	Hybrid	39.5	20.0	100	100	79.00	7900.0	790000
	varieties	26.0	20.0	80	25	20.31	1625.0	130000
4	**Jowar**	104.0		100		44.72	5592.0	727200
	Hybrid	42.0	12.0	150	100	22.40	3360.0	504000
	varieties	62.0	12.0	100	30	22.32	2232.0	223200
5	**Bajra**	96.0	4.0	200		4.01	970.7	244800
	Hybrid	38.0	4.0	300	100	1.69	506.7	152000
	varieties	58.0	4.0	200	40	2.32	464.0	92800
6	**Ragi**	17.0	5.0	80	12	1.59	127.5	10200
7	**Barley**	8.0	100.0	15	10	355.56	5333.3	80000
	Total cereals					12764.64	301881.8	9304700
PULSES								
8	**Gram**	85.0	75.0	10	5	3187.50	31875.0	318750
9	**Lentil**	14.5	25.0	30	7	28.19	845.8	25375
10	**Peas**	6.0	100.0	10	8	480.00	4800.0	48000
11	**Urd**	36.0	20.0	40	15	67.50	2700.0	108000
12	**Moong**	35.0	20.0	40	20	87.50	3500.0	140000
13	**Arhar**	35.0	20.0	100	10	7.00	700.0	70000
14	**others**							
	Total pulses					3857.69	44420.8	710125
	Total Foodgrains					16622.33	346302.7	10014825
OILSEEDS								
15	**Groundnut**	75.0	150.0	6	10	31250.00	187500.0	1125000
16	**R/Mustard**	65.0	5.0	100	30	9.75	975.0	97500
17	**Soybean**	62.0	62.5	15	15	2583.33	38750.0	581250
18	**Sunflower**	18.0				24.90	1900.0	146500
	Hybrid	13.0	10.0	80	100	20.31	1625.0	130000
	varieties	5.0	10.0	60	33	4.58	275.0	16500
19	**Linseed**	8.0	25.0	50	10	8.00	400.0	20000
20	**Castor**	11.8				35.17	1475.0	86250
	Hybrids	4.8	12.5	100	100	6.00	600.0	60000
	varieties	7.0	12.5	30	30	29.17	875.0	26250
21	**Safflower**	5.3	12.0	60	30	5.30	318.0	19080
22	**Sesame**	17.2	5.0	250	15	0.21	51.6	12900
23	**Niger seed**							
	Total oilseeds					33916.65	231369.6	2088480
FIBRE CROPS								
24	**Cotton**	94.0				201.87	10520.0	558000
	Hybrid	24.0	4.0	75	100	17.07	1280.0	96000
	varieties	70.0	20.0	50	33	184.80	9240.0	462000
25	**Jute**	7.3	10.0	100	30	2.18	217.8	21780
26	**Mesta**	2.1	12.5	40	30	4.92	196.9	7875
27	**Sunnhemp**	0.6	25.0	30	30	5.00	150.0	4500
	Total fibre crops					213.97	11084.7	592155
VEGETABLES								
28	**Onion**	5.0	10.0	100	10	0.50	50.0	5000
29	**Potato**	14.0	3000.0	6	5	58333.33	350000.0	2100000
30	**Okra**	3.5	8.0	60	80	6.22	373.3	22400
31	**Eggplant**	5.0	0.8	400	80	0.02	7.5	3000
32	**Chillies**	8.7	1.0	250	50	0.07	17.4	4350
33	**Tomato**	5.0	0.5	100	80	0.20	20.0	2000
34	**Cabbage**	2.5	0.5	500	100	0.01	2.5	1250
35	**Cauliflower**	2.8	0.5	500	100	0.01	2.8	1400
36	**Others**	22.2	2.5	500	80	0.18	88.8	44400
	Total vegetables					58340.46	350544.9	2179450
	GRAND TOTAL					**109093.41**	**939301.9**	**14874910**

CHAPTER-4

Demand and Supply Projections for Foodgrains for Tenth Five Year Plan

4.1 The demand projections for foodgrains can be worked out on the basis of two different methodologies. One way is to estimate the demand based on Normative Approach. Here the normative requirement of foodgrains as recommended by National Institute of Nutrition, Hyderabad is taken as the basis and multiplied with the consumption unit to work out the demand for a particular period. The consumption unit is calculated by deflating it with the standard deflator. The requirement towards seed, feed and wastage is also added to arrive at the total requirement for the country as a whole. The second method for assessing demand projections is known as Behavioristic Approach and it is worked out by calculating the growth rate in population, growth rate in per capita income and expenditure elasticity.

4.2 It may be mentioned that both these methods were used in the earlier Five Year Plans to assess the demand requirements. Accordingly, these methods have been used for assessing the demand requirements for the 10th Plan also.

4.3 Demand Projections based on Normative Approach.

4.3.1 The figures of population as given by the latest Population Census (2001) have been used. The mid-year population was worked out for the year 2001 and based on that population for each of the 5 years of 10th Plan have been estimated. The basic assumption is that the population will grow at a compound rate of 1.9 percent per annum. This is based on the past trend of population growth. The normative requirements of 182.50 Kg/CU/Year as recommended by National Institute of Nutrition, Hyderabad has been taken for working out the requirements. The Consumption Unit (CU) has been worked out by deflating the total population by a factor of 1.0696. The same deflator was also taken for 9th Plan.

4.3.2 The total seed, feed and wastage have been assumed as 12.5 percent of the gross output comprising of 5 percent towards seed, 5 percent towards feed and 2 ½ percent towards wastage. In fact with the increase in production and productivity the seed requirements, as a percentage of total output, has been declining over the years. For instance, it is estimated that 1 quintal of seed is needed for the crop of wheat for one hectare of land. The average national productivity of wheat is 27 quintals per ha. This gives a percentage of 3.7 of wheat output. Like-wise for paddy the seed requirement varies from 0.30 to 1.0 quintal per ha depending on whether it is transplantated or direct seeded, while the yield is 30 quintal per ha giving a percentage of about

2.5 of per ha. output. For sorghum per ha requirement of seed is 0.12 quintal, while the average productivity is 9 quintals which gives a seed requirement of approximately 1.7 percent. For bajra also the seed requirement is only 1.7 percent while for maize it is about 1.3 percent. For Pulses, the seed requirement is about 7.5 percent. Thus, it is seen that the total requirement of seed will be considerably less than 5 percent, which is being assumed by the Working Group. However, here it may be mentioned that with the higher growth rate in output of animal husbandry sector, the quantities required towards feed are estimated to be much higher than 5 percent being assumed by us. It is felt that by keeping a total component of 12.5 percent towards seed, feed and wastage, the higher requirement presumed towards seed & wastage may compensate for additional requirements towards feed. However, this is only a rough estimate.

4.3.3 The demand projections of cereals and pulses worked out based on the above assumptions are given at Annexure-4.I. It may be seen that as per normative approach the country would require 221.4 million tonnes of foodgrains by 2006-2007, comprising 203.7 million tonnes of cereals and 17.7 million tonnes pulses.

4.4 Demand based on Behavioristic Method.

4.4.1 Under Behavioristic Approach, the demand projections have been attempted based on the following three assumptions :-

(a) That population will grow at a compound rate of 1.9 percent per annum for the reasons given in para 4.4.1 above.

(b) The per capital income shall grow at the rate of 4.7 percent per annum. This rate is based on the past 6 years growth rate of per capita income. It may be mentioned here that for working out the demand requirements what is more relevant is not per capita income per se, but per capita expenditure out of this income i.e. after adjusting income for the savings. Normally house-hold savings are found to be around 20 percent. Therefore, the growth in per capita income has been adjusted by the rate of savings to work out per capita expenditure.

(c) The expenditure elasticity has been assumed to be 0.15 percent for cereals and 0.62 percent for pulses. These are based on certain studies of expenditure behaviour in recent years.

Demand for Cereals

4.4.2 Year-wise domestic availability of cereals for the period 1997-98 to 2000-2001 was worked out on the basis of production of cereals, net imports and changes in stocks held by the Food Corporation of India (FCI). This availability was assumed to represent the annual

consumption. The three points moving average was worked out to remove the effects of fluctuations in production. On the basis of growth rate of moving averages, the consumption during the terminal year of 9th Plan (2001-02) was estimated at 190.46 million tonnes, which for a population of 1033.52 million (mid-year population as estimated on the basis of data from Population Census 2001) works out to 184.29 Kg/capita/year including the quantities required towards seed, feed and wastage. The per capita income of Rs.1585 for the year 1999-2000 was extrapolated till the terminal year of 10th Plan, assuming a growth rate of 4.7 percent at constant prices, which is the actual growth rate in per capita income achieved since 1994-95. The per capita of human consumption of cereals (by excluding the seed, feed and wastage at the rate of 12.5 percent) worked out to 161.25 Kg/year for the year 2001-2002. This base figure was extrapolated for all the years of 10th Plan on the basis of growth in per capita income and income elasticity of 0.15 percent for the cereals. The projected population for each year was then multiplied by corresponding figures of projected per capita demand for human consumption which was then inflated to include the demand for seed, feed and wastage @ 12.5 percent. The total projected demand of cereals for different years of 10th Plan so worked out, is given in Annexure-4.II.I. For 2006-07, the total demand for cereals for 2006-07 works out to 216.74 million tonnes.

Demand for Pulses

4.4.3 As in case of pulses, a time-series of domestic availability (a proxy for total consumption) was worked out as production plus net imports for the period 1980-81 to 1999-2000. The consumption for the terminal year of IX Plan viz., 2001-2002 was extrapolated using a linear trend equation, which gave the best fit. The trend consumption for the year 2001-2002 was found to be 15.17 million tonnes, which for a population of 1027 million translates to 14.68 Kg per capita per year including the requirement for seed feed and wastage. This per capita consumption was extrapolated for all the five years of 10th Plan taking income elasticity of consumption was 0.62. The figures for demand for pulses for various years of 10th Plan were obtained by multiplying estimated per capita consumption with the projected population. The total demand for pulses for 2006-07 works out to 19.24 million tones(Annexure-4.II.I).

4.4.4 The demand for foodgrains for the terminal year of the X Plan (2006-07) works out to 235.98 million tonnes.

4.4.5 As mentioned earlier, another exercise was also done by adjusting the per capita requirements for savings and working out the demand for foodgrains based on per capita consumption. This is given at Annexure-4.II.II. From Annexure-4.II.II, it will be seen that the total foodgrains demand for the year 2006-07, based on the assumption that the entire per capita income goes towards expenditure gives a

figure of 235.98 million tones of foodgrains. While based on savings taken out of per capita consumption gives a figure of 234.26 million tonnes of demand of foodgrains for 2006-2007.

4.4.6 If we have to achieve doubling of the per capita income in next 10 years, then the per capita income has to increase at 7.177% p.a.. Assuming elasticity of expenditure of 0.15 for cereals and 0.62 for pulses, we get a total foodgrains demand of 241.49 million tonnes in the year 2006-07. If, however, the elasticity is assumed at 0.2% for cereals and 0.62% of pulses, the demand will increase to 245.44 million tonnes. Finally, with further changed assumption of elasticity of 0.3% for cereals and 0.62% for pulses, the demand increases to 253.5 million tonnes (Annexure-4.III).

4.5 From the above, it can be seen that depending on our assumptions the projections of demand vary substantially. The normative requirement for the end year of 10th Plan works out to only 221 million tonnes. The Behaviouristic model gives a range of demand between 236 million tonnes to 253 million tonnes depending on assumptions made by us. However, the demand by Normative Approach would be nearer to the actual requirements. For instance, in 1999-2000 we produced 209 million tonnes of foodgrains and out of these about 50 million tonnes are in stocks. The consumption demand after taking a 3 year average has been worked out to only 203 million tonnes. It may also mentioned here that it is not possible for the consumption behaviour or demand to alter radically in the short run even if the incomes increases substantially. For instance, if one's income suddenly doubles, he/ she would still continue to eat and enjoy the same standards of living as used to in the past. It would take considerable time to change the living standard and adjust to additional income. As per the Economics principle of "Upper Secular Drift of Consumption Function". Even if the income of the poorest people increase, they would continue to eat which they are using now and in the quantities which they are consuming at present. Their demand would only increase marginally. Secondly, the estimates of World Bank and IMF are that the international prices of foodgrains and other agricultural commodities are likely to rule soft for coming few years. That being the case it is doubtful whether we would be in a position to export large quantities of rice, wheat etc. in the international market as our domestic prices are much higher than international prices.

4.6 If we produce large quantities and try to export at lower international prices, it will have not only fiscal implications but also may attract penalties under WTO because of export subsidies are not supposed to be given. The assessment of the Working Group is that we may pitch a demand of about 230 million tonnes which we would be able to manage. It will definitely be difficult to manage the situation if we produce more than 230 million tonnes year after year.

4.7 Finally, higher per capita income is a statistical concept where national income is divided by population. It conceals inequalities of incomes. The question is about increase in incomes of the poorest sections even if the per capita income doubles. Will their per capita income also double? Further their per capita income is so low at present that even if it doubles, it will not have any material affect. The very fact that even with low per capita incomes they are surviving implies that they must be eating some foodgrains, most probably, coarse cereals. With increased incomes (if at all) this section would definitely not shift its pattern of consumption and the increase in demand may be only marginal. In conclusion, it seems that the figure of 230 million tonnes of foodgrains would be fairly adequate.

4.8 Supply Projections

4.8.1 During 1999-200 the foodgrain production was about 209 million tonnes which was a record. The simple linear regression (Method-I) based on actual production for the last 11 years gives likely production of 208.6 million tonnes during 2001-02 which will be base year for the Tenth Five Year Plan. The same method gives an expected production of 224.8 million tonnes by the end of Tenth Five Year Plan (2006-07). The Method-II , of exponential growth function Y=ab^T using log linear regression gives the base year production of foodgrains to 209.3 million tonnes and for the year 2006-07, 228.2 million tonnes. The Method-III i.e. forecast of production based on variables[6] namely area under foodgrains production; percentage of irrigated area of foodgrains; and fertilizer consumption, gives the X Plan terminal year production of 243.1 million tonnes. This is based on the assumption that the area under foodgrains will remain around 124 million ha; fertilizer consumption will grow at the same rate as in 90s; and proportion of irrigated area will go up from 40% to 45%, same as in 90s. The year wise supply projections worked out under these 3 methods mentioned above are given in Table-4.1 .

Table-4.1: Supply Projections of foodgrains for X Plan as worked out by different methods.

(million tonnes)

Year	Method -I	Method-II	Method- III
2002-03	211.8	212.9	223.0
2003-04	215.1	216.6	227.9
2004-05	218.3	220.4	232.9
2005-06	221.6	224.3	2380
2006-07	224.8	228.2	243.1

[6] Functional relationship estimated on the formula;
Y=(427.67)+2.963X1+0.055X212+6.541X3, where
Y=Foodgrains Production;
X1=Area under foodgrains in million hectare;
X2=Per ha fertilizer consumption incase of foodgrains;
X3=Percentage area of foodgrains under irrigation.

4.9 The foodgrains production in the country during 1998-99 was approx. 203 million tonnes, in 1999-2000 it was 209 million tonnes, while during the current year 200-2001, as per advance estimates the foodgrain production is expected to be 196 million tonnes. Therefore, the average production of foodgrains for three years comes to about 203 million tonnes. If from this level of production of 203 million tonnes, which can be assumed as the base level for current year (2000-2001), we wish to achieve the target of 221 million tonnes by the end of 10th Plan (worked out on the basis of Normative Approach) the annual compound rate of growth of production comes to 1.71% p. a. On the other hand, the compound rate of growth required to achieve the level of 230 million tonnes of foodgrains would be 2.52%p.a. However, if the highest production of 1999-2000, 209 million tonnes is taken as the base the required growth rate to achieve 221 million tonnes production would be only 1.12% p.a. and to reach 230 million tonnes foodgrains production it would require a growth rate of 1.94% p.a. Between the years 1993-94 and 1999-2000 the actual annual compound growth rate of foodgrains achieved was 2.11%p.a. Based on the past trend of growth it can be said that it would be possible to reach the targeted level of 230 million tonnes of foodgrains production by the year 2006-07, even if certain deceleration in the rate of growth is suffered.

4.10 Need for Review of Price Policy

4.10.1 While with some concerted efforts it seems possible to achieve a higher rate of growth as against the past compound rate of growth of 2.11%, yet there are certain important related issues which also need to be taken into account as they also impact on agricultural growth. The price policy of the Govt. has been implemented largely through the Minimum Support Price (MSP) Scheme. The MSP has been so implemented as to favour certain crops so as to encourage farmers to grow those crops. This was done through higher prices fixed for such crops, like wheat, rice, sugarcane and certain oilseeds. This policy was supported through market interventions by FCI and NAFED who intervened in the market and procured these commodities if prices fell below the Minimum Support Prices fixed by the Government. This model has worked very well till recent past and the results are quite apparent and as per expectations. The country is now in a position to even export certain cereals particularly wheat, rice and even commodities like sugar. But in the changed environment of globalisation and opening of the economy, the model does not seems to be working effectively. For instance, the prices of copra, which is covered under MSP declined last year to about Rs.2200 per quintal and despite massive procurement of copra by NAFED, till date about 2.5 lakh tonnes of copra has been procured, the prices have remained at around Rs.2200 per quintal against the MSP price of Rs.3350 per quintal. Accordingly the procurement is continuing.

4.10.2 Not only that the old model, which was relevant for a closed economy, is not functioning effectively, it is apprehended that if the same model is persisted with, it might ultimately result in the country not being able to export certain agricultural commodities covered under MSP scheme, but may also have to face the unpleasant situation of large imports. Through the mechanism of MSP, we have been revising the MSP of wheat, rice etc. every year and as a result the prices of these commodities in India are much higher than the international prices. For instance the price of wheat in India is around Rs.700 per quintal while the international price is about $110 per tonne which is about Rs.500 per quintal (fob). Since the import duty has recently been revised, the imports of wheat stopped. Yet there was a situation in 1998-99 when despite a record production of wheat, large quantities of wheat got imported into the country because of price differential between Indian and international prices. The same is the case with respect to edible oils sector where if anything the situation is worse and despite repeated revision of import duties, the country imported almost 4 million tonnes of edible oils in the country last year and the same quantity is expected to be imported during the current year. This is despite the fact that the country does not need so much of edible oils.

4.10.3 From the above it can be seen that if the country continues to pursue the old model of price support/ fixation, there may be serious consequences not only from the fiscal point of view but also from the point of view of impact on production and farmers themselves. Accordingly, there seems to be an urgent need to review the policy and work out an alternative so as to achieve sustained production. Since in the short run there is not expected to be much change in agricultural technology and investment in irrigation or infrastructure, price factor assumes considerable significance and needs immediate attention of the government. There is an urgent need to work out an alternative scheme which ensures not only remunerative prices to the farmers but also can keep us competitive in the world market.

Cropping Pattern

4.10.4 Finally, it may be mentioned that Pricing Policy is also intimately linked to the question of cropping pattern. The cropping pattern depends on both price factors and non-price factors. As mentioned above, in the past by implementing price policies in a particular way, the cropping pattern has been developed so as to have larger area under wheat, rice. The crop diversification needs to be followed with great caution particularly in view of the fact that the country cannot afford to slacken its efforts on the question of food security. The position of foodgrains needed by the country is qualitatively different from the edible oils or other commercial crops needed.

Annexure-4.I

DEMAND PROJECTIONS OF FOODGRAINS BASED ON THE NORMATIVE APPROACH

(In million tonnes)

YEAR	POPULATION (In millions)	CONSUMPTION UNITS	HUMAN CONSUMPTION	TOTAL CONSUMPTION
		CEREALS		
2001-02	1033.520	966.268	162.236	185.413
2002-03	1053.157	984.627	165.319	188.936
2003-04	1073.167	1003.335	168.460	192.526
2004-05	1093.557	1022.398	171.661	196.184
2005-06	1114.335	1041.824	174.922	199.911
2006-07	1135.507	1061.618	178.246	203.709
		PULSES		
2001-02	1033.520	966.268	14.108	16.123
2002-03	1053.157	984.627	14.376	16.429
2003-04	1073.167	1003.335	14.649	16.741
2004-05	1093.557	1022.398	14.927	17.059
2005-06	1114.335	1041.824	15.211	17.384
2006-07	1135.507	1061.618	15.500	17.714
		TOTAL FOODGRAINS		
2001-02	1033.520	966.268	176.344	201.536
2002-03	1053.157	984.627	179.694	205.365
2003-04	1073.167	1003.335	183.109	209.267
2004-05	1093.557	1022.398	186.588	213.243
2005-06	1114.335	1041.824	190.133	217.295
2006-07	1135.507	1061.618	193.745	221.423

Note:

(1) The consumption requireement has been worked out by using normative requirement of foodgrains (182.50 kg/cu/year comprising of 167.90 kg/cu/year of cereals and 14.60 kg/cu/year of pulses), as recommended by National Institute of Nutrition, Hyderabad.

(2) According to the provisional results compiled quickly for the Census of India 2001, the population of India stood at 1027 millions on 1st March 2001. The population is projected to rise by 1.9 per cent during the next 5 years.

(3) To convert the total population in consumption units (cu), total population has been deflated by the factor 1.0696.

(4) the total seed, feed and wastage has been assumed as 12.5 per cent of the gross output.

Annexure-4.II.I

PROJECTED DEMAND FOR FOODGRAINS ON THE BEHAVIOURISTIC APPROACH
(based on the assumptions entire per capita income goes towards expenditure)

(in million tonnes(mt)

Year	Projected Population (million)	Per capita income at 1999-2000 prices(Rs.)	Per capita demand of Cereals for Human Consumption (kg/yr)	Cereals Demand for Human Consumption	Total Cereals demand including seed feed and wastage	Per capita demand for Pulses (Kg/Yr)	Total Demand for Pulses including seed feed and wastage	Total Food grains Demand
2001-02	1033.52	17376	161.25			14.68		
2002-03	1053.16	18193	162.39	171.02	195.45	15.10	15.91	211.36
2003-04	1073.17	19048	163.53	175.50	200.57	15.55	16.68	217.25
2004-05	1093.56	19943	164.68	180.09	205.82	16.00	17.49	223.31
2005-06	1114.33	20880	165.84	184.81	211.21	16.46	18.35	229.55
2006-07	1135.51	21862	167.01	189.65	216.74	16.94	19.24	235.98

Annexure-4.II.II

PROJECTED DEMAND OF FOODGRAINS ON BEHAVIORISTIC APPROACH-
(based on the savings taken out of per capita consumption)

(in million tonnes)

	Mid year population millions	PCC **Cereals**	PCE (RS pa)	**Cereals**		**Pulses**		Foodgrain
				Human cons DD Cereals	Total dd **Cereals**	PCC **Pulse**	Total **Pulses DD**	**Total Foodgrains**
1999-2000			12681					
2000-2001			*13163*					
2001-2002	1033.520	**161.25**	*13663*	166.65	190.68	**14.68**	15.17	205.85
2002-2003	1053.1569	**162.17**	*14182*	170.78	195.41	**15.02**	15.82	211.23
2003-2004	1073.1669	**163.09**	*14721*	175.02	200.25	**15.38**	16.50	216.76
2004-2005	1093.557	**164.02**	*15280*	179.36	205.22	**15.74**	17.21	222.44
2005-2006	1114.3346	**164.96**	*15861*	183.81	210.31	**16.11**	17.95	228.27
2006-2007	1135.507	**165.90**	*16464*	188.37	215.53	**16.49**	18.72	234.26

Note: Bold figures represent the estimates derived on the basis of growth in PCE.

PCC- Per Capita Consumption.

PCE-Per Capita Consumption Expenditure (80% of per Capita Income in the year 1999-2000) Figures for subsequent years have been obtained by applying a growth rate of 3.8% p.a.

Total demand for the year 2001-02 assessed on the basis of Production, Net Exports and Change in Stocks.

Annexure-4.III

DEMAND PROJECTIONS OF FOODGRAINS BASED ON BEHAVIORISTIC APPROACH
WITH ASSUMPTION THAT THE PER CAPITA INCOME WOULD DOUBLE IN NEXT TEN YEARS

Scenario-1

Rate of growth which will double something in ten years =7.177

(in million tonnes)

	Mid year	**Elast(crls)=0.15**		**Cereals**		**Elast(puls)=0.62 Pulses**		
	population	PCC	PCE	Human	Total dd	PCC Total		**Total**
	millions	**Cereals**	(RS pa)	cons DD Cereals	**Cereals**	**Pulse**	**Pulses DD**	**Foodgrains**
1999-2000			**12680.8**					
2000-2001			*13591*					
2001-2002	**1033.52**	**161.25**	*14567*	**166.65**	**190.4622**	**14.68**	**15.17**	**205.63**
2002-2003	1053.1569	162.99	*15613*	171.6	**196.1713**	15.33	**16.15**	**212.32**
2003-2004	1073.1669	164.74	*16734*	176.8	**202.0514**	16.01	**17.18**	**219.24**
2004-2005	1093.557	166.52	*17936*	182.1	**208.1079**	16.73	**18.29**	**226.40**
2005-2006	1114.3346	168.31	*19223*	187.6	**214.3458**	17.47	**19.47**	**233.81**
2006-2006	1135.507	170.12	*20604*	193.2	**220.7707**	18.25	**20.72**	**241.49**

Scenario-2

		Elast(crls)=0.2		**Cereals**		**Elast(pls)=0.62 Pulses**		
1999-2000		**Cereals**	**12680.8**	**Cereals**	**Cereals**	**Pulse**	**Pulses DD**	**Total**
2000-2001			*13591*			**PCC**		**Food grains**
2001-2002	**1033.52**	**161.25**	*14567*	**166.65**	**190.4622**	**14.68**	**15.17**	**205.63**
2002-2003	1053.1569	163.56	*15613*	172.3	**196.868**	15.33	**16.15**	**213.01**
2003-2004	1073.1669	165.91	*16734*	178.1	**203.4893**	16.01	**17.18**	**220.67**
2004-2005	1093.557	168.30	*17936*	184.0	**210.3332**	16.73	**18.29**	**228.62**
2005-2006	1114.3346	170.71	*19223*	190.2	**217.4073**	17.47	**19.47**	**236.88**
2006-2006	1135.507	173.16	*20604*	196.6	**224.7193**	18.25	**20.72**	**245.44**

Scenario-3

		Elast(crls)=0.3		**Cereals**		**Elast(puPulses**		
1999-2000		**Cereals**	**12680.8**	**Cereals**	**Cereals**	**Pulse**	**Pulses dd**	**Total**
2000-2001			*13591*			**pcc**		**Foodgrains**
2001-2002	**1033.52**	**161.25**	*14567*	**166654.4621**	**190.4622**	**14.68**	**15.17**	**205.63**
2002-2003	1053.1569	164.72	*15613*	173.5	**198.2615**	15.33	**16.15**	**214.41**
2003-2004	1073.1669	168.27	*16734*	180.6	**206.3802**	16.01	**17.18**	**223.56**
2004-2005	1093.557	171.90	*17936*	188.0	**214.8313**	16.73	**18.29**	**233.12**
2005-2006	1114.3346	175.60	*19223*	195.7	**223.6285**	17.47	**19.47**	**243.10**
2006-2006	1135.507	179.38	*20604*	203.7	**232.7859**	18.25	**20.72**	**253.51**

NOTE: Boxes represent the estimates derived on the basis of growth in PCE

PCC- Per Capita Consumption

CHAPTER-5

SUMMARY: MAJOR ISSUES AND RECOMMENDATIONS

5.1 The Indian Agriculture made a rapid stride, especially after the introduction of High Yielding Varieties (HYV) of rice and wheat in the mid 60s and development of related infrastructure together with the arrangements to provide remunerative prices to the farmers for their produce. The foodgrains production during 1999-2000 reached a record level of 208.88 million tonnes. Though India has achieved self-sufficiency in foodgrains, but the production of oilseeds and pulses has remained much below the required level and the country have been facing problem on these fronts.

5.2 Vigorous efforts appear to be called for systematic examining the availability of technologies, particularly pest tolerant varieties of several pulse crops to improve productivity and production. Despite the open market prices being much higher than the Minimum support Prices being announced by the Government of India in most of the years there does not appear to any large inclination on the part of the farmers to grow pulse crops. In fact in many of the traditional areas the area under pulses show decline over the years in both the *Kharif* and *Rabi* seasons. Tur or pigeonpea is the dominant of *Kharif* pulses and gram during the *Rabi* season. A major factor could be the risks inherent in the growing of these crops due to incidence of pod-borers where substantial losses could occur. It is not also that better processing technologies could contribute to larger recovery of the split pulse that is dal with higher revenue flowing to the farmers. Technology Mission in the case of pulses has become essentially one of making available improved varieties available and farmers adopting higher production technologies mainly improved agronomic practices, an approach that characterised the traditional programmes in the case of all crops. To what extent other technology considerations have been brought into play impinging on the farmers' going in for pulse crops has not been clear. It seems that creation of Technology Mission on Pulses has not made any impact as production remained almost stagnant with wide year to year fluctuations. This calls for review of the Technology Mission on Pulses.

5.3 Similarly even in the case of oilseeds where the technology Mission has been generally considered to be very successful in stepping up the production of oilseeds and hence vegetable oils, a more in-depth examination appears to be warranted. One of the principal objectives of the Technology Mission was to look at availability of technologies at every stage of handling of the crop that is right from production of the agricultural produce to processing, storage and marketing so that the farmers' profitability in growing of oilseeds could be improved with equal benefits flowing to the consumers with the vegetable oils being available at more reasonable prices. It was in this

view that the TMO had as an integrated component a Market Intervention Scheme and it was expected that it would be possible to ensure that the prices of the oilseeds would be allowed to prevail within a band such that the lower end of the band ensured that the oilseed growers would get more remunerative prices, thereby providing the incentive for sustainable increases in production with higher and higher productivity as also larger area being under the oilseed crops. On the other hand the higher end of the band would be so fixed that the consumers got the oil at reasonable price representing almost some sort of ceiling in oil prices without the markets being controlled by forces other than supply and demand. It is true that the oilseed production showed spectacular growth. However, to what extent this was contributed by the large increases in area and productivity of mustard on the one hand, and vast area expansion of soybean is a moot question. Between 1985-86 when the total rapeseed & mustard area was close to 4 million hectares it rose to about 7 million hectares in 1997-98, an increase of over 3 million hectares that is 75% or so in about10 years. The area had been in he range of 3 to 4 million hectares during the entire two decade prior to this. Extent of irrigated area also shows commendable growth from about 30-35% to 65-69% in the latter half of the nineties. Similarly the area under soybean went up rapidly from about 1.5 million hectares in 1986-87 to about 6 million hectares in the more recent years. On the other hand in case of a major oilseed crops like the groundnut the area around 7.5 million hectares plus or minus 0.5 million hasn't shown any change from the early sixties with the irrigated area being in the range of 12-20% from 1979-80. Sunflower was attempted to be aggressively promoted with the inception of TMO and while the area went up from 0.70 million ha in 1983-84 to about 2.67 million ha in 1993-94 it has been consistently coming down in the later years with the area under sunflower being about 1.26 million ha in 2000-01. Clearly issues relating to processing or other facets have not been such as to promote yield improvement efforts and farmers' propensity for bringing additional areas.

5.4 There has been a slow down in the growth rate of agriculture during 90s as compared to the 80s. Except, 1999-2000, in other three years of the Ninth Plan the agriculture sector suffered a setback. The average growth rate of agriculture sector during the first four years of the Ninth Plan has remained low at 1.6% as compared to 4.7% during the Ninth Plan. As agriculture sector contributes significantly to economy, about 26% to GDP, the overall growth rate had also declined from 6.7% in the Eighth Plan to about 6% during the first four years of the Ninth Plan.

5.5 Several factors have been responsible for the deceleration in the growth rate in the agriculture sector during the 90s. The share of public sector investment in agriculture witnessed a declining trend because of lack of resources with the States. There has not been much development in the rural infrastructure and the

maintenance of irrigation system remained very unsatisfactory. The high level of subsidies on water and electricity affected on their sustainable utilization and there are instances of over-exploitation of natural resources resulting in degradation of soils and lowering of ground water table. In command areas, particularly where the drainage system have not been maintained properly or where the natural drainage has been impeded water-logging has begun to surface rendering affected area less productive. The over-exploitation of ground water has resulted in development of soil alkalinity and in several states number of dark blocks have increased resulting in water scarcity in these areas. This calls for the implementation of proper policies including the levying of reasonable user charges so as to encourage the sustainable use of natural resources and more investment for infrastructure development including development of drainage systems in the command areas where attention may not have been paid in the past.

5.6 The high cost of phosphatic and potassic fertilisers resulted in the imbalanced use of plant nutrients, especially in the Green Revolution areas. Besides, the lesser use of organics has affected on soil adversely and organic carbon content in the soil has gone down in most areas. These factors affected the productivity and as the cost of production has increased the share of benefits to the farmers has declined. On one hand yields seems to be plateauing in the high productivity areas and on the other hand there has not been any substantial increase in productivity in the rainfed areas and in the eco-fragile regions .

5.7 The Tenth Five Year Plan Approach Paper envisages to double the per capita incomes in ten years and visualizes to achieve an overall growth rate of 8% per annum during the Plan and increasing it in the subsequent period/plans. Though, it is not impossible to achieve the projected high growth rate of 8%, but there are several implications. In agriculture GDP, the crops share is about 69.3% followed by 23.1% of the livestock sector, about 4% of the forestry & logging and 3.6% of fisheries sector (TE 1999-2000). Therefore, for achieving the higher growth rate in the agriculture sector, the production of crops have to be increased substantially. It is estimated that if the growth rate of agriculture GDP is to grow 3.5% per annum or little higher, the crop production has to increase by about 3% per annum, livestock sector by about 6% per annum and fisheries sector also by about 6% per annum. If the crop sector is to achieve an overall growth rate of over 3% p.a., it would call for massive efforts for yield enhancements. Anything over 3% growth rate may be infeasible. The Approach document indicates to achieve the overall growth rate of 8% in the initial years of the Tenth Plan for which the industry should grow at the rate of 10% per annum. However, considering the contribution of about 28% by the industry, 24% by the agriculture and 48% by others, if the tertiary sector grows just at 8% p.a. to achieve an overall growth rate of

8%, the agriculture sector should grow at 5.46%, this would be very difficult to achieve.

5.8 The Working Group, considering the normative requirement of 182.5 kg foodgrains per capita per year, has worked out the requirement for the terminal year of the X Plan (2006-07) which comes to about 221.4 million tonnes, comprising 203.7 million tonnes of cereals and 17.7 million tonnes pulses. The requirement for seed, feed and wastage has been assumed as 12.5% of gross output. With behaviouristic approach, based on the assumption that the entire per capita income goes towards the expenditure, the foodgrains requirement works out to about 236 million tonnes. While, based on savings taken out of per capita consumption gives a figure of 234 million tonnes of demand of foodgrains. However, assuming that the income will double in next 10 years, as has been envisaged in the Approach Paper, and assuming elasticity of expenditure of 0.15 for cereals and 0.62 for pulses the total foodgrains demand comes to 241.49 million tonnes in the year 2006-07. But, if the elasticity is assumed 0.3 for cereals and 0.62 for pulses, the demand increases to 253.5 million tonnes. It seems that, the actual demand may lie somewhere between 221 million tonnes as works out on normative approach and 236 million tonnes as by behaviouristic approach. The demand by the normative approach would be nearer to the actual requirement. The present consumption demand after taking a three year's average (1998-99-2000-01) works out to only 203 million tonnes. Besides, it is not possible for the demand to alter radically in the short run even if the incomes increases substantially. However, some additional production would be required to meet the export needs. The assessment of the Working Group is that we may take the demand to be at about 230 million tonnes of foodgrains which would be manageable. This will require achieving a growth rate of the order of 1.94% p.a from a base level of 209 million tonnes.

5.9 Productivity in Eastern and North Eastern States and also in Central India has remained low, though some of the States have achieved a good progress. On the other hand in the high productivity areas which had witnessed a good growth rate of foodgrains production during the 80s, the growth rate had declined during 90s. There are concerns whether the yields of rice and wheat have reached a plateau, as these are the most important cereals all across the country. The high productivity areas are suffering from soil degradation, loss in soil fertility especially the deficiency of micro nutrients and decrease in the soil carbon content. Therefore, the prospects of high productivity areas continuing with the momentum of growth witnessed during the eighties do not seem to be high. Hence the additional production has to mainly come from Eastern, North Eastern and Central regions of the country where the productivity has hitherto been low. Special measures are required to be taken to accelerate the growth in agriculture in these less developed areas/regions; Eastern and North-Eastern States, Central India and Western Region.

5.10 These less developed areas/regions basically suffer from the lack of required infrastructure and irrigation facilities. The irrigation coverage in these areas is low and the crop production activities largely depend on monsoon. In Madhya Pradesh the gross cropped irrigated area is only 25%, in Maharashtra 15%, Orissa 27%, and in Gujarat 34%. In NE States the irrigated gross cropped area is still less; Tripura only 13%, Mizoram 9%, Nagaland 27% and Meghalaya 22%. In the Eastern and North Eastern region although there is adequate ground water potential it has not been harnessed and present utilization is only about 20% of the existing potential. This calls for development of minor irrigation facilities through scientific exploitation of the ground water. The Department of Agriculture and Cooperation has formulated a scheme on minor irrigation development in the Eastern and North Eastern region which is likely to give a boost to the agriculture in the region. However, the outlay provided under the schemes for 2001-02 is only Rs.70.00 crore, which is for the 10 States. The amount seems to be grossly inadequate considering the need for the development of minor irrigation facilities based on the ground water potential in the region. Therefore, during the X Plan the minor irrigation development should be taken up on a massive scale by enhancing the investment substantially.

5.11 Because of the larger dependence of crops on monsoon the productivity has remained low. In the absence of irrigation facilities large area in this region remains mono cropped as sizeable area remains fallow after the harvest of kharif crops. The development of irrigation facilities will facilitate the cultivation of second or even a third crop in relatively drier part of the year. This would facilitate the adoption of improved crop production technologies which will help increase the land productivity and also income of the people. The development of irrigation facilities will on one hand will increase the productivity of existing crops it will also facilitate the expansion of gross cropped area through multiple cropping.

5.12 Even with the existing situation and considering that the rainfall in the Eastern and North Eastern region is high some additional area can be put to use under multiple cropping. The low water requiring crops like oilseeds and pulses can be cultivated under the residual soil moisture conditions. The propagation of technologies for rain water harvesting/conservation can also help in introducing the multiple cropping in these mono cropped areas including in other States where rainfall is low. Therefore, besides the development of minor irrigation, the rainfed farming is needs to be given a thrust if productivity and production of foodgrains and other crops is to be increased substantially. The agriculture development in these less developed areas will also facilitate diversification to more remunerative crops and also help create some additional income to the farmers.

5.13 The analysis of data on area and production performance of different crops show that rice and wheat are the important crops which

will contribute significantly in achieving the targeted growth rate of agriculture. At present these two crops together share about 37% of the gross cropped area and contribute 79% to total foodgrains production. Especially, the *Rabi*/ summer rice has better prospects as has been observed in West Bengal. The other crop which has good prospects for the development is maize, especially during *Rabi*/ summer season in Eastern India. Therefore, thrust is required to be continued for the development of rice especially during the rabi/ summer season(also hybrid rice), wheat and rabi/ summer maize. As these crops will continue to remain to be important for the food security point of view the central intervention would be necessary. It is also suggested that DAC may have a look and consider to take out rice and wheat development programmes out of the Macro Management and implement these from the Centre directly as our efforts in improving productivity and production of rice and wheat may be critical to our maintaining National food security.

5.14 The seed is a very vital input which have a major bearing on the crops out put. However, it has been observed that the Seed Replacement Rate (SRR) has remained very low and much to the desired. In case of rice and wheat the present SRR is only about 9% as against desired level of 20% per annum. In case of pulses the SRR is still low when the recommended SRR is 30%. Although the overall production of certified/ quality seeds estimated to has been higher than the demand projected by the States, often there are varietal mismatches leading to shortage of seeds of certain crop varieties. It is, therefore, suggested that as envisaged under the seed Vision 2020 of the DAC, effective seed multiplication plan for breeder, foundation and certified seeds for each of the crop at national, State and district level be prepared and implemented effectively. The state governments have to play the major part, for their assessment of demand of different varieties of crops would be the basis for all seed planning and taking steps to get the seed production organised. Unless seed supply is adequate and a higher SRR is achieved it would not be possible to exploit the production potential of the existing varieties. Whereas the seed supply of crops/ varieties cultivated in the irrigated areas is generally adequate, there is shortage of seeds of the crops/ varieties specific to rainfed areas and to other problem areas like waterlogged situation, saline/ alkaline soils, acidic soils, high altitude hilly areas, etc. Therefore, efforts are required for increasing the production of seeds of crops/ varieties specific to problem areas so as to increase the productivity of such areas. Special thrust is required for increasing the supply of seeds of high potential varieties of pulses and oilseeds crops and of the hybrid rice which has a great potential.

5.15 To increase the seed production of various crops and achieve the higher SRR there would also be need to develop the required infrastructure for seed processing, seed certification, seed testing and

the seed storage facilities. The certification tag gives confidence to the users as it is supposed to be the guarantee for the quality. However, the process seems to be cumbersome and not always a full proof one. The centre may therefore, consider for allowing self-certification by seed producing agencies. For the seed produced and marketed by the private sector the brand name of the company itself should infuse a confidence into the users about its quality. The government could consider even private sector to play a role apart from the kind of crops they are currently dealing with by providing a level playing field in seed distribution subsidies, etc. subject to their conforming to the framework worked out by the State Governments.

5.16 Whereas the R&D on development of GMOs, need to be intensified so as to exploit the vast potential the technology has, but the commercial utilization of such material should be allowed after thorough testing on the safety aspects of such products. Besides, the Terminator Technology commercialization of which could pose a threat to our rich bio-diversity need to be watched carefully.

5.17 The Seed Minikit Programme is the only tool through which newly developed varieties are being introduced to the farmers. However, off late the programme does not seem to have been implemented in true spirit and often seeds of old varieties which are already under commercial cultivation have found their way in the Minikit Programme. Whereas it would be desirable to continue the implementation of Seed Minikit Programme, it needs to be streamlined by the effective planning and organization of Minikit demonstration at farmer's field and more importantly by allowing the inclusion of only pre-released varieties in seed minikits.

5.18 The use of fertilisers in the country is only about 95 kg/ ha which seems to be less considering the nutrient requirement of various crops grown and cropping systems followed. Moreover, all the gross cropped area is not being covered by the use of fertilisers. There seems a wide gap between the quantity of NP&K nutrients removed by the crop and the quantity added in form of fertilisers, Farm Yard Manure/ compost, green manure, etc. There is a negative balance of 6 million tonnes. This calls for increased use of organics and bio-fertiliser, besides increasing the fertiliser use especially in the areas where its consumption is low.

5.19 Besides the unfavourable situations like dependence of crop on monsoon and occurrences of droughts and floods, the lack of market infrastructure seems to be also one of the factors affecting the use of fertilisers, especially in North Eastern States and other backward areas having difficult terrain. The concentration of fertiliser retail outlets in these areas is very less. On an average there are only 44 fertiliser retail outlets for every 100 villages in the country. In Nagaland it

is only 3 retail outlets per 100 villages, in Arunachal Pradesh 7, Meghalaya 9 and in Mizoram only 8 fertiliser retail outlets for every 100 villages. This calls for the strengthening of market infrastructure, opening of additional retail outlets and stocking fertiliser before the start of seasons so as to make it available in time and in required quantities.

5.20 After the price rise of phosphatic and potassic fertilisers, the ratio of NP&K use became wider at 9.5:3.2:1.0 (1992-93). However, some improvement have been observed in the recent past and the NP&K use ratio has narrowed down to 6.9:2.9:1.0 (1999-2000). But it is still wider compared to the desired use ratio of 4:2:1. The imbalance in fertiliser use is affecting the soil health adversely. The deficiency of micro-nutrients is increasing and the response ratio of fertiliser use to crop out put seems to be declining. Therefore, there is need to encourage the use of phosphatic and potassic fertilisers based on the soil test, by continuing the support to the farmers. Besides, the use of micro nutrients, organics and bio-fertilisers need to be encouraged for maintaining the soil health and enhancing the productivity.

5.21 The present soil testing capacity is only for about 6.5 million samples annually. This seems to be grossly inadequate considering that we have over 106 million operational holdings covering over 142 million hectares of net sown area. It is unfortunate that even the existing capacity, which is grossly inadequate, is not being utilized fully in some of the States. This calls for providing adequate support for required equipment, chemicals and manpower so as to facilitate the utilization of existing capacity. Besides, adequate support is required for creation of additional infrastructure so as to provide services to the farmers which could help them in correcting the deficiency of micro nutrients in the soil and adopting the balanced use of fertilisers. The Government may also consider for providing soil health cards to each of the farm holding indicating the fertility status and soil reaction of his entire holding. The programme may be chalked out to take soil analysis in a systematic manner so as to encourage the balanced and efficient use of fertilisers.

5.22 The fertiliser use efficiency in the country is very low especially in the problem soils and in the areas affected with soil moisture stress and excess soil moisture/water situations. Whereas the technologies developed by the ICAR-SAUs research systems with regards to fortification and placement of fertiliser in such areas needs to be propagated there is also need for carrying out further research on this aspect so as to find out better and efficient materials and application techniques.

5.23 In the field of mechanization the progress in the country has remained very slow. This could be because of huge manpower resources we have and traditional practice of using animal power in

farming. Although, the research seems to have developed several improved implements and machines, both power operated and manual/ bullock power operated, but somehow such machines have not become popular with the farmers. This could be because of inadequate availability, poor quality and high prices. The sector seems to have also suffered because of reservation of manufacture of farm machines and implements in the small sector. There is need to give a big push to this sector so as to make available the cost effective and efficient farm machines and implements. In these days getting the various agricultural operations done scientifically, efficiently and in time is of vital necessity. It is only then it would be possible to produce the agricultural commodities at low unit costs of production which could be considered competitive. Efficiency of operations, be that placement of seeds or fertilisers, application of irrigation water, spraying of pest controlling materials, transplanting or harvesting, would be required if the farmers are to get the best in terms of their investments and efforts. Unfortunately, the scheme implemented by the DAC for the development of new machines have not yielded the desired results. Therefore, the Working Group suggests that a major programme for the development, fabrication and mass production of efficient farm machines and implements be prepared and implemented. It would be necessary to involve private sector in mass production and supply of efficient machines and implements by providing them designs developed by the public research system. The adequate credit support to the farmers would also be necessary to help them reap the benefits of mechanization and develop their on-farm resources.

5.24 Our cost of production is very high as compared to the other countries because of which the country is facing a problem in exporting farm produce. There is need to develop and propogate energy conservation and time saving devices useful in precision farming. Selective mechanization for some of the operations like seeding/ transplanting, harvesting, threshing and cleaning will help in carrying out operations timely, efficient use of resources and in reducing the cost of cultivation.

5.25 Because of tropical climate which is hot and humid and conducive to the growth of insect-pests and diseases, agriculture in India faces an increasing challenge in the field of plant protection. The insect-pests and diseases cause severe losses to crops and the complete crop failures are not uncommon. The high use of inputs which is required for exploiting the potential of high yielding varieties and hybrids often results in increased pest damage. The indiscriminate use of pesticides in some areas, have resulted in resurgence of non target pests and resistance in some of the insect-pests against several insecticides. Because of this severe pest problem is being experienced in cotton, gram, redgram, rice, etc. The policy of the Government to encourage the adoption of IPM approach for the control of insect-pests and diseases seems to have been encouraging as the

pesticides consumption has declined from 75000 tonnes in 1990-91 to 46000 tonnes in 1999-2000. However, there is need to strengthen the infrastructure and machinery for effective and timely surveillance and forecast for likely outbreak / infestation of insects-pests and diseases. Unless the surveillance and forecast system is strengthened adequately the IPM concept will not work. Besides, adequate infrastructure for multiplications of bio control agents have also to be developed with private sector involvement so as to facilitate the use of such agents by the farmers for the pest management. The Dte. PPQ&S/ ICAR-SAUs research system also need to develop IPM protocols for all the crops and for all the regions of the country so as to encourage the adoption of cultural and biological pest management methods.

5.26 The pesticide residue is becoming a major health hazard for the human being and is also polluting the environment. Besides discouraging the use of pesticides farmers need to be educated on proper use of pesticides if such a necessity arises. The pesticide residue testing facilities in the country are not adequate enough to take up the regular monitoring of pesticides residues in the farm produce which off late is being experienced increasingly. The testing facilities for pesticides as such are also limited which are required to be taken up under the implementation of Insecticide Act, 1968 and to ensure the supply of quality pesticides to the farmers. Therefore, testing facilities/ infrastructure for quality control and pesticide residue testing in farm produce are required to be strengthened at central level as well in the States where these are lacking.

5.27 The extension machinery in the country was strengthened through the World Bank aided project T&V. The system has worked well till recently. But now this VLW and community development block based manual extension system seems to has become outmoded and got to be replaced with more vibrant system using information technology, electronic media and print media. The private sector also needs to be encouraged to enter into the field of agriculture extension on self sustaining basis.

5.28 The ICAR has also developed a huge extension infrastructure in the form of KVKs, besides implementing Institute Village Linkage Programme (IVLPs) of extension. However, there seem lack of coordination and linkages between ICAR infrastructure and state/district extension programmes. There seems a need to review the role of KVKs in direct extension support to farmers and forge the strong linkages with district/state extension machinery, if not bringing them under the direct control of DAC and the states since extension is in their mandates.

5.29 Credit is an important input which help farmers adopt the improved crop production technologies and develop on-farm

resources/infrastructure. However, with the collapse of cooperative credit infrastructure in most states farmers are facing grave difficulties and paying exorbitant interest on the lending by local/village money lenders. Therefore, measures are required to facilitate agriculture credit availability which would be necessary to enhance the productivity and achieve the targeted growth in the sector.

5.30 The Minimum Support Price(MSP) Scheme and procurement operation of foodgrains and some other crop commodities have helped farmers in increasing production by way of providing them a guaranteed market at remunerative price. However, the operation seems to have benefited only to some States /areas and especially to comparatively bigger farmers who have surplus produce to market. In other areas the distress sale has continued because of lack of procurement operations. It is suggested that, if MSP scheme and procurement operations are to be continued, these should be operated all over the country so that a large population of farmers is benefited and they are saved of exploitation by the local traders. In fact the problem of over flowing foodgrains stocks with FCI and States, which has reached about 60 million tonnes, calls for a review of MSP operations to chalk out a cost effective strategy and alternatives.

5.31 To sum up, the Working Group recordss that the infrastructure development is more crucial to bring agriculture on the fast track of growth. The Prime Minister's *'Gram Sadak Yojana'* with an investment of Rs.2500 crore annually, is likely to bring a sea change in the rural areas. Similar intensive developmental programmes on an extensive scale for rural electrification and minor irrigation are also needed. The rural road, power, credit and unrestricted domestic trade with free movement of agricultural commodities across the states and the proactive policy support are essential elements to be provided by the Government. Other developmental activities like agro-processing, rural cottage industries, markets, etc. are likely to follow in a natural course.

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