

TFYP WORKING GROUP Sr.No.14/2001

REPORT OF
THE WORKING GROUP ON

HORTICULTURE DEVELOPMENT
(Fruits, Vegetables, Tuber Crops, Floriculture, Medicinal
& Aromatic Plants, Spices, Plantation Crops including
Tea, Coffee and Rubber)

FOR
THE TENTH FIVE YEAR PLAN

(Main Report)

**GOVERNMENT OF INDIA
PLANNING COMMISSION
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PREFACE

Over the years, horticulture has emerged as one of the potential agricultural enterprise in accelerating the growth of economy. Its role in the country's nutritional security, poverty alleviation and employment generation programmes is becoming increasingly important. It offers not only a wide range of options to the farmers for crop diversification, but also provides ample scope for sustaining large number of Agro-industries which generate huge employment opportunities. At present, horticulture is contributing 24.5% of GDP from 8% land area.

During the previous two Plan periods, focused attention was given to horticultural research and development. The result has been encouraging. On account of significant production increases in horticultural crops across the country, a Golden Revolution is in the offing and India has emerged as a leading player in the global scenario. We have now emerged as the world's largest producer of coconut and tea and the second largest producer and exporter of tea, coffee, cashew, spices exports of fresh and processed fruits, vegetables, cut flowers, dried flowers have also been picking up

As a result of a number of thoughtful research, technological and policy initiatives and inputs, horticulture in India, today, has become a sustainable and viable venture for the small and marginal farmers. It is a matter of satisfaction that their food consumption levels and household income have increased. Besides, this sector has also started attracting entrepreneurs for taking up horticulture as a commercial venture. Therefore, there is a great scope for the horticulture industry to grow and flourish.

The growth of any enterprise on a notional scale pre-supposes sound and responsive infrastructure. During the past several years, we have created commensurate infrastructure facilities for horticultural research, education and development in the country in terms of setting up of institutes, National Research Centres, All India Coordinated Research Projects, establishment of separate Departments of Fruits, Vegetables, Floriculture in several State Agricultural Universities

and carving out State Departments of Horticulture from the erstwhile Agriculture Departments in many of the States. About 10 per cent of the total budget of Indian Council of Agricultural Research (ICAR) and 17 per cent of the total budget of the Department of Agriculture & Cooperation (DAC) has been earmarked for the horticulture sector during the IX Plan. There is no doubt that the tempo generated during the IX Plan will be accelerated, during the next plan and to meet the aspirations of the farmers of the country besides providing the needed nutritional security to the Indian population.

The planning process for the development of horticulture during the X Plan has commenced with the constitution of the Working Group on Horticulture Development covering fruits, vegetables, potato, tropical tubercrops, mushroom, floriculture, medicinal & aromatic plants, plantation crops and spices. To ensure greater participation of various departments of Government of India, State Govts and other public and private institutes and individual farmers, 13 Sub-Groups were constituted, each with about 10 members with outstanding and experienced individuals in various fields both from within and out of the Working Group. While 7 groups were devoted to various horticultural crops, the remaining 6 were devoted to related issues concerned with production & export.

This report is the outcome of the deliberations of the Working Group, which held four meetings, besides the reports submitted by 13 Sub-Groups.

The report has been divided into 17 Chapters covering various commodities and sectors of horticulture. Efforts have been made to highlight the current status of horticulture industry in terms of area, production productivity & exports, future demand, infrastructure available for the same, constraints, progress during the Ninth Plan, opportunities and strategies to achieve objectives, organisational and infrastructure support besides drawing programmes for the X Plan. The emerging trends in deployment of hi-tech horticulture have also been discussed in detail. An attempt has been made to provide recommendations, which could result into action programmes for accelerating the growth of the horticulture sector. The report of the Sub-Groups has been given separately in Volume II.

The task assigned has been a challenging one, the accomplishment of which would not have been possible without the cooperation and support of many. I take this opportunity to place on record my thanks to all the members of the Working Group for their active participation in the deliberations and for providing necessary guidance and inputs for drawing the recommendations.

I also express my sincere thanks to the Chairmen and Member Secretaries of all the 13 Sub-Groups for their valuable inputs. I also take this opportunity to thank the Members of various Sub-Groups for their participation and contribution in the finalization of the detailed Sub-Group report.

My special thanks are due to Dr.H.P.Singh, Horticulture Commissioner, Govt. of India, who as a Member Secretary,for chairing two Sub-Group, providing the logistic support for organising the meetings and finalising the report. Thanks are also due to Shri J.P.Negi, Executive Director, National Horticulture Board and his staff for providing facilities for holding two meetings of the Working Group at their premises at Gurgaon. I shall also like to record my thanks to Shri R.S. Kanade, Director Agriculture, Planning Commission for participation in all the meetings and sharing his views on the X Plan formulations.

The assistance and support rendered by Dr. P. Rethinam, Chairman, Coconut Development Board, in finalising the report of the Working Group is gratefully acknowledged.

I am highly thankful to Dr. Jose C. Samuel, Additional Commissioner (Horticulture), New Delhi, Dr. K. Sivaraman, Director, Directorate of Arecanut and Spices, Smt. Remya Gopalakrishnan, Deputy Director, Coconut Development Board, Shri P. K. Thampan, retired Chief Coconut Development Officer, Coconut Development Board, Kochi for their unstinted help in compiling and finalising this report.

I am thankful to Shri J.N.L. Srivastava IAS, Secretary ,Department of Agriculture & Cooperation (DAC) and Shri Hemendra Kumar IAS, Special Secretary, (DAC) for extending help in terms of the Officers and Staff of Horticulture Division, DAC.

I, personally, feel honoured and thankful to the Planning Commission for giving me the opportunity to head the Working Group on Horticulture Development. The Terms of Reference drawn by the Planning Commission is worthy of appreciation, which has been the guiding principle for the Working Group.

I hope this report would prove to be a useful document for finalising the strategies and programmes for the holistic development of horticulture in the country during the Tenth Plan and will usher in an era of nutritional sufficiency and prosperity among the populace of the country.

Dated 30th June, 2001

(Dr. K.L. Chadha)
Chairman
Working Group on Horticulture
And Plantation Crops

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[Annexure 2](#) Constitution of Sub-Group on Fruits to assist the Working Group on Horticulture Development including Spices, Aromatic & Medicinal Plants and Plantation Crops for formulation of the Tenth Five Year Plan (2002-07)- Regarding.

[Annexure 3](#) Constitution of Sub-Group on Vegetables (Root & Tuber Crops and Mushroom) to assist the Working Group on Horticulture Development including Spices, Aromatic & Medicinal Plants and Plantation Crops for formulation of the Tenth Five Year Plan (2002-07)- Regarding.

[Annexure 4](#) Constitution of Sub-Group on Floriculture to assist the Working Group on Horticulture Development including Spices, Aromatic & Medicinal Plants and Plantation Crops for formulation of the Tenth Five Year Plan (2002-07)- Regarding.

[Annexure 5](#) Constitution of Sub-Group on Medicinal & Aromatic Plants to assist the Working Group on Horticulture Development including Spices, Aromatic & Medicinal Plants and Plantation Crops for formulation of the Tenth Five Year Plan (2002-07)- Regarding.

[Annexure 6](#) Constitution of Sub-Group on Spices to assist the Working Group on Horticulture Development including Spices, Aromatic & Medicinal Plants and Plantation Crops for formulation of the Tenth Five Year Plan (2002-07)- Regarding.

[Annexure 7](#) Constitution of Sub-Group on Plantation Crops-I (Palms, Cashew & Cocoa) to assist the Working Group on Horticulture Development including Spices, Aromatic & Medicinal Plants and Plantation Crops for formulation of the Tenth Five Year Plan (2002-07)- Regarding.

[Annexure 8](#) Constitution of Sub-Group on Plantation Crops-II (Coffee, Tea, Rubber etc.) to assist the Working Group on Horticulture Development including Spices, Aromatic & Medicinal Plants and Plantation Crops for formulation of the Tenth Five Year Plan (2002-07)- Regarding.

[Annexure 9](#) **Constitution of Sub-Group on Infrastructure for Horticulture to assist the Working Group on Horticulture Development including Spices, Aromatic &**

Medicinal Plants and Plantation Crops for formulation of the Tenth Five Year Plan (2002-07)- Regarding.

[Annexure 10](#) Constitution of Sub-Group on Exports, WTO Issues, Quality Control of Horticultural Produce to assist the Working Group on Horticulture Development including Spices, Aromatic & Medicinal Plants and Plantation Crops for formulation of the Tenth Five Year Plan (2002-07)- Regarding.

[Annexure 11](#) Constitution of Sub-Group on Organisational Support for Horticulture to assist the Working Group on Horticulture Development including Spices, Aromatic & Medicinal Plants and Plantation Crops for formulation of the Tenth Five Year Plan (2002-07)- Regarding.

[Annexure 12](#) Constitution of Sub-Group on Hi-Tech Horticulture to assist the Working Group on Horticulture Development including Spices, Aromatic & Medicinal Plants and Plantation Crops for formulation of the Tenth Five Year Plan (2002-07)- Regarding.

[Annexure 13](#) Constitution of Sub-Group on Human Resource Development in Horticulture to assist the Working Group on Horticulture Development including Spices, Aromatic & Medicinal Plants and Plantation Crops for formulation of the Tenth Five Year Plan (2002-07)- Regarding.

[Annexure 14](#) Constitution of Sub-Group on Bee-Keeping to assist the Working Group on Horticulture Development including Spices, Aromatic & Medicinal Plants and Plantation Crops for formulation of the Tenth Five Year Plan (2002-07)- Regarding.

[Annexure 15](#) Minutes of the meeting of the working group on horticulture development for formulation of Tenth Five Year Plan held under the chairmanship of Dr. K. L.

Chadha on 29th December 2000 at Krishi Bawan, New Delhi

[Annexure 16](#) Minutes of the second meeting of the working group on horticulture development for formulation of Tenth Five Year Plan held under the chairmanship of Dr. K. L. Chadha on 25th January, 2001 at National Horticulture Board, Gurgaon

[Annexure 17](#) Minutes of the third meeting of the working group on horticulture development for formulation of Tenth Five Year Plan held under the chairmanship of Dr. K. L. Chadha on 22nd and 23rd March, 2001 at National Horticulture Board, Gurgaon

[Annexure 18](#) Minutes of the fourth meeting of the working group on horticulture development for formulation of Tenth Five-Year plan held under the chairmanship of Dr. K. L. Chadha on 26th April, 2001 at Krishi Bhavan, New Delhi

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CHAPTER - I

INTRODUCTION

1. INTRODUCTION

The horticulture sector encompasses a wide range of crops e.g., fruit crops, vegetables crops, potato and tuber crops, ornamental crops, medicinal and aromatic crops, spices and plantation crops. While the first few Five Year Plans assigned priority to achieving self sufficiency in food grain production, over the years, horticulture has emerged as an indispensable part of agriculture, offering a wide range of choices to the farmers for crop diversification. It also provides ample opportunities for sustaining large number of agro-industries which generate substantial employment opportunities. The horticulture sector contributes about 24.5% of the GDP from about 8% of the area.

2. PLANNING PROCESS

The planning process in the country, through the Five Year Plans, has been instrumental in creating favourable policy environment, through earmarking resources for different sectors to ensure the overall development of the country. Even though, separate allocation for horticulture sub-sector started from the IV Plan onwards, this sub-sector attracted the attention of the planners only from the VII Plan onwards. There was a quantum leap during the VIII Plan in financial allocation for horticulture development programmes, which was sustained even during the IX Plan. The Working Groups constituted by the Planning Commission during the VIII and IX Plans provided the necessary directions in setting priority for programmes in horticulture development. Now that, the IX Plan will be ending in March 2002, the Planning Commission has initiated advance action for the formulation of the X Five Year Plan by constituting a number of groups to cover various national activities.

3. CONSTITUTION OF WORKING GROUP

A Working Group on Horticulture Development (covering fruits, vegetables, floriculture, potato, tropical tuber crops, ornamental crops, medicinal and aromatic plants, spices and plantation crops) has also been constituted for the formulation of the X Five Year Plan (2002-07) vide orders No. M-12043/6/2000-Agri and 12043/6/2000-Agri dated 11.12.2000. It has the following membership.

- i. **Dr. K.L.Chadha,**
National Professor,
Former DDG (Horticulture),
Division of Fruits & Horticulture,
IARI Campus,
Pusa,
New Delhi-110012. - **Chairman**
- ii. **Dr. Manmohan Attawar,**
Chairman & Managing Director,
Indo- American Hybrid Seeds,
17th Cross , 2nd A Main, BSK, 2nd stage,
Bangalore- 560070. - **Member**
- iii. **Dr. Vishnu Swaroop,**
Indo- American Hybrid Seeds,
M-56, Palika Bhavan, Sector-13,
R.K.Puram,
New Delhi- 110 066. - **Member**
- iv. **Dr. P.Pushpangadan,**
Director,
National Botanical Research Institute,
Rana Pratap Marg,
Lucknow-226001. - **Member**
- v. **Dr. S.P.Ghosh,***
DDG (Horticulture),
ICAR, Krishi Bhavan,
New Delhi-110001. - **Member**

* Due to the retirement of Dr. S.P. Ghosh, DDG(Hort.), Dr. R.N. Pal, Acting DDG(Hort.) attended the Working Group meetings.

- vi. **Mr. N.K. Das** - **Member**
Chairman,
Tea Board,
14, Biplabi Trailokya Maharaj,
Sarani, (Brabourne Road),
Calcutta – 700 001
- vii. **Mrs. Lakshmi Venkatachalam** - **Member**
Chairperson,
Coffee Board,
No.1, Dr. Ambedkar Veedhi,
Bangalore – 560 001
- viii. **Mr. S.M. Desalphine** - **Member**
Chairman,
Rubber Board,
Ministry of Commerce, Govt. of India,
PB No.1122,
Kottayam – 682 002
- ix. **Mr. J.K.Thomas,** - **Member**
Former President ,
United Planters Association of South India,
Malankara Rubber & Produce Co. Ltd.,
Malankara Building, Kodimata,
Kottayam – 686039
- x. **Mr. N.Bose Mandanna** - **Member**
Vice Chairman,
Coffee Board,
Subramanya Estate,
PB No.12,
Sunti Coppa Post- 571237, Kodagu.
- xi. **Mr. M.H.Ashraf** - **Member**
President,
United Planters Association of
South India (UPASI),
M.D. Tata Coffee Limited,
N- 502, North Block ,Manipal Centre,
47, Vickenson Road,
Bangalore- 560052
- xii. **Mrs. Amita Prasad** - **Member**
Director (Plantation),

Department of Commerce,
Udyog Bhavan,
New Delhi-110001

- xiii. **Mr. K.N. Reddy** - **Member**
113, Keshavayinigunta,
Tirupati – 517 501
- xiv. **Dr. Narayan G. Hegde** - **Member**
BAIF Development Research Foundation,
BAIF Bhavan,
Dr. Manibhai Desai Nagar, Warje,
Pune- 411 029
- xv. **Dr. H.P.Singh,** - **Member**
Horticulture Commissioner,
Deptt. Of Agriculture & Cooperation, **Secretary**
Ministry of Agriculture,
Krishi Bhavan,
New Delhi-110001

4. TERMS OF REFERENCE

Terms of References of the Working Group are;

- i) To review the progress and performance of horticulture and plantation crops in terms of objectives, strategies and thrust given during IX Five Year Plan.
- ii) To study present status of research and development in horticulture and plantation crops, supply of seed and planting material, their quality and adequacy on a large scale and strategies for area expansion for diversification of Indian agriculture.
- iii) To identify the constraints in implementation of programmes of development of horticulture and plantation crops, suggest modifications and remedial measures with a view to make horticulture and plantation sub-sector more vibrant and efficient.
- iv) To review the existing status of small and marginal farmers of horticulture crops and small growers of plantation crops and identify their basic needs for development of these sub-sectors including backyard horticulture and formulate an appropriate strategy so as to make them active participants in the overall development.

- v) To assess the progress in recent techniques in horticulture and plantation crops (micro-propagation, hybrid seed and seedlings production, high density planting, integrated nutrient management, use of bio-fertilizers, micro-irrigation, fertigation, organic farming, integrated pest management and use of bio-pesticides, molecular diagnostics, pesticide residues, etc.)
- vi) To assess and study the present status of Infrastructure development for post harvest management of horticulture and plantation crops such as washing, cleaning, grading/sorting, packaging, transportation, storage and marketing, besides identifying constraints and recommend suitable measures for strengthening the infrastructure and positioning the same in strategic locations to meet the challenges of growing population in the domestic market and expanding scope of exports in the international market.
- vii) To assess the impact of World Trade Organization (WTO) Regime on horticulture and plantation sub-sector, identify the factors governing competitiveness and suggest appropriate measures for level playing field in the international market.
- viii) To study and recommend suitable measures for production for export of spices, medicinal and aromatic plants, floriculture products and suggest suitable measures for increasing the exports of these products.
- ix) To critically review the Indian standards for quality and purity of the products derived from horticulture and plantation sub-sectors and to suggest suitable measures for upgrading, so as to meet the quality standards at par with available international level.
- x) To study the need and urgency for promotion of human resource development in horticulture and plantation sub-sectors.
- xi) To study the status of the existing organizations, both formal and informal, dealing with horticulture and plantation sub-sectors, review their effectiveness in promoting the growth and development of this sector and suggest measures for increasing their effectiveness for the cause of development of the sub-sector, including promotion of human resource development.
- xii) To assess the status of existing regulatory framework of seed and planting material required for horticulture and plantation crops.
- xiii) To study the modes and methods for establishing the complementarity of public and private sector investment in horticulture and plantation sub-sectors.

The Working Group was given a time limit of three month to submit its report by 31st March. Since the report of the Sub-Group on Plantation Crops II comprising

coffee, tea and rubber could not be submitted along with reports of other groups, the work of finalization of the report was delayed. Accordingly the Planning Commission was requested to extend the date of submission of the report till 30th June, 2001.

5. CONSTITUTION OF SUB GROUPS

The Chairman of the Working Group was authorized to constitute various sub-groups keeping in view of the terms of references. Accordingly, 13 sub-groups dealing with various crops and issues related to horticulture development were constituted drawing members from central and state governments, ICAR and its institutes, SAUs, entrepreneurs and farmers in the respective field. While some of the sub-groups were headed by the members of the Working Group, for other sub-group eminent people in the field were identified to act as chairmen of sub-groups. A list of chairmen and member secretaries of each sub-group are given in Table 1.1. The constitution of the various Sub-Groups are given in the Annexures 2 to 14.

Table 1.1. Chairmen and Member Secretaries of Sub-Groups of Working Group on Horticulture

Sl. No	Sub Group	Chairman	Member Secretary
I.	Fruits	Dr. I.S.Yadav, Director (Retd.), IIHR, Bangalore, XIII, Sadar Bazar, New Delhi - 110006	Dr. R.K. Pathak, Director, Central Institute of Sub- tropical Horticulture, Rehmankhara, Kakori (P.O.), Lucknow - 226002
II.	Vegetables	Dr. Vishnu Swaroop, Indo American Hybrid Seeds, M-56, Palika Bhavan, Sector 13, R.K.Puram, New Delhi - 110066	Dr. B.S. Dhankar, ADG (Vegetables), ICAR, Krishi Bhavan, New Delhi - 110001

III.	Floriculture	Dr. Manmohan Attawar, Chairman & Managing Director, Indo-American Hybrid Seeds, Bangalore - 560070	Dr. M.L. Chaudhury, Head, Division of Floriculture, IARI, New Delhi - 110 012
IV.	Medicinal & Aromatic Plants	Dr. P. Pushpangadan, Director, National Botanical Research Institute, Rana Pratap Marg, Lucknow -226001	Dr. S. B. Maiti, Director, National Research Centre on M&AP, Boriavi, Anand -387310
V.	Spices	Dr. R.N. Pal, Deputy Director General (Hort.), ICAR, Krishi Bhavan, New Delhi -110001	Dr. Y.R. Sarma, Director, Indian Institute of Spices Research, Marikunnu, Calicut - 673012
VI.	Plantation crops -I	Dr. P. Rethinam, Chairman, Coconut Development Board, Cochin -682 011	Dr. K. Sivaraman, Director, Directorate of Arecanut & Spices, West Hill, Calicut -673 005
VII.	Plantation crops-II	Mr.S.M. Desalphine, Chairman, Rubber Board, Kottayam - 682002	Dr. R. Naidu Director of Research, Coffee Board, Bangalore - 560001
VIII.	Infrastructure	Mr. J.P. Negi, Executive Director, National Horticulture Board, 85, Institutional Area, Sector 18, Gurgaon - 122015	Mr. H.K. Sharma, Director (Hort.), Department of Agriculture and Cooperation, Krishi Bhavan, New Delhi - 110001
IX.	Exports	Mr. D. Rajagopalan, Chairman, APEDA, NCUI Building, Khelgaon Marg, New Delhi -110016	Mr. Arvind Gupta, Addl. Executive Director, NHB, 85, Institutional Area, Sector 18, Gurgaon -122015

X.	Organisational Support	Mr. Satish Chander, Joint Secretary (NHB), Department of Agriculture & Cooperation, Krishi Bhavan, New Delhi -110001	Mr. Paramjit Singh, Deputy Commissioner (Hort.), Department of Agriculture & Cooperation, Krishi Bhavan, New Delhi -110 001
XI.	Hi-Tech Horticulture	Dr. H.P. Singh, Horticulture Commissioner, Department of Agriculture & Cooperation, Krishi Bhavan, New Delhi -110001	Dr. Jose C. Samuel, Deputy Commissioner (SWC-E), Department of Agriculture & Cooperation, Krishi Bhavan, New Delhi -110001
XII.	Human Resource Development	Dr. R.P. Awasthi, Vice Chancellor, YS Parmar University of Horticulture & Forestry, Solán -173230	Dr. K.K. Jindal, Director of Research, Y. S. Parmar University of Horticulture and Forestry, Nauni, Solán -173230
XIII.	Bee-Keeping	Dr. H.P. Singh, Horticulture Commissioner, Department of Agriculture & Cooperation, Krishi Bhavan, New Delhi -110001	Dr. Jose C. Samuel, Deputy Commissioner (SWC-E), Department of Agriculture & Cooperation, Krishi Bhavan, New Delhi -110001

6. MEETINGS HELD

The first meeting of working group was held on 29th December, 2000. During the meeting it was felt that it was necessary to constitute various sub-groups to go into the detailed aspects of various issues related to horticulture development.

The second meeting was held on 21st January, 2001. A brainstorming session was held to identify issues, which needed attention.

The third meeting of the working group on 22nd & 23rd March, 2001 was mainly devoted to presentation and discussion of the reports of the sub-groups which were presented by their respective Chairman/Member Secretary. The final

report of the Working Group is based on the recommendations of these sub-groups, which has been discussed in subsequent pages of this report.

The fourth meeting was held on 26th April, 2001. The minutes/proceedings of all the meetings of the Working Group are given in the Annexures 15 to 18.

CHAPTER – II

AREA, PRODUCTION AND PRODUCTIVITY

1. INTRODUCTION

India, with its wide variability of climate and soil, is highly favourable for growing a large range of horticultural crops such as fruits; vegetables, potato, tropical tuber crops and mushroom; ornamental crops; medicinal and aromatic plants, spices and plantation crops like coconut, green nut, cashew, cocoa, tea, coffee and rubber.

A major emphasis was laid by the Government of India in achieving self-sufficiency in food production especially cereals immediately after attaining independence in 1947. The efforts successfully brought in Green Revolution in the late Sixties and early Seventies. It also showed that horticulture crops for which the Indian topography and agro-climate is well suited could be an ideal choice in achieving sustainability by small farmers. However, only in mid Eighties did the Govt. of India identify horticulture crops as a means of diversification for making agriculture more profitable through efficient land use, optimum utilization of natural resources (soil, water and environment) and creating skilled employment for rural masses especially women folk. The past efforts have been rewarding in terms of increased production and productivity and availability of horticultural produce. India has thus emerged as the largest producer of coconut, arecanut, cashew, ginger, turmeric, black pepper and tea, and the second largest producer of fruits and vegetables. Among the new crops, kiwi, olive crops and oil palm have been successfully introduced for commercial cultivation in the country.

The changing scenario encourages private investment, to go for hi-tech horticulture with micro-propagation, protected cultivation, drip irrigation, fertigation, and integrated nutrient and pest management, besides making use of latest post harvest

measures particularly in the case of perishable commodities. As a result, horticulture crop production has moved from rural confines to commercial ventures and has attracted youth since it has proved to be intellectually satisfying and economically rewarding.

2. ADVANTAGES OF DIVERSIFICATION

Diversification in Horticulture is the best option as there are several advantages of growing horticultural crops. These crops:-

- Produce higher biomass than field crops per unit area resulting in efficient utilization of natural resources.
- Are highly remunerative for replacing subsistence farming and thus alleviate poverty in varied agro-ecosystems like rainfed, dryland, hilly, arid and coastal.
- Have potential for improvement of wastelands through planned strategies.
- Need comparatively less water than many other field crops.
- Provide higher employment opportunities.
- Are important for nutritional security.
- Are environment-friendly.
- Have a high potential for value addition.
- Have high potential for foreign exchange earning.
- Make higher contribution to GDP (24.5 per cent from an area of 8.5 per cent.)

3. R & D IN HORTICULTURE

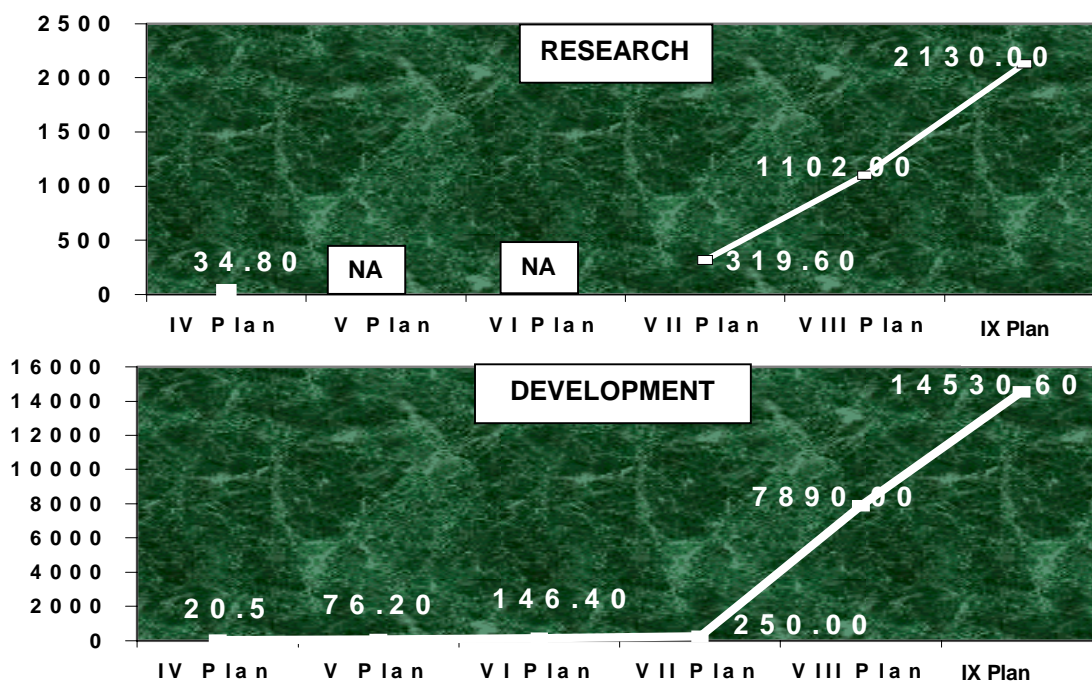
Horticulture development was at very low ebb till the third Five-Year Plan and received meager attention even thereafter. However, the plan investment in horticulture development increased significantly since the VIII Five Year Plan which resulted in considerable strengthening of the horticultural development programmes in the country.

The Plan allocation for research on horticulture crops by the Indian Council of Agricultural Research (ICAR) was first made in IV Plan with a modest allotment of Rs. 34.8 million. This was enhanced to Rs. 319.6 million, 1,102 million, 2,130 million during

the VII, VIII and IX Plan respectively. At present, it is about 10 per cent of the total outlay for agricultural research made by the ICAR.

Starting with a meagre financial allocation of Rs. 20.5 million for development in IV Plan, it rose to Rs.76.2 million in V, Rs. 146.4 million in VI, Rs. 250 million in VII, Rs. 10,000 million in VIII (utilization Rs.7890 million) and Rs.14530.6 million in IX Plan (Fig.2.1).

Fig. 2.1 Plan allocation for horticulture research and development (Rs. In millions)



While the increase in budgetary allocation from IV to IX Plan was 61 times for research, it was 584 times in respect of development programmes

In addition, the Ministry of Commerce has been promoting research, development and exports of cardamom, tea, coffee, and rubber through the Commodity Boards set up for the purpose namely Spices Board, Tea Board, Coffee Board and Rubber Board respectively. Also, an Agriculture Produce Export Development Authority (APEDA) has been set up under the aegis of the Commerce Ministry for promoting export of horticultural commodities both fresh as well as value added products. Indirect organizational support for horticulture development is also being provided by two agencies in Ministry of Agriculture namely National Cooperative Development Corporation (NCDC) and National Agricultural Cooperative Marketing Federation

(NAFED). The details about organisational support in horticulture have been discussed in chapter VIII.

Focused attention to horticultural research and development has paid dividend by way of increased production and productivity and enhanced exports. Large areas have been brought under improved cultivars as a result of considerable increase in production of quality planting material and seeds. A large number of farmers were trained in innovative technologies like drip irrigation, green house cultivation, micro grafting etc.

4. CHANGING SCENARIO

As a result of the above efforts, significant progress has been made in area expansion resulting in higher production. Besides, use of modern technologies has also brought about improvement in productivity. More than 50 per cent increase in production is seen in many of the horticulture crops between 1991-92 and 1998-99 (Table 2.1).

Table 2.1 Area and production of important horticultural crops in India

(Area '000 ha., Production '000 tonnes)

Crops	1991-92		1998-99		increase over 1991-92	
	Area	Production	Area	Production	Area (%)	Production (%)
Fruit	2870	28630	3729	44042	29.93	53.83
Vegetable	5140	58530	5870	87530	14.20	49.55
Mushroom	NA	NA	N A	40	---	---
Flowers	NA	NA	74	459	---	---
Medicinal & Aromatic Plants	NA	NA	NA	NA	---	---
Spices	2005	1900	2500	2907	24.69	53.00
Coconut	1530	6930	1910	10270	24.84	48.20
Arecanut	212	240	277	330	30.66	37.50
Oil Palm	8	12	50	75	525.00	525.00
Cashew	530	300	730	460	37.74	53.33
Tea	420	754	436	870	3.81	15.38
Coffee	279	180	329	265	17.92	47.22
Rubber	325	367	387	605	19.08	64.85
Cocoa & Others	14	7	12	820	-	-
Total	13333	97850	16304	148673	21.28	51.94

NA - Not available

Between 1991-92 to 1998-99, there has been a significant increase in area and production of various horticultural crops. The total area during 1998-99 was 16.30 million ha with a production of 148.67 million tonnes.

While the area under horticultural crops increased by 21.28 per cent between 1991-92 and 1998-99, the production increased by 51.94 percent thus indicating a boost in production due to increased productivity besides area expansion. The maximum increase in area took place under oil palm followed by fruits cashew, arecanut and fruits. The increase in production was also highest in oil palm followed by rubber, spices, fruits, cashew and vegetables.

The impact of increased production of horticultural produce has been reflected both by gluts in crops like onion and potato and increased value of exports in several other commodities.

4.1 Fruits

A large variety of fruits are grown in India. Of these mango, banana, citrus, pineapple, papaya, guava, sapota, jackfruit, litchi and grape, among the tropical and sub-tropical fruits; apple, pear, peach, plum, apricot, almond and walnut among the temperate fruits and aonla, ber, pomegranate, annona, fig, phalsa among the arid zone fruits are important. A comparison of area, production and productivity of different fruits during 1991-92 and 1998-99 is given in Table 2.2.

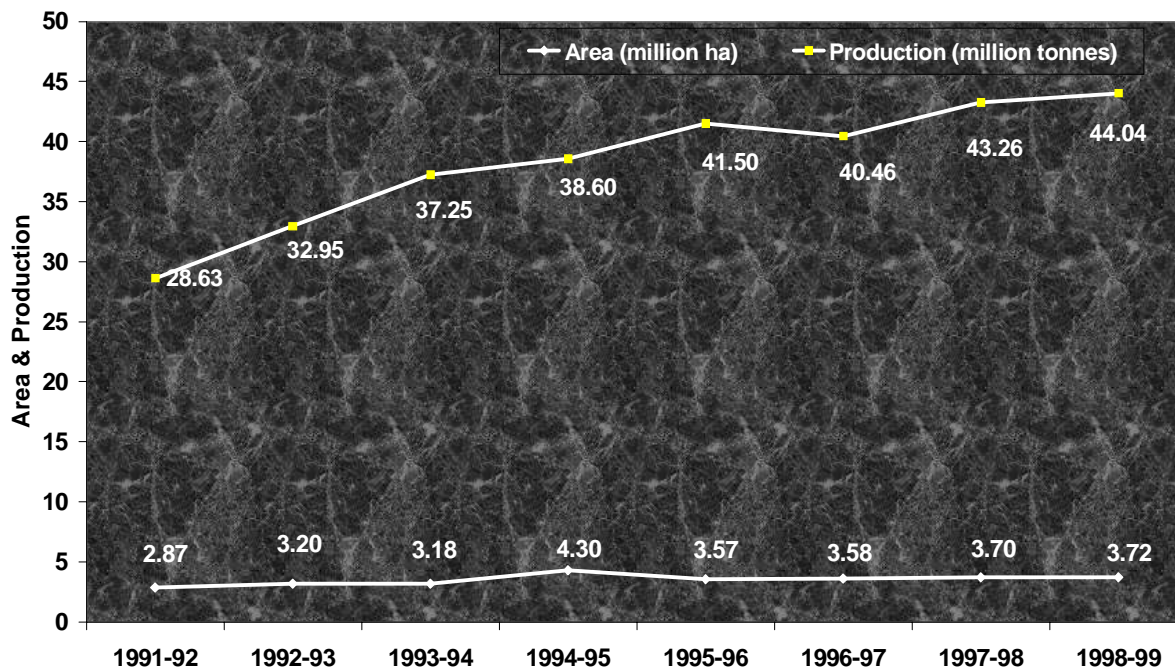
Table 2.2 Area and production of major fruit crops in India

(Area '000 ha., Production '000 tonnes)

Crop	1991-92		1998-99		Productivity (t /ha)	
	Area	Production	Area	Production	1991-92	1998-99
Apple	195	1148	231	1380	5.88	6.00
Banana	384	7790	464	15073	20.27	32.50
Citrus	387	2822	488	4575	7.21	9.40
Grapes	32	668	43	1083	20.87	25.40
Guava	94	1095	151	1800	11.64	11.90
Litchi	49	244	56	429	4.97	7.60
Mango	1078	87521	1401	9782	8.11	7.00
Papaya	45	805	68	1582	17.88	23.40
Pineapple	57	769	74	1006	13.49	13.60
Sapota	27	396	50	668	14.66	13.20
Others	526	4144	699	6664	787	-
Total	2874	28633	3725	44042	9.96	11.80

The trend of area and production of fruits since 1991-92 is depicted in Fig 2.2.

Fig 2.2 Area and Production of Fruits



India accounts for 10 per cent of the total world production of fruits. It leads the world in the production of mango, banana, sapota and acid lime and has recorded highest productivity in grape. India accounts for an area of 3.73 million ha under fruit crops with a production of 44.04 million tonnes. During the period 1991-92 to 1998-99 the area, production and productivity of fruits increased by 29.9, 53.8 and 18.4 per cent respectively. Fruit production increased five times i.e., from 5.5 million tonnes in 1952-53 to 28.63 million tonnes in 1991-92 and further eight times to 44.04 million tonnes by 1998-99.

Comparative area and production of fruits in various states is given in Table 2.3. The five largest fruit producing states are Maharashtra (17.08 per cent) Karnataka (12.37 per cent), Andhra Pradesh (10.42 per cent), Bihar (8.62 per cent) and U.P. (8.21 per cent). The highest average productivity is in Karnataka and Maharashtra states

(17.3 and 17.2 tonnes/ha), the least being 10.2 tonnes/ha in Uttar Pradesh.

Table 2.3 Area, production and productivity of fruits in major fruit growing states (1998-99)

(Area '000 ha., Production '000 tonnes)

State	1991-92		1998-99		Productivity (tonnes/ha)	
	Area	Production	Area	Production	1991-92	1998-99
ANDHRA PRADESH	313.1	4008.2	378.6	4589.6	12.80	12.12
BIHAR	266.9	2799.3	303.6	3797.2	10.49	12.51
GUJRAT	84.5	1828.9	163	2293.5	21.64	14.07
KARNATAKA	209.3	3191.8	314.6	5446.3	15.25	17.31
KERALA	236.3	1101.3	233.1	1621.2	4.66	6.95
MADHYA PRADESH	64.7	1245.0	63.1	1374.4	19.24	21.78
MAHARASHTRA	256.1	3518.4	436.1	7521.7	13.74	17.25
ORISSA	136.3	978.0	249.4	1718.4	7.18	6.89
TAMIL NADU	136.2	2316.1	213.5	5447.6	17.01	25.52
UTTAR PRADESH(HILL)	150.5	428.7	187.9	520.4	2.85	2.77
UTTAR PRADESH (PLAIN)	303.2	2449.8	305.2	3097.8	8.08	10.15
WEST BENGAL	111.3	1131.7	128	1536	10.17	12.00
Others	606.0	3634.8	750.7	5078.3	6.00	6.76
TOTAL	2874.4	28632.0	3726.8	44042.4	9.96	11.82

4.1.1 Mango

Mango is the most important fruit covering 37.60 per cent of area and accounting for 22.21 per cent of total fruit production in the country. India's share in the world production of mango is 54.2 per cent. The area and production of mango (1998-99) was 1.401 million ha with a production of 9.782 million tonnes. Major mango producing states are Andhra Pradesh, Bihar, Karnataka, Maharashtra and U.P. Andhra Pradesh ranks first in mango production with a share of 20 percent and highest in productivity. There has been an increase of 29.62 and 11.77 per cent in area and production respectively in mango between 1991-92 and 1998-99. Comparatively lesser increase in production seems to be due to larger areas under new plantations which are yet to come to full bearing stage.

4.1.2 Citrus

Citrus ranks second in total area with 0.488 million ha and 13.09 percent area under fruits with production of 4.575 million tonnes (10.39 per cent of total production under fruits). Limes, lemons, sweet orange and mandarin cover bulk of the area under this group of fruits. Cultivation of grapefruit and pummelo introduced decades back did not catch up commercially. Citrus fruits are grown mainly in the states of Maharashtra, Andhra Pradesh, Punjab, Karnataka and N.E. region. The increase in area and production of citrus in India (1991-92 to 1998-99) has been of the order of 28.20 and 63.12 per cent respectively. Productivity has increased from 7.21 to 9.40 t/ha (1991-92 to 1998-99). Area under Kogazi-lime has increased significantly all over the country.

4.1.3 Banana

Banana ranks third in area with 0.464 million ha covering 12.46 per cent of the total area. However, it is first in total production (15.07 million tonnes), being nearly one-third (34.22 per cent) of total fruit production. India occupies first position in banana production globally. Among the states, Tamil Nadu ranks first in area and production while productivity is highest in Maharashtra. Most of the banana is produced on a small scale basis in different production systems. Total increase in area and production of banana has been 21.05 per cent and 93.83 per cent respectively between 1991-92 and 1998-99. The phenomenal increase in production has been due to adoption of high density planting, use of tissue-cultured seedlings and drip irrigation, which significantly improved productivity.

4.1.4 Apple

Apple is the fourth major fruit crop of the country and occupies a total area of 0.231 million ha with production of 1.38 million tonnes. It is grown mainly in the states of Jammu and Kashmir, Himachal Pradesh, Uttaranchal and Arunachal Pradesh. Share of total area and production of apple in the total fruit production during 1998-99 was 6.2 and 3.13 per cent, respectively. While the total area under apple is highest in Himachal Pradesh, the productivity is highest in Jammu and Kashmir. Increase in area and production between 1991-92 and 1998-99 has been virtually of the same order i.e. 21.05 and 20.0 per cent respectively.

4.1.5 Guava

Guava is the fifth important fruit covering an area of 0.151 million ha with a total production of 1.8 million tonnes. This fruit accounts for 4.06 and 4.09 per cent of the total area and production, respectively. The increase in area and production in guava between 1991-92 and 1998-99 has been 66.66 and 63.63 per cent respectively.

4.1.6 Papaya

Papaya ranks sixth in area and production with 0.068 million ha (1.82 per cent) of the total area under fruits and 1.582 million tonnes (3.59 per cent) of the total production under fruits respectively. The increase in area and production between 1991-92 and 1998-99 has been 40.00 and 97.00 per cent respectively. The phenomenal increase both in area and production has been due to the development of several gynodioecious and high quality varieties in different states of the country.

4.1.7 Grape

Another fruit in which significant increase in area and production has taken place is grapes. Grape occupies 1.14 per cent of the total area with 2.56 per cent of the total production of fruits. The total area and production during 1998-99 were 0.043 million ha and 1.083 million tonnes respectively. Though primarily grown in Maharashtra, Andhra Pradesh, Karnataka and Tamil Nadu, it is also grown on a limited area in the plains of northern states. The area and production increases (1991-92 to 1998-99) have been 33.33 and 61.19 per cent respectively.

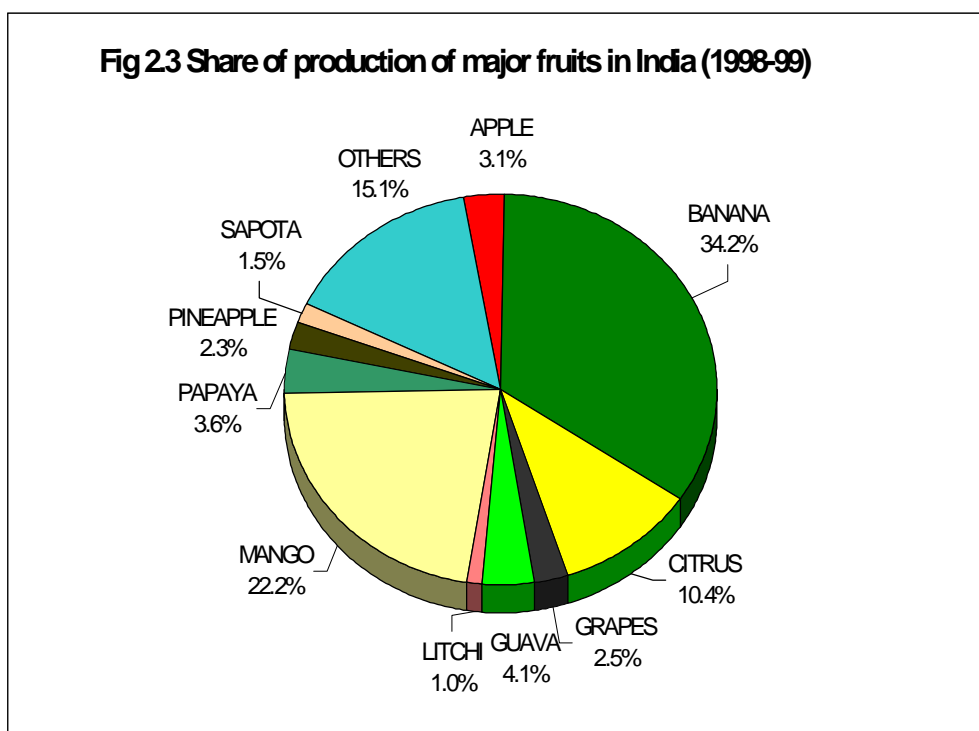
4.1.8 Litchi

Litchi is assuming importance owing to its high economic returns and export potential. It occupies 1.5 per cent of the total area and 0.97 per cent of total production of fruits (1998-99). It is largely grown in Bihar and has potential for its expansion in sub-tropical regions free from hot winds during April-May. It is grown in small pockets in Punjab, Haryana, U.P., West Bengal and N.E region. The increase in area and production of litchi (1991-92 to 1998-99) has been 20.0 and 79.16 per cent respectively.

4.1.9 Other Fruits

Pineapple and Sapota are other major fruits covering an area of 0.074 and 0.050 million ha with a production of 1.006 and 0.668 million tonnes respectively. Their share in total area and production of fruits is 1.99 and 1.35 per cent respectively. They also contribute 2.28 and 1.52 per cent respectively to the country's total fruit production. These are grown mostly in coastal belts of the country with Kerala, Karnataka, Tamil Nadu and Gujarat being the major states. The increase in area and production of these crops between 1991-92 to 1998-99 has been 16.66 and 29.87 per cent in pineapple and 133.33 and 65.00 per cent in sapota respectively. Comparatively less increase in productivity in sapota is possibly due to large areas yet to come to bearing.

The share of production of different fruits is given in Fig 2.3.



The arid zones of the country are potential areas for fruits like aonla, ber, pomegranate, annona etc. There has been a steady increase in the area and production of these fruits particularly aonla, ber and pomegranate in the country as a result of identification and development of suitable varieties and production technologies. In addition to these, date palm and fig cultivation is also finding favour in suitable areas.

There are a large number of indigenous fruits such as jackfruit (*Artocarpus heterophyllus*), jamun (*Syzigium cumini*), bael (*Aegle marmelose*), kamrakh (*Averrhoa carambola*), phalsa (*Grewia subinaequalis*), wood apple (*Limonia acidissria*) mulberry (*Morus alba*) and Lasooda (*Cordia mixa*). These fruits have diverse uses, besides being hardy and well adapted to different agro-climatic conditions and stress situations.

In recent years, olive and kiwi fruits have been successfully introduced in the temperate areas of Jammu and Kashmir, H.P. and U.P. Other useful introductions have been kinnow mandarin and low chilling varieties of pear, peach and plum, which have become very popular in the sub-tropical zone of northern plains. A number of tropical, sub-tropical fruits like avocado, macademia nut, mangosteen and rambutan though introduced in the country have yet to be commercially exploited. There is also need to give priority to nut fruit production, e.g. almond, walnut, pecan nut and pistachio nut in suitable areas in temperate regions of the country. Being low volume, high value crops having a long shelf life, these nuts will find favour with farmers in Jammu and Kashmir, Himachal Pradesh and Uttaranchal particularly in far flung areas.

A unique feature of growing fruits in India is the advantage of its climatic variability, which can be utilized for extending harvest. For instance, aonla can be harvested in tropical climate from September to November while in sub-tropical climate from December to February. Similarly, Dashehari mango grown in south India is available two months earlier than the crop in north India. This climatic variability could be meaningfully utilized for extended harvest of these fruit crops.

4.2 Vegetables

More than 40 kinds of vegetables belonging to different groups, namely, solanaceous, cucurbitaceous, leguminous, cruciferous (cole crops), root crops and leafy vegetables are grown in India in tropical, sub-tropical and temperate regions. Important vegetable crops grown in the country are tomato, onion, brinjal, cabbage, cauliflower, okra and peas.

India is next only to China in area and production of vegetables. India contributes 13.38 per cent to the world vegetable production and occupies first position in the production of cauliflower, second in onion and third in cabbage in the world. The estimated cropwise area and production of major vegetables during 1991-92 and 1998-99 is given in Table 2.4. The present area is estimated at 5.87 million ha with a production of 87.53 million tonnes and average productivity of 14.9 tonnes per ha. West Bengal, U.P., Orissa, Bihar and Maharashtra are reported to be major vegetable growing states contributing 18.69,14.49,11.52,10.76 and 5.12 % of total vegetable production respectively.

Table 2.4 Crop-wise area, production and productivity of major vegetable crops

Area '000 ha., Production '000 tonnes

Crops	1991-92		1998-99		Productivity (tonnes/ha)	
	Area	Production	Area	Production	1991-92	1998-99
Brinjal	N.A.	N.A.	496	7881	N.A	15.9
Cabbage	177	2771	240	5624	15.7	23.4
Cauliflower	203	2998	255	4691	14.8	18.4
Okra	222	1886	326	3380	8.5	10.4
Onion	332	4706	481	5461	14.2	11.4
Pea	178	1296	282	2704	7.3	9.6
Potato	1135	18195	1280	22494	16.0	17.6
Tomato	289	4243	466	8271	14.7	17.7
Others	260	22436	2044	27020	86.3	13.2
Total	5137	58532	5870	87530	11.4	14.9

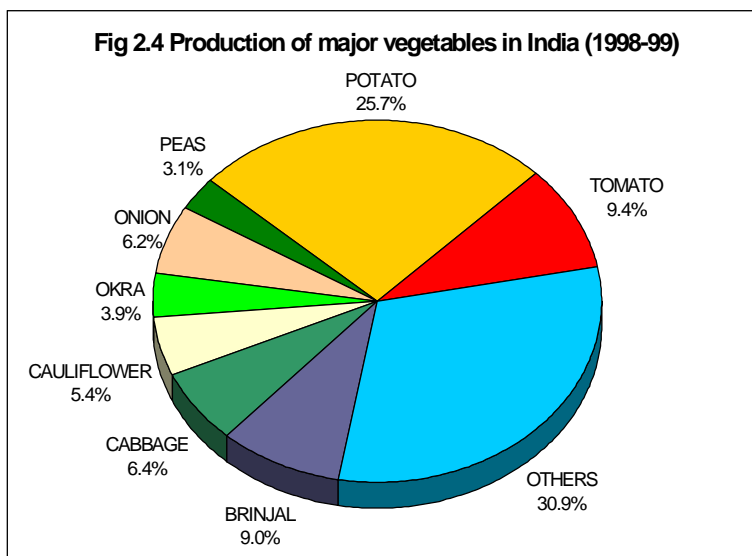
The percent production of various vegetables is given in Fig. 2.4. The changing scenario of production of vegetables in different states is given in Table 2.5.

Table 2.5 State-wise area and production of vegetables

(Area in '000 ha., Production in 000 tonnes)

STATE/ UT's	1991-92		1998-99		Productivity t/ha	
	Area	Production	Area	Production	1991-92	1998-99
Andhra Pradesh	155.2	1452.6	249.3	3541.2	9.36	14.20
Assam	222.4	2132.3	245.9	2834.8	9.59	11.53
Bihar	843.3	8643.1	616.6	9418.4	10.25	15.27
Gujarat	114.6	1667.9	189.9	3255.0	14.55	17.14
Karnataka	351.0	3673.2	309.7	4944.9	10.46	15.97
Kerala	202.1	3229.1	159.7	2857.2	15.98	17.89
Madhya Pradesh	176.4	2221.0	234.0	3276.2	12.59	14.00
Maharashtra	241.1	4171.3	341.2	4479.5	17.30	13.13
Orissa	710.3	7275.0	883.9	10087.1	10.24	11.41
Tamil Nadu	889.3	3796.9	206.7	5704.8	4.27	27.60
Uttar Pradesh (Hill)	57.1	617.6	91.5	840.7	10.82	9.19
Uttar Pradesh (Plain)	576.7	9627.3	640.7	12680.6	16.69	19.79
West Bengal	456.1	4680.0	1100.0	16367.4	10.26	14.88
Others	597.7	5344.7	596.9	7248.2	8.94	12.14
Total	5593.3	58532.0	5866.0	87536.0	10.46	14.92

Adoption of high yielding cultivars, F1 hybrids and disease and pest resistant varieties and a sound seed production programme with suitable production technologies have largely contributed to higher production and productivity. Per capita consumption



of vegetables has also increased from 95 g to 175 g per day. The largest vegetable growing states (area-wise and production wise) are West Bengal, Orissa and U.P.

4.2.1 Tomato

Tomato is one of the most important vegetable crops grown across the length and breadth of the country. The area under tomato cultivation is 0.466 million ha with a production of 8.271 million tonnes contributing 7.95 and 9.45 per cent of total area and production respectively. Major tomato growing states are Bihar, Karnataka, Orissa, Maharashtra and Andhra Pradesh. The average productivity of tomato is 17.7t/ha.

4.2.2 Brinjal

Brinjal is the second major vegetable crop and is grown almost throughout the country. It covers an area of 0.496 million ha with a total production of 7.881 million tonnes contributing 8.45 per cent and 9 per cent respectively of the total area and production of vegetables respectively. Major brinjal growing states are West Bengal, Orissa and Bihar. The average productivity of brinjal is 15.9 t/ ha.

4.2.3 Cabbage

Cabbage is the third major vegetable crop primarily grown in the winter season. Total area under cabbage cultivation in India is 0.24 million ha with a production of 5.624 million tonnes accounting for 4.10 and 6.42 per cent of total area and production respectively. Major cabbage growing states are West Bengal, Orissa, Bihar, Assam and Karnataka. The average productivity of cabbage has risen (1991-92 to 1998-99) to 23.4 tonnes per ha as a result of popularization of F1 hybrids.

4.2.4 Onion

Onion is the fourth most important commercial vegetable crop covering an area of 0.481 million ha with a production of 5.461 million tonnes contributing 8.19 per cent of the area and 6.24 per cent of the production. The major onion producing state is Gujarat followed by Maharashtra and Karnataka. Onion has three major seasons of harvest i.e. Kharif, Late Kharif and Rabi. More than 60 per cent production comes from Rabi crop and rest from the other two seasons.

4.2.5 Cauliflower

Cauliflower is the fifth most important vegetable crop of the country primarily grown in the winter season. It is grown over an area of 0.255 million ha with a production of 4.691 million tonnes contributing 4.35 and 5.36 per cent of the total area and production, respectively. With a wide range of heat tolerant varieties, cauliflower can now be grown virtually all over the country. The average productivity of cauliflower has risen from 14.8 to 18.4 t/ha during 1991-92 to 1998-99.

4.2.6 Okra

Okra is the sixth important vegetable crop cultivated throughout the country for its immature fruits for cooking. Area and production under okra is 0.326 million ha and 3.380 million tonnes respectively. It contributes 5.50 and 3.86 per cent of total area and production, respectively. Productivity of okra which was 4.6 t/ha during 1987-88 has increased considerably to 10.40 t/ha in 1998-99 after the development and introduction of yellow vein mosaic resistant varieties for commercial cultivation in different regions of the country.

4.2.7 Pea

Pea occupies a very special position because of its importance both as a vegetable and a pulse crop. It is grown over an area of 0.282 million ha with a production of about 2.704 million tonnes which comes to 4.81 and 3.09 per cent of total area and production, respectively. The average productivity of pea has risen from 7.3 t/ha to 9.6 t/ha during 1991-92 to 1998-99.

4.3 Potato & Tuber Crops

4.3.1 Potato

India ranks 5th in area and production of potato with 22.494 million tonnes from 1.28 million ha in 1998-99. Potato is grown in India in almost all the states under diverse conditions. Nearly 90 per cent of the potato is grown in the vast Indo-gangetic plains of north India during short winter days from October to March. About 6 per cent of area under potato cultivation is in the hills, where the crop is grown during long summer days of April-October. Plateau region of south-eastern, central and peninsular

India constitutes about 4 per cent area where potato is grown as a rainfed kharif crop during (July-October) or as irrigated rabi crop during (October-March). The states of U.P., West Bengal and Bihar account for nearly 71 per cent of the area and 76 per cent of the production. In Nilgiris and Palani hills of Tamil Nadu, the crop is grown round the year both as irrigated and rainfed crop covering an area of about 4000 ha. The crop is also grown in of Darjeeling hills. The improved varieties grown are Kufri Jyothi, Kufri Jawahar, Kufri Giriraj, Kufri Pukharaj, Kufri Chipsona-1 and Kufri Chipsona-2.

4.3.2 Tuber Crops

Tuber crops are most important food crops after cereals, grains and legumes. There are 15 different tuber producing crop species grown in our country. These include the two major crops cassava and sweet potato; aroid species e.g., colocacia, amorphophallus, xanthosomas, alocacia and cytosperma sp.; three yams e.g., lesser, greater and white yam and five minor tuber crops e.g., yam bean, coleus, arrowroots etc. These crops have the potential to produce more food per unit area and are drought tolerant and adapted to marginal lands.

Cassava has been an important crop in South India as a staple food. While changes in dietary habits have been noticed, its industrial use particularly for starch and sago products has been increasing. The area under cassava is estimated at 0.245 million ha with a production of 5.868 million tonnes and has been more or less stable since 1976. However, productivity per ha has risen from 9 t/ha in Seventies to 17.7 t/ha in Eighties to 22.6 t/ha in Nineties. The Salem belt of Tamil Nadu and the Smalkot belt of Andhra Pradesh are known for cassava cultivation as an industrial crop. The important varieties of cassava are Sree Visakhram, sree Harsha and H-165.

The area and production of sweet potato has been dwindling because of competition from cereals. Sweet Potato is grown in most parts of India, though the leading states are U.P., Bihar, Maharashtra, Tamil Nadu, Madhya Pradesh and Karnataka. The improved varieties of sweet potato are Sree Ratna, H-41, H-42, and H-268.

Commercial cultivation of yams and aroids is popular in Andhra Pradesh, Tamil Nadu, West Bengal, Uttar Pradesh and Orissa states.

In the context of food security, the role of tuber crops may seem to be trivial. However, being concentrated sources of energy, they can definitely turn out to be a remedy for of hunger in times of food crisis and famine.

4.4 Mushroom

Mushroom production in India had a beginning in late Sixties in Himachal Pradesh and Jammu & Kashmir. Commercial mushroom cultivation and production, however, is of comparatively recent origin. In early nineties, several export oriented units were put up by corporate houses with the use of advanced technology for mushroom growing. The total production of mushrooms is 40,000 tonnes as per details given in table 2.6.

Table 2.6 State-wise production of cultivated mushrooms in India

Name of State	Production (tonnes)	Type of Mushroom		
		Agaricus	Pleurotus	Volvariella
Andhra Pradesh	2500	+	+	
Goa	1000	+	+	
Haryana	4000	+		
Himachal Pradesh	500	+		
Jammu & Kashmir	400	+		
Karnataka	600	+	+	+
Kerala	100		+	+
Madhya Pradesh	2000	+	+	
Maharashtra	7000	+	+	
Orissa	700		+	+
Punjab	4000	+		
Rajasthan	50		+	
Tamil Nadu	10000	+	+	+
Uttar Pradesh	4000	+	+	
West Bengal	250	+	+	
North Eastern States (including Sikkim)	1000	+	+	
Delhi / Pondicherry / Chandigarh / Others	1900		+	
Total	40000			

Majorities of the commercial units are 'Export Oriented Units' and grow white button mushroom, which has maximum acceptability in domestic, and export market both in fresh and canned form.

Oyster (*Pleurotus*) mushroom cultivation is confined to small and marginal mushroom growers in tropical and sub tropical areas and the produce is sold fresh/dehydrated in the local market. Oyster mushroom is gaining popularity because of its adaptability to wider range of temperature e.g. 20°-30°C, simple cultivation practices with minimum infrastructure facilities as compared to the requirements of white button mushroom cultivation.

Volvariella, the tropical paddy straw mushroom is grown in hot/humid areas of peninsular India and is also popular in southern coastal areas, particularly in states of Karnataka, Kerala, Orissa and Tamil Nadu, where temperature is suitable for its cultivation all the year round. It has a very short shelf life and is consumed in its local area of production.

The production of mushrooms has till recently been in the unorganized sector. With the increased awareness on the nutritive value of mushroom, importance of their export potential and advances in their production technology, mushroom production has picked up in the organised sector during the last two decades.

4.5 Floriculture

Though flower cultivation has been practiced in India since times immemorial, floriculture has blossomed into a viable business only in recent years. Considering the potential this sector has in generating income and employment opportunities, promoting greater involvement of women and enhancement of exports, it has been identified as an Extreme Focus Area for exports by the Govt. of India.

India is known for growing traditional flowers such as jasmine, marigold, chrysanthemum, tuberose, crossandra and aster. Commercial cultivation of cut flowers such as rose, orchids, gladiolus, carnation, anthurium, gerbera and lillies has also become popular. The important flower growing states are Tamil Nadu, Karnataka,

Andhra Pradesh in the south; Maharashtra in west, West Bengal and North Sikkim in the east and Himachal Pradesh, Jammu & Kashmir in the north.

The area under flower cultivation during 1998-99 was estimated at 73,970 ha with a production of 4,59,163 tonnes of loose flowers and 1,15,613 cut flowers with stem. Although quantitative data on trade value of flowers in the country is not available, yet the availability of flowers in all the cities and growing number of florists are indicative of very high rate of growth (Table 2.7).

Almost all the area under flower production is reported to be under open field conditions. It is only in the last decade or so that an area of about 200 ha has come under protected cultivation with the participation of several exports oriented enterprises in the country. This trend is expected to increase in years to come.

Table 2.7 State-wise area and production of loose flowers

State/UTs	1993-1994		1998-1999	
	Area (000' ha)	Production (000'tonnes)	Area (000' ha)	Production (000'tonnes)
Andhra Pradesh	5.78	17.34	8.36	32.00
Delhi	0.80	4.05	3.45	21.0
Haryana	1.20	22.40	2.25	40.50
Karnataka	15.24	88.00	20.78	124.30
Madhya Pradesh	0.91	9.00	1.96	1.17
Maharashtra	2.28	18.19	4.98	38.58
Rajasthan	1.21	-	2.35	2.38
Tamil Nadu	12.34	61.70	17.75	133.13
West Bengal	12.61	9.02	10.50	58.00
Others	0.91	2.84	1.59	8.10
Total	53.28	232.54	73.97	459.16

More than two third of the area is devoted to production of traditional flowers like marigold, jasmine, tuberose etc. The area under flower production for cut flowers with stem has increased in recent years, so has the product range. While the crops mentioned earlier still form bulk of the total produce, the variety of commercial flowers like orchids, anthuriums, liliiums, gerbera, chrysanthemum and several bulbous flowers are increasingly being grown for exports as well as for domestic market.

4.6 Medicinal and Aromatic Plants

India has been considered as a treasure house of valuable medicinal and aromatic plant species. The Ministry of Environment and Forests, Govt. of India have identified and documented over 9,500 plant species considering their importance in the pharmaceutical industry. In the present context of 'back to nature' in health care, it is relevant that these valuable plant species are not only conserved but also promoted for commercial cultivation in order to meet the increasing demand within the domestic and export markets. Shift from collection to cultivation of medicinal and aromatic plants will also ensure purity, authenticity and sustainable supply of raw materials required for herbal drugs, including polyherbals. Agro-techniques have been developed for a large number of medicinal and aromatic plants by the ICAR Institute and several State Agricultural Universities under the of All India co-ordinated project on Medicinal and Aromatic Plants. However, due to unorganised marketing arrangements this sector has not exploited its full potential. A Medicinal Plants Board has been constituted in the Department of Indian Systems of Medicines & Homeopathy to address all the issues.

4.7 Spices

Spices constitute an important group of horticultural crops and are defined as vegetable products or mixture thereof, free from extraneous matter, used for flavouring, seasoning and imparting aroma in foods. The term applies equally to the product in the whole form or in the ground form. India is known as the home of spices and produces a wide variety of spices like black pepper, cardamom (small and large) ginger, garlic, turmeric, chilli and a large variety of tree and seed spices.

Almost all the states grow one or more spices. The major spice producing states are Andhra Pradesh, Kerala, Gujarat, Rajasthan, Maharashtra, West Bengal, Karnataka, Tamil Nadu, Orissa and Madhya Pradesh. N.E. region and Andaman & Nicobar Islands have also been identified as potential areas for spice cultivation. While black pepper and small cardamom are mainly confined to south India, ginger and turmeric are grown in S.E, N.E. region and in many other states. Large cardamom is mainly confined to Sikkim. Cumin, coriander and fenugreek are mainly confined to

northern states. The area covered under spices in the country is estimated to be 2.517 million ha with an annual production of 2.907 million tonnes, valued at about Rs. 70 billion (1998-99)(Table 2.8 and 2.9).

Table 2.8 Area and production of spices in India

(Area '000 ha., Production '000 tonnes)

Spice crops	1991-92		1998-99	
	Area	Production	Area	Production
Pepper	184.20	52.01	238.32	65.99
Ginger	59.83	182.65	77.61	263.17
Chillies	846.30	617.50	892.20	921.30
Turmeric	120.30	373.20	155.80	598.40
Coriander	349.70	158.50	546.50	290.00
Garlic	94.30	370.70	114.40	517.70
Cumin	163.59	64.89	264.02	108.74
Fennel	20.26	25.14	18.43	24.08
Fenugreek	26.85	25.96	82.67	80.48
Nutmeg	3.58	3.39	6.58	2.09
Clove	1.70	1.50	3.17	2.86
Cardamom	117.72	9.52	84.91	8.79
Others	16.67	15.04	32.32	23.55
Total	2005.00	1900.00	2516.93	2907.15

Table 2.9 Major spice growing states of India

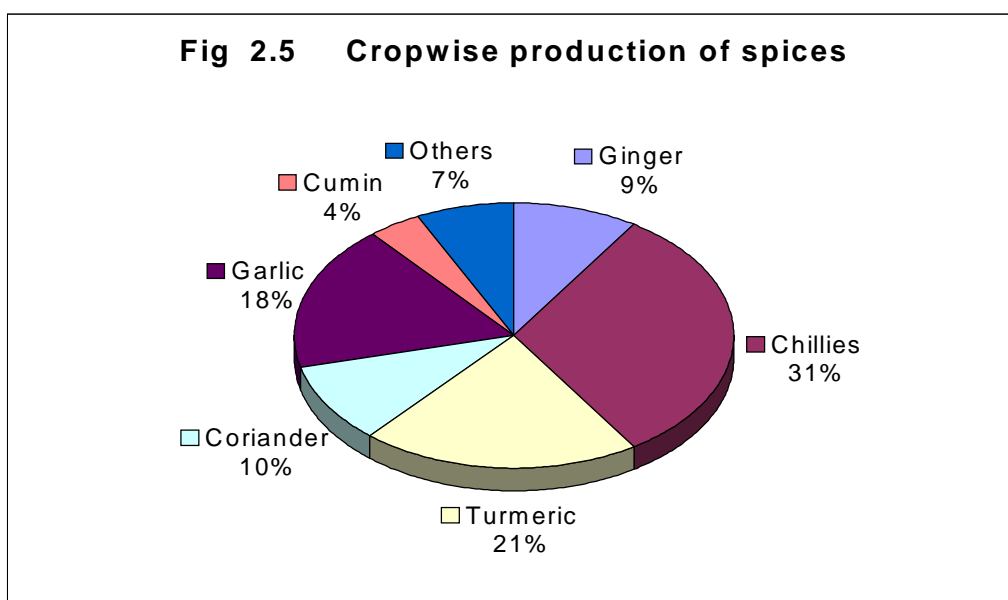
(Area '000 ha., Production '000 tonnes)

States	1991-92		1998-99	
	Area	Production	Area	Production
Andhra Pradesh	328	433	395	746
Gujarat	125	152	171	239
Karnataka	194	114	236	181
Kerala	195	62	298	131
Madhya Pradesh	195	164	312	307
Maharashtra	137	107	117	116
Orissa	168	203	156	227
Rajasthan	271	198	447	361
Tamil Nadu	121	113	129	205
Others	271	354	256	394
Total	2005	1900	2517	2907

Among various spices grown in our country, chilli is most widely grown with a share in the total production of 32 per cent. The demand for chilli as spice and its

oleoresins as a natural colouring material is going up in the domestic as well as international market. Andhra Pradesh is the leading state in the production of chilli with an overall share of 49.1 per cent followed by Karnataka (12.9 per cent), Orissa (7.6 per cent), Maharashtra (6.3 per cent), Rajasthan (6.2 per cent), West Bengal (5.3 per cent) and Tamil Nadu (2.8 per cent).

Turmeric has a share of 21 per cent in the total production of spices. It is grown mainly in the states of Andhra Pradesh, Tamil Nadu, Orissa, West Bengal and Karnataka. Garlic, coriander, ginger and cumin contribute 18, 12, 9 and 4 per cent respectively (Fig.2.5).



More than 90 per cent of the spices produced in the country are used for domestic consumption and the rest exported as raw as well as value added products. The per capita consumption of spices in India has been estimated at 2.64 kg as compared to the per capita consumption of 1.5 kg in U.S.A.

4.8 Plantation Crops

Plantation crops constitute a large group of crops. These are grown over an area of 3.82 million ha (2 per cent of total cropped area) and contribute about Rs. 75 billion to export earnings. While the major plantation crops include coconut, arecanut, oil palm, cashew, tea, coffee and rubber, the minor plantation crops include cocoa. Their total

coverage is comparatively less and they are mostly confined to small holdings. However, they play an important role in view of their export potential as well as domestic requirements and in employment generation and poverty alleviation programmes particularly in rural sector.

4.8.1 Coconut

Coconut is an important crop and about 10 million people depend on coconut cultivation, processing and related activities. In India, coconut is grown mainly along the coastal states of the country and also in the N.E. region. The major coconut growing states are Kerala, Tamil Nadu, Karnataka, Andhra Pradesh, Orissa, West Bengal, Maharashtra, Goa, Assam, Pondicherry, Lakshadweep and Andaman & Nicobar Islands. In other states like Gujarat, Madhya Pradesh, Bihar and North Eastern region coconut cultivation is now gaining importance.

Coconut is grown over an area of 1.91 million ha with a production of 1,49,248 million nuts with a productivity of 6,834 nuts per ha (Table 2.10). India ranks first in total production of coconuts among 90 coconut producing countries in the world. The state-wise area, production and productivity of coconut in India during 1991-92 to 1998-99 shows that Kerala state accounts for a large share in production. Through, Tamil Nadu state has the highest productivity of 11,620 nuts/ha, Karnataka state has the lowest productivity of 5,127 nuts/ha. The area under this crop has increased by 24.07 per cent while the total production by 48 per cent during the period 1991-92 to 1998-99. As much as 48 per cent of the nuts produced are consumed in the raw form for edible and religious purposes, 30 per cent for production of milling copra for oil extraction, 10 per cent as tender coconuts, 8 per cent for the production of edible copra and the remaining 4 per cent for the production of various other products of commercial importance such as desiccated coconut, cream, milk powder etc.

The coir obtained from processing coconut husk is of high commercial value. Besides coir, shell based products have also gained entry into the national and international markets. The coir pith made into brick like structure is now used for raising horticultural plants specially in greenhouses.

Table 2.10 State-Wise area, production and productivity of coconut In India (1991-92 and 1998-99)

State	Area (000 ha)		Production (million nuts)		Productivity (nuts/ha)	
	1991-92	1998-99	1991-92	1998-99	1991-92	1998-99
Andhra Pradesh	63	98	9592	19221	15129	8588
Karnataka	238	288	12276	14951	5145	5127
Kerala	846	1078	42061	66720	4969	5793
Tamil Nadu	240	266	27558	30967	11468	11620
Others	141	180	9309	17389	6602	9660
Total	1528	1910	100796	149248	6592	6834

4.8.2 Arecanut

Arecanut is a commercial crop cultivated as a source of betelnut or supari. It covers an area of 0.277 million ha with an annual production of 0.33 million tonnes (Table 2.11). India is the largest producer and consumer of arecanut in the world. Karnataka is the major arecanut growing state with an area of 91,500 ha and production of 131,000 tonnes accounting for 40 per cent of the country's production. Kerala ranks second with an area of 80,600 ha and production of 92,500 tonnes contributing 28 per cent of the total production. Assam ranks third with a production of 55,500 tonnes from an area of 74,500 ha and contributes 20 per cent of the total production. It is grown on a limited scale in Tamil Nadu, Meghalaya, West Bengal, Maharashtra and Goa.

Table 2.11 State-wise area, production and productivity of arecanut in India (1991-92 and 1998-99)

State	1991-92			1998-99		
	Area (000 ha)	Production (000 tonnes)	Yield (t/ha)	Area (000 ha)	Production (000 tonnes)	Yield (t/ha)
Assam	68	55	0.822	74	55	0.744
Karnataka	65	95	1.465	91	131	1.200
Kerala	63	67	1.071	80	92	1.148
Meghalaya	9	8	0.978	9	11	1.208
Andaman	3	4	1.500	3	5	1.528
Others	4	11	2.750	20	36	1.800
All India	212	240	1.132	277	330	1.189

4.8.3 Oil Palm

Oil palm, though introduced as an ornamental crop during 1848 at National Botanic Gardens, Kolkatta, attained the status of a commercial plantation crop during 1960 in Kerala, and between 1971-1982 in Andaman & Nicobar islands. However, its development was stalled in India due to poor performance of the plantations managed by the two corporations. Considering the vast potential in India, a working group constituted by Govt. of India in 1986 and subsequent committees identified a total area of 801 thousand ha in eleven states of India. However, about 81 per cent of this area is located in Andhra Pradesh and Karnataka. Assam, Gujarat, Goa, Kerala, Maharashtra, Orissa, Tamil Nadu, Tripura and West Bengal are the other states having limited areas suitable for oilpalm cultivation. So far, an area of 50,000 ha has been planted under this crop in different states. Under irrigated conditions, oil palm yields as high as 30 tonnes FFB/ha/yr.

4.8.4 Cashew

Cashew is an important horticultural crop and has assumed an important place in the Indian economy. India produces 44.7 per cent of the global production of cashew. Area under cashewnut has increased from 0.533 million ha to 0.730 million ha during 1991-92 to 1998-99. During the same period, production has increased from 0.30 million tonnes to 0.46 million tonnes (Table 2.12). There have been significant increases in productivity/unit area. India is the largest producer, processor, consumer and exporter of cashew in the world.

Cashew cultivation is confined mainly to the peninsular India. The major cashew producing states are Karnataka, Kerala, Maharashtra, Goa along the West Coast and Orissa, Andhra Pradesh, and Tamil Nadu along the East Coast. It is also grown to a limited extent in Andaman and Nicobar islands, Madhya Pradesh, Manipur, Meghalaya and Tripura. The area, production and productivity of cashew have been increasing as a result of identification of superior clones, standardisation of vegetative propagation techniques and near self-sufficiency in quality planting material.

However, the production of raw nuts is not sufficient to meet the requirements of the processing units which have grown from 572 in early 80s to 1098 units in 1998-1999, consuming nearly 650 thousand tonnes of raw nuts.

Table 2.12 Area and production of cashew (1991-92 and 1998-1999)

State	1991-92		1998-99	
	Area (000 ha)	Production (000 t)	Area (000 ha)	Production (000 t)
Andhra Pradesh	71	33	101	80
Goa	44	32	53	20
Karnataka	74	31	89	40
Kerala	135	131	122	130
Maharashtra	47	23	119	85
Orissa	60	31	114	50
Tamil Nadu	91	16	83	35
West Bengal	5	3	9	8
Others	3	0	40	12
Total	530	300	730	460

4.8.5 Cocoa

The cocoa, though introduced in India in the early half of the last century, got into commercial cultivation only in 1970. The crop is now cultivated over an area of 12,402 ha with an annual production of 5,198 tonnes. Kerala accounts for 71 per cent of the area and 80 per cent of production in India. Karnataka and Andhra Pradesh is the other cocoa growing states (Table 2.13).

Table 2.13 Area and production of cocoa in major states (1998-99)

State	Area (ha)	Production (tonnes)
Andhra Pradesh	670	150
Karnataka	2,780	1,325
Kerala	8,909	3,686
Tamil Nadu	43	37
Total	12,402	5,198

In the global scenario, India is nowhere in the production of cocoa, with the meager production of 5198 tonnes against the total world production of 2.95 million

tonnes. Cocoa is grown as a mixed crop in the irrigated coconut and / or arecanut gardens in Kerala and Karnataka states. It is estimated that about 300 thousand ha of suitable area is available for expansion of cocoa as a mixed crop in the coconut and arecanut gardens. Pure plantations of cocoa are virtually non-existent. The present production of cocoa beans hardly meets 30 per cent of the demand of processing industry in India. The improved varieties of cocoa are PA x NH 32, Jorgan Red Axil, Amel x PA 7, T 86/2 and CCRP 1-7

4.8.6 Tea

India is the largest producer of tea in the world with a production of 805.61 million tonnes annually and accounting for 1/3 of global production. It however ranks 2nd in total area (437860 ha) as also in productivity (1840 kg/ha). The indreased production in tea was achieved by enhanced productivity through introduction of high yielding quality material improved water management (both irrigation and drainage).

Table 2.14 Area, production and productivity of tea

	Area (000 ha)	Production (million kg)	Productivity (Kg/ha)
1990	416.269	720.33	1731
1999	437.86	805.61	1840

While the area under tea measures for 0.416 to 0.438 million hectares, tea product measured for 720.33 to 805.61 million kg between 1990-1999.

In India tea is grown in 13 states. Among these the largest producers are Assam (50.7 per cent), West Bengal (22.1 per cent), Tamil Nadu (15.9 per cent) and Kerala (8.3 per cent). Tea is also grown in a very small area in Karnataka, Tripura, H.P., U.P., Sikkim, Bihar, Manipur, Orissa, Nagaland and Arunachal Pradesh which together account for only 3 per cent of the total production (Table 2.15).

Being located in backward rural and hilly areas, the tea plantations supplement the economic life of these through employment generation and region provide a higher standard of living at the grass root level.

Table 2.15 State-wise share of Tea production

S. No.	State	Percent Share
1.	Assam	50.7
2.	West Bengal	22.1
3.	Tamil Nadu	15.9
4.	Kerala	8.3
5.	Others	3.0

The tea industry provides direct employment to more than a million workers of which a sizable number of women. More than two million persons derive their livelihood from ancillary activities associated with production, value addition and marketing of tea. Substantial foreign exchange earning with negligible import content, contribution to the state and central exchequers, preserving pollution free biosphere, soil conservation are some other important features of tea cultivation.

Because of these advantages in recent past, several small farmers in Assam, North Bengal and Bihar have switched over to tea. As a result the contribution from the small grower segment has measured from 5% at the beginning of the IX Plan period has now gone upto 17%.

4.8.7 Coffee

Coffee is the second important commodity in international trade next to petroleum products. It plays a very important role in the national economy. Coffee cultivation has been instrumental in preserving the precious forest eco-system. Since coffee production and harvesting is labour intensive, it provides an important source of rural employment for both men and women. India accounts for only 4.5 per cent of the total area under coffee in the world. In India, coffee is cultivated in an area of 0.3 million ha mainly in southern states of Karnataka (57.1 percent), Kerala (24.4 percent) and Tamil Nadu (8.8 percent) which form the traditional tracts. It is also grown in non-traditional areas like A.P., Orissa and north-eastern states to an extent of about 30,000 ha. The coffee production in the country has risen from 18,000 tonnes during 1991-92 to 2,65,000 tonnes in 1998-99. (Table 2.17).

Table 2.17 Area, production and productivity of coffee

Year	Area(000' ha)			Production (000'tonnes)			Productivity
	Arabica	Robusta	Total	Arabica	Robusta	Total	(Kg/ha)
1991-93	127	132	279	88	92	180	645
1998-99	161	168	329	97	168	265	806

This phenomenal increase in production could be attributed not only to the increase in cultivated area over the years but also to improvement in productivity levels. The average productivity has risen from a meagre 204 kg/ha during 1950 to 645 kg/ha in 1991-92 and 806 kg in 1998-99. India ranks third in the world in average productivity levels next only to Vietnam and Costa Rica. Over 99% of the total coffee production is in the three southern states of Karnataka (71.6%), Kerala (20.7%) and Tamil Nadu (6.6%). Out of a total of 0.14 million holding small growers constitute about 98%. Their area and production share is 65% and 60% of the total area and production respectively.

Commercial coffee production mainly relates on two types of coffee, arabica (*C. arabica*) and robusta (*C.canefrhora*). whole arabica occupies 49% of the total area, its production contributes 35%. Coffee industry provides direct employment to 0.5 million workers in the coffee plantations and to an equal number in coffee related activities.

4.8.8 Rubber

India is the third largest producer of natural rubber next only to Thailand and Indonesia accounting for 9.2 per cent of the global output. The country has the distinction of having the highest average yield per ha. The country is also the fourth largest consumer next to USA, China and Japan. The increase in production of rubber during the period 1990-91 to 1998-99 has been phenomenal (85.0 percent) while the area under rubber cultivation increased by 16.4 percent (Table 2.18).

Table 2.18 Growth in natural rubber production in India

Year	Area (000 ha)	Product (tonnes)	Productivity (kg/ha)	Annual growth in production (%)
1950-51	75	15,830	284	
1990-91	475	329,615	1076	10.9
1998-99	553	605,045	1563	3.6

During the last fifty years the area, production and productivity have increased by 7.4, 38.3 and 5.5 times respectively.

The traditional rubber growing regions are Kerala and Kanyakumari district in Tamil Nadu. However, rubber cultivation has been successfully introduced in the non-traditional areas like Karnataka, Andaman & Nicobar islands, Goa and Maharashtra and in the north-eastern states viz., Assam, Meghalaya and Tripura. It has been recently introduced in certain other states including Orissa. However, in spite of all this expansion, Kerala enjoys a near monopoly position with 92 per cent of the total production in the country followed by Tamil Nadu and Karnataka with 3.4 percent and 2.4 percent of the total production respectively.

A salient feature of the rubber industry is its dominance by small holders. Currently, 86 per cent of the area and production in the country is contributed by small holdings. The average size of holding is less than half hectare. However, in spite of the predominance of small holdings, the national average productivity is 1,563 kg/ha. Though natural rubber is processed into different marketable forms in India, about 72 percent are made as ribbed smoked sheets. Concentrated latex (11 percent) and technically specified rubber (10 per cent) are the other two major forms of natural raw rubber in the country.

CHAPTER III

EXPORTS AND IMPORTS

1. EXPORT OF AGRICULTURAL PRODUCTS

Exports of agri-horti products are dependant on factors such as domestic production and consumption, exportable surpluses, consumer preferences, varieties traded, quality, domestic and international prices and availability of infrastructure facilities for storage, post harvest handling, etc. Having regard to the social and economic importance of the agricultural sector, the export strategy of the Government is based on the premise that foreign earnings from this sector should be enhanced thereby leading to higher income to farmers, taking care to make agricultural products available at reasonable prices to the domestic consumers.

The exports of agricultural products which were valued at Rs.77600 million at the beginning of the VIII Plan have virtually doubled to Rs.1,50,000 million by 1996-97, the end of VIII Plan. At the end of the financial year 1998-99, the exports of Agricultural products have further risen to Rs. 1,60,000 million (approx). The agricultural products exported can be divided into three broad categories, ie., exports of raw products, semi processed products and export specific value added products. The raw products exported are of low value but high volume. Semi-processed products exported are of intermediate value and limited volume; while export specific and value added products are of high value and low volume.

2. EXPORT OF HORTICULTURAL COMMODITIES

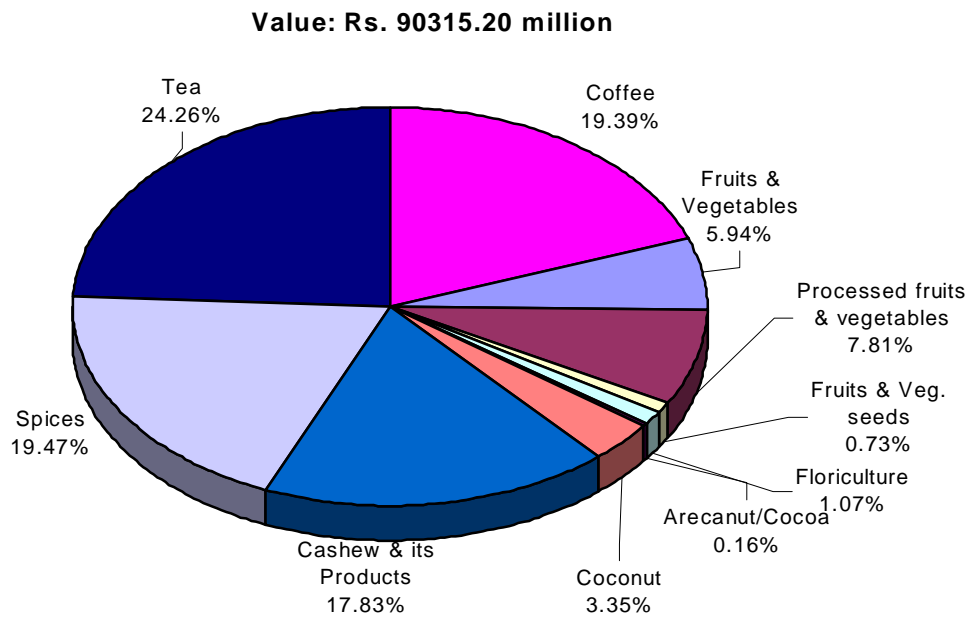
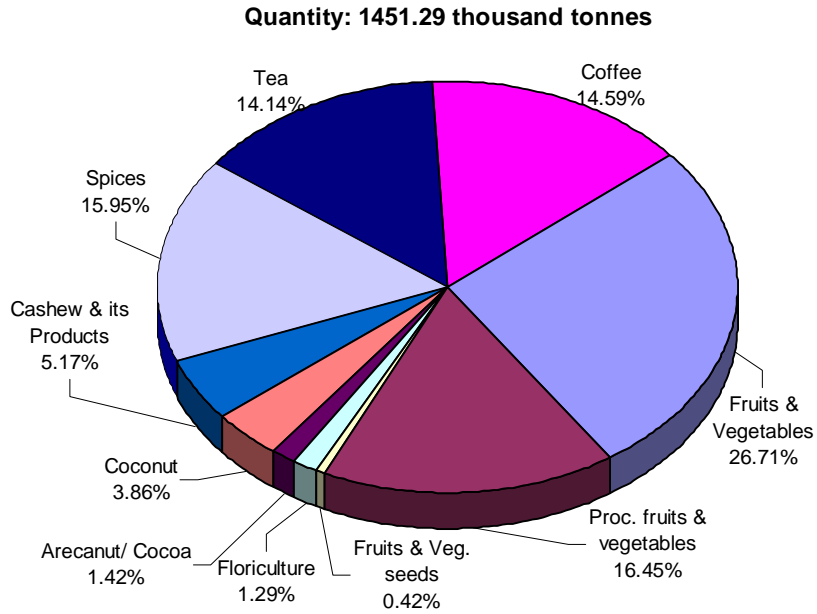
Among horticultural commodities, India is exporting fresh fruits, vegetables, processed products of fruits and vegetables, cut & dried flowers, medicinal and aromatic plants, seeds, spices, cashew kernels and their products, tea and coffee. The total value of export of these commodities increased from Rs.29722.78 million in 1991-92 to Rs.90315.20 million in 1998-99 (Table 3.1 and Fig. 3.1).

Table 3.1 Export of horticultural products from India

Products	1991-92		1998-99	
	Quantity ('000 tonnes)	Value (Rs. in million)	Quantity ('000 tonnes)	Value (Rs. in million)
Fruits & Vegetables	493.61	2934.50	387.43	5360.20
Processed fruits & vegetables	79.90	1777.80	238.60	7056.80
Fruits & Vegetable seeds	8.42	160.90	6.06	663.30
Floriculture	NA	148.00	18.72	966.00
Arecanut/ Cocoa	0.21	111.40	20.59	140.30
Coconut	31.00	745.50	56.00	3021.00
Cashew & its Products	47.74	4422.40	75.02	16099.00
Spices	142.10	3809.68	231.39	17580.20
Tea	216.45	12122.60	205.86	21918.40
Coffee	111.45	3490.00	211.62	17510.00
TOTAL	1130.88	29722.78	1451.29	90315.20

Horticulture products account for more than 54.55% (1998-99) of the total value of exports of agricultural commodities from India. Of these, export of tea leads all horticultural commodities followed by spices, coffee, cashew and processed fruits and vegetables. The status of export of individual commodities / groups of commodities is given in this chapter.

Fig. 3.1 Export of Horticultural Products during 1998-99



2.1 Fresh Fruits & Vegetables

There has been significant increase in the export of fresh fruits and vegetables during the past few years. Exports increased from Rs.2934.5 million in 1991-92 to Rs. 5360.2 million in 1998-99. Among fruits mango was the main fruit exported. Export of fresh mango had commenced as early as 1925. Among vegetables onion has been the major crop exported from India. The Government of India has established Agricultural and Processed Food Export Development Authority (APEDA) under the Ministry of Commerce to promote fruits and vegetables export. The APEDA in turn has initiated a programme for an integrated training of horticulture producers for some identified fruits such as grape, mango, litchi, Kinnow in the selected regions. Farmers have been provided training in integrated post harvest management practices for better handling of the produce to ensure export of quality products. APEDA is also making efforts to enhance the shelf life of fruits such as mango, grape, litchi through use of controlled/modified atmosphere storage and use of reefer containers so that they could be transported by sea freight and achieve higher competitive advantage. In order to improve quality of fruits and vegetables, pre-harvest manuals on certain fruits and vegetables have been prepared for dissemination to farmers and producers.

2.1.1 Fruits

During 1998-99, 96487.57 tonnes of fruits and nuts were exported (Table 3.2). The export earnings, which was Rs. 726.5 million during 1991-92 increased to Rs. 2384.48 million in 1998-99. Mango occupies a premier position among fruits valued at Rs. 791.37 million. Other fruits, which have attained significant position in export, are grape, walnut, citrus (Kinnow), banana and apple. Small quantities of a number of other fruits e.g. litchi, guava, custard apple, pineapple papaya and tamarind have also demand in the export market.

Mango varieties exported from India are Alphanso, Kesar, Dashahari, Banganapalli. Variety Thompson Seedless variety constitutes the bulk of exports of grape. Besides, Kinnow is other fruit exported, which has attained a sizeable status value-wise, however, the four fruits and nut exported are mango, grape, kinnow and walnut respectively.

Table 3.2 Export of major fruits from India (1998-99)

Product	Quantity (tonnes)	Value (Rs in million)
Apple	7442.12	100.24
Banana	8111.42	168.94
Citrus	12786.30	151.94
Grapes	11382.12	370.91
Guava	496.84	6.92
Mango	45407.59	791.37
Pineapple	244.68	1.68
Pomegranate	4239.15	89.61
Sapota	1049.45	13.69
Walnut (Whole + Kernel)	5327.9	689.18
Total	96487.57	2384.48

2.1.2 Vegetables

Fresh vegetable exports have been on the rise. During 1998-99, the total vegetable exports amounted to 238279.28 tonnes valued at Rs. 2104.23 million (Table 3.3). The major item exported is onion, worth 1760.47 million, with a share of 83.66% in vegetable exports. Other crops with significant exports include tomato (Rs.4.75 million) peas (Rs.1.63 million) and cucumber (Gherkin) (Rs.71.65 million). Mixed vegetable exports amounted to Rs.265.73 million, with the share of exports being 12.63%. Main vegetable exports from India are to South-east Asia and Middle East, except cucumber and gherkin which are exported to Europe and the U.S.A. High-value beans, peas, green chilli etc. have good scope for export.

Table 3.3 Export of major vegetables from India (1998-99)

Crop	Quantity (Tonnes)	Value (Million Rs.)
Cucumber (Gherkin)	5132.32	71.65
Mixed vegetables	16738.06	265.73
Onion	215693.61	1760.47
Peas	72.58	1.63
Tomato	642.71	4.75
Total	238279.28	2104.23

2.2 Processed Fruits & Vegetables

Export of processed fruits and vegetables is another thrust area for increasing export of value added products. While processing industry in India has been dependent on small units without modern facilities a large number of multinational companies have entered the processed food industries in recent years with a thrust on exports.

Some of the new products which have been introduced in the market are tomato paste in bulk aseptic packs, freeze dried and Instant Quick Frozen fruits, vegetables and gherkins. The total export of processed fruits & vegetables from India is Rs. 7056.8 million. This consists 54.24 % of dried & preserved vegetables, 19.70 % of mango pulp, 15.30 % of other processed fruits & vegetables and 10.76 % of pickles & chutney. The APEDA in its quality upgradation programme has covered 26 Mango pulp processing units in Andhra Pradesh and Tamil Nadu for certification under the HACCP Quality Management tool.

2.3 Potato

Limited quantities of potato are exported from India as fresh potato, seed potato and frozen potato. Fresh potato exports during 1998-99 amounted to 20883.80 tonnes valued at 9.037 million. Frozen potato exports amounted to 1590.30 tonnes, valued at Rs. 1.104 million. Seed potato exports amounted to 431.64 tonnes, valued at Rs.0.469 million (Tables 3.4).

Major potato exports are to the neighboring countries of South Asia and South East Asia. Since most potatoes in India are harvested in spring, when fresh potatoes are not available in Europe, with a large production base and a sound export strategy, India has opportunities to exploit fresh potato as well as seed potato exports.

Table 3.4 Export of potatoes from India (1998-99)

Item	Quantity (tonnes)	Value (Rs. in million)
Potato fresh	20883.80	9.037
Frozen potato	1590.30	1.104
Potato seed	431.64	0.469
Total	22905.74	10.610

2.4 Mushroom

Mushroom exports started in 1993-94 with 4811.478 tonnes. However, there has been a decline in mushroom export during 1998-99 with a total export of 3548.37 tonnes, mostly in dried/processed form (Table 3.5).

Table 3.5 Mushroom exports from India (1998-99)

Type of Mushroom	Quantity (tonnes)	Value (in million Rs.)
Dried	90.13	277.27
Processed	3458.24	139.27
Total	3548.37	416.54

Dried mushrooms were exported to 18 Countries, the major share of which went to France, Germany and Switzerland. The major importer of processed mushroom from India were USA, Israel, Denmark and Canada.

2.5 Flowers

Although India's share in the export market of flowers is still insignificant, it has registered a sharp increase from Rs.144.5 million in 1991-92 to Rs. 966.0 million in 1998-99. The cut flower export value have shown a tremendous increase during the period from Rs. 4 million to Rs. 253.0 million. This has come about with the establishment of a large number of export oriented cut flower units around Bangalore, Pune, Delhi and Hyderabad during the last five years. The major product has been rose being grown by more than 90 per cent of commercial units followed by tropical orchids (dendrobium). Limited exports are also taking place in carnation, geranium etc. The major destinations have been Europe (Germany, Holland & U.K.). The other markets importing Indian flowers are Japan, Australia, Russia and Singapore. A unit near Chennai is exporting tropical orchids. Other potential commodities for export are cut flowers, house plants, tissue culture material, dry flowers and hybrid seeds.

Dry flowers contribute a major share of the floriculture trade. Flower crops like dahlia, bell cup, marigold, jute flower, wood roses, wild lilly, helicysum, lotus pods which can be easily processed and preserved as dry flowers hold enormous potential as

these are becoming popular due to their non-perishability and are being exported from India.

Export of dry flowers and floral products has been going on since 1985. Indian flower trade has crossed 10,000 tonnes with major markets being US, Israel, Hongkong, Japan, Singapore and West European countries. U.K. has been the largest importer of dried flowers from India, ahead of Germany, Italy, the Netherlands and Spain. The dry flower units are concentrated in places like Tuticorn in Tamil Nadu and Kolkata (Calcutta).

2.6 Medicinal and Aromatic Plants

Demand for medicinal and aromatic plants has been increasing progressively with the increase in the number of multinationals establishing consumer oriented cosmetics and pharmaceutical units. Currently, most of these herbs are grown in large quantities and marketed by France, U.K., Canada, Turkey and U.S.A. The foreign exchange earned by these countries through the export of these medicinal and aromatic plants and their products is quite substantial.

The potential for foreign exchange earning by India from the exports of medicinal and aromatic plants is estimated to be over U.S. \$ 3000 million per annum. The exports of these plants and their products have a tremendous potential particularly to advanced countries like U.S.A., Japan and Europe. The demand for such plants is increasing both in developing and developed countries. The international market of medicinal plants related trade is estimated at US \$ 60 billion per year having a growth rate of 7 per cent per annum. The annual exports of the derivatives of medicinal aromatic plants are to the tune of Rs. 600-700 million. A list of medicinal plants finding place in the international trade is given in Table-3.6.

Table 3.6 List of Indian medicinal plants entering into international trade

Sl.No.	Name of Medicinal Plant	Sl. No.	Name of Medicinal Plant
1.	<i>Cycas circinalis</i>	8.	<i>E. epidendracea</i>
2.	<i>Dendrobium candidum</i>	9.	<i>E. herbaceae</i>
3.	<i>D. chrysanthum</i>	10.	<i>E. nuda</i>
4.	<i>D. fibriatum</i>	11.	<i>E. ramentacea</i>
5.	<i>D. nobile</i>	12.	<i>Gnetum montanum</i>
6.	<i>Eulophia dabia</i>	13.	<i>Gymnadenia orchidis</i>
7.	<i>N. khasiana</i>	14.	<i>Nepenthes distillatoria</i>

2.7 Spices

India has a long history of producing and exporting spices. The world trade in spices is estimated around 0.45 million tonnes. In India, spices exports have been consistently moving up during the last one-decade with an increase of 210% in quantity and 622% in value during this period. The country commands 46% in global trade in terms of quantity and 28% in terms of value. Exports during the year 1998-99 have been 231389 tonnes valued at Rs.17580.2 million (Table 3.7). The exports rose during 1999-2000 creating an all time record in terms of value both in rupee and dollars. Compared to last year, export has registered an increase of 6% in rupee and dollar terms. However the export has shown a decrease of 10% in volume. The distribution of spice exports during 1991-92 and 1998-99 are given in Fig. 3.2 and Fig.3.3 respectively. During 1998-99, in the total spices export earnings, pepper contributed about 36.3 per cent followed by spice oils and oleoresins (24.1%) and chillies (12.3%) in terms of value. The value-added products in the export basket constitute 37% of the total value of exports.

Table 3.7 Estimated export of spices from India

Item	1991-92			1998-99		
	Quantity (tonnes)	Value (Rs. in millions)	% of total value	Quantity (tonnes)	Value (Rs. in millions)	% of total value
Pepper	20535	743.17	19.51	34864	6381.13	36.30
Cardamom (S)	544	155.74	4.09	475	252.12	1.43
Cardamom (L)	910	50.45	1.32	1424	119.09	0.68
Chillies	32603	894.85	23.49	61253	2166.11	12.32
Ginger	14259	218.81	5.74	8778	406.48	2.31
Turmeric	19661	377.62	9.91	36522	1245.50	7.08
Coriander	9954	132.35	3.47	20685	458.90	2.61
Cumin	1654	63.75	1.67	10723	601.09	3.42
Celery	3489	58.46	1.53	3991	96.91	0.55
Fennel	2136	48.09	1.26	5279	153.81	0.87
Fenugreek	6375	55.73	1.46	10082	191.49	1.09
Other seeds(1)	1282	25.15	0.66	2001	74.91	0.43
Garlic	10282	82.84	2.17	4068	74.10	0.42
Other spices (2)	13512	183.11	4.81	19077	765.95	4.36
Curry powder	3516	110.01	2.89	5210	359.68	2.05
Mint oil			0.00	4207	1225.22	6.97
Spice oleoresins & other oils	1392	609.55	16.00	2750	3007.74	17.11
Total	142104	3810		231389	17580.23	

(1) Include aniseed, ajwain seed, dill seed, poppy seed, mustard etc.

(2) Include tamarind, asafoetida, cinnamon, cassia, kokam, saffron etc.

Source: Spices Board, Kochi

Fig. 3.2 Share of export of spices from India during 1991-92

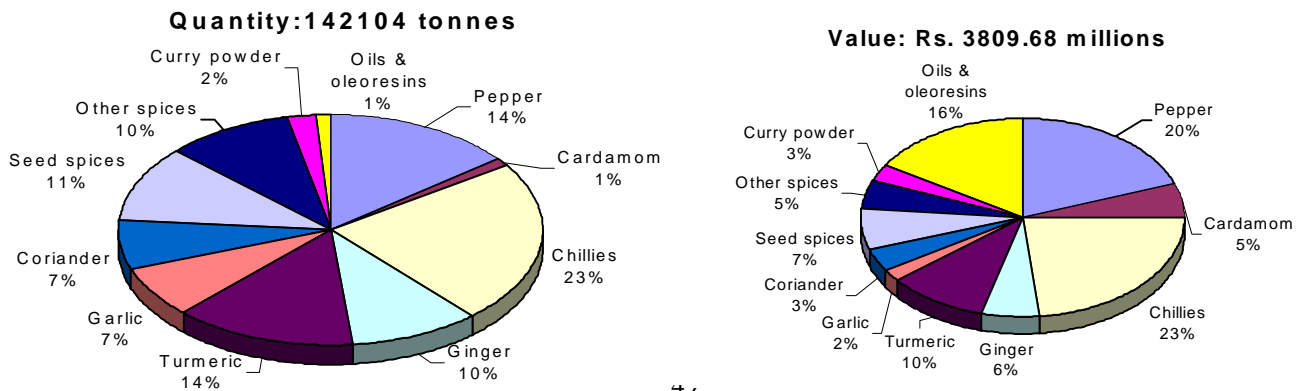
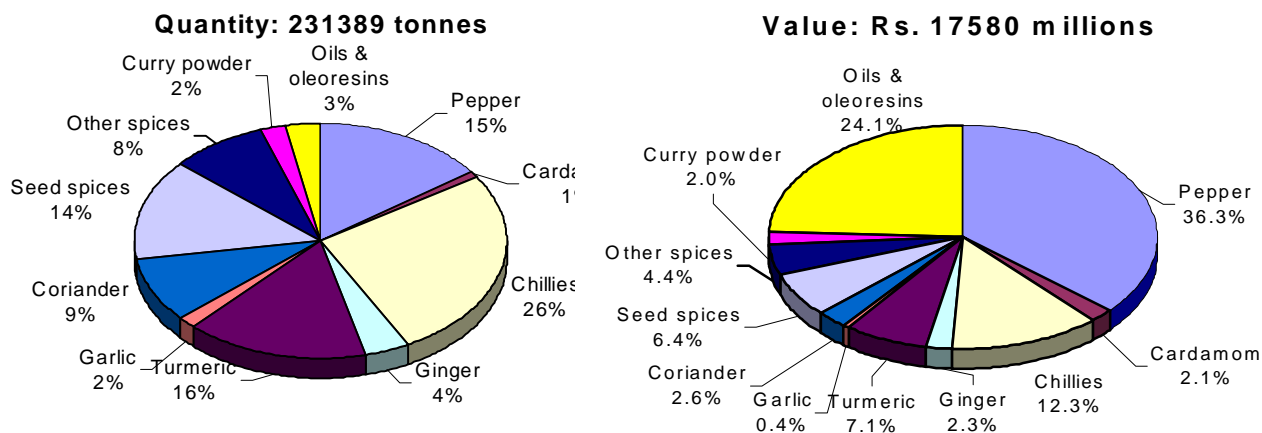


Fig. 3.3 Share of export of spices from India during 1998-99



From a comparative analysis of the total value of export of spices from India during the period 1991-92 and 1998-99, it could be seen that in case of pepper, the prime export earner, the total export value rose from Rs.743.2 million to Rs.6381 million. The percentage value, which was 19.50 in 1991-92 has risen to 36.30 by 1998-99. In the case of small cardamom the percentage value which was 4.1 in 1991-92 has come down to 1.43 at 1998-99. All the crops except garlic recorded increase in export quantity and value during this period. Export value of garlic has come down from 82.8 million to 74.10 million with a difference in total value from 2.17 to 0.42 percent.

2.8 Plantation crops

2.8.1 Coconut and its Products

While coconut as such is not exported, of late, the export of coconut products has increased considerably. The overall export of coconut and its products including coir increased from Rs. 731.90 million during 1991-92 to Rs. 3121.53 million in 1998-99.

Coconut oil fetched maximum export earnings of Rs. 62.19 million among the products other than coir, followed by coconut shell (raw)(Rs.11.19 million), desiccated coconut (Rs.8.92 million) and shell charcoal (Rs.6.42 million). Coconut oil is exported

primarily to Middle East and African countries like Jordan, Kuwait, Oman, UAE and Kenya.

Table 3.8 Export and import of coconut products and coir products
(Rs. in million)

Year	Exports of Coconut products	Coir Products	Import of Coconut Products
1991-92	4.30	627.60	21.92
1998-99	99.83	3021.70	43.28

There is still vast scope to increase export earnings from coconut and its products. Coir and coir products alone earned Rs. 2921 million during 1998-99.

Among the coconut products imported into India only refined coconut oil is imported from Indonesia and Philippines. The value of imports during 1998-99 was Rs. 43.28 million. The details of export and import of coconut and coconut products are given in Table 3.9.

Table 3.9 Export and Import of coconut and coconut products

Quantity in 000 tonnes, Value Rs. in Million

Sl. No	Item	Exported to	Imported from	1993-94				1998-99			
				Export		Import		Export		Import	
				Qty	Val.	Qty	Val.	Qty	Val.	Qty	Val.
1.	Coconut (Fresh)	Nepal,UAE, Oman, Kuwait, Mauritius, Qatar, Netherland, Bahrian Is, Saudi Arabia, Germany, & UK	-	0.02	0.20	-	-	0.10	0.92	-	-
2.	Coconut (Dried)	Oman, Kuwait, Saudi Arabia, UAE, Iran, Mauritius, UK, USA, Canada, Japan, Hongkong and Russia	Myanmar Thailand	0.001	0.03	-	-	0.08	4.84	-	-

3.	Copra	Germany, Iran, Oman, Pakistan, UAE & USA	Malayasia, Papua New Guinea, Sri Lanka, & Phillippines	0.016	0.28	0.359	5.24	0.049	1.86	-	-
4.	Desiccated coconut	Afganistan, Argentina, Kuwait, UK, Brazil, Japan, Sudan, UAE & USA	Sri Lanka	0.005	0.25	-	-	0.211	8.92	-	-
5.	Coconut Oil	Australia, Bharian, Bangladesh	Malayasia, Singapore								
5.(a)	Coconut Oil (Crude)	Jordan, Kenya, Kuwait, Oman, UAE	Sri Lanka, Denmark	0.014	1.17	2.733	44.3	0.03	2.78	-	-
5.(b)	Coconut Oil (Refined)	Isreal, Hongkong, Brazil, Italy, Nepal, New Zealand, USA, UAE & UK	Indonesia, Phillippines	0.304	21.7	0.452	9.18	0.829	63.0	1.37	43.3
6.	Oil Cake (De-fatted)	Malayasia	Sri Lanka, Nepal	1.52	4.54	-	-	0.042	0.42	-	-
7.	Coconut Shell (Raw)	Italy, Japan, Kuwait, Saudi Arabia, Spain, Sri Lanka, UK & USA									
8.	Shell Charcoal	Bhutan, Oman, Singapore, Sri Lanka, Kenya, Netherland, Italy, Malayasia, Mauritius, Japan, USA & UAE	-	4.56	8.51	-	-	0.71	6.41	-	-
9.	Shell Hukah	Bahrain, Germany, Spain, Sri Lanka, Pakistan, Italy, USA & UAE	-	0.1	0.65	-	-	0.001	0.29	-	-
	Total			6.54	37.33	3.544	58.72	2.052	89.44	1.37	43.3

2.8.2 Arecanut

While it is claimed that arecanut production in the country is sufficient for internal consumption, a review of the available data provides some important trends. India has been a regular importer of arecanut and its exports, which was 658 tonnes valued at Rs. 45.70 million in 1991-92 has declined marginally during 1998-99 when only 533 tonnes of arecanut valued at Rs. 46.89 million was exported. During 1998-99, Indian imports were more than 12 times of exports, being 6707 tonnes valued at Rs. 187.56 million.

Table 3.10 Export and Import of Arecanut from India

Sl. No.	Year	Export		Import	
		Qty (tonnes)	Value (million Rs.)	Qty (tonnes)	Value (million Rs.)
1	1991-92	658	45.70	-	-
2	1998-99	533	46.89	6707	187.56

To reduce imports we have to lay emphasis in increasing productivity in the existing arecanut plantation rather than increasing the area under the crop. The arecanut imports were primarily from Sri Lanka followed by Indonesia and Myanmar. Small quantities of arecanut were imported once in a while from Hongkong, Bangladesh, Singapore, Bhutan, Nepal and Pakistan.

2.8.3 Oil Palm

The Country is importing huge quantity of vegetable oils, of which palm oil accounted for nearly 1.2 million tonnes. There is huge demand for vegetable oil in general and palm oil in particular, being a cheaper oil. The country has just started producing a small quantity of palm oil. There is, however, great scope for producing palm oil in the country, which can be exploited bringing one million ha under oil palm to produce three million tonnes of crude palm oil and 0.3 million tonnes of kernel oil by 2025.

2.8.4 Cashew

India is the leading producer, processor and exporter of cashew kernels in the world. The export earnings from cashew and allied products during 1991-92 was only Rs.6690.90 million which increased to Rs. 16300.8 million by 1998-99. During 1999-2000 the export rose to Rs. 24514 million, which is an all time record. Cashew stood fourth in position amongst horticultural products exported from India, after tea, coffee and spices. The export of cashew and its products has increased from 47,738 tonnes in 1991-92 to 77,026 tonnes in 1998-99. During the same period the value of exports increased from Rs. 6,690.90 million to Rs.16300.8 million. There is still potential for more exports in future.

Cashew kernels obtained from raw cashewnuts are exported to more than 30 countries. Very small quantities of roasted/salted cashewnuts in consumer packs of 1 kg or less are also exported. Principal destinations of exports are the USA, the Netherlands, Japan, U.K, Australia, Singapore, France, UAE and Germany.

Cashew nut shell liquid (CNSL) is also an exported item, which was 4542 Mt. in 1991-92 dripped to 1912 Mt in 1998-99, which earned RS, 42.1 million. The details of export and import of cashew is given in Table 3.11.

The growth of cashew processing industry has been substantial over the last two decades, whereby the processing units doubled, doubling the domestic production. There were 572 units in early 80's, consuming nearly 0.35 million tonnes of raw nuts. This increased to 1098 units in 1998-1999, consuming nearly 0.65 million tonnes of raw nuts. The processing capacity of these units is about 1 million tonnes, which is not being fully utilized due to short supply of raw nuts. The average demand growth rate for cashew kernels for export and internal consumption is around 13 per cent. However, the production of raw cashewnuts in the country at about 0.35 million tonnes is inadequate to meet the requirements of the installed processing capacity in the country. The cashew processors are, therefore, importing raw cashewnuts to meet their demand. During 1998-99, about 0.24 million tonnes of raw nuts worth Rs. 9580.3 million were imported.

Keeping in view the export potential of cashew, several countries are laying emphasis on cashew cultivation. Particularly countries like Brazil, Tanzania, Vietnam and Indonesia are emerging as competitors. Brazil and Tanzania are already close to 1/4th of the total cashew production in India. Some of these countries are improving their processing capability. To maintain its leadership in exporting cashew, India will have to increase its production to meet the installed processing capacity within the domestic market, improve the quality and reduce cost of production to be competitive.

Table 3.11 Export of cashew kernel, cashewnut shell liquid (CNSL) and import of raw cashewnut during 1990-91 to 1998-99

Value in Rs. in Million
Quantity in MT

Year	Cashew Kernel		CNSL		Raw nut	
	Quantity	Value	Quantity	Value	Quantity	Value
1991-92	47738	6690.9	4542	40.2	106080	2666.8
1992-93	53436	7454.9	4258	38.1	134985	3763.3
1993-94	69884	10460.2	3625	29.0	191322	4827.0
1994-95	77000	12460.2	3807	24.4	228109	6909.4
1995-96	70334	12405.0	760	14.5	222819	7600.8
1996-97	68663	12855.0	1735	27.7	212866	6876.0
1997-98	76593	13961.0	4446	71.7	247181	7696.0
1998-99	77076	16300.8	1912	42.1	241161	9580.3

2.8.5 Cocoa

Large quantity of cocoa are being imported as the present production of about 7000 tonnes is far less than the processing capacity of 30000 tonnes per annum. Efforts will have to be made to bridge the gap to reduce the foreign exchange loss.

2.8.6 Tea

Until 1987-88 tea was the most significant export item from India. It accounted for 20.7% of total export and ranked first among the agricultural products. Thereafter, the export has declined considerably third position by contributing only 8.8% of the total

exports. The details of export of tea are given in Table 3.12. In 1990 the share of exports decreased to 18.55, while in 1999 it further came down to 14.31. Whole developing markets stagnate growth is expected in the developing countries. These markets are expected to open up substantially in the wake of the WTO regime. This will however bring about increased global competitiveness in the area of cost, price, quality, supply schedules, packaging and market focus and customer satisfaction.

Table 3.12 Export of Tea from India

Year	Export (Qty m Kg)	Value Rs. million	Unit Price Rs. /Kg
1950	200.7	804.2	4.10
1991	202.9	11345.5	55.91
1999	191.7	19658.6	102.5

The overall tea situation in India is quite different from other producing countries. While some of these countries like Sri Lanka export as much as 95 per cent of their produce, in case of India nearly 75 percent of the total production is consumed within the country. However, the per capita consumption of tea in India is still one of the lowest in the world with only 660 gms per head. With improved economic levels, the demand for domestic consumption is expected to increase. As a consequence India has been importing tea from other countries. During 1999 India imported 9.79 million kgs of tea valued at Rs.590.70 million.

The issues affecting India's export performance in tea are:-

- Inadequate efforts made in respect of marketing and brand building in overseas market.
- Over dependence for export on CIS countries, UK and UAE.
- Competitions from countries like Sri Lanka and in Russia.
- Limited presence in emerging market like Syria, Germany, Kenya, Saudi Arabia and Dubai.
- Higher growth rate registered by China in green tea marketing.

The export of tea from India during 1999 was estimated at 191.7 million kg. valued at Rs. 19658.6 million with a unit price of Rs.102.5 per kg. The increase in value of exports between 1991 and 1999 indicates a decline in export volume. On the other hand the export earnings have gone up in value terms. The Indian share in global tea exports, however had declined from considerably during the period.

Import of tea touched around 9.79 million in 1999 compared to 1-2 million kg upto 1997-98 (Table 3.13). This was value at Rs. 590.7 million at a unit CIF value of Rs. 60.39. The unit CIF value of tea imported from a few countries was lower than the prices fetched at Indian auction. As a result Indian tea industry which was earlier competing in the international market will now have to compete in domestic market also protecting the home market is going to be a challenging task. The Indian tea industry will have to evolve same strategy to counter the new competing forces unleashed by globalization.

Table: 3.13 Import of tea into India during 1995-2000

Year	Quantity (million kg)	Value (million Rs.)	Unit (Rs./kg)
1995-96	0.45	24.1	53.56
1996-97	1.25	62.1	49.68
1997-98	2.61	177.9	68.16
1998-99	8.93	647.3	72.79

2.8.7 Coffee

India's coffee industry has great potential for exports and 80 per cent of total produce is exported to over 60 countries worldwide. The major importing countries are Italy, Germany and Russian Federation which together accounts for 43.93 per cent of imports from India. The countries like USA, Germany, Spain and Belgium are the major buyers of *arabica* coffee, while Russian Federation imports mainly the other value added products (instant coffee). The emerging new markets for Indian coffee are Japan and Middle East countries. India's share in world exports is around 4.6 per cent. India exports both *arabica*, which is classified under "other mild category" and *robusta* with their percentage share in world exports of 5 and 12 per cent respectively. During 1998-

99, exports amounted to 2,11,623 tonnes earning Rs.17515 million (US \$ 431.4 million) (Table 3.14).

Table 3.14 Export a coffee from India

Year	Export Q/Mt	Value (RS. in million)	Unit price (RS. /Kg)
1990-91	100110	2788.90	27.58
1998-99	211623	17515.30	82.77

India's share in world export of coffee was only 2.0 and 4.7 per cent during 1991-92 and 1998-99 respectively. During the X Plan an annual coffee growth rate of 5 per cent is envisaged keeping a base level of 2,50,000 tonnes.

India has to evolve suitable strategy to increase exports in the current oversupply situation. Even though India produces the best robusta in the world, it will find it difficult to compete with its Asian neighbours, i.e. Vietnam and Indonesia in the cost of production. However, Indian Arabica is more cost competitive than others, and India should exploit this situation through engaging the key market of USA for Indian coffee. Similarly in Germany the focus should be in building washed Arabica.

2.8.8 Rubber

The accelerated growth in demand for natural rubber in India made the country a net importer of Natural rubber in 1947. The situation remained unchanged until 1970. But, during the first three years of 1970s, owing to the industrial recession and slackness in demand, import of natural rubber was banned from April 1973. Apart from this measure, limited quantities of natural rubber were exported during 1973-74, 1974-75, 1976-77 and 1977-78. To overcome occasional glut in the market and also in accordance with the new economic policy of Government of India, all restriction on export of natural rubber was removed since 1991. But the indigenous production was insufficient to meet internal consumption and natural rubber continued to be deficit in the country. Though export was freely allowed, only nominal quantities were actually exported. However, India has been exporting significant quantities of rubber in the form

of value added products. The export earning from rubber products during 1999-2000 was Rs. 5730 million.

CHAPTER IV

WTO ISSUES

World Trade Organisation (WTO) provides a legal and institutional framework for a multilateral trading system. It is basically committed to establishing an open and liberal global economy, free from any barrier or restriction on trade, and to encourage participation of both developed and developing countries in the multi-lateral trading system. Under this, there is also a desire for making efforts to ensure that the developing countries and least developed countries secure a share in international trade. The basic principles, which are of importance and relevance to horticultural exports under WTO, are discussed in this chapter:

1. BASIC PRINCIPLES

1.1 Non Discrimination

A country should not discriminate its trading partner i.e. every member country will be granted the same status that is granted to Most Favoured Nation. It means that products made in member's own country are not given any favourable treatment in comparison to the products which originated from other member countries and are imported into their territory. It includes that the procedures and standards which are applicable to the domestic industry will automatically be implied to the imported goods i.e., once a foreign good satisfies the conditions including payment of customs duty and/or other charges, it will be treated no less favourably in terms of taxes and measures with equivalent effect than domestic goods.

1.2 Reciprocity

The agreements administered by WTO are based on a balance of rights and obligations achieved through reciprocal exchange of market access

commitments. The open trading system is to be based upon the rules for bringing competition.

1.3 Market Access

An important goal of the WTO is to facilitate the availability of the goods across the border. This agreement also helps in increasing the transparency under the trade regimes. Through this Agreement, the trade across the borders is only governed by imposition of tariffs while rest of the quantitative restrictions, such as quota are to be waived off in a phased manner. In order to exploit the marketing accessibility, competitiveness of a product with respect to its price and quality is a fundamental criteria.

1.4 Fair Competition

The main objective of this principle is to discourage the unfair trade practices such as export subsidies and dumping of products at below cost to gain market share. It is being carried out through regulation of subsidies on export and imposition of anti-dumping duties.

2. AGREEMENT ON AGRICULTURE

Agreement on Agriculture has 4 main components, namely: -

- Concession and commitments on market access
- Domestic support and export subsidies
- The Agreement on sanitary & phytosanitary measures, and
- Ministerial declaration concerning least developed and under developed countries.

The Agreement on Agriculture seeks to liberalise the world trade in agriculture so as to make it free from Government measures that inhibit the trade movement and thereby inefficiency of the sector. Under this agreement, there are different ways of subsidising farmers through governmental interventions. As per this agreement, the member countries are required to reduce the direct subsidies i.e. the subsidies which are based on products or are being given to

the individual farmers either for the promotion of export or selling their products at a price below the cost of supply.

However, the other subsidies which are also called green subsidies are presently being allowed under this agreement. The allowed subsidies are basically broad based in terms of research and pest and disease control, training services, extension services, marketing and promotion services, infrastructural services in order to exploit the market accessibility.

After going through the agreement, it clearly comes out that in order to exploit the facilities being given in the above agreement, there is need to overcome the infrastructure inadequacy and other impediments to the large scale investments. Apart from this, it is necessary that post-harvest technologies for food processing and preservation should be promoted so as to bring about added value to the agriculture economy.

Finally, the gain or loss to a country as a result of liberalisation will largely depend on achieving the market accessibility through providing the green box subsidies.

Indian export basket consisting of agro-based products and manufacturing items suffers from considerable supply related problems. So far as the agro based products are concerned, the question of surplus is most critical. In case of manufacturing products, there are serious problems of competition relating to high cost, inefficiency in production, outdated technology, problems related to delivery schedule and product specification.

2.1 Categorization of Rubber

While coffee and tea have been classified under 'agriculture' and come under the purview of the 'Agreement on Agriculture', natural rubber has been taken as an industrial raw material and does not come under this Agreement. This implies that natural rubber will not enjoy tariff and non-tariff protection generally available to agricultural commodities. Rubber is a tree product and is practically grown in the rain-fed plains, in elevations up to about 1500 feet.

There are nearly one million growers of rubber, cultivating the crop in about 0.55 million hectares in the country. Most of them are small farmers with an average holding size of less than 0.5 ha. Their livelihood is solely dependent on the returns from the crop. They tap the rubber trees, collect the latex, dry it as sheets and sell in the market. There is no manufacturing process involved as far as the growers are concerned and the entire operation is purely agricultural. In fact, the entire income from natural rubber in sheet form is treated as agricultural income under the Indian constitution and is taxed accordingly under the Agricultural Income Tax Acts of the respective state governments. In these circumstances, there is no justification to exclude natural rubber from the purview of agriculture. It is pertinent to note here that natural rubber has been classified as agricultural raw material under the commodity trade classification of UNCTAD as well as under the Integrated Programme for Commodities (IPC) of the Common Fund for International Development Assistance.

There are several disadvantages arising from rubber not being included in the category of 'agriculture' under WTO. The first disadvantage is the bound rate i.e., the maximum rate of import duty, allowed to be levied. It is noted that the bound rates for agricultural commodities are relatively higher. While the bound rate for tea is 150%, and coffee and pepper 100%, that for natural rubber is as low as 25%. Another aspect is that agricultural commodities come under the basket of 'green box', arising from which certain concessions including developmental subsidies could be extended and we may have certain bargaining powers on the ground that items in this box are eco-friendly in contrast to pollution-prone industrial products.

In view of the above:

- At the time of the next round of WTO negotiations, India may take up that, in all fairness, natural rubber should be classified as an 'agricultural commodity', and should be brought under the purview of the Agreement on Agriculture, which is fully justified.

- Meanwhile, the bound rate on natural rubber should be increased to a reasonably higher level to be on par with other agricultural products. It should be examined if this could be done through the provisional safeguard measures, in the wake of the QR removal.
- Rubber is a tree crop which is environmentally friendly and therefore, be put under the 'green box'.

3. AGREEMENT ON SANITARY AND PHYTO-SANITARY (SPS) MEASURES

The objective of this Agreement is to improve health or life of human, animal and plant and overall phyto-sanitary situations in all the member countries. This agreement states, that the measures should not be applied in a manner, which would result in a means of arbitrary or unjustifiable discrimination between the members. In other words, it means that the sanitary and phyto-sanitary measures applied by each member country should be based on scientific justification and to the extent possible, it should take into consideration, the international standards and guidelines already available. The major articles in the Agreement having an effect on the horticulture produce are as follows

3.1 Article 3 on Harmonisation

This Article states to harmonise the sanitary and phyto-sanitary measures, which basically include levels of food additives, contaminants, pesticide residues, microbiological criteria and other related toxins with the international standards and guidelines. It means that the standards already available in India for fresh horticulture produce should be immediately harmonised with the international guidelines and if higher level of measures is required, the scientific justification for the same may be documented at the earliest. This process of harmonisation is crucial with respect to both exports and imports. In case our domestic standards are inferior to the international guidelines, we will not be in a position to impose stringent standards on the imported products, thereby, all the inferior quality products will be dumped into our country. This issue of harmonisation is

also required when we enter into an equivalence agreement for exporting our goods into other countries. Before entering into equivalence, we are required to submit the detailed data on the SPS measures applied within our country and the mechanism for monitoring the implementation of the same.

3.2 Article 4 on Equivalence

Article 4 of the Agreement directs the WTO members to accept SPS measures of the other countries as equivalent even if these measures differ from their own or from those used by other countries trading in similar products, provided, the supplier country can demonstrate to the importing country that its measures achieve the importing country's appropriate level of SPS protection. Under this Article, WTO members can also enter into bilateral or multi-lateral agreements on mutual recognition of equivalence of specified SPS measures. The current trend is that many developed countries are entering into mutual equivalence agreements as it facilitates trade between the respective countries. This has been one of the reason for a more favourable treatment of products imported from developed countries as against products originating from developing countries resulting in the latter's further marginalisation.

3.3 Article 5 on SPS Measures to be Based on Scientific Evidence

As per Article 5 of the Agreement, countries are required to ensure that the measures of SPS protection are based on risk assessment on the basis of available scientific evidence, production processes and environmental conditions. Where scientific evidence is lacking, countries can resort to temporary SPS measures. In such cases, countries are required to obtain scientific evidence for a final position and within a reasonable time frame. Moreover, such SPS measures cannot be more trade-restrictive than is necessary to achieve the appropriate level of protection taking into account the technical and economic feasibility.

3.4 Article 7 on Transparency

According to Article 7 (transparency), all WTO members have an obligation to notify to the WTO committee, any changes in their SPS measures. They are also required to notify measures, which have a “significant effect on trade of other Members” and that depart from an international standard guideline or recommendation.

3.5 Article 9 on Technical Assistance

As per Article 9, the WTO members are expected to facilitate technical assistance to other members especially the developing countries either bilaterally or through the relevant international organisations. This assistance may be in the areas of processing technologies, research and development, infrastructure, etc. and may be in the form of information, credits, grants, training and equipment to enable the countries to comply with the SPS measures necessary to achieve the level of SPS protection adopted by the importing country.

3.6 Article 10 on Special & Differential Treatment

As per Article 10 of the SPS Agreement, Special and Differential Treatment (SDT) is required to be provided to the developing countries, whereby, longer time frames for compliance with SPS measures are supposed to be provided by the developed countries. Moreover, the SPS Committee can grant developing countries specified time limit exceptions to comply with the application of the SPS Agreement.

4. PRODUCTS FACING SPS RELATED PROBLEMS

4.1 Mango and Grape

Japan, Australia and China have banned imports of mangoes and grapes from India on account of presence of certain fruit flies. China has imposed a ban on grapes for a species of fruit fly that does not even exist in India. Australia

desires to have complete details about pest management practices in India and a ban can only be lifted after signing of a MOU on mutual recognition of pest management practices. US rules governing import of fresh fruits and vegetables are very stringent. USDA gives clearance only after detailed tests involving inspection of the production areas.

Japan, on the other hand, desires Vapor Heat Treatment (VHT) of fruits for dis-infestation before these can be allowed to enter into their country. Lot of research work has been carried out in India to meet the Japanese requirements. It has taken more than five years to develop the protocols and inspite of this lifting of the ban is not anticipated in the near future. The lengthy procedure involved is that even after evaluation of our report (which itself is pending for one year), the Japanese quarantine experts have yet to visit India for their own evaluation on the VHT machine. Thereafter, a public debate will have to be carried out in Japan before the decision on lifting of the ban can be considered. In the process, we are likely to lose a total of about 10 years before India can think of actually exporting these fruits to Japan. The Japanese regulation is too strict a SPS measure for any country to comply with.

It is, informally learnt that these restrictions are actually a non tariff barrier to trade because of the commercial interest of Japanese companies in Philippines and Thailand, where they have their own mango orchards for meeting the Japanese demands.

4.2 Coffee

The European Union (EU) introduced a regulation prescribing unreasonably low levels of Ochratoxin-A (OTA) in coffee. The implementation of the EU regulation got delayed after 38 supplier countries presented a joint memorandum to the EU stating that the proposed EU regulation was not strictly related to the extent of risk involved and it also had negative trade effects. The EU has decided to review the situation by the end of 2002.

5. PESTICIDE RESIDUE PROBLEMS

5.1 Grape

The European Union (EU) has introduced regulations on pesticide residue levels in fruits and vegetables imported from different countries. A number of chemicals have been listed and more are being added on a regular basis. Indian exporters are required to comply with the maximum pesticide residue levels for exporting their products to the EU. This problem has specially been faced in exporting grapes, where a number of procedures had to be introduced by India to ensure that grapes were exported with pesticide residue levels within the prescribed limits.

5.2 Gherkins

India is currently the largest exporter of provisionally preserved gherkins to the EU. Our exports, however, have shown a declining trend during the last two years. One of the reasons is different pesticide residue levels fixed by different member states of the EU. Moreover, the chemicals for which residue levels have been prescribed also differ from country to country within the EU with the result that there are no harmonized regulations in this regard and no intra-EU trade in gherkins. This is restricting free flow of trade in this commodity.

5.3 Tea and Spices

There are also different regulations of the EU member countries with regard to import of spices and tea, whereby maximum pesticide residue levels prescribed by them have to be complied with India is particularly facing problems in export of chilli to Spain which has different pesticide residue levels as compared to those of another EU country.

5.4 Honey

The EU has prescribed maximum levels of pesticide residues in honey and these are required to be tested before exports to the EU. While this appears to be an appropriate level of protection, the procedure of implementation is

cumbersome. India is required to provide to the EU with its residue plans for the previous year and for the following year with respect to honey produced in all regions of the country. This is practically difficult keeping the Indian conditions in view where honey is required to be collected from a large number of producers different sources before being packed. One may not be surprised if India sees a ban on exports of honey to the EU sooner than later.

6. FACTORS GOVERNING COMPETITIVENESS

6.1 Lack of Range of Varieties

While a wide variety of germplasm is available in most of the horticultural commodities, varieties most suited for exports have not been adequately identified in several crops. Similarly, many well-known varieties having demand in the international market have not been introduced and tried. Work on developing export -oriented varieties and those suited for value addition needs to be given due priority

6.2 Pre- Harvest Practices to Control Post Harvest Losses

Several post harvest diseases and pests can be avoided with appropriate pre-harvest treatment. Such recommendations need to be popularized among growers to reduce losses and improve quality. Apart from this, pest infestation is also a problem, which is affecting the price realization of Indian produce in the market. Both these problems can only be dealt with by following the correct pest management and pre- harvest practices.

6.3 Loss of Produce at the Primary Level

There is significant loss of produce at the primary production level as a result of inappropriate harvesting methods. There is therefore need to develop and implement proper harvesting methods. An important example is mango, which is required to be plucked at a stalk length of more than 5 cms in order to prevent the fungus infection. Once the stalk is removed either during or soon after, the sap flows on the fruit surface spoiling its appearance and often resulting

in fungus infection. This problem could be minimized to a great extent by using the mango harvester, which has been developed in the country in a number of institutions e.g. IIHR Bangalore, CISH Lucknow and KKV Dapoli. Efforts would be needed to popularize the same among the farmers.

6.4 Lack of Adherence to Maturity Indices

The maturity indices in most of the horticultural crops are either not available or not followed by the farmers resulting in harvesting of these crops at varied maturity levels. Thereby, a large quantity of produce has to be rejected while sorting and grading due to under or over maturity/ripening e.g. fruits and vegetables. Further, once such a lot is exposed to controlled atmosphere condition or modified atmosphere packaging, the reaction of the commodity is varied, making it difficult to standardize the post-harvest treatments. In crops like coconut and oil palm lack of implementation of uniform maturity standards can result in avoidable loss in quantity and quality. Hence, there is need to create awareness about the maturity indices of different horticultural commodities among the farmers both for catering the needs of export market and for marketing of produce in distant locations within the country.

6.5 Lack of Facilities for Physical and Chemical Treatment After Harvesting

Several post harvest treatments are recommended for minimising post harvest losses in different horticulture commodities. However, adequate facilities for large-scale treatment are not available at the farm level. As a result, gap between harvesting and post-harvest treatment such as hot water dip is very long resulting in avoidable losses to quality.

6.6 Lack of Post Harvest Infrastructure and Logistics

In order to maintain the quality of horticultural commodities there is need to develop proper infrastructure in terms of pre-cooling units, grading and packing houses in the producing areas. For instance, in Controlled Atmosphere

(CA) storage, the time gap permitted between the harvesting and the hot water dip is 8 hours. However, due to inadequate packing house facility and lack of refrigerated transport, the above condition is difficult to implement in practice. Such a situation is not conducive to promoting exports. In view of this, it is the need of the hour to establish pre-cooling units or packhouses as well as cold storages for fruits, vegetables and flowers in the growing regions. Under WTO, the subsidies for creation of such an infrastructure are allowed. Therefore, the Government should take immediate steps for creation of such facilities for the common use of all the farmers in different production regions of the country.

7. NEW OPPORTUNITIES

7.1 Organic Farming

There is a need to promote organic farming in production of different horticultural commodities with the objective of promoting exports and improve returns. There is, therefore, an urgent need to develop technology for organic farming and create awareness on the benefits it provides. This calls for standardization of technologies for producing vermi-compost, biofertilizer, mycorrhizae and bio pesticides for different crops. There is also need to develop guidelines for this purpose and designate agency / agencies for accreditation of such produce meeting international requirements.

7.2 Import Substitution

There is vast scope of reducing imports of horticultural commodities like dates, nuts like almond, pecannut, pistachionut, macedemia nut, palm oil , raisins, cocoa and rubber. Area under such commodities needs to be increased. There is also need to develop commercial plantations of fruits like mangosteen, durian, longan,rambutan, etc which are commercially grown in most south Asian countries namely Thailand, Malaysia and Indonesia.

7.3 Import Intimation System

The need for having adequate, reliable and timely data in respect of import of commodities has become extremely necessary now in the context of opening

up of the economy. There should be on line records about quantity, value, quality etc., of the commodities imported in the country so that both the government and interested entrepreneurs could make use of this information for various purposes. There is more urgent need for commodities like spices, cashew where international trade is sizeable.

7.4 Products having an Edge in International Market

India being largely a tropical country, it is necessary to concentrate efforts on tropical horticultural crops such as fruits like mango, litchi, sapota, passion fruit, aonla, bael and guava and plantation crops like coconut, cashew, cardamon, black pepper, tea and coffee. Since most of the developed and importing countries are in the temperate region the chances of increasing our market share with such crops in this region are more. Apart from this, India is also very rich in medicinal plants. In order to promote export, R&D on these crops needs to be intensified and cultivation of crops with export potential needs to be promoted. In case of coffee, there is a need to exploit the potential of Indian Arabica Gourmet Sector and of robusta in expresso segment.

8. PRODUCT SPECIFIC MEASURES

8.1 Floriculture

Cut flower industry in India is at a nascent stage. In recent years floriculture units have come up near most metropolitan cities like Bangalore, Pune, Delhi, Hyderabad and Chennai. India enjoys the advantage of favourable agro- climate, cheap labour, extensive arable land and skilled manpower. Because of these reasons, India has a very high potential for export of cut flowers. The Government of India has given Thrust Area Status for floriculture industry as a potential foreign exchange earner.

Floriculture exports from India have shown a steady growth and have increased from Rs 146 million in 1990-91 to Rs 1733.7 million in 1998-99. Among Floriculture products, the growth of fresh cut flower sector has been very

significant. From Rs 10.2 million in 1991-92 to Rs 251.1 million in 1998-99, this cumulative growth of about 90% has come largely due to the proactive role

played by APEDA in promoting this industry. However, India's share in the global cut flower trade remains less than one per cent. This shows the potential and the vast opportunities that exist for export of cut flowers. With new markets being identified and exporters having negotiated the learning curve, the prospects are improving.

Rose, orchids, anthuriums, carnations, chrysanthemums and gerbera are the most common cut flowers having a major share in the international trade. The key flower exporting countries are Holland, (59% share in the world export market), Columbia (10%), Italy (6%) and Israel (4%). The major destination for export of cut flowers from India is Europe (45%), Japan (30%), Australia (10%) and other countries (15%). There is thus a good potential for export of flowers from India to Europe, Japan, Australia, Singapore and North America.

9. HORTICULTURAL QUALITY STANDARDS

9.1 Indian Standards In Agricultural Products

Indian standards in the agricultural sector have been framed by various organisations of the Government most of which are under Ministry of Agriculture. These organisations are responsible not only for production and product standards, but also for their inspection and quality control. Some of the major organisations involved are given below in Table 4.1

9.2 Agreement on Technical Barriers To Trade

This Agreement deals with the product standards related to physical parameters such as size, colour, appearance, maturity, packaging and labelling requirements. Presently, for most of the horticulture produce the standards stating the above requirements are not mandatory for domestic produce, in lieu of which, the imported products are enjoying the liberty of following their own

standards as applicable in their country. As a result several of the packaged imported products are having labels which are in foreign languages. However, as per our national legislation on packaged item it should be made incumbent on all packaged products to have labels either in English or Hindi.

Table 4.1 Organisation involved in standards for Agricultural Products

No.	Departments	Organisation	Products Covered
I	Agriculture & Cooperation	Directorate of Marketing Inspection (Agmark), under the Ministry of Agriculture	Fresh fruits & vegetables, walnuts, flowers and Spices
		Directorate of Plant Protection, Quarantine & Storage under the Ministry of Agriculture	Issue of phytosanitary certificate for export of fresh fruits & vegetables, flowers, and seeds.
		State Seed Certification agencies	Seeds of fruits, vegetables and flowers
		Food Products Order (FPO) under the Ministry of Agriculture, Dept. of Food Processing Industries (DFPI)	All processed food products specially processed fruits and vegetables including pickles & chutneys.
II	Consumer Affairs	Bureau of Indian Standards	All agricultural products
III	Commerce	Agricultural and Processed Food Export Development Authority (APEDA)	Grading & packing standards for exports
IV	Health and Family Welfare	Directorate General of Health Services	Standards on food hygiene

Apart from the product standards, there is also need to develop procedure for implementation and monitoring of these standards from import point of view. As per the above Agreement, all the standards should be clearly laid down so that they are published in a transparent manner and other member countries may utilise these in order to promote their exports. In order to meet these conditions, there is an urgent need to specify procedure in this regard.

9.3 Harmonisation of Standards

There is also multiplicity of standards in several horticultural products. There is, therefore, an urgent need to not only rationalise standards fixed by various organisations but also to harmonise these with ISO standards for different commodities. Standards for growing and package requirements of international markets are also not available in a large number of commodities. The standards developed by Directorate of Marketing and Inspection are old and outdated. There is, therefore, an urgent need to fix standards to promote domestic as well as international trade in agricultural / horticultural commodities.

10. INTELLECTUAL PROPERTY RIGHTS (IPR)

In the present scenario of globalisation, it has become important to understand the implications of the IPR. A patent is a legal monopoly granted to the owner of any new invention, which is capable of being used for limited period of time. It is a privilege granted by the Government to an inventor and other persons deriving their rights from inventions. The patents also stimulate the technology process through diversification of products and upgradation of the technologies. The owner of a patent on a product / variety has full right to prevent others from making, using or importing this product without his consent. Presently, in India there is no legislation, which covers the protection of plant breeders right. As a result, many of the foreign nurseries do not encourage the supply of horticultural crop varieties to India since their rights are not fully protected. Thus, India does not have access to many useful materials due to non-protection of plant breeder's right.

11. QUALITY ISSUES

In the light of recent changes in the international trade, to exploit the potential for export of horticulture produce to its full capacity, sincere efforts are required to be made to develop a full fledged Quality Assurance Machinery. This proposal would affect business of all sizes engaged in production and trade of products and services throughout the supply chain. In addition to compliance with

national legislation, this machinery will ensure that the following issues are considered.

- To ensure that all stages of production and distribution for which they are responsible are carried out in such a manner as to comply with food safety and consumer protection requirement;
- To inform the competent authority if it considers or suspects that a product placed on the market does not comply with the relevant food safety requirement and of action taken to prevent risk to the final consumer;
- That no product is exported which does not comply with the general requirement of the food laws;
- To have a system in place to identify the supplier of the product and the buyers or traders to whom they have supplied such products.
- To adequately label and identify produce to allow its traceability and withdraw the product if it considers or suspects that it is not complying with food safety requirements.

The above machinery would also be useful for ensuring that the products imported into India comply with conditions outlined above. In the present situation, there are chances that the developed countries could dump their products at throw away price to capture the Indian market along with the pests and diseases. Similarly it will ensure that genetically modified organisms (GMO) and microorganisms presently not existing in Indian soil do not enter into the food chain of the country.

There is a need to have a national approach for ensuring the quality and safety of food items including domestic, imported and exported products. This necessitates the overhauling of the current monitoring and control mechanism to ensure that the products entering into Indian market comply with the national food safety laws. In order to give a systematic approach to this important issue, a two-way action plan is suggested.

11.1 Quality Building Machinery

Includes activities targeted to upgrade the status of food processing industries including handling of fresh produce to achieve good quality and safe

food products, through creating awareness and training among food industries. This has to be ensured by the industry.

11.2 Quality Assurance Machinery

To ensure development and implementation of produce and process standards through monitoring and certification thereby ensuring the quality and safety of the final product.. This is primarily the role of the Government in the current scenario.

12. LAYING DOWN STANDARDS

The task of laying down the standards, their notification and ensuring their adherence may be divided within different Government Departments product wise such as:

12.1 Voluntary Standards

A National Committee for Product and Process Standard should be formed under the umbrella of Ministry of Agriculture. Its role would be to form different subject wise-sub committees under various Departments of the Ministry of Agriculture. The other members of the Sub-Committee may include various promotional boards and state departments. These sub-committees may be constituted product-wise such as: -

12.1.1 Sub-Committee on Fresh Fruits and Vegetables

This Committee may be formed under the chairmanship of Directorate of Marketing and Inspection for developing Standards for fresh fruits and vegetables. These standards should include the following requirements: -

- Name of the standard
- Scope
- Description
- Essential composition and quality factors
- Food additives and contaminants
- Hygiene
- Weights and measures
- Labeling
- Method of analysis and sampling

In order to achieve the goal of safety of the product, the final product testing is not a reliable criteria. In view of this, it is required that the practices, which are implemented at the production and harvesting level should also be improved. In view of this, process standards should be developed which would identify the critical points, which are required to be monitored at the production and the harvesting level. It would also provide reference in terms of guidelines for production of fresh fruits and vegetables during primary production and packaging.

12.1.2 Sub-Committee on Processed Products

Processed Products would include Processed Fruits and Vegetables, Nuts, alcoholic and non alcoholic beverages, coconut, spices, tea, coffee, honey, medicinal & herbal preparations, etc. Product wise Sub-Committees should be formulated to develop product and process standard under the umbrella of Ministry of Agriculture i.e. Department of Food Processing Industries. These standards should also be harmonized in terms of format prescribed under international standards such as Codex Standards. The different Product Orders such as FPO specification which lays down requirements related to location of the factory, personnel hygiene, equipment requirements, and its maintenance etc. are also required to be modified in order to incorporate the hygienic practices as prescribed under Codex i.e. General Principles for Food Hygiene.

12.2 Mandatory Standards

The standards related to Sanitary and Phyto Sanitary (SPS) aspects listed below are refereed to as Mandatory standards:

- Minimum residue level for pesticides (MRL's)
- Heavy metals
- Mycotoxins
- Microbiological requirements
- Any other requirements related to food safety of processed horticultural products.

All the requirements may be notified under PFA (Prevention of Food Adulteration Act) because the major objective of PFA formulation is to protect the health of the consumer. Thereby, the rule formulated under PFA would be mandatory for all the commodities for domestic consumption import and export.

12.3 MONITORING AND INSPECTION MECHANISMS TO ENSURE IMPLEMENTATION OF PRODUCT AND PROCESS STANDARDS

Once the product and process standards for various commodities are laid down and notified under the various departments, the next aspect which requires attention is the monitoring and inspection of the above standards. Primarily the monitoring and inspection is the role of the government. However, this task may be carried out through accreditation of inspection agencies which would be accredited the task of carrying out the inspection on behalf of the government before granting approval for processing of the respective food commodities. In order to achieve this objective of accrediting the inspection bodies which may include both private and government bodies, the following action is required to be taken

- Laying down the guidelines for assessment and accreditation of inspection and certifying bodies which would also cover the legislative framework and other infrastructure requirements including control programmes.
- Laying down the guidelines to be followed by inspecting bodies for inspection and monitoring of food processing industries for certification.

The responsibility of ensuring the implementation of above product and process standards and also laying down the guidelines for assessment, accreditation and inspection would lie with the Departments which are chairing product wise Sub-Committees. These Departments may also accredit private agencies which would further identify the certification bodies to carry out the inspection of food industries for compliance to the product and process standards on behalf of each Department.

The overall evaluation of the situation related to the implementation and assurance of product and process standards may be with **National Committee of Product and Process Standards**. It would include the yearly review of the

status of national standards with respect to the changes taking place in international scenario related to the aspects of quality and safety in food trade.

12.4 NETWORKING

In the light of the above developments, a networking of the laboratories also requires equal importance as these laboratories would be utilized for analysis to ascertain whether the products comply with the standards laid down by the government. It is, therefore, necessary that there is a wide network of laboratories distributed through out the country to carry out this task. In order to monitor this task, a sub-committee under the National Committee may be formed which would recognise laboratories as per the standards, laid out. This would primarily include the following:

i) Standards related to the various technical capabilities required with respect to the target product to be tested.

ii) The system requirements specifying the procedures for processing of samples and other documentation requirements needed to comply with for recognition of the laboratory.

iii) The role of this Committee will be to develop a system of recognition and continuous surveillance of the laboratories. In order to ensure the implementation of above standards, the whole task may be done through a nodal agency which is presently National Accreditation Board for Laboratories under the Department of Science and Technology. This agency has also notified standards for laboratories including detailed procedure for accreditation of these agencies at the government and non-government level for recognising the laboratories meeting the above-notified standards. A regular feed-back mechanism is also needed to be in place, in order to continuously improve the procedure where necessary.

12.5 Nodal Agencies

With the approach of introducing system standards within the food industries such as Hazard Analysis Critical Point (HACP) and ensuring their

implementation through the certification process, it is required that a nodal agency may be identified, with following role.

- Laying down the guidelines for implementation of food safety management system in food industry including standards for HACCP based on the Codex requirements.
- Laying down the guidelines for assessment and accreditation of certification bodies for the quality assurance system.

CHAPTER V

RESEARCH PROGRAMMES

1. RESEARCH INFRASTRUCTURE

The Indian Council of Agricultural Research (ICAR) has been gradually building up research infrastructure for a wide variety of horticultural crops. Several regional stations in horticulture, started by the ICAR in its early phase now form the nuclei of our research efforts in various states. Major initiatives in this regard were taken in 1954 when a Horticulture Section was established in the Division of Botany, IARI, New Delhi. Horticulture research further got impetus in the IV Five Year Plan when an Institute of Horticulture research was established at Hassarghatta near Bangalore, to work on fruits, vegetables, mushroom, ornamental and medicinal and aromatic plants. Research on plantation crops was started with the establishment of a Coconut Research Station at Kasaragod in 1943, which later became Central Plantation Crops Research Institute and an Arecanut Research Station at Vittal in 1957.

In addition to these organisations, the Ministry of Commerce established one Research Institute each for Coffee, Rubber and Spices and two for Tea to carry out research exclusively on these crops.

Similarly, a large number of CSIR laboratories like Central Food Technological Research Institute (CFTRI), National Botanical Research Institute (NBRI), Central Institute for Medicinal and Aromatic Plants (CIMAP), Regional Research Laboratories (RRLs) and Defence Food Research Laboratory (DFRL) are undertaking research on post harvest management of large number of horticulture commodities including research on value added products. In addition, the Planning Commission has agreed in principle for the establishment of three new National Research Centres each on Litchi, Pomegranate, and Mukhana. Further, several traditional Universities and other central organizations e.g., Department of Biotechnology (DBT) , Bhaba Atomic Research Centre (BARC)

and Indian Space Research Organization (ISRO) are also undertaking basic and strategic research.

The ICAR also provides funding support to several non-ICAR institutes through a large number of time bound ad-hoc mission mode projects to solve specific problems as well as International collaborations and foreign aided projects to promote horticulture research in certain specific areas.

Rapid expansion in infrastructure was, however, witnessed in the Seventh and Eighth Plan. A full fledged horticulture division was created at the ICAR Headquarters headed by a Deputy Director General during 1987. At present, the following research infrastructure in horticulture exist in the country:

- 10 Central Institutes with 27 Regional Stations.
- 10 National Research Centres on important crops.
- 9 Multidisciplinary Institutes working on horticultural crops.
- 15 All India Coordinated Research Projects with 223 centres.
- One full fledged State Agricultural University in Horticulture & Forestry.
- 25 State Agricultural Universities with Horticulture discipline.
- 5 network projects.
- 330 Ad-hoc research projects.
- 29 Revolving fund schemes.

2. ACHIEVEMENTS

Systematic research efforts over the years have led to the development of about 500 improved varieties and hybrids, improved production and protection technologies for different horticultural crops for varying agro-climatic regions and situations of the country as well as post harvest processing. Major achievements made in horticulture are given below.

2.1 Crop Improvement

- Building up of large germplasm in almost all horticultural crops.

- Development and release of clones /varieties and hybrids in:
 - Fruits: 45 varieties in 12 fruit crops comprising of aonla (2), acide lime (4), apple (4), banana (5), custard apple (1), grape (6), guava (3), litchi (2), mango (8), papaya (6), pomegranate (3) and sapota (1).
 - Vegetables: About 182 open pollinated varieties and 36 F1 hybrids and 2 synthetics in vegetables like tomato, bringal, cucumber, capsicum, cabbage, musk melon, water melon. Varieties are also developed possessing resistance to diseases and insect pests.
 - Potato: 34 high yielding varieties for different agro climatic regions of the country. Varieties are also developed for short growing period, resistant to late blight, tolerance to viruses, and immunity to wart disease and resistant to cyst nematode.
 - Tropical tuber crops: 24 improved varieties of tuber crops like Cassava, sweet potato, yams and aroids.
 - Ornamental crops: 57 varieties of rose, 35 of chrysanthemum, 42 of gladiolus, 150 of bougainvillea, 25 of hibiscus and 2 of orchids.
 - Medicinal and aromatic plants: 25 improved varieties of medicinal plants and 7 of aromatic plants developed by the ICAR/SAUs. In addition 89 varieties are developed by CIMAP, Lucknow (CSIR Institute).
 - Spices: 7 varieties of black pepper, several of cardamom, ginger, turmeric released.
 - Coconut: 12 hybrids involving tall and dwarf parents.
 - Arecanut: 4 high yielding varieties released for commercial production.
 - Cashew: 12 hybrids with a high yield potential developed and released.
 - Tea: 30 high yielding vegetative clones each released by Tea Research Association and UPASI, Tea Research Foundation. Of these UPASI TRF-1 recently released in south India has yield potential upto 11000 plus kg/ha of made tea.
 - Rubber: Evolved many hybrid clones out of which RR11105 is outstanding clone.
- Commercial cultivation of crops like Kiwi, strawberry, olive, gherkin, oil palm, anthurium orchids and vanilla established.

2.2 Plant Propagation

Several innovations and improvements have been made in the propagation of plant material and seed. These include:

- Standardization of vegetative propagation techniques viz., veneer grafting, soft wood grafting and chip budding in crops like aonla, bael, ber, cashew custard apple, jamun, mango, sapota, jackfruit, walnut.
- Commercial production of tissue cultured plants in banana, strawberry cardamom, orchids and anthurium.
- Production of virus-free planting material and shoot tip grafting in citrus.
- Suitable rootstocks standardized for grape, citrus, mango, apple, tea.
- Breeder seed production of 120 open pollination high yielding varieties of vegetables. Improvement in hybrid seed production with development of male sterile lines in tomato, incompatible lines in cauliflower and gynocious lines in cucumber and muskmelon.
- Seed plot technique for processing disease free potato seed in plains developed. Entire breeder seed production in of potato undertaken by CPRI.
- Seed gardens for production of TxD and DXT hybrids in coconuts and indigenous tenera seed in oil palm established.
- Near self-sustainability achieved in production of planting material in cashew.
- Rapid methods of production of rooted cutting and commercial production for micro propagation developed.

2.3 Production Technology

- High density planting systems standardized in mango, kinnow, banana, pineapple and papaya for higher productivity & profitability.
- Multispecies cropping systems standardized in coconut, arecanut, oil palm
- Production technologies for Kharif season onion in North India and long day type onions for high altitude.
- Standardized protected cultivation / green house alteration techniques for strawberry, tomato, cucumber, capsicum, rose, gerbera, cactus, chrysanthemum, anthurium, orchids.
- Drip irrigation/fertigation in banana, grape, papaya, pomegranate and mandarin standardized for saving water and fertilizer by 30-40 % with increasing yield and better quality fruit.
- Use of plant growth regulatives / chemicals for flower production /regulation in mango, improvement of berry size and quality in grape, control of fruit drop in citrus, mango, ripening of fruits standardized.

- Techniques for mango, grapes and staggered pruning techniques for production of cut flowers, eg. Rose etc.
- Standardization of micro-vegetative techniques in grape, banana, coconut, oil palm, tomato, brinjal and cucumber.
- Compatible rootstock series of tea clones release by TRA and UPASI-TRF, which have combining effects and additional yield potential of 26-27 % over the parents.
- Cultivation aspects of tea like pruning shade management and organic nutrition in soil, soil amendment application of weedicides and balanced application of fertilizers have been refined over the years to increase yield.
- Fertilizer schedules standardized for a number of crops grown in different agro climatic regions.
- Leaf nutrient guides developed in a number of crops for monitoring nutrient status and scheduling fertilizer application.

2.4 Crop Protection

- Plant protection schedules established for all commercially cultivated horticultural crops
- Integrated Pest Management strategies in crops like cabbage (diamond back moth), tomato (fruit borer), potato (bacterial forecasting and tuber moth) standardized
- Apple scale and potato late blight forecasting system developed.
- Biological control standardised for control of mealy bug in grapes, scale insects in citrus, rhinoceros beetle and leaf eating caterpillar in coconut.

2.5 Post Harvest Management

- Development of mango harvester.
- Standardization of pre and post harvest chemical treatments to control post harvest diseases in citrus, mango, banana during long distance transport and stage.
- Post harvest treatments including pre-cooling, passive evaporative cooling for increasing the shelf life of fresh fruits, vegetables, floriculture products, processed fruits and vegetables standardized.
- Packing materials like jute, laminated bags, multi wallpaper, sacks and flexible packaging substances developed are being used commercially.

- Development of fruit products like mango fruit kernel as cocoa substitute, essential oils from citrus, fruit wines, papain from papaya, dehydrated products from grapes, pomegranate, mango, apricot, and coconut.
- Technologies for commercial production of value added coconut products like vinegar, cream, milk, milk powder and pouched tender coconut water.
- Development of multipurpose copra drier, electronic copra moisture meter and tree climbing device in coconut, mango fruit harvester.
- Development of small scale processing plant for oil palm.
- Disposable plates as well as cups from arecanut and extraction of tannins from arecanut.
- Protocol for preparation of cashew jam, jelly, candy and juice.
- Quality improvement in tea achieved through training, modernization of factories upgrading of plucking standards and improving sanitation and hygienic situation ISO-9000 and HACCP as the package for quality improvement introduced.

2. ACHIEVEMENTS DURING THE NINTH PLAN

Significant achievements made during the IX Five Year Plan are highlighted below.

3.1 Fruit Crops

A mango hybrid, CISH M-2 (Dashehari X Chausa) has been developed which is better than Dashehari. Its fruit surface remains free from sooty mould even after exposure to heavy rains, with fruits maturing 15-days later. Another mango hybrid, CISH M-1 has been recommended for release as an export variety. Hybrid H 18 (Alphonso X Kensington) has shown better fruit quality. The technology for rejuvenation of old and unproductive mango trees has been developed.

Soil application of paclobutrozol (a.i. 4 g/tree in cv. Dashehari and 2 g/tree in cv. Chausa) has been developed which has potential for increased flowering, fruiting and regular bearing.

A mango grader has been designed and developed on the basis of physical dimensions and shape of fruits.

A guava variety, Lalit yielding saffron yellow colour, medium size fruits (average weight 185 g) with red blush has been identified for commercial cultivation. This variety is suitable for both table and processing purposes. Crop regulation technology for eliminating inferior quality rainy season crop has been developed.

In grapes, Dogridge rootstock was found to be superior in comparison to other rootstocks. Computer software has been developed for forecasting grape diseases namely, downy mildew, powdery mildew and anthracnose.

In ber, selection Ganesh Kirti has been developed for cultivation in tribal belts of Gujarat, Maharashtra and Madhya Pradesh. This is an early variety and escapes incidence of fruit borer and fruit fly.

In papaya, hybrid H-39 (Sunrise Solo X Pink Flesh Sweet) has been developed which is superior in both quality and yield in comparison to Coorg Honey Dew and Sunrise Solo. A hybrid line CP-81 (Coorg Honey Dew X CP-85) has been identified for high yield and quality.

In pomegranate, hybrid Ruby has been released. The fruit has red bold arils, soft seeds, red ring, good keeping quality and high TSS even during summer. Leaf nutrient standards have been developed for cultivar, Ganesh giving fruit yield of 15.60 to 18.80 tonnes/ha.

CFB boxes made from cotton stick pulp were developed for transportation and storage of Alphonso mango.

Modified Atmosphere Packaging (MAP) technology using polymeric films and shrink-wrapping has been developed for increasing the keeping quality of mango, banana, pomegranate, guava and citrus fruits to 30 days; thereby enlarging the scope for domestic marketing and export trade.

Several innovative processed products from fruits viz. ber candy, ber churah, dried aonla shreds, cherry nectar, banana fruit bar, apple rings dried osmotically and oil-less aonla pickles have been developed and standardized.

Osmotic dehydration studies have revealed that steam-balanced aonla fruits retain better vitamin C compared to non-blanched fruits.

A raw-mango processing machine has been developed at Bangalore. The industrial prototypes of raw mango processing machine with capacity of 25 tonnes/day have been designed.

3.2 Vegetable Crops

In vegetable crops, 17 open pollinated varieties comprising 7 in brinjal (3 long, 2 small round, 1 each round and green), 3 in pea (mid season), 2 in bitter gourd, one each in tomato (indeterminate), garlic, cowpea, onion and french bean, and 11 F1 hybrids comprising of 2 each in brinjal, chilli, cabbage, okra, tomato (determinate) and one in bitter gourd have been identified for cultivation in different agro-climatic zones. Tomato variety, BRH-2 is resistant to bacterial wilt.

The crop sequence of cowpea-tomato-cucumber (net returns - Rs 32,758/ha) followed by tomato-pea-okra (net return - 24,940/ha) is recommended for Satpura hill region in Madhya Pradesh.

3.3 Potato and Tuber Crop

3.3.1 Potato

Five improved varieties namely, Kufri Pukhraj, Kufri Anand, Kufri Giriraj, Kufri Chipsona -1 and Kufri Chipsona -2 have been released for commercial cultivation. Kufri Pukhraj is an early bulking variety suitable for North Indian plains and plateau areas with resistance to late blight, whereas Kufri Anand is suitable for cultivation in western and central Uttar Pradesh. Kufri Anand yields attractive and oblong tubers with fleet eyes, pale yellow flesh and resistance to late blight. Kufri Giriraj has been identified to replace Kufri Jyoti, (which has developed susceptibility to late blight and cyst nematodes) cultivation in the hills of Tamil Nadu.

DNA fingerprinting of commercial and indigenous cultivars using RAPD and micro-satellite markers has been completed and database created for future use. A highly reproducible vitrification-based cryo-preservation method has been

developed for long-term conservation of germplasm. Transgenic lines with osmotin (PR-S) gene have been developed for improving resistance to tuber moth and *Helicoverpa armigera* have been developed, which are under evaluation.

3.3.2 Tuber Crops

Two cassava varieties, Sree Jaya and Sree Vijaya with an average yield of 34 and 32 t/ha respectively suitable for lowland cultivation as a rotation crop in a paddy-based cropping system; *Dioscorea alata* hybrid, Sree Shilpa with an average yield of 28 tonnes/ha; and elephant foot yam selection, Sree Padma, for cultivation in Kerala state have been released. In addition, three sweet potato varieties, Gouri (19 tonnes/ha) and Sankar (14 tonnes/ha) for cultivation in eastern region and Sree Bhadra for national release have been recommended. Further, three colocasia varieties, NDC 1 and NDC 2 for Uttar Pradesh and Kadma for Bihar Plateau; two cassava short duration (6-month) clones, CI-649 and CI-731 with yield potential of 25-30 t/ha; and elephant foot yam clone, AM-15 with yield potential of 42 t/ha have been identified for release.

The technique for nursery planting of newly released cassava varieties has been standardized for mass multiplication.

Biological control of sweet potato weevil has been recommended by using *Rhaconotus menippus* (10 pairs/sq m) and *Metarhizium enisopliae* after 50 days of planting followed by re-ridging after 65 days of planting.

Cassava starch based biodegradable plastics has been developed which is a significant breakthrough. The technology has been patented and know-how has been transferred to commercial establishments in India. A cold-water soluble starch derivative from cassava has been prepared. A cassava drying system with a turnover of 1000 kg in 20 hrs has been developed. Cassava ensiling technology has been perfected. A digester of 250 litres capacity has been designed for cassava starch liquid adhesive. A starch globulator has been fabricated for accelerating globulation step in sago manufacturing.

3.4 Mushroom

In mushroom, two single spore strains, NCS 100 and NCS 101 and one hybrid strain, NCH 102 of white button mushroom (*Agaricus bisporus*) have been released for commercial cultivation. Two species, *Pleurotus florida* and *P. ostreatus* have been found superior in yield with 75% bio-efficiency. Two temperature tolerant strains, NCB 6 and NCB 13 of white button mushroom (*Agaricus bitorquis*) are found promising. A *Ganoderma* sp. having medicinal value has been collected from Shivalik hills and cultured for cultivation. Wild edible mushrooms namely, *Lepista sordida*, *Lentinus ponderosus* and *Pleurotus diamore* var. *roseus* were collected for the first time in India.

On-farm trials for cultivation of white button and oyster mushroom were conducted in village Bergaon to motivate farmers in hilly areas.

3.5 Ornamentals Crops

In rose, 8 improved cultivars, namely Pusa Gaurav, Pusa Bahadur, Pusa Priya, Pusa Barahmasi, Pusa Virangana, Pusa Pitamber, Pusa Garima, Dr. Bharat Ram have been developed at IARI, New Delhi.

In gladiolus, new varieties, Anjali (bright orange), Archana (Scarlet Pink with yellow dusting on wavy falls in the throat region), Bindiya (yellowish-cream with fan-shaped re-colouration at 2 side falls), Chandani (greenish-white), Chirag (orange-yellow), Sarang (purple red), Shweta (white with light yellow throat), Sunayana (pinkish red) and Vandana (bright orange) have been developed at New Delhi. Two varieties, namely, Rajani and Chandrani from Kalyani and hybrids, Arka Suvarma and Arka Kesar from Bangalore have been released for cultivation.

Three improved varieties of chrysanthemum, namely, White Charm from Lucknow; Basanti and KS 16 from Kalyani have been released. A new no-pinch no-stake variety named Mother Teresa, which bears small white flowers of Argemone type has been released. One attractive hybrid Punjab Gold has been developed for pot culture.

In carnation, cultivar Laurella at Ludhiana, Fambia at Pune and Arthur Sim at Kodaikanal were developed.

The marigold hybrid MS-8 X Pusa Narangi Gaiinda has been developed in New Delhi

3.6 Medicinal and Aromatic Plants

Isabgol and guggal germplasm accessions have been collected from Gujarat and Rajasthan and cuttings transplanted for evaluation.

The germplasm of Safed musli, collected from north western, southern and hilly areas of western Madhya Pradesh has been characterized for exploitation. Gujarat Asalio I, a variety of garden cress has been identified for release.

3.7 Spices

Fifty accessions of pepper species, seven proximal branching types of cardamom, 37 accessions of ginger, five accessions of turmeric, 3 *Amomum* spp., 9 vanilla accessions, 12 wild types of cinnamom, 2 wild types of *Myristica*, 2 species of knema, 1 high yielding allspice and 4 types of *Garcinia* have been collected. A putative new species of pepper was collected from Cudallur (Tamil Nadu). In black pepper hybrids, HP 782, 813, 34 and 105 and collection 1041 have been developed. Six hybrid lines and one cultivar have also been shortlisted in black pepper for high altitude areas of South India. Root knot nematode resistant variety, Pournami has been released. Integrated disease management schedules involving *Phytophthora* tolerant pepper lines, biocontrol and chemical control measures have been standardized for pure crop as well as mixed cropping systems.

Two value-added turmeric varieties, IISR Prabha and IISR Pratibha, developed through open pollinated progeny selection have been released for Kerala and Tamil Nadu. In addition, Sonali, a variety resistant to rhizome rot, leaf blotch and scale insect has been developed. In ginger, IISR Varada was released, which is suitable for Kerala, Andhra Pradesh, and Orissa. Seven proximal branching types of cardamom were collected and protoplasts were isolated from *in vitro* derived leaf tissue of cardamom. Microcalli were developed

from cardamom protoplast. A quick method of clonal multiplication of cardamom suckers was standardized.

3.8 Plantation Crops

3.8.1 Coconut

In coconut, production technology of seedlings raised in poly bags with potting mixture of red earth + sand + cow dung in equal proportion was standardized. Standardization of enzyme extraction and PAGE was done in leaf samples of tall and dwarf coconut varieties. A protocol for DNA extraction from newly emerged leaf of coconut has been standardized. Coconut-based cropping and farming system continues to give increased net return per unit area. Similarly, an auto irrigation system to overcome the problem of low voltage has been standardized. Efficient collapsible copra dryer has been fabricated.

In Coconut, by- products like coconut cream, vinegar, pouched tender coconut water, coconut milk and powder were developed for commercial application.

3.8.2 Cashew

In cashew, a promising accession, Goa 11/6, which escapes tea mosquito bug infestation has been developed. A new variety, Goa-1 has been recommended for release in Goa. Application of 200 liters of water once in fortnight or 80 litres once in 4 days as supplementary irrigation to cashew during summer have beneficial effect in higher fruit set, retention and doubling the yield. Database on processing aspects of cashew industries has been established.

In Cashew, a working model of raw cashew nut grader consisting of gravity separator and oscillating sieve separator has been fabricated.

3.8.3 Oil Palm

In oil palm nursery technologies have been standardized. Indigenously about 7 lakh *tenera* sprouts were produced from the seed gardens at Palode, Thodupuzha and Lakshmipuram. Harvesting the yield level of 20 tonnes FFB per ha with optimum fertilizers and water in indigenous *tenera* was also demonstrated. Effective control measures were developed for control of

rhinoceros beetle using low cost traps as well as pheromones. Similarly bud rot and stem rot management was also demonstrated. The boron deficiency in oil palm was well managed with the application of borax.

3.8.4 Cocoa

Clones NA242xICS95 and NC45/5 from Lalbagh, India and Nigerian clones performed better. Progenies of NA35xICS89, SCA6xIMC69, I-56xII-67, I-14xI-56, I-56xIII-35, ICS6xSCA6, AmelxNa-33, II-67xNC42/94 and II-67xNC29/66 were identified as better performers. Nigerian cocoa accessions NC42/94, NC23/43 and NC29/66 and I-29xNC23/43 also showed tolerance for drought.

Soft wood grafting has been successfully adopted for producing cocoa grafts. Cocoa grown in spacing of 2.7mx5.4m in arecanut gardens as mixed crop performed well. It is possible to produce 6 lakh cocoa grafts per year from CPCRI.

3.8.5 Tea

In tea infrastructure has been created to set up future programmes on DNA markers and hybridization. Tissue culture techniques and technology for production of haploid lines were standardized. Production technology of tea have been redefined to harvest, increasing yield.

Nutrition in tea is adopted based on the computer model and green leaf yield potential. Role of sulphur, zinc and other micro nutrients like Ma, Mn, Bo has been proved necessary in high yielding areas. Biocides and bio control measures in plant protection have been developed to minimise pesticide residues.

Improved packaging of tea has been developed by using jute, laminated bags, multiwalled paper sacks and flexible packaging substances. ISO 9000 and HACCP as the package for quality improvement have been introduced.

3.8.6 Coffee

Protocols for micro propagation, isolation and cryopreservation of DNA were developed and Plant regeneration was achieved through somatic

embryogenesis and embryo culture. RAPD markers were used for finger printing of leaf rust differentials. SIn-5B a clone of arabica strain with wide adaptability frost tolerant and superior bean was identified.

Micro irrigation techniques were proved beneficial in judicious utilization of irrigation water. Integrated pest management supplemented by using pheromone traps and parasitoids for control of major pests like coffee berry borer and mealy bugs gave better results. Field trials on high density planting are in progress. A guide on package of practices was prepared for the benefit of farmers.

3.8.7 Rubber

Five high yielding clones of rubber have been introduced under Category III of planting material recommendation. India has achieved highest productivity of 1576 kg/ha during the IX plan period. Protocols have been evolved for somatic embryogenesis and field level evaluation of plants generated by this technique has been in progress. Genetic transformation of *Hevea* has been attempted using genes conferring tolerance to drought and tapping panel dryness (TPD). Recommendations have been issued for intercropping of banana and pineapple with rubber in the North East. The norms for Diagnosis and Recommendation Integrated System (DRIS) have been evolved. The infrastructure for offering discriminatory fertilizer recommendation has been augmented with the establishment / strengthening of 10 regional soil testing laboratories. Low frequency tapping systems have been studied and ad-hoc recommendations issued for on-farm evaluation. Latex diagnosis parameters have been identified to assess the status of exploitation of rubber trees. Experiments on cropping systems based on rubber have been laid out and based on the results obtained, ad-hoc recommendations have been issued. Based on research findings, the outbreak of *Corynespora* leaf disease in the southern parts of Karnataka and northern part of Kerala has been controlled effectively. Biogas generation using rubber latex serum has been perfected and the technique has been widely accepted. A semi-automatic cleaning machine for upgradation of low quality sheet rubber has been developed. Integrated drying systems incorporating solar, biogas and smoke drying have been developed. Pilot plant-scale production of styrene grafted natural rubber (SGNR) using gamma radiation has been made

and the material has been found acceptable by the footwear manufacturing industry as a substitute for the synthetic rubber.

CHAPTER - VI

DEVELOPMENT PROGRAMMES

1. ORGANISATIONAL STRUCTURE

The Department of Agriculture & Co-operation of the Ministry of Agriculture is the nodal department for over viewing horticulture development in the country. The Division of Horticulture was carved out of Crop Division in 1981 and a position of Horticulture Commissioner was created in 1985. The Division of Horticulture in the Department is vested with the responsibility of over-seeing the overall development of horticulture at national level and is supported by two Boards i.e., National Horticulture Board, Gurgaon and Coconut Development Board, Kochi with their centres spread across the country, and two Directorates i.e. Directorate of Cashew and Cocoa, Kochi and Directorate of Arecanut and Spices, Calicut. The National Committee on use of plastics in agriculture is also attached to the Division which has 16 centres to work on plasticulture intervention. A Bee Keeping Development Board to integrate the efforts for honey bee development is also functioning under the Department. Many states now have separate Secretaries, Commissioners and Ministers for Horticulture. The Department implements the programmes through the State Departments of Horticulture and provides the leadership and coordinates activities for the promotion of horticulture.

The thrust areas identified during the IX Five Year Plan were addressed through a planned chain of activities. The allocation for the IX Plan was stepped up to Rs. 14,530 million which was about 45 per cent higher as compared to the VIII Plan allocation of Rs. 10000 million and virtually double of the expenditure incurred during the VIII Plan. The details of allocations and expenditure under different schemes during the IX Plan are given in Table-6.1

Table: 6.1 Financial profile of horticulture schemes during IX Plan
(Rupees in million)

S. No	Name/Type	Allocation During IX Plan	1997-98		1998-99		1999-2000		2000-2001	*2000-2001	Funds under Macro Mgt.
			B.E.	Exp.	B.E.	Exp.	B.E.	Exp.	B.E.	Ten. R.E.	2000-01
1	Post Harvest Mgt. & Horticulture Promotion through NHB	2630.0	185.0	135.0	280.0	200.0	270.0	410.0	780.0	780.0	—
2	Int. Dev. of Coconut	1050.0	200.0	197.5	230.0	206.5	210.0	210.0	200.0	700.0	—
3	Int. Dev. of Fruits	1250.0		167.2	250.0	198.4	250.0	214.9	52.5	52.5	157.5
4	Int. Dev. of Vegetables including Root & Tuber crops	438.4	**241.0	22.7	220.0	14.6	60.0	45.0	17.5	17.5	52.5
5	Int. Dev. of Floriculture	199.0		14.7	100.0	56.3	50.0	40.0	12.5	12.5	37.5
6	Int. Dev. of Medicinal & Aromatic Plants	145.0		5.4	20.0	14.9	20.0	18.8	5.0	5.0	15.0
7	Int. Dev. of Mushroom	195.0	40.0	29.5	47.5	19.8	40.0	17.8	5.0	5.0	15.0
8	Dev. of Bee-keeping for Improving Crop Productivity	225.0	25.0	11.6	25.0	11.8	20.0	18.1	5.0	5.0	15.0
9	Integrated Dev. of Spices	142.84	300.0	295.9	375.0	243.0	340.0	300.0	75.0	72.8	220.0
10	Integrated Dev. of Cashew & Cocoa	760.0	166.0	134.6	207.0	171.2	180.0	154.5	40.0	40.0	120.0
11	Use of Plastics in Agriculture	3750.0	810.0	801.8	1100.0	1083.5	1000.0	967.4	200.0	200.0	600.0
12	Human Resource Dev.	50.0	100.0	0.0	41.0	0.0	20.0	11.4	15.0	15.0	
13	Integrated Dev. of Tribal/Hilly Area	100.0	6.0	0.0	30.0	0.0	20.0	1.5	3.0	3.0	
14	Integrated Dev. of Marketing & Handling of Fruits & Vegetables	16.0	2.0	0.0	6.0	0.0	6.0	0.0	2.0		
15	Technology Mission of N.E Region	2293.8	0.000	0.0	44.5	0.0	50.0	0.0	500.0	500.0	
	TOTAL	14530.6	1834.0	1815.9	2976.0	2220.0	2536.0	2409.4	1912.5	2408.3	1232.5

2. PROGRAMMES AND PROGRESS

The activities envisaged under different schemes during the IX Plan are reviewed in this chapter:

2.1. Integrated Development of Fruits

2.1.1 Objectives

- Provide support for the production and supply of good quality planting material of high yielding varieties of fruit crops, both through conventional and in vitro system of propagation.
- Bring more area under fruit crops with focus on location specific fruit crops in the country.

- Provide critical inputs for improving the productivity of old orchards/neglected orchards.
- Educate the farmers about the efficacy of improved techniques for increasing productivity.
- Provide assistance for establishing plant health clinics and leaf nutrient analysis labs for fruit crops.
- Provide support for integrated management of pests and diseases including disease forecasting.

2.1.2 *Achievements*

The details of expenditure under the Fruits scheme during the IX Plan are given in Table-6.2.

Table-6.2 Expenditure under the scheme on integrated development of fruits during IX Plan

YEAR	EXPENDITURE (Rs. million)
1997-98	167.16
1998-99	198.43
1999-2000	214.96
2000-01 part exp.	51.50
TOTAL	632.05

The expenditure under the scheme has been of the order of 50.6 per cent of the approved outlay of Rs. 1250 million. The Scheme was amalgamated with the Centrally Sponsored Scheme on Macro Management in Agriculture with effect from the year 2000-01 along with the funds, hence there has been less expenditure during the year. The significant achievements during the period are:

- 240 nurseries (35 large and 205 small) were established in different parts of the country.
- 11 Tissue culture units (5 Private and 6 Public) were established.
- About 53,600 ha brought under improved varieties of crops like mango, guava, sapota, apple, plum, pear, peach, ber, amla etc.
- About 30,600 ha of area was rejuvenated.
- About 10,100 farmers were imparted training on improved technologies.

- The productivity of fruits increased from 10.34 tonnes/ha to 11.80 tonnes per ha.

Since the Scheme was approved for implementation in accordance with the guidelines for the IX Plan only with effect from the year 2000-01 and since the scheme got merged in the Macro Management Scheme during the same year, the implementation could not be effected as contemplated in the scheme.

2.2 Integrated Development of Vegetables Including Root & Tuber Crops & Mushroom

2.2.1 Objectives

- Improve the production & productivity of vegetables including onion, potato and root & tuber crops.
- Improve the availability of vegetables round the year by utilizing climatic variability through augmentation and improvement in seeds and production technology.
- Improve availability of seeds of high yielding cultivars of onion and potato.
- Disseminate technology through farmers participatory demonstrations of cultivars and technology; information dissemination and training of farmers.
- Improve efficiency of human resource in vegetable production through farm mechanization.
- Reduce post harvest losses through on-farm post harvest management.
- Develop informatics system conducive for monitoring production/prices etc.

2.2.2 Achievements

Against an outlay of Rs. 438.4 million an expenditure of Rs. 99.8 million (22.8%) has only been incurred.

2.3 Integrated Development of Commercial Floriculture

2.3.1 Objectives

- Improve production and productivity of traditional as well as cut flowers through availability of quality planting material and transfer of technology.
- Improve human resource capabilities for growing flowers scientifically.

- Promote production of off season and quality flowers through protected cultivation.
- Improve on farm post harvest handling of flowers.

2.3.2 Achievements

Against an outlay of Rs. 199 million an expenditure of Rs. 123.5 million (62.1%) has been incurred.

2.4 Integrated Development of Medicinal and Aromatic Plants

2.4.1 Objectives

- To conserve and develop the cultivation of important medicinal and aromatic plant species.
- To expand the area under cultivation.
- To meet the growing domestic as well as export demand.

2.4.2 Achievements

The year-wise expenditure under the MAP Scheme is given in Table 6.3.

Table 6.3 Expenditure under MAP scheme during IX Plan

Year	Expenditure (Rs. In million)
1997-98	3.294
1998-99	14.991
1999-2000	18.825
2000-01	5.000
Total	42.10

The expenditure has been to the tune of 29% of the total outlay of Rs. 145.00 million during the first four years of the Ninth Plan. The significant achievements are : -

- 164 ha were brought under quality planting material of aromatic plants.
- 137 ha were brought under herbal gardens.
- 16 nurseries attached to herbal gardens were maintained.
- 5 Regional analytical labs were maintained or established.

- 5700 demonstration-cum-seed multiplication centers were established.

2.5 Integrated Development of Spices

2.5.1 Objectives

- To increase production and productivity of various spices.
- To improve the quality of spices produced in the country to make them more competitive in the international market and to generate adequate exportable surplus.
- Extend cultivation of spices to non-traditional areas particularly North-Eastern Region and Andaman & Nicobar Islands.
- To elevate the income level of small and marginal farmers engaged in spice production.
- To generate employment opportunities in the rural sector.
- Encouraging women in cultivation and community processing of spices.

2.5.2 Achievements

Against an outlay of Rs.1428.4 million an expenditure of Rs.913.9 million (64%) has been incurred.

The area expansion programmes were taken up to cover 1,15,000 ha. under different spices by providing 25% cost of selected inputs as incentive. The programmes were implemented through the extension network of the State Horticulture Departments. Achievements in this regard are estimated to be over 50% of the target by the end of the Plan Period. The shortfall in achievement is due to the transfer of the scheme to the State Governments under macro management.

2.6 Integrated Development of Cashew & Cocoa

2.6.1 Objectives

- Increase production of Cashew & Cocoa in the country through productivity improvement and area expansion programmes.
- Improve the availability of quality planting material through establishment of nursery.

2.6.2 Achievements

- Assistance is being extended for production of quality planting material through regional nurseries
- Area expansion covering about 4000 ha, technology dissemination and support for infrastructure development.
- 27 nurseries for cashew and 15 nurseries for cocoa were established.
- 77700 ha of new plantation of cashew were raised and 97000 ha old plantation were maintained besides replanting 5600 ha
- Three scion banks for cocoa were established.
- 10.9 lakh vegetatively propagated planting material for cocoa were produced and distributed.
- 80 ha of new cocoa plantation were raised and 1600 ha of old cocoa plantation were recommended.

Against an outlay of Rs.760 million an expenditure of Rs.500.3 million (65.85) has been incurred.

2.7 Integrated Development of Coconut

2.7.1 Objectives

- To increase production and productivity of coconut.
- To bring additional area under coconut in potential non-traditional areas.
- To develop new technologies for product diversification and by-product utilisation.
- To strengthen mechanism for transfer of technologies.
- To elevate the income level of small and marginal farmers engaged in coconut cultivation.
- To build up sound information base for coconut industry and market information.
- To generate ample employment opportunities in the rural sector.

2.7.2 Achievements

- An area of 16,763 ha are newly covered under new planting programmes and nearly 29.75 lakh quality planting materials were produced & distributed.

- An area of 86,400 ha was covered for improving the productivity of coconut through various management practices.
- Two research projects "Utilisation of Coir Pitch for Bio-gas Production" and "Development and Standardisation of Dairy Foods Incorporating Coconut" are completed.

Against an outlay of Rs. 1050 million an expenditure of Rs. 814 million (77.5%) has been incurred.

2.8 Post Harvest Management, Marketing and Exports

2.8.1 Objectives

- Develop high quality horticulture farms in identified belts and make such areas vibrant with horticultural activity which in turn will act as hubs for developing commercial horticulture.
- Develop post harvest management infrastructure.
- Strengthen Market Information System and horticulture database.
- Assist R&D programmes to develop products suited for specific varieties with improved methods and horticulture technology.
- Provide training and education to farmers and processing industry personnel for improvement of agronomic practices and new technologies.
- Promote consumption of fruits / vegetables in fresh and processed form.

2.8.2 Achievements

Against an outlay of Rs. 2630 million an expenditure of Rs. 1525 million (58%) has been incurred.

2.9 Horticulture Development Through Plasticulture Interventions

2.9.1 Objectives

- Promote horticultural development through applications like drip irrigation, green house construction, plastic mulching, low tunnels etc. in the farmer's fields.
- Demonstrate various applications like drip irrigation, green house construction, plastic mulching at Government farms and farms belonging to ICAR Institutes, State Agricultural Universities, NGO's and progressive farmers.

- Conduct applied research, and organize training programme through Plasticulture Development Centres (PDCs).

2.9.2 Achievements

An expenditure of Rs. 3052.7 million has been incurred till 2000-2001 against the IX Plan outlay of Rs. 3750 million constituting about 81% of the outlay. The major achievements are:

- Coverage of about 0.14 million ha under drip irrigation under crops like coconut, arecanut, grape, pomegranate, citrus etc.
- 85 ha under green houses.

2.10 Development of Beekeeping for Improving Crop Productivity

2.10.1 Objectives

- To promote role of honey-bee as an agent of pollination for increasing crop productivity.
- To develop newer strains of bees for evolving disease resistant types as well as for higher production of honey.
- To encourage State/Regional level associations/cooperatives to undertake procurement, primary processing, storage, etc. of honey and its products on behalf of bee keepers to ensure maximum returns.
- To impart training to unemployed and young entrepreneurs/farmers and SC/ST aspirants in handling and managing bee colonies.
- To promote awareness and faster growth of bee keeping through mass media as well as awards at appropriate levels.

2.10.2 Achievements

An expenditure of Rs. 46.5 million has been incurred against the IX Plan outlay of Rs. 225.0 million. The significant achievements are :

- Distribution of over 0.1 million honey bees colonies
- Training of about 2,000 farmers

2.11 Integrated Development of Horticulture in Tribal/Hilly Area:

2.11.1 Objectives

- Production of quality planting material of improved cultivars

- New planting with seed /planting material of improved high yielding varieties
- Improving productivity through adoption of improved cultivation technology, plant protection chemicals, nutrient and water management:
- Transfer of technology through farmers participatory demonstrations, training, visits of farmers, publicity through media support, extension literatures etc.
- Creation of on-farm and post harvest infrastructure such as, collection centres, packaging, transport, storage and marketing.

2.11.2 Achievements

Against an outlay of Rs. 100 million an expenditure of Rs. 4.5 million has been incurred.

2.12 Human Resource Development In Horticulture

2.12.1 Objectives

- To promote rapid growth of horticulture by bridging the gap of knowledge and skill both managerial and technical by training people to become entrepreneurs, or self-employed in the horticulture sector.
- To create skills for employability in the horticulture units/farms
- Upgrade the knowledge of departmental staff in the field of horticulture.

2.12.2 Achievements

Financial achievements in terms of funds allocation & utilisation are given in table 6.4.

Table 6.4 Financial achievements in term of funds allocation and utilisation

S.No.	On going HRD Programmes	Centers	Locations	Annual Intake	Amount sanctioned for 3 years (Rs. In millions)
1.	Supervisors Training	6	Dr YSPUHF, Solan. ANGRAU, Hyderabad. IIHR, Bangalore. NDAU, Faizabad. MPKVV, Rahuri BAU, Ranchi	25	205.795

2.	Gardeners Training	5	PAU, Ludhiana RMADKVK, Ranchi Dr. PDKV, Akola AHC, Hyderabad RAU, Samastipur	50	45.85
3.	Entrepreneurs	3	Dr. YSPUHF, Solan IIHR, Bangalore MPKV, Rahuri	20	20.30

2.13 Technology Mission for the Integrated Development of Horticulture in the NE Region including Sikkim

Owing to diverse agro-climatic conditions, horticulture has been identified as the main activity for development in North Eastern region. It was felt that a Mission-mode programme having end to end approach will be useful in achieving desired goals. Accordingly Technology Mission for Integrated Development of Horticulture in North Eastern region including Sikkim was mooted.

2.13.1 Objectives

- To establish convergence and synergy among numerous ongoing governmental programmes in the field of horticulture development to achieve horizontal and vertical integration of these programmes.
- To ensure proper linkage of adequate, appropriate, timely and concurrent attention in the production, post harvest and consumption chain.
- To maximise economic, ecological and social benefits from the existing investment and infrastructure created for horticulture development..
- To promote ecologically sustainable intensification, economically desirable diversification and skilled employment.
- To generate value addition, promote development and dissemination of eco-technologies based on blending of the traditional wisdom and technology with frontier knowledge such as biotechnology, information technology and space technology.
- To provide the missing links in on-going horticulture development projects.

2.13.2 Achievements

- The scheme was launched during 2001-02.

2.14 Integrated Development of Tea

2.14.1 Objectives

The activities taken up by the Board during the IX Plan include.

- Extension of tea area.
- Replanting of old and uneconomical plantations.
- Rejuvenation & consolidation of existing tea areas.
- Organizing training programmes on modern aspects of tea growing for the small growers.
- Setting up of tea nurseries for the supply of planting materials to the small tea grower.
- Creation of irrigation facilities in the tea gardens.
- Improvement of the quality through replacement of old and worn out tea processing machinery.
- Extending advisory services.
- R&D support.
- Organizing management training programmes for the plantation managers through Indian Institute of Plantation Management.
- Organizing study tours for the small farmers.

2.14.2 Achievements

The existing schemes have led to an increase in the production and productivity of tea. The particulars of crop increase during the IX plan period over the terminal year of VIII plan period are shown in the table below. It would be worthwhile to note that the schemes have particularly benefited the small growers who have been enabled to switch over to tea cultivation as remunerative enterprise.

Table 6.4. Trend in production and export of tea.

Year	Period	Production, million kg		Exports		
			Increase over previous year m.kg	Yield Kg/ha	Volume m.kg	Value (Rs.million)
1996-97	Terminal year of VIII plan period	786.53	--	1809	169.04	13014.5
1997-98	1st year of IX plan (actual)	834.87	48.34	1865	211.26	20003.1
1998-99	2nd year of the IX plan (actual)	850.25	15.37	1995	205.856	21918.4
1999-2000	3rd year of the IX plan (actual)	816.06	(-) 34.19	1840	192.32	19223.1
2000-01	4th year of the IX plan (anticipated)	846.00	29.94	1931	201.00	18000.0
2001-02	5h year of the IX plan (anticipated)	875.01	54.00	2045	210.00	20000.0

Table 6.5. Physical achievement under the plan schemes

Name of the Scheme	No. of applications received				No. of applications sanctioned				Area involved in Ha	
	Loan		Subsidy		Loan		Subsidy		Loan	Subsidy
	No.	Rs	No.	Rs	No.	Rs	No.	Rs		
1.Plantation Development Scheme										
1.1 Extension /replanting	76	2812	1771	3435	32	1128	879	1572	1200	10500
1.2.Rejuvenation pruning & infilling	-		1513	1264			801	733		11000
1.3. Irrigation	141	2043			97	1062				
2.Tea Processing and packaging Development Scheme	421	5317			243	2335				
3.Tea Development Scheme for N.E. Region			123	306			65	298		1700
4.New Area Development			61	139			20	69		395
5.Small Grower Development Scheme			1916	435			1028	244		1150

Table. 6.6. Financial achievement under the plan schemes (Rs. in million)

	Loan*	Subsidy	Grant in aid	Total
Revised approved outlay	630.4	1042.5	493.1	2166.0
Utilization during 1st 4 years	463.1	612.1	343.1	1418.3
Anticipated utilization in 5th year	130	400.0	140.0	670.0
Total Utilization	593.1	1012.1	483.1	2088.3
% Of utilization	95%	97%	98. %	96.4%

•The loan component was handled without any budgetary support from the Government from 2nd year onwards. To combat the unprecedented drought situation in Assam and North Bengal during the last quarter 1999-2000, priority was given in Sanctioning of the loan for the irrigation activities and a sum of Rs. 4 crores was Disbursed as loan.

2.15 Integrated Development of Coffee

During the IX plan period, (1997-02), the Board focused its activities in the critical areas of Research, Extension and Market Development. The basic goals of the IX plan were oriented towards increasing production, improving productivity and enhancement of quality through research and extension network apart from promotional activities aimed at improving the demand for Indian Coffee in the global and internal markets. The Board is also engaged in market intelligence activities in order to disseminate information to the various sectors of the industry. The coffee development programmes envisaged in Non-traditional and North Eastern States are aimed at increase in production and socio-economic development of the tribal inhabited areas.

2.15.1 Programmes

During IX Plan period, Coffee Board implemented the following 10 broad programmes, with 40 schemes:

- Plant Improvement
- Crop Management
- Crop Protection
- Post Harvest Technology
- Maintenance of Research farms
- Special area programme for North east Region and other Tribal sector
- Free Market Development and Promotion

- Support for Small Grower sector
- Human Resources Development programme
- Building Construction Programme

2.15.2 Achievements

During the IX Plan, the envisaged growth rate in production was 8%. However, by the end of the penultimate year-2000-01, the industry had achieved an overall annual growth of about 10% by crossing the production target of 300 thousand tonnes set for the final year of IX Plan. The average productivity which stood at 816 Kg. in the beginning of the IX plan period has gone upto 970 Kg in 2000-01. The production improvement programmes implemented during the IX Plan period have augmented production mainly because of the success in water augmentation programme. Remunerative prices during first part of the plan period also fuelled investments in plantations and had a favorable impact on production.

The Board set a target of 100 thousand tonnes for domestic consumption during the IX Plan period. However, due to escalation of international prices on account of reduced global coffee supplies (due to frost in Brazil in 1994) there was a significant export pull, which impacted on the supplies to internal market where the demand was also not significant. Instant coffee consumption pattern in the country has remained fairly stable, at 55,000 tonnes/annum (55 gms per capita) for over a decade. The export target of 200 thousand tonnes by the end of IX Plan was achieved by the end of 2nd year itself and during the subsequent years also the exports crossed 200 thousand tonnes.

Against the financial out lay of Rs. 1340 million, 99 per cent utilization was achieved for implementation of various schemes.

2.16 Integrated development of Rubber

2.16.1 Thrust areas

The thrust areas for rubber development during the IX Plan are;

- Increasing rubber production,
- Enhancing and upgrading processing facilities,

- Accelerating development programmes in North-East with focus on economic resettlement of shifting cultivators,
- Promoting group approach in development particularly for processing and marketing,
- Devolution of extension functions through farmers' participation and adopting an integrated approach with focus on gender and environmental issues,
- Building up infrastructure for human resource development leading to capacity building and skill development within the organization as well as in the sector in general,
- Intensifying research on bio-technology, plant protection, exploitation assistance, crop management, farming system and germplasm conservation,
- Augmenting research in rubber technology,
- Promoting rubber industries based on natural rubber by establishing rubber based industrial parks,
- Broadening the use of natural rubber,
- Special schemes for the upliftment of the socially backward classes under the tsp/scp and
- Measures for improving the living conditions of the workers in the plantation sector in the unorganized sector.

2.16.2 The strategies adopted during the IX Plan

The strategies during the IX Plan were :

- Expansion of area through new planting with thrust in the non-traditional region, particularly in the North-East. (The focus was to promote rubber through group planting with community participation aimed at rehabilitating shifting cultivators).
- Replanting of old and uneconomic plantations with high yielding clones, mostly in the traditional region.
- These two activities were to be promoted with intensive extension support and increased financial incentive for adoption of scientific cultural practices.
- Improving the productivity of the existing plantations through adoption of better agro-management techniques.

- Improving the quality of small growers' rubber by promoting group processing through the Rubber Producers' Societies (RPS), the grass root level voluntary association of small growers.

2.16.3 Achievements

The various schemes discussed above are inter-related. The overall impact has been:

- The area under rubber increased from 0.533 million hectares in 1996-97 to 0.559 million hectares in 1999-2000.
- The production increased from 0.549 million tonnes in 1996-97 to 0.622 million tonnes in 1999-2000.
- The productivity increased from 1503 kg per hectare in 1996-97 to 1576 kg per hectare in 1999-2000, the highest among the major NR producing countries in the world.

The growth indicated above has been achieved notwithstanding the adverse climatic conditions, as a result of sound R & D programmes and well coordinated extension work and this has contributed to rural development and generation of employment. The plantation sector employs more than 3 lakh workers. The small holding sector has a strength of one million growers. The growth achieved has helped to reduce imports thereby saving foreign exchange. The increase in production has helped to generate adequate cess revenue to the central government and tax revenue to the state government. The incremental production of 73,000 tonnes is valued at above Rs.2190 million and has helped in contributing about Rs.270 million as cess.

The total outlay, including IEBR of the Board, approved by the Planning Commission under the IX Plan for the rubber sector was Rs. 3731.9 million. As against this, the budget sanctioned year-wise inclusive of the IEBR aggregates to Rs. 3901 million. The expenditure incurred during the first 4 years works out to Rs. 2846 million. Anticipating an expenditure of Rs. 700 million during the terminal year (2001-02), the achievement is estimated at Rs. 3546 million. In terms of utilization with reference to the approved outlay, the expenditure works out to 95.02%.

CHAPTER – VII

CONSTRAINTS IN DEVELOPMENT

In spite of the fact that India is blessed with a wide range of soil and climatic conditions for growing large number of horticultural crops, a reasonable budgetary allocation, a sound network of R & D system, a large number of high yielding varieties / hybrids and proven technologies, there are still several constraints which adversely affect development of a sound horticulture industry.

Major common constraints are given below in respect of various sectors of horticulture.

1. COMMON PROBLEMS

- (i) Inadequate availability of disease free, high quality planting material
- (ii) Micro-propagation techniques are under exploited.
- (iii) Slow dissemination and adaptability of improve high yielding cultivars/hybrids.
- (iv) Inadequate facility for identification of nutrient deficiency and disorders
- (v) Lack of diseases and pests' outbreak forecast service.
- (vi) Unavailability of refined intensive integrated production systems
- (vii) Lack of quality standards.
- (viii) Lack of technologies in value addition.
- (ix) Lack of post harvest management technology and infrastructure
- (x) Weak database and poor market intelligence.
- (xi) Poor marketing practices and infrastructure
- (xii) Instability of prices, with no support price mechanism.

- (xiii) Inadequate technical manpower/human resource in farming system.
- (xiv) Poor credit supply, high rate of interest coupled with inadequate crop insurance scheme.
- (xv) Ineffective transfer of technology and poor adoption of improved techniques (transfer of technology system need thorough reorientation with active participation of public, NGO's and private sector).
- (xvi) Poor linkage between Research and Development sectors, industries and farming communities.
- (xvii) Late implementation of government policies and schemes.
- (xviii) Absence of horticultural crop suitability map of India based on agro-climatic conditions depicting most suitable areas for optimum productivity of a particular crop.

While several above listed problems are common to all horticultural crops, there are also crop specific problems causing constraints. The problems are listed below.

2. CROP SPECIFIC PROBLEMS

2.1 Fruit crops

- (i) Long gestation period.
- (ii) Predominance of senile orchards (e.g. apple and mango)
- (iii) Lack of technology to manage problems like spongy tissue, alternate bearing and malformation in mango, wilt in guava, decline in citrus, etc.
- (iv) Location specific technologies are not available.
- (v) Lack of proper crop management and soil health techniques.

2.2. VEGETABLE & TUBER CROPS

2.2.1 *Vegetable crops*

- (i) High cost of production due to labour intensive technologies.
- (ii) Exorbitant charges of hybrid seeds.

- (iii) Risk intensive production system.
- (iv) Lack of low cost environmental controlled green houses for high quality production.
- (v) Supply and demand profile frequently changing with season, year and kind of vegetable.
- (vi) Non availability of technology for extending production to semi arid areas under low moisture regime and mild problematic soil conditions.

2.2.2. Potato

- (i) Lack of varieties for diverse processing problems.
- (ii) Low seed multiplication rate (5-10 times) from breeders' seed to certified seed.
- (iii) Rapid deterioration of varieties due to viral complexes.
- (iv) Lack of awareness of TPS technology.
- (v) Lack of required cold storage space and non availability of low cost short term storage structure.

2.2.3 Mushroom

- (i) Available technology not cost effective.
- (ii) Lack of design of low cost mushroom houses.
- (iii) Inadequate availability of quality spawn of different strains.

2.2.4. Tuber crops

- (i) Slow multiplication rate.
- (ii) Poor management practices for pests like sweet potato weevil and diseases like cassava mosaic and colocasia blight.

2.3. Floriculture

- (I) Lack of indigenous production techniques.
- (II) F1 hybrids not fully exploited.

- (III) Narrow product range.
- (IV) High rate of tariff imposed by importing countries.

2.4. Medicinal and Aromatic Plants

- (I) Trade of medicinal and aromatic plants is very secretive due to absence of any regulatory mechanism.
- (II) Very less number of plants under cultivation (out of 4000 identified plants only 20-30 are cultivated).

2.5. Spices

- (I) Lack of variability for host resistance to biotic and abiotic stresses.
- (II) Severe crop losses caused due to disease and pests.
- (III) Vagaries of monsoon affect crop growth, productivity and sustainability.

2.6. Coconut

- (i) Large area of old and senile plantations and most of these plantations under rainfed condition.
- (ii) Rainfed cropping nature.
- (iii) Prevalence of diseases and pests like root-wilt, ganoderma wilt, Thanjavur wilt, tatipaka diseases and eriophide and red palm weevil pests pose severe threats to industry.
- (iv) Farm level processing is inadequate.

2.7. Arecanut

- (i) Incidence of diseases like yellow leaf diseases.
- (ii) Lack of irrigation facilities.

2.8. Oilplam

- (i) Poor water management in the palm orchards.

2.9. Cocoa

- (i) Large areas of old and senile plantations.

- (ii) Lack of high yielding clones.
- (iii) Black pod rot in cocoa continues to be problems in production front.
- (iv) Farm level processing is inadequate.

2.10. Cashew

- (i) Increasing level of senility of the existing plantation.
- (ii) Poor management of pests like tea mosquito bug and stem borer.
- (iii) Farm level processing is inadequate.

2.11. Tea

- (i) Old age of tea bushes.
- (ii) Slower pace of replantation- the rate of replanting is less than 0.4% as against the desired level of 2.0%
- (iii) Poor drainage and lack of irrigation when needed greatly reduces the yield.
- (iv) Stagnation in productivity level compounded by high land labour ratio.
- (v) Higher rate of taxation in the income from tea.
- (vi) Stiff competition from the soft drinks.

2.12. Coffee

- (i) Presence of large number of tiny growers with less than two hectare.
- (ii) Existence of old moribund plant material due to reluctance of replant with new varieties.

2.13. Rubber

- (i) Unattractive financial assistance to meet out incentives for the growers to undertake scientific planting.
- (ii) Low price of rubber.
- (iii) Inadequate infrastructure for primary processing.

- (iv) Stiff competition from natural and synthetic rubber.

Some of the major constraints are discussed in detail below.

3. TECHNICAL

3.1. Inadequate Availability of Quality Planting Material

The acute shortage of quality planting/seed materials including seeds of improved varieties is one of the major constraints limiting faster development in many horticulture and plantation crops. This is despite the fact that a large number of private and government owned nurseries and seed companies are engaged in production and supply of planting materials. The Nursery Registration Act is operating only in four states namely, Haryana, Himachal Pradesh, Maharashtra and Uttar Pradesh. In most of the nurseries, no attention is paid to the selection of mother plants and trees. The repeated propagation of a clone from a single mother plant has contributed to the decline in vigour and other characters of plantations. Some unscrupulous nurserymen are even reported to sell seedling plants in place of grafts whenever the demand is heavy. The state Departments of Horticulture / Agriculture are the major buyers of plant materials every year for distribution to the farmers on subsidised costs under various developmental programmes. It is mostly through these purchases that the farmers receive inferior material.

The impact of using quality of planting material will become manifest in increased productivity of several horticultural crops e.g., mango, citrus, grape, pineapple, banana among fruits, capsicums, cabbage in vegetables and in plantation crops like tea, coffee and rubber,. However, there is acute shortage of quality planting material in majority of perennial fruit crops like litchi, sapota, walnut and plantation crops like coconut, cashewnut, cocoa, oil palm. Efforts have been made to propagate some of the horticulture crops like banana, strawberry and papaya and ornamentals like orchids, chrysanthemums, anthuriums, gerberas, spices like cardamoms etc. through micropropagation. However, there is no agency so far to certify them that they are completely free from diseases.

Low productivity due to cultivation of varieties of poor genetic potential, non-manuring, under manuring or imbalanced manuring, non-adoption of other recommended package of practices due to limited financial resources of small and marginal farmers are some of the other constraints which is affecting the productivity of horticultural crops.

3.2. State of Old and Neglected Orchards

The low productivity of the perennial fruits like mango, citrus, apple and the plantation crops like coconut, arecanut, cashewnut, etc. is mainly due to the small size of holdings, the preponderance of old and senile trees and the poor management available to them. The average size of a fruit orchard holding is reported to be 0.21 to 0.79 ha. Apart from the small holding size, the poor condition of trees in most plantations and orchards is another contributing factor to the low yields. The thickly shaded mango orchards in the Malihabad areas of U.P., the seedling orchards of guava and cashewnut throughout the country and the disease affected pepper, cardamom and coconut plantations are commonly seen in large numbers in different parts of the country. These have brought down the average productivity in these crops drastically.

Old age of tea bushes is a major reason for the declining productivity. Nearly 48% of the present tea area in India is more than the economic threshold age limit. Uncontrolled growths of small tea growers and poor adherence to quality production norms are main factors thus affecting the productivity. Poor drainage and lack of irrigation when needed greatly reduce yield

In coffee, presence of large number of tiny growers with less than 2 ha and existence of old moribund plant material due to reluctance to replant with new varieties, lack of quality awareness, inadequate technology adoption, inadequate financial resources and lack of infrastructural facilities at farm level have been the major constraints among small grower sector.

The rubber plantation industry is labour intensive and has been facing shortage of skilled labour, especially for harvesting

3.3. Pests / Disorders of National Importance

Most of the major horticultural crops, are beset with several physiological disorders, which have defied all attempts for resolution, and have contributed heavily to low productivity. Besides, there are pests and virus diseases, which have no solution. Important problems / diseases affecting productivity adversely are the following:

Mangoes	:	Malformation; alternate bearing / irregular bearing; spongy tissues
Guava	:	Wilt
Citrus	:	Decline
Coconut:		Root wilt; Ganoderma wilt; Tatipaka disease; Eriophid mite
Black pepper	:	<i>Phytophthora</i> foot rot, and nematodes
Ginger	:	Rhizome rot and Bacterial wilt
Cardamom	:	'Katte' disease
Oil palm	:	Ganoderma
Vegetables	:	Virus disease
Coffee	:	White stem borer, Berry borer, leaf rust
Rubber	:	Phytophthora leaf fall disease, corynespora, leaf disease and pink disease

In addition, the nutritional deficiency disorders like boron deficiency in coconut and oil palm, zinc deficiency in citrus and grapes, potassium deficiency in mango affect the growth and yield of crops.

Non adoption of adequate and timely control measures against pests and diseases also cause major crop losses.

3.4. Inadequate On-Farm Handling

There are several on-farm operations, which can minimize post harvest losses thus fetching higher returns to the farmers. Suitable maturity standards

are not available in a large number of horticultural crops. These have not been given adequate attention. Further, considerable loss of quality in mango could be assured merely by using harvesters developed at various centers. Similarly removing / transporting the produce immediately to a packing shed after harvesting can save spoilage loss from extreme heat in the field. Even grading at field level can be done in a variety of crops (e.g., black pepper). Even processing operations like removal of husks, thrashing of pepper, separating beans from cocoa pods, are not followed at the farm level. There is therefore need to give importance to primary processing for improving the quality of produce thereby ensuring better returns from horticultural crops.

3.5. Weak Database & Poor Market Intelligence

For any planning process aimed at development of particular sector, an authentic and upto date statistical base is an essential pre-requisite. Agricultural statistics is confined only to the major field crops and few horticulture crops. In the latter group only crops like mango, citrus, banana, potato, sweet potato, tapioca and onion are covered despite the fact that there are a large number of other crops. The National Horticulture Board (NHB) has been making attempts to compile the data on area, production and productivity of some of the horticultural crops. But the NHB has to be dependent on the State Departments of Horticulture/Agriculture for generating the information. Moreover, there is considerable time lag in collecting and disseminating the data with reference to the actual year of production. The latest data available on area and production of most of the horticultural crops was for the year 1998-99. More realistic planning would have been possible if actual data for the year 2000-01 and estimates for 2001-02 were available. In the absence of this information, it has not been possible to make realistic assessment of the actual needs of this sector. Unless the data base is made stronger and broader in its coverage, long-term planning for horticultural development will be difficult and unrealistic. Coffee Board has recently set up a market intelligence unit to provide market/ trade information to all sectors of the industry. There is an urgent need to develop horticulture database system for generation, documentation and dissemination of

information. To start with, a bench mark survey of all horticultural crops need to be conducted.

4. INFRASTRUCTURAL

4.1. Inadequate Post Harvest Infrastructure

Horticulture and Plantation crops are both perishable (e.g., fruits, vegetables, ornamentals, mushrooms, tea, etc.) and non-perishable (e.g., spices, cashewnut etc.). Perishability alone contributes to heavy losses in the availability and quality after harvest of these crops and makes investments risk-oriented. According to the Swaminathan Committee (1985), post harvest handling accounts for 20 to 40 per cent of the losses at different stages of grading, packing, storage, transport and finally marketing of both fresh and processed products. Such an enormous loss has proved a great handicap in exploiting the full production potential of these crops and thereby improve the rural income, employment and nutrition of the masses. The production and marketing of these commodities also suffer from the crippling uncertainty and instability of the domestic as well as export market conditions. Since most of these are grown by small and marginal farmers, and handled at the retail level by poor sections, the effect is all the more devastating. Very often these commodities have to be sold through distress sales.

To meet the domestic as well as international quality standards, upgradation, post harvest marketing operations e.g., harvesting, pre-cooled grading (cool chain), packing and transportation have to be improved. For international regulations it is also essential to have ISO systems of certification.

4.2. Poor Marketing Infrastructure

Marketing of horticultural produce is a major constraint in the production and disposal system and has a major role to play in making the industry viable or otherwise. Fruits and vegetables are mostly marketed through commission agents. A very small portion is handled by cooperative marketing societies. In some case fruits, the owners to the pre-harvest contractors also auction

vegetables and flowers. The pre-harvest contract could be for one or even three years in perennial crops. The returns from such arrangements are very low. Such sales also result in poor upkeep of the plantation / orchards and the contractors hesitate to make further investment in the upkeep of such plantations / orchards. In coffee, subsequent to dismantling of pooled marketing system during 1993-96 and collapse of ICO quota system in 1989 trade has been fully liberalized and it is currently exposed to the vagaries of international market situations.

4.3. Inadequate Processing Facilities

The weak processing infrastructure, as it exists today, has been one of the contributing factors for ineffective utilization of the raw materials resulting in huge post harvest losses. Further, serious price fluctuations commonly observed in the Indian horticulture scenario lead to glut situation in individual commodities and opens opportunities for exploitation of the small and marginal farmers by the traders and commission agents. Insufficient technologies for commercial utilization of by-products / value added products also act as a damper for handling horticulture produce. Lack of sufficient processing units for production of quality copra, arecanut, cardamom, pepper, palm oil etc., is a major bottleneck for these crops. Lack of adequate standards for quality produce also hinders the export prospects of these crops. Lack of infrastructure like coffee pulpers / drying yards etc., due to high capital investment hinders effective utilization of raw materials.

The infrastructure for primary processing of rubber has been too inadequate. As small and marginal growers predominate the production sector, individual processing facilities are not available due to lack of skill as well as investment capability

4.4. Inadequate Research and Extension Support

Having regard to the number of crops covered in the horticulture group, the peculiarities of the problems being faced by each one, their perishable nature and the elaborate organisational support required, the type and volume of the

research are not commensurate with the situation (Refer Chapter V). The R&D support available is highly inadequate despite major strengthening of the research system through establishment of National Research Centres and upgradation of centers to Institutes. Besides most of the NRCs have been started only during the VIII and IX Plan periods and they have yet to make a mark in their achievements in the areas being dealt with by them.

Improved production technologies developed at Research Stations have not been transferred to the field to the required extent due to lack of sufficient extension personnel and infrastructure.

Motivation of farmers to adopt new technology through field demonstration has not been carried out satisfactorily.

5. FINANCIAL

5.1. High Investments and Long Gestation Period

The high capital cost involved in establishing an orchard/ a plantation, or rejuvenation of existing old unproductive plantation poses serious constraint in area expansion under these crops. The situation becomes all the more difficult in view of the large number of small holdings devoted to these crops which are essentially owned by weaker section, who have no means to invest, nor can afford to stand the burden of credit even if available. Added to this is the long gestation period that the perennial horticultural crops like mango, sapota, citrus, apple and plantation crops like coconut, arecanut, cashewnut, oil palm coffee, tea and rubber coming to the economic bearing age. This calls for liberalized credit facilities in easy installments for repayment in the form of soft loans to small and marginal farmers to be introduced if the benefits of the horticulture industry are to be fully exploited.

High cost of inputs and lack of enough incentives for production of quality varieties /species, product diversification, value addition, etc. also hinder crops development.

6. POLICY ISSUES

6.1. Implementation Mode

Most of the programmes for the IX Five year Plan became operational only with effect from the financial year 2000-2001, viz. Fourth year of the Plan period. Moreover, most of the programmes got subsumed under the centrally sponsored scheme on Macro-Management in Agriculture – Supplementation / complementation of States efforts through Work Plans with effect from October 2000. Due to the change in the mode of implementation, the desired results could not be achieved during the Plan period.

6.2. Differential Taxation and Price Fluctuations

Presently differential tax structure for diverse agricultural commodities is in existence within and outside states. This needs review and rationalization. The current low prices for rubber, tea, coffee, coconut, oil palm etc have acted as deterrent particularly to small farmers to make adequate investment in plantation and in adoption of cultural practices.

CHAPTER VIII

ORGANISATIONAL STRUCTURE

Planning for agriculture in the last decade demonstrates a distinct shift from concentration on food (field) crops to horticultural crops. Horticultural crops, in view of their ability to generate higher profitability for the farmers through higher economic returns per unit area and being a good source of nutrition (fruits, vegetables, plantation crops), have emerged as a viable agri-business diversification option. Importance of horticultural crops was recognized through a significant increase in the developmental support by Govt. of India during VIII and IX Plan periods. The total allocation of Rs.250 million for horticulture development during VII Plan period was increased to Rs.10,000 million during VIII Plan (1992-97). This significant increase in allocation enabled strengthening of the ongoing programmes on fruits, vegetables, plantation crops & spices besides initiation of new programmes in mushrooms, medicinal & aromatic crops. During the IX Plan, the financial allocation was further enhanced to Rs.14,530.6 million.

The organisational support for horticulture programmes is available both in the Ministry of Agriculture and Ministry of Commerce at national level. At State level, Departments of Agriculture/Horticulture provide the required infrastructure. A number of Boards, Councils, Directorates, Foundation and Authorities have been established under the Ministries at Central and State level to promote their product both in the domestic and export market. Various organisations engaged in production and marketing and export of horticultural crops are detailed in this chapter.

1. MINISTRY OF AGRICULTURE

1.1 Horticulture Division

The Horticulture Division was created in September, 1980 by re-organisation and redeployment of existing staff in the Crops Division. Policy planning for horticulture development is being done by the Horticulture Division in the Department of Agriculture & Cooperation (DAC) of Ministry of Agriculture (MOA) headed by a Horticulture Commissioner. It has the following mandate:

- Support and formulate policies aimed for accelerated growth of horticulture.
- Provide leadership and co-ordinate activities for the promotion of horticulture.
- Implement programmes for improving production, productivity and utilisation of horticultural crops.
- Facilitate the availability of disease free planting material and seeds of horticultural crops.
- Work as facilitator for the transfer of technology to farmers and promote the use of information technology.
- Promote better utilisation and increased consumption of horticultural produce to ensure higher returns to farmers and nutritional security to people.
- Develop strong base for the supply of inputs, transfer of technology and human resource developmental activities.
- Promote horticulture in NE region, hills, tribal & backward areas for improving economic status of people.

There are two Boards namely National Horticulture Board & Coconut Development Board and two Directorates namely Directorate of Arecanut & Spices Development and Directorate of Cashew and Cocoa Development supporting horticultural development activities in the Ministry of Agriculture.

The enhanced allocation of funds for horticulture development from VIII Plan onwards increased the work load substantially for implementation of ongoing and new programmes/schemes in the existing as well as new areas in the country.

1.2 National Horticulture Board (NHB)

The National Horticulture Board (NHB) was set up by the Government of India in 1984 as an autonomous society under the Societies Registration Act, 1860 with a mandate to promote integrated development of horticulture, to help in coordinating, stimulating and sustaining the production and processing of fruits and vegetables and to establish a sound infrastructure in the field of production, processing and marketing with a focus on post-harvest management to reduce losses. The Board's programmes include :-

- Capital investment subsidy scheme for construction/expansion/modernisation of cold storages and storages for horticulture produce.
- Development of commercial horticulture through production and post-harvest management.
- Technology development and transfer for promotion of horticulture.
- Market information service for horticultural crops.
- Establishment of nutritional gardens in rural areas.
- Horticulture promotion service.
- Strengthening capabilities of the NHB.

NHB has a network of 33 regional offices located through the entire length and breadth of the country to promote horticulture in the country. The initiative of the Board has helped in developing infrastructure for horticultural development. The Board is ill-equipped in terms of manpower in spite of added responsibilities and needs critical appraisal to make it responsive to the needs of the industry.

1.3 Coconut Development Board (CDB)

The Coconut Development Board was established on 12th January, 1981 under the Coconut Development Board Act, 1979 enacted by the Parliament. It has a mandate for integrated development of coconut industry in the country through promoting production, processing, marketing and product diversification of coconut. The functions of the Board are:

- Adopt measures for the development of coconut industry.
- Recommend measures for improving marketing of coconut and its products.
- Impart technical advice to those engaged in coconut cultivation and its industry.
- Provide financial and other assistance for expansion of area, improving productivity and product diversification.
- Compile statistics on coconut.
- Undertake publicity and publication activities.
- Encourage adoption of modern technologies for processing of coconut and its product.
- Recommend measures for regulating imports and exports for coconut and its products.
- Fix grades, specifications and standards for coconut and its products.

The Board has its headquarters at Kochi, Kerala, with three Regional offices at Bangalore (Karnataka), Patna(Bihar) and Chennai(Tamilnadu) and six State Centres at Hyderabad(Andhra Pradesh), Kolkatta(West Bengal), Guwahati(Assam), Agartala(Tripura), Bhubaneshwar(Orissa) and Port Blair(Andaman & Nicobar Islands). In addition, nine Demonstration cum Seed Production Farms have also been established, two in the State of Kerala and one each in Andhra Pradesh, Assam, Bihar, Karnataka, Madhya Pradesh, Orissa and Tripura.

The Board has been implementing various development programmes during the last two decades. Efforts of the Board have been rewarding in terms of increased production and productivity and also for diversification of coconut products. The Board is bringing out “ The Indian Coconut Journal “ in 5 languages i.e. English, Hindi, Malayalam, Kannada and Tamil and has established information system on coconut.

The major programmes of the CDB include :-

- Production and distribution of planting material.
- Expansion of area under coconut.
- Integrated farming for productivity improvement.
- Technology demonstration.
- Market promotion and statistics.
- Information and information technology.
- Human resources development.

1.4 Directorate of Cashewnut & Cocoa Development, Kochi

This is one of the two Directorates devoted to development of horticulture crops. It came into existence with effect from 01.04.1966 with headquarters at Kochi (Kerala) as a subordinate office of the Union Ministry of Agriculture with primary objective of development of cashewnut in the country. Development of cocoa was transferred to this Directorate during 1998. This Directorate is responsible for formulation and coordination of schemes /programmes for development of the mandated commodities in the country. It maintains close liaison with the State Governments and other state level agencies in implementation of its programmes. The Directorate conducts comprehensive studies on various aspects of cashewnut & cocoa development including production, marketing, prices and other related problems. It has been instrumental in dissemination of technical information and research findings of practical

value through technical bulletins/leaflets. The establishment of this Directorate has helped in promotion of cashew & cocoa development by adoption of improved technology for production and making available quality planting material. The Directorate also brings out a quarterly journal titled “ The Cashew“.

1.5 Directorate of Arecanut & Spices Development, Calicut

This Directorate was established at Calicut, Kerala with effect from 01.04.1966 as a subordinate office of the Ministry of Agriculture (Department of Agriculture & Cooperation). It has the mandate to formulate appropriate development schemes on spices, medicinal & aromatic plants and arecanut at the national level. These schemes are implemented through State Governments, Agricultural Universities, ICAR Institutes as well as through Regional Research Laboratories under CSIR and monitored by the Directorate. This Directorate also collects, compiles and publishes data on area, production, price trends, export and import of arecanut and spices in addition to keeping liaison with research and development agencies both at the State and Central levels. Through the efforts of this Directorate, there has been an unprecedented increase in production and quality of these products. Directorate of Arecanut & Spices Development now looks after the development of Arecanut, 52 Spice crops, Betelvine and Medicinal & Aromatic plants at national level. It also publishes a quarterly journal titled “ Indian Journal of Arecanut, Spices and Medicinal Plants“.

1.6 National Committee on Use of Plastics in Agriculture (NCPA), New Delhi

A National Committee on Use of Plastics in Agriculture was initially constituted in the Department of Chemicals & Petro-chemicals to promote use of plasticulture in agriculture. In November, 1993, it was transferred to the Ministry of Agriculture. The Committee is chaired by

Agriculture Minister. With Horticulture Commissioner as the Member-Secretary. The NCPA has the mandate to implement and monitor the Centrally Sponsored Scheme on “Development of Horticulture through Plasticulture “ with an outlay of Rs.3750 million during the IX Plan. Technical, financial and administrative staff and officers are deployed from Indian Petro Chemicals Limited (IPCL) which also provides their salaries and perks. The Ministry of Agriculture provides grants to the NCPA for funding of research , development and training programmes conducted by Plastic Development Centers (PDC).

There are 16 PDC’s working in the country at major Agriculture Universities situated in different agro-climatic conditions. PDC’s had been given broad mandate of carrying out adaptive research in areas of drip irrigation, green houses, mulching, online field channels, sprinkler irrigation, etc.

The use of plasticulture in horticulture has made steady and fast progress in the country during VIII and IX Plan. The area coverage under drip irrigation, green houses and mulching has considerably increased. The committee, in the field of horticulture, has an extremely important role in improvement of productivity and quality, water saving and protection from vagaries of weather. Thus it is envitable to strengthen this committee by making a separating organisation to support Hi-Tech horticulture.

1.7 Bee-keeping Development Board, New Delhi

This is a co-ordinating Board to integrate the programme on honey bee. The Board is headed by Secretary (Agriculture & Cooperation) with Horticulture Commissioner as the Member Secretary. The Board decides the various programmes to be taken up for the development of honey bee & bee products. This Board needs to be given a separate status with functional autonomy.

1.8 National Cooperative Development Corporation (NCDC), New Delhi

NCDC was established in March 1963 under an act of Parliament as successor organization to the National Cooperative Development and Warehousing Board set up in 1956, in pursuance of the recommendations of the All India Rural Credit Survey Committee (1954) under the aegis of the Reserve Bank of India.

NCDC has emerged as a major development financing institution for the Cooperative Sector in the country. A major objective of the corporation is to promote, strengthen and develop the institution of farmers' cooperatives for increasing production and productivity and instituting post harvest facilities for augmenting income. The Corporation's focus has been on programmes of agricultural inputs, processing, storage and marketing of agricultural produce and supply of consumer goods in rural areas. In the non-farm sector, the Corporation's endeavour has been to equip cooperatives with facilities to promote income generating streams of activities with special focus on weaker sections of the community/rural poor such as handlooms, sericulture, poultry, fisheries, etc. The Government of India implements its cooperative development programmes through the NCDC. The main programmes implemented through NCDC are :

- Margin money to NAFED,
- Integrated cooperative development project,
- Development of cooperative rural growth centre in Bihar (EEC assisted),
- Oilseed development project, Kerala (EEC),
- Assistance to coop marketing, processing and storage in cooperatively underdeveloped states/UTs,
- Share capital participation in cooperative sugar and spinning mills

1.9 National Agricultural Cooperative Marketing Federation (NAFED), New Delhi

National Agricultural Cooperative Marketing Federation of India Ltd. popularly known as NAFED was set up on October 2, 1958. NAFED promotes cooperative marketing of agricultural produce for the benefit of farmers through its headquarters at Delhi, four regional offices at Delhi, Mumbai, Calcutta and Chennai and 29 branches located in the state capitals and other important cities, five Agro service centres, four sales outlets of processed foods and five Industrial Units. NAFED undertakes internal trade and export/import of agricultural and horticultural commodities.

NAFED is the central nodal agency for procurement of oilseeds and pulses under Price support scheme and for procurement of horticultural commodities under Market intervention scheme (MIS). NAFED is also undertaking buffer stocking of onions on behalf of Central Government for checking price rise in the consumer markets. It has opened NAFED Bazar for making available various consumer items of daily use at a reasonable price.

1.10 National Horticultural Research and Development Foundation (NHRDF), Pune

In November, 1977, the Associated Agricultural Development Foundation (AADF) was constituted under the National Agricultural Cooperative Marketing Federation of India Ltd (NAFED) mainly to cater to applied research and development of onion and for promoting export oriented crops. Its name was changed to National Horticultural Research and Development Foundation (NHRDF) during 1993 for widening the scope of research and development programmes. The Foundation has its headquarters at Nasik and registered office in Delhi. There are three research stations, one each in Nasik (Maharashtra), Karnal (Haryana)

and Mydukur (Andhra Pradesh) through which multi-locational research work is being taken up on onion and garlic. The results obtained from these research stations and also other ICAR institutes and State Agricultural Universities are being taken to farmers and others through seventeen extension centres located all over the country. NHRDF also produces and distributes quality seeds of onion and garlic as a service to the farmer. The NHRDF estimates area, production and crop condition of onion and garlic periodically and passes on the information to the Ministry of Agriculture. Presently, NHRDF is implementing projects with the financial assistance of NHB, DAC, ICAR, NAFED and other agencies for development of onion and garlic in the country.

1.11 Small Farmer's Agri-Business Consortium (SFAC), New Delhi

The Small Farmers' Agri-Business Consortium (SFAC) is functioning as a society under the Ministry of Agriculture, Department of Agriculture and Cooperation. It is involved in the following activities:-

- Subsidize or pay in full the cost of preparation of any project report/feasibility study/marketing opportunity analysis/base level studies for the marketable surplus of any agricultural produce on a request made either by any state government or any state agency, or any group of farmers etc.
- Sponsor and meet the cost of preparation of feasibility studies for any innovative and/or new technology driven projects, taking into account national priorities, and/or the requirements of domestic surpluses/international trade.
- Function as a Venture Capital Fund(VCF)
- Undertake the implementation of any project based upon technology transfer
- Collaborate with Indian Institute of Management, Regional Engineering Colleges, MANAGE, Hyderabad, NIRD, Hyderabad, Vaikunth Mehta National Instt. of Cooperative Management, Pune and IRMA, Anand.

- Assist farmer's interest groups, collective grower's groups, to organise better inputs, material supply and production services for the agricultural produce.
- Set up small scale cold storages, environment friendly demonstration units for value -addition through agro-based/agro-processing units in rainfed, drought-prone eastern and hilly regions.
- Promote of drip irrigation/sprinkler irrigation/watershed management/farm ponds/rainwater harvesting/environment friendly land reclamation micro-projects/drainage systems in lands owned by groups of farmers.
- Undertake or assist in publicity campaign of awareness and market niche for organic farming and environment friendly products
- Promote organic farming, organic inputs for agriculture, horticulture and plantation crops.
- Promote of inter-linked and multi-lingual Agri-Business Information Centres, organisation of seminars, group discussions, workshops, promotion of contract farming.
- Promote and handle agricultural in-puts or outputs.
- Promote printing and publishing of periodicals, magazines, monographs or books for furtherance of any objectives of the society.

2. MINISTRY OF COMMERCE

Horticulture development programmes also receive support for marketing, more particularly export promotion from Agricultural and Processed Food Products Export Development Authority (APEDA), Spices Board, Tea Board, Coffee Board, Rubber Board and the Cashew Export Promotion Council. The major mandate/activities of these organization are :-

2.1 Agricultural and Processed Food Products Export Development Authority (APEDA), New Delhi

The Agricultural and Processed Food Products Export Development Authority (APEDA) was established by an Act of Parliament in December, 1985. The Act was brought into force with effect from 13th

February, 1986 and the new authority replaced the Processed Foods Export Promotion Council. It is headed by a Chairman.

APEDA is mandated with the responsibility of Export Promotion and Development of the following horticultural products:

- Fruits, vegetables and their products.
- Horticulture and Floriculture products.
- Herbal and Medicinal plants.
- Pickles, Papads and Chutneys.
- Cocoa products.
- Honey.
- Alcoholic and non-alcoholic beverages.

APEDA is implementing a number of schemes for promotion of export of the above listed commodities and its programmes have resulted in significant increases in the export of several Agriculture/horticulture products.

2.2 Spices Board, Kochi

The Spices Board was established in 1987 with headquarters at Cochin, Kerala under the Spices Board Act, 1986. It is an apex body for export promotion of Indian spices and spice products. The Board has been assigned responsibility of export development of 52 spices. Some of the major spices among them are pepper, chilli, ginger, turmeric, cardamom, coriander, cumin, fennel, fenugreek, celery, vanilla and saffron. The Board is implementing a number of schemes aimed at export development of spices such as quality evaluation and upgradation with a view to meet international standards and promotion of export of value added spices. The Board has well established quality evaluation and upgradation laboratory at Kochi which is engaged in surveying the quality of spices procured from different producing and marketing centres. It

offers training in quality upgradation to growers and exporters and undertakes physical, chemical and biological analysis of the samples brought by the exporters.

As per the spices Board Act, 1986 the Board is also responsible for the development of cardamom including its export promotion activities. Various programmes implemented by the Spices Board for the development of cardamom include production and supply of planting material, cardamom replanting, irrigation, land development and afforestation programmes; Extension Advisory Scheme; and Tribal Development Programme.

Spices Board is also assisting tribal growers of cardamom by implementing various development programmes with enhanced financial assistance. Similarly, in case of large cardamom also, assistance is given through these schemes. Apart from these, Indian Cardamom Research Institute under the Spices Board carries out need based research programmes on crop improvement, production and also post-harvest techniques of cardamom.

2.3 Tea Board, Kolkatta

The Tea Act, 1953, established the Tea Board of India on April 1, 1954. The Board is functioning as a statutory body of the Central Govt. under the Ministry of Commerce with 31 members (including Chairman) drawn from the Members of Parliament, Tea producers, Tea traders, Tea brokers, consumers, representatives of the Governments from the principal tea producing states, and Trade Union leaders. While the Tea Act mainly focuses on controls, the scope of activities of the Tea Board is focused on ensuring overall development of the Tea industry and trade. Accordingly, the Board's activity is directed towards increasing tea production and productivity, extension of area under tea cultivation,

improvement in quality of tea, catalyzing co-operative efforts, backing up research and development, labour welfare, market development, export promotion and regulatory functions such as issuance of licenses and monitoring of various trade related activities. Tea Board also plays a major role in the collection and dissemination of statistical data.

Tea Board's Head Office is located in Calcutta, West Bengal. It has 15 Regional and Sub-Regional Offices in India located at Agartala, Bombay, Coonoor, Guwahati, Jorhat, Kochi, Kottayam, Kurseong, Lucknow, Madras, New Delhi, Palampur, Silchar, Siliguri and Tezpur.

It has five overseas offices located at Dubai, Hamburg, London, New York and Moscow. All these foreign offices of the Board are designed to undertake various promotional measures to boost export of Indian tea. These offices also act as a liaison office for interaction between importers of Indian tea of the respective regions as well as Indian Exporters.

In order to increase Tea production, productivity, marketing and export of tea, the following Plan schemes have been implemented by the Tea Board during the IX Plan period.

- Plantation development scheme.
- Tea processing and packaging development scheme.
- Tea development scheme for North Eastern states for the control of jhum cultivation.
- New area development scheme.
- Small grower development scheme.
- Marketing development and export promotion scheme.
- Research and development scheme.

- Human resource development scheme.

2.4 Coffee Board, Bangalore

The developmental activities of coffee in India come under the purview of the Coffee Board – a statutory organization established under the Coffee Act VII of 1942, under the administrative control of the Ministry of Commerce & Industry, Government of India. The main functions of the board are research, extension, development, quality up-gradation, market intelligence, external and internal promotion and labour welfare. During the pre-liberalised era, the Coffee Board was vested with the powers for marketing the entire coffee produce under a unique pooling system. Consequent to depooling in the early 1990s, the Coffee Board withdrew from the direct marketing activities and focused in the areas of research, extension, development and market development programmes.

In the present scenario, the Coffee Board is functioning as a service provider to various segments of the industry. As an umbrella organization, it facilitates the co-ordination of different segments viz: growers, processors, exporters, domestic traders, consumers and various associations representing the industry. Above all, the Coffee Board plays the role of industry spokesman to take up relevant issues with State and Central Governments and international organizations like International Coffee Organisation, Association of Coffee Producing Countries, Common Fund for Commodities etc.

2.5 Rubber Board, Kottayam

The Rubber Board was constituted under the Rubber Act, 1947. The functions and duties of the Board include promoting the development of rubber industry, advise the Government of India on all matters related to rubber industry including the import and export of rubber and participation in international conference/seminars. The central office of the Board is located at Kottayam in Kerala . Similarly, the Rubber Research Institute of

India, the research department of the Rubber Board, is located near the Central Office. The Board has 2 zonal offices, 6 supervisory offices, 2 nucleus rubber estates and training centers, 40 regional offices, 170 field offices, 15 regional nurseries, 23 tappers training schools, 2 experiment stations, 1 regional research complex, 10 regional research stations and 10 soil and tissue testing laboratories in different regions.

The Board has various departments for performing following functions/ activities:-

- Promoting the development of rubber industry by undertaking, assisting or encouraging scientific, technological or economic research.
- Training in improved methods of planting, cultivation, manuring and spraying.
- Providing technical advice to rubber growers.
- Improving marketing of rubber.
- Collection of statistics from growers, dealers and manufacturers.
- Securing better working conditions and the provisions and improvement of amenities and incentives to workers.
- Carrying out any other duties vested with the Board as per rules made under the Act.

The Rubber Board undertakes Research and Development on scientific, technological and economic aspects of natural rubber. These include, germplasm collection, conservation and utilisation, crop improvement programmes through breeding and selection, propagation techniques, genetic engineering and molecular biology; rubber based farming systems, soil and nutrient management; drought management; diseases and pests and their control, microbial management of soil fertility and environmental pollution; plant physiology and exploitation studies. The Board also undertakes comprehensive studies on all

aspects of rubber processing, product development and quality improvement of processed rubber and rubber products, blends of natural rubber with other polymers, modification of natural rubber, reverse engineering and recycling, market development, trade research, industrial market and customised services, specialised training towards manpower development for the plantation and manufacturing sectors and services for establishing rubber processing, rubber wood and rubber goods manufacturing industry, etc.

2.6 Cashew Export Promotion Council, Kochi

India is a leading producer, processor and exporter of cashew kernel in the world. The export earnings from cashew and allied products during 1998-99 was Rs.16.132 billion which is an all time record. Cashew stood at fifth position amongst agricultural products exported from India. The Cashew Export Promotion Council looks after the promotional activities related to exports. The activities undertaken by the Council include participation in fairs, trade delegations, arranging buyer-seller meets, regular publications etc.

The council proposes to extend financial assistance to the tune of Rs.10 million to Cashew exporters for modernising cashew factories, adopting new processing technologies of international standards for adopting ISO 9000/HACCP by Cashew processing units and for installing new generation packaging systems.

The council's laboratory and technical division provides testing facilities to exporters so that their products can conform to international standards. Besides that it imparts training to cashew factory owners, managers, supervisors, workers etc. to inculcate quality awareness and educate them on international hygiene requirements of food products.

3. STATE DEPARTMENTS OF HORTICULTURE

Many State Governments have created separate Departments of Horticulture along with Directorates of Horticulture for implementing the horticultural development programmes with Central / State funding. The Directorates are also responsible for transfer of technology to the farmers for cultivation of horticulture crops. A list of states alongwith the Departments looking after various horticulture commodities is given in Table 8.1.

Table 8.1 Organisations responsible for development programmes on horticulture in different states

SI.No.	Name of States/ UTs	Departments	Crop Responsibility
1.	A&N Islands	Agriculture	All horticulture crops
2.	Andhra Pradesh	Horticulture	All horticulture crops
3.	Arunachal Pradesh	Horticulture Agriculture	Fruits Vegetable & Spices
4.	Assam	Forestry Agriculture	Floriculture All horticulture crops
5.	Bihar	Horticulture.	All horticulture crops
6.	Chhatisgarh	Agriculture	All horticulture crops
7.	Goa	Agriculture	All horticulture crops
8.	Gujarat	Horticulture.	All horticulture crops
9.	Haryana	Horticulture	All horticulture crops
10.	Himachal Pradesh	Horticulture Agriculture	Fruits/floriculture and medicinal & aromatic plants Vegetables, potato and spices
11.	Jammu & Kashmir		All horticulture crops
12.	Jharkhand	Agriculture Forestry	Vegetables & spices floriculture
13.	Karnataka	Horticulture.	All horticulture crops
14.	Kerala	Agriculture	All horticulture crops
15.	Lakshadweep	Agriculture	All horticulture crops
16.	Madhya Pradesh	Horticulture	All horticulture crops
17.	Maharashtra	Horticulture	All horticulture crops

18.	Manipur	Horticulture & Soil conservation	All horticulture crops
19.	Meghalaya	Horticulture	All horticulture crops
20.	Mizoram	Horticulture	All horticulture crops
21.	Nagaland	Horticulture	All horticulture crops
22.	Orissa	Horticulture	All horticulture crops except cashew
23.	Pondicherry	Agriculture	All horticulture crops
24.	Punjab	Horticulture	All horticulture crops
25.	Rajasthan	Horticulture	All horticulture crops
26.	Sikkim	Horticulture	All horticulture crops
27.	Tamil Nadu	Horticulture & Plantation crops Agriculture	All horticulture crops coconut, oil palm
28.	Tripura	Horticulture & Soil conservation	All horticulture crops
29.	Uttar Pradesh	Horticulture & Food processing	All horticulture crops
30.	Uttranchal	Horticulture	All horticulture crops
31.	West Bengal	Horticulture Agriculture	All horticulture crops Potato

While in States like Karnataka, J&K and U.P, the Departments of Horticulture are quite old, in most others these have been set up only during the last 2-3 decades. These have been carved out of Directorates of Agriculture without adequate infrastructure and technical support for horticulture. In some of the states like Kerala horticulture development schemes continue to be implemented by the Directorate of Agriculture for want of creation of separate Directorate of Horticulture. Moreover, in some states the horticulture development programmes are being implemented by the Directorate of Agriculture or other Departments, despite the existence of Directorate of Horticulture. Floriculture in Jammu & Kashmir, coconut and oil palm in Tamil Nadu, potato in West Bengal, potato and vegetables in Himachal Pradesh are few examples.

4. NON GOVERNMENTAL ORGANIZATIONS

Several non government organisations are also engaged in the development of horticulture crops. These include "Maha Grape", and 'Maha Mango' in Pune, Maharashtra. Similarly, Cadbury and CAMPCO, Mangalore (Karnataka) is dealing with the production and processing of cocoa and arecanut and also their marketing.

HOPCOM, Bangalore (Karnataka) is a successful cooperative organisation for marketing of horticulture produce. The Society is under operation in the districts of Bangalore (Urban and Rural), Kolar, Tumkur, Mandya, Shimoga, Dakshina Kannada and Mysore. The main objective of the Society is to procure fruits and vegetables from the member growers and supply to consumers through its own retail outlets. There are 405 retail outlets. The Society is handling around 44,000 metric tonnes of fruits and vegetables with a total turnover of Rs.400 billion annually.

4.1 National Dairy Development Board, New Delhi

The NDDB which is a cooperative organisation is implementing a fruit and vegetable marketing project in Delhi through a number of retail channels.

5. FUTURE THRUST

5.1 Strengthening of Horticulture Division, DAC

The current strength of the Horticulture Division is grossly inadequate to meet the growing aspirations of this sector. In this context, it would be relevant to add that the Committee on Petitions of Rajya Sabha, in its 10th Report had observed that "if taken care of properly horticulture can not only feed the countrymen but can also contribute significantly to the economic development of the country. The Committee

finds that horticulture crops particularly fruit & vegetables are part of national Agriculture Policy but in view of the overall importance of these sectors in the country right from the production, marketing, consumption and employment angle, special emphasis needs to be given to the horticulture sector. The Committee, further, recommended that a separate Ministry may be formed at the Centre to promote the horticulture sector and a policy document may be prepared by the Union Government so that special emphasis is given to this sector. This recommendation of the committee was considered in the DAC and it was agreed that horticulture needs emphasis and focussed attention for overall development to harness the potential. A view was, however, taken that creation of new Ministry of Horticulture may not be necessary as the target groups for agriculture and horticulture are the same.

In spite of increased outlays and many new initiatives undertaken, the Horticulture Division is yet to be strengthened. Presently, there is no field level organizations for providing technical input and feedback about implementation and monitoring of various programmes for development of fruits, vegetables, floriculture, mushroom, root & tuber crops.

Keeping in view the growth of the horticulture sector, there is a definite and urgent need for strengthening the Horticulture Division with technical and other supporting staff. Other Divisions in the DAC, which provide input support for agriculture, such as the Seeds Division, Fertilizer Division, Directorate of Economics & Statistics will also have to be strengthened suitably to provide the required support for horticultural crops.

5.2 Creation of Directorate of Fruits and Vegetables

There is no field organisation for providing technical input and feedback from the field about implementation and monitoring of the

programmes for development of fruits, vegetables, floriculture, mushroom, root & tuber crops, etc. Fruit and vegetable crops are cultivated along the entire length and breadth of the country. India is the second largest producer of fruits with a production of 44.04 million tonnes of fruits from an area of 3.72 million hectares. A large variety of fruits are grown all over India, in tropical and sub-tropical, temperate and arid regions of the country. Although fruit are grown throughout the country, the major fruit growing states are Maharashtra, Tamil Nadu, Karnataka, Andhra Pradesh, Bihar, Uttar Pradesh and Gujarat.

Similarly, in vegetables, adoption of high yielding cultivars and FI hybrids and suitable production technologies has largely contributed for higher production and productivity in vegetable crops. More than 40 kinds of vegetables belonging to different groups are grown in different agro-climatic situations of the country. Except a few indigenous vegetables namely brinjal (egg plant), colocasia, cucumber, ridge gourd, sponge gourd, pointed gourd etc., most of the other vegetables have been introduced from abroad.

Potato is another widely grown vegetable crop in the country with a share of 25.7 per cent. The area under potato cultivation is 1.28 million ha with total production of 22.49 Million Tonnes. Uttar Pradesh is the leading potato growing state in the country with a production of 9.53 million tonnes followed by West Bengal and Bihar. Tomato, brinjal and Cabbage occupy second, third and fourth most widely grown crops.

In recent years, commercial mushroom cultivation has also started in the country. In early nineties, export oriented units were put up by corporate houses/industrialists from length and breadth of the country with use of advanced machinery/computers for mushroom growing. The

mushroom production in, the country has increased 6-7 fold and at present production of mushroom stands at 40000 tonnes.

By no standards, the average per capita availability of fruits and vegetables is adequate to meet requirements for nutritional and protective diet of the population. With increasing income levels and demand the production of fruits and vegetables has to reach the level of 318 million tonnes by the year 2020 from the present level of 131.57 million tonnes in 1998-99. A large number of fruits and vegetables are produced in tropical sub-tropical and temperate regions throughout the length and breadth of the country and it requires to increase production of fruits and vegetables more than 2 1/2 times by the year 2020. Every fruit and vegetable crop is afflicted by different set of pest and diseases and there are different production technologies. There is , however, no technical support available in the Horticulture Division for either fruits or vegetables. Also there is no Directorate to provide support to the Division in monitoring the programmes in the State and keep liaison with the State Govts. for promotion of these crops. To provide competent technical support for development of fruits & vegetables and also to monitor programmes and keep liaison with State Govts. two directorates one for Fruits and other for Vegetables including tuber crops need to be set up under DAC.

5.3 Setting up Regional Offices of Directorate of Arecanut & Spices Development

India is the largest producer, consumer and exporter of a variety of spices and has a rich diversity of medicinal & aromatic plants. Malabar Pepper, Alleppey Finger Turmeric, Cochin Ginger are important names in the international spice markets. At present there are more than 50 spice crops and quite a large number of medicinal and aromatic plants on which developmental activities are being taken up. The Directorate of Arecanut & Spices Development is assigned the task to develop technical

expertise, data base and advice the Government on matters/ issues and policies connected with these crops. During VIII Plan, Ministry of Finance had agreed for setting up 2 regional offices of the Directorate each in the North-East and North-West Regions. These Regional Offices could not be made operative as no additional staff was sanctioned during the Plan period. At present, the Directorate with its headquarters at Calicut, Kerala is concentrating on spice crops, and the related programmes which are important only for the southern States. In the absence of any regional offices, it has not been possible to monitor implementation of programmes for development of spices like coriander, cumin, fennel, fenugreek, ginger, turmeric, chillies etc., which are important in Northern, Eastern, North-eastern and North-western States. It would, therefore be necessary to create two Regional Offices for North-West Region and North-East Region.

5.4 Setting up of Palm Board

At present, Coconut Development Board is looking after the work relating to policy planning, formulation & implementation of programmes for promoting coconut cultivation, product diversification and bye-product utilisation, marketing, technology development and transfer, training, etc. The Board has infrastructure spread over in various States and is concentrating only on a single crop. In order to effectively and efficiently utilise the available infrastructure and human resources, the Board could be assigned the role of development of all palms, such as, coconut, arecanut and oilpalm and called The Palm Board. The existing technical personnel of the Board who have specialised themselves in the field of coconut may be imparted required training so that they acquire necessary skills/expertise in the field of other palms. The required additional technical support and infrastructure may also be considered to strengthen it adequately. For facilitating this, it would be necessary to

modify the Coconut Development Board Act, 1979. In the event of consideration of this Board, the Arecanut crop now being looked after by a Directorate will be looked after by this board.

5.5 Establishment of Precision Farming Development Centres (PFDC)

The NCPA is implementing and monitoring a Centrally Sponsored Scheme on Development of Horticulture through intervention of Plasticulture. There are 16 Plasticulture Development Centres (PDC) working in the country to carry out adaptive research in areas of drip irrigation, green houses, mulching, online field channel, sprinkler irrigation, etc. In view of increasing importance of precision farming, i.e., precise application of inputs required for various crops under different climate and locations for optimum utilization of scarce water and other inputs, plant protection measures, the existing PDCs need to be strengthened and renamed as Precision Farming Development Centres (PFDC) under Horticulture Division, DAC.

5.6 Redefine Activities of Spices Board

The programmes relating to research and development of cardamom is presently being handled by the Spices Board. Since cultivation is the responsibility of the Ministry of Agriculture, the work relating to research & development of cardamom should come under the purview of the Ministry of Agriculture. Recommendation to this effect was made by the Standing Parliamentary Committee of Ministry of Commerce & Industry during 1999-2000. The Spices Board should concentrate on post-harvest handling of spices, quality control, processing and export promotion. Hence there is need for redefine the allocation of work to this Board. There is also need to review the other Boards i.e Tea Board, Coffee Board and Rubber Board also for their functioning.

5.7 Setting up of Horticulture Planting Material Development Authority

Most of the planting material of horticulture crops is vegetatively propagated, produced in the nurseries and sold to the farmers. The planting material - seedlings/grafts of fruits and plantation crops show their full characteristics after a long gestation period. It is, therefore, essential to ensure that the planting material produced and supplied by nurseries for planting are of good quality, true-to-type and of named varieties. At present, there is no legislation to regulate production and sale of planting material by nurseries. Some of the states have enacted Nursery Registration Act. In these states, while nurseries are being registered under the act, the quality aspect of the vegetatively propagated planting material is not ensured. Similarly, no mechanism is available for ensuring quality of micro-propagated plants. There is true need to develop a mechanism to ensure quality of planting material supplied to farmers. In order to facilitate supply of healthy, elite planting material to farmers and regulate sale, import & export of planting material, a national level Horticulture Planting Material Development Authority (HPMDA) need to be set up.

5.8 Strengthening/ Creating State Departments of Horticulture

The State Directorates of Horticulture are the suitable agency for implementing the Horticulture development and to guide and provide technical support to the farmers for cultivation of various crops in potential areas in a state. A review of the situation reveals that the Directorates of Horticulture in states are without adequate infrastructure and technical support. In States like Kerala, which is growing predominant horticultural crops, there is need for re-designating the Agriculture Directorate as Directorate of Horticulture. In Tamil Nadu, coconut and oil palm

programmes are being handled by the Directorate of oilseeds while the scheme for drip irrigation is being handled by Agricultural Engineering Department. In Maharashtra, an important State from the point of view of horticulture, the Directorate of Horticulture has been brought under the Commissionerate system, as a result of which there is dilution in focus on horticulture. In most of the Eastern and North-Eastern States, the major constraint in implementation of the horticulture development programmes has been ill-equipped Departments of Horticulture. Keeping these aspects in view, it seems important to create separate Directorate of Horticulture in every State. The staff inherited from Directorate of Agriculture needs to be trained in horticulture to enable them to handle the work relating to horticultural extension and development in the right earnest. The set up of horticulture directorates will largely depend on the size of the State and the potential for development of different corps being implemented. The present structure of the Directorate of Horticulture, Govt. of Karnataka could be a guiding model for replication.

CHAPTER IX

PLANTING MATERIAL

The increasing demand for horticultural products for meeting the internal and external demands has resulted in the increased demand of planting material and seeds for various development programmes. Most of the planting material of the perennial horticulture crops is vegetatively propagated, produced in the nurseries and sold to the farmers. The planting material - seedlings/grafts of fruits and plantation crops show characteristics after a long gestation period. It is, therefore, essential to ensure that the planting material produced and supplied by nurseries is true- to- type, disease free and recommended of varieties.

1. PRODUCTION MECHANISM AND REQUIREMENT

1.1 Fruits

The process involves the production of nucleus planting material by the ICAR/ SAUs and its multiplication in the nurseries. While the nurseries are useful for meeting the usual demand, the large scale propagation involves micro-propagation techniques like tissue culture. One of the main objectives of the programmes for the development of horticulture during the VIII and IX Plan has been to ensure the production of quality planting material. For this purpose, assistance was extended for establishing nurseries under the Public and Private Sector. Under the programme for the development of fruits, 240 nurseries (35 large and 205 small) were established in different parts of the country. Besides assistance was extended for establishing 11 Tissue Culture Units i.e. 5 in Private and 6 in Public sector.

At present there are approximately 4,409 fruit nurseries, of which 1,575 Government owned and 2,834 private owned. Fruit nurseries have also been established under State Seed Farms. It is perhaps due to lack of infrastructure

facilities and trained manpower that these have not been able to translate the real objective in true sense for which these were established.

The requirement of planting material by the end of the X Plan has been estimated to be of the order of 1185 million fruit plants. A part of this demand could be met during the Plan period through nurseries as well as tissue culture (TC) units. It is however necessary to ensure that public sector nurseries have mother blocks for supply of true to type planting material of good pedigree to small nurseries as well as growers. The mother stock planting material should be made available from the Research Institutes, State Agriculture Universities and other sources, where productivity and quality have been tested and certified by the Horticulture Department of the State Government. The functioning of the existing units will have to be reviewed and good ones accredited for ensuring the supply of good quality planting material. This would be achieved by giving emphasis on nursery development in the private sector.

1.2 Vegetables

Among vegetable crops, the annual requirement of onion seed alone is about 5000 tonnes while in garlic the requirement of mother cloves is around 50,000 tonnes. About 55,000 kg breeders' seed of various vegetables crops was produced during 2000-2001 by the ICAR-SAUs network against the target of 48,600 kg. While most institutions, which have, bred varieties are responsible for raising Breeder's seed of these varieties. Infrastructure for raising F₁ hybrids does not exist with most & suitable mechanism needs to be evolved in producing F₁ hybrid seeds either through contract farming or through private sector seed companies. The production of vegetable seedlings of recommended varieties/hybrids could also be raised under protected conditions (or low tunnels) on a community basis, for a group of growers in a cluster of villages and healthy seedlings could be supplied in trays, jiffy pots, plugs to the vegetable growers in the right season.

1.3 Potato

The major problem in potato production is the non-availability of disease free seed/planting material of the recommended varieties. However, low seed multiplication rate (5 to 10 times) from breeders seed to certified seed is a major constraint. Another problem is the long period of 10 to 12 years for evaluating promising varieties /hybrids before they are released for commercial cultivation. The entire breeder seed requirement of the country cannot be met by the single Institute CPRI of ICAR and its regional stations. A total of 14,745.53 q breeders' seed of 10 commercial varieties was supplied from plains and hills to State Departments, NSC and other seed production agencies during 2000-01 by this Institute.

Further monitoring of multiplication of seed potatoes, by seed departments of Agriculture/Horticulture and probably there may be some leakage in multiplication chain. There is also a situation where some State Departments do not lift the indented quantities of seed material from CPRI. Modern seed production techniques like *In vivo* multiplication of VTS stocks under controlled condition and micropropagation at initial stages of breeder seed production have to be integrated. Innovative technologies like the use of minitubers in high density planting, synthetic seed technology and low cost virus detection techniques require to be promoted and integrated in potato seed production programme.

1.4 Tuber crops

Tuber crops are vegetatively propagated group of crops and hence multiplication rate of newly evolved high yielding good quality varieties will be very slow unless a massive seed production and distribution programme is organized at the national level. During IX Plan, seed production and supply of quality planting materials have been initiated by the following agencies:

- Central Tuber Crops Research Institute (CTCRI),
- All India Coordinated Research Project on Tuber Crops (AICRPTC), and

- National Agricultural Technology Project (NATP)

The major constraints in the production of planting material are:

- Vegetative propagation and slow multiplication rate;
- Bulk of seed material;
- Difficulty in transportation to far off places;
- High perishability.

The Remedial measures to overcome these would include:

- Adoption of rapid propagation techniques likes 2-3 node cuttings in cassava, mini sett in yams and aroids etc.
- Networking of seed production centers in association with various state Agric /Horti Departmental farms, KVKs and voluntary agencies for easy access of planting material to farmers through out the country.

1.5 Mushroom

A number of centres in Mushroom Research have been established by the ICAR in various states. Each of these centres are running a small unit for supply of spawn in their area. However, there is need to established more spawn supply units in the X Plan keeping in view properly of mushroom production council in the country.

1.6 Ornamental Plants

For the production of quality flowers, improved seeds plating materials are essential components. One of the problems faced by Indian floriculture industry is lack of quality seeds/planting materials. There are several problems to be addressed in the seed production aspect of Floriculture, in view of the expected stiff competition in the international and domestic market due to the WTO regime. The major constraints faced by the industry are the following:

- Land ceiling regulation.
- Lack of competent patent laws.
- No mention for Floriculture items in Exim policy.
- Lack of timely and adequate credit supply.
- High transportation cost.

- Lack of organized market and market intelligence.
- Lack of availability of trained persons.
- Lack of proper quality control measures.
- Multiplication of seeds without the consent of breeders.

In order to strengthen the seed industry the following steps may be taken:

- Suitable modifications in the existing land utilization Acts.
- In exim policy, floriculture export and import should be included and sufficient attention should be paid to encourage the sector.
- Subsidies for transportation should be provided
- Concept of regulated/co-operative marketing should be adopted.
- Need based research.
- Training for farmers, students and scientific staff, the various seed production techniques.
- Backward linkage: farmers should be provided with right quality seeds and training should be given for pre and post harvest management.
- Market promotion: Creation of brand consciousness and promotion of products by advertisement.
- Establishing seed co-operative societies.

1.7 Medicinal & Aromatic Plant

Medicinal and aromatic plants in general have a very short history of cultivation and directed artificial selection. Leaving aside a few, most of requirements of these plants are met from wild sources. High quality product and regular and sustainable supply of high quality medicinal and aromatic plants etc. Cultivation cannot be ensured by wild collection. It is, therefore, essential to domesticate and bring more and more medicinal and aromatic plants, which are currently collected from wild sources under cultivation for which suitable package of practices have to be developed. The strategies for the same may include:

- Selection of important wild medicinal plants for commercial cultivation.
- Development of agro-techniques for selected medicinal and aromatic plants.

This involves:

- Selection of superior plants from wild for domestication.
- Study on heritability of important traits.
- Genetic enhancement of selected species by different methods of breeding including the modern biotechnology tools/methods such as mutation, somoclonal variant selection and other molecular breeding techniques.
- Standardization, cultivation practices, harvesting time to get the desired quality of medicinal and aromatic plants.
- Post harvest management/pre processing packages, storage and development of value added products.

For propagation of planting material preference may be given to Medicinal and Aromatic plants identified in cultivation (As per Table 9.1):

Table 9.1 List of Medicinal Plants Identified for Cultivation and Development

<u>Sl.No.</u>	<u>Common Name</u>	<u>Botanical Name</u>
A. Annuals		
1.	Isabgol	<i>Plantago ovata</i>
2.	Long Pepper	<i>Piper longum</i> Linn.
3.	Senna	<i>Cassia angustifolia</i>
4.	Ashwagandha	<i>Withenia somnifera</i>
5.	Kalmegh	<i>Andrographis paniculata</i>
6.	Safed Musli	<i>Chlorophytum arundaenaceum</i>
7.	Liquoice	<i>Glycyrrhiza globra</i> Linn.
8.	Bhumi amla	<i>Phyllanthus niruri</i>
B. Perennials		
1.	Amla	<i>Emblica officinalis</i> Gaertn
2.	Ashoka	<i>Sarca asoka</i>
3.	Bael	<i>Aegle marmelos</i> L Corr
4.	Guggal	<i>Commiphora wightii</i>
5.	Sandal Wood	<i>Santalum album</i> Linn.

6. Kokum *Gracinia indica Linn.*

C. Climbers

1. Giloe *Tinospora cordifolia*

2. Glory lilly *Gloriosa superba Linn.*

3. Madhunasini *Gymnema sylvestre*

4. Satavari *Asparagus racemosus Willd*

D. Plants for High Altitudes

1. Atis *Aconitum heterophyllum Wall*

2. Chirata *Swertia chirayita*

3. Indian Barberry *Berberis aristata DC*

4. Jatamansi *Nardostachys grandiflora*

5. Kutki *Picrorrhiza kurrooa*

6. Kuth *Saussurea cost*

1.8 Spices

Lack of adequate quality planting material was one of the major constraints in spice production. Production of nucleus planting material for spices was, therefore, taken up during the IX Plan period through the State Agriculture Universities and ICAR Institutes. Large-scale multiplication of the nucleus planting material was also taken up in the departmental farms of the State Horticulture Departments, SFCI, NHRDF etc. Achievements in this regard are expected to be cent per cent of the target (Table 9.2)

Table 9.2 Target and Achievement of Production of Planting Material

Details of measures	Target	Achievement (anticipated)
(a) Nucleus planting materials		
1. Black pepper (lakhs)	50	50
2. Ginger seed rhizomes (ton)	1800	1800
3. Turmeric seed rhizomes (ton)	2250	2250
4. Chillies (q)	70	70
5. Seed spices (ton)	1250	1250
(b) Large scale production of planting materials		
1. Black pepper (lakhs)	690	465
2. Lateral rooted cuttings (lakhs)	1	0.3925
3. Tree Spices		
i) Clove / Allspice seedlings ('000)	790	567.25
ii) Cinnamon / Curry leaf seedlings ('000)	1500	825
iii) Nutmeg /Tamarind grafts ('000)	150	85.1775
4. Garlic (ton)	3000	1935.75
5. Saffron (area in ha)	6	3
6. Vanilla (lakhs)	1	0.25
c)Infrastructure Development (nursery units)	250	62.5

The details of spice varieties identified and recommended for release during the IX Plan is given in Table-9.3

Table 9.3. Spices Varieties Identified and Recommended for Release During IX Plan

Name of Spices	Variety Recommended for Release
Black pepper	Panniyur-6, Panniyur-7, PLD-2
Cardamom	Mudigere-2, ICRI-4, RR-1
Coriander	Rcr-2, Rcr-435, Rcr-436, Rcr-684
Cumin	Guj. Cumin-3
Fennel Fenugreek	Gu. Fennel-2, RF-101, Guj. Methi-1, RMT-303, Co-2
Mango ginger	Amba
Ginger	IISR, Varada, Himgiri
Turmeric	Prabha

During the X Plan, the programme for promoting the production of quality planting materials in large scale, adopting the latest technology including tissue culture techniques through Department, Research Institutes, voluntary and private organisation and individuals would be taken up. The estimated requirement of planting material during the X Plan is given in Table 9.4

Table 9.4 Estimated total requirement of planting material for spices during X Plan

Spice Name and Unit Requirement	Total Requirement for X Plan
Pepper rooted cuttings (@1100/ha) (No.)	63888000
Ginger (@ 1400 kg/ha) (Kg.)	26479000
Chillies (@ 2 kg/ha) (Kg.)	434868
Turmeric (@ 2000 kg/ha) (Kg.)	75938000
Coriander (@20 kg/ha) (Kg.)	26637000
Garlic (@ 500 kg/ha) (Kg.)	13939500
Cumin (@15 kg/ha) (Kg.)	965145
Fennel (@ 10 kg/ha) (Kg.)	44640
Fenugreek (@ 25kg/ha) (Kg.)	503675
Celery (@ 5 kg/ha) (Kg.)	5605
Clove seedlings (@ 200/ha) (No.)	154400
Nutmeg seedlings (@ 150/ha) (No.)	236550
Cinnamon seedlings (@ 275/ha) (No.)	48950
Cardamom (small) seedlings @ 5000/ha (No.)	-

1.9 Coconut

Coconut nurseries have been established by the Coconut Development Board as well as the State Governments for the supply of coconut seedlings. The Board has established Demonstration cum Seed Production (DSP) Farms for coconut and also coconut nurseries attached to the DSP Farms. In addition, assistance has been provided for the establishment of Regional Coconut Nurseries in different States. The Board has also identified private farmers/entrepreneurs for raising seed gardens.

1.10 Arecanut

As the production of arecanut has reached the level of self-sufficiency there was no scheme during the IX Plan.

1.11 Oil Palm

In oil palm, there are two old seed gardens one each at Thodupuzha and Palode (Kerala) which can produce 0.3 million hybrid seeds each per year. Subsequently, one private seed garden at Lakshmi Puram was established during 1990 under the technical guidance of National Research Centre(NRC), A.P.The NRC itself has the capability to produce about 0.5 million seeds per annum. In addition, under the Technology Mission on Oilseeds and Pulses (TMO&P) funded project, three seed gardens of 20 ha each have been established at Thodupuzha (Kerala), Rajamundry (AP) and Taraka (Karnataka). . These seed gardens will produce hybrid seed within another three years. Recently one more seed garden with imported dura seeds has been raised at NRC, Oilpalm, Pedavegi. All these seed gardens will be able to produce planting material of about 1.5 million seeds per year within another five years. This can help to reduce or overcome the shortage of sprouts and also save lot of foreign exchange now used for importing seed material from outside.

1.12 Palmyrah

Seeds are to be collected from the fruits which had reached 80-90% of ripeness. The fruit bunches which are selected for seeds are to be heaped for about 5-6 days which facilitate for the automatic stripping of fruits from bunches. Then allowed to ferment. This will facilitate for easy removal of mesocarp. While removing the mesocarp the fibres adhering to seed nuts need to be retained. This will help to absorb water and retain which helps for better germination. Seed selected from single nuts will give female trees and double nuts will give one each of female and male. The tri-nuts will give two male and one female. While collecting seeds, it is better to collect 10-15% of double nuts so that the female and male ratios can be maintained. Plumpy seed nuts without termite attach and healthy should alone be selected.

The palmyrah seed starts growing from 22 days after planting. The plumule coming out initially utilizes the food material stored in the seed nut. This germinated part will go down into the earth as a tuber. When the tuber matures

the rooting will start and these roots will be in a position to absorb the nutrients available in the soil. Then growing part which is at the centre of the tuber will start growing upwards and come out of the soil. The part, which is of light green colour and is in a boat shape comes out of the soil. After that one after another the leaf will start coming out. At the initial stage of this growth, care has to be taken to prevent the animal trespass. The animal may eat these young leaves which lead to the delayed growth of the palm.

1.12.1 *Mount bed nursery*

Nursery bed of convenient length, 1 metre width and 30cm height filled with sand can be used as nursery bed. After sowing the seed, cover with another 5 cm moist and germination percentage will be higher in this method than the conventional method.

1.12.2 *Masonry nursery*

A small tank of 3 m width, 60 cm height and convenient length built by brick and clay and filled with sand can also be used for raising nursery. These tanks are filled with sand upto 50 cm. The seed nuts are sown at 10cm interval and filled with 5 cm of sand above the seed. These tanks can be covered with polythene sheets of 250 guage or covered with mulches to retain moisture.

1.12.3 *Secondary nursery*

The seedlings raised in the above nurseries are pulled out and planted in poly bags. These poly bags are arranged in the planting pits of 1m width, 2m length and 0.5 depth and covered with poly bag of 250 guage. This low cost humid chamber helps for better growth.

1.13 *Cashew*

During VIII five year Plan, massive New Planting and Replanting programmes with clones of high yielding varieties were aimed at to increase the area under cashew. A major constraint confronting this, cause, was the non availability of quality planting material. To overcome this problem a novel idea of establishing cashew regional nurseries for the generation of quality planting

materials in major cashew growing states under public and private sector was thought of and financial assistance extended in the form of interest free repayable revolving fund. The financial aid provided was Rs. 12.0 lakh per nursery payable in two instalments of Rs.8.00 lakhs and 4.00 lakhs as 1st and 2nd instalments respectively for the establishment of one unit under departments of the states and Research Institutes. For public sector undertakings, such as Cashew Development /Plantation corporations of the state this assistance was Rs.8.00 lakhs as one time payment. Rs.3.00 lakhs per unit as one time payment with the stipulation of producing a Bank Guarantee and entering into a memorandum of understanding with Government of India was also made available to the private entrepreneurs. Each such unit should have a minimum of 2 ha. Scion Banks stocked with clones of recommended varieties to serve as mother plants for large scale multiplication. As this programme has made a good result in the production of quality planting materials in VIII Plan and as the programmes of the VIII Plan has been continued till 1999-2000 of the IX Plan. In 2000-01 the pattern of assistance is changed to grant in aid of Rs.3.00 lakhs per nursery for private entrepreneurs only. Accordingly in the IX Plan (1997-98 to 2000-01) 27 such nurseries have been established in various part of the country including North Eastern states at a cost of Rs.114.0 lakhs. Therefore, complete elimination of use of seeds and seedlings for plantation development and these of clones of the recommended varieties alone became possible in the IX Plan. Now a total capacity of production of 75 lakh clones is possible from the nurseries established so far from VIII Plan onwards. A total of 75 Nos. nurseries are available and this set up is almost self sufficient. There is no dearth in planting material production as 60 lakhs cones have been produced annually which can cater for development of 30,000 ha.

The State-wise target and achievements during the IX Plan is given in Table 9.5.

Table 9.5 Target and achievement for regional nurseries for cashew during IX Plan.

Phy – No. of Units
Fin – Rs. in Lakhs

(Year to Year Sanction) States.	9 th plan Target Achievement.		1997-98 to 2000-01.			
	Phy.	Fin.	Phy.	Fin.	Phy.	Fin.
1. Kerala	2	6.00	3	9.00		Nil
2. Karnataka	1	3.00	----Nil ---			
3. Goa	2	6.00	3	9.00		Nil
4. Maharashtra	2	6.00	8	24.00	14	42.00
5. Tamil Nadu	3	9.00	4	12.00	2	6.00
6. Andhra Pradesh	4	12.00	6	23.00	1	3.00
7. Orissa	3	9.00	3	9.00	6	23.00
8. West Bengal	1	3.00	1	3.00	---	---
9. Madhya Pradesh	3	14.00	4	17.00		Nil
10. Meghalaya	1	12.00	1	12.00	1	8.00
11. Tripura	1	12.00	2	15.00	1	8.00
12. Assam	1	12.00	1	12.00	1	12.00
13. Pondicherry	1	12.00	2	16.00		Nil
14. Manipur	1	12.00	---	Nil	---	---
15. Nagaland	1	12.00	1	12.00	1	12.00
Total	26	137.00	40	176.00	27	114.00

1.14 Cocoa

During IX Plan a total number of 13 Regional Nurseries of Cocoa were proposed for establishment in private sector with an outlay of Rs.45.50 lakhs. All this Nurseries are proposed to establish in the 1st year of IX Plan so as to get the nucleus planting materials for area expansion and replanting / rejuvenation programmes during the IX Plan itself. Thus the entire allocation has been sanctioned in 2000-01. In order to provide elite planting materials 3 scion gardens were established in the VIII Plan at Kerala Agricultural University, Trichur, Central Plantation Crops Research Institute, Vittal and Central State Farm, Aralam, which has been continued in the IX Plan for its maintenance and production of planting materials at a cost of Rs. 50.00 lakhs.

The target proposed for IX Plan and the details of nurseries established till 2000-01 are given in Table 9.6

Table 9.6 Target and achievements for nursery development for cocoa during IX Plan

Physical -No. of units

Financial - Rs. in lakhs

State	IX Plan Target		1997-98 to 2000-01			
	Physical	Financial	Year to year Sanction		Achievement	
			Phy.	Fin.	Phy.	Fin.
Kerala	5	17.500	3	10.500	3	10.500
Karnataka	2	7.000	3	10.500	4	14.000
Goa	1	3.500	-	-	1	3.500
Maharashtra	1	3.500	2	7.000	2	7.000
Tamil Nadu	1	3.500	3	10.500	3	10.500
Andhra Pradesh	2	7.000	2	7.000	2	7.000
Pondicherry	1	3.500	-	-	-	-
Total	13	45.500	13	45.500	15	52.500

The details of progress for establishment of scion gardens is given in Table 9.7

Table 9.7 Establishment of scion gardens for cocoa during IX Plan

Scion Bank – Nos. financial – Rs.in lakhs

Programme	IX plan target		1997-98 to 2000-01 (Year to year)			
	Phy.	Fin.	sanction		Achievement	
	Phy.	Fin.	Phy.	Fin.	Phy.	Fin.
Kerala						
1. KAU						
Estt.of Scion Bank	6.520	1	6.520	1	6.520	1
Prodn.of planting materials (Lakh Nos)	1.5		1.5		1.5	
2. CSF						
Estt.of Scion bank	1	4.600	1	4.600	1	4.600
Production of planting Materials (Lakh Nos)	1.0		1.0		1.12	
Karnataka						
CPCRI						
Estt.of Scion Bank	1	3.880	1	3.880	1	3.330
Production of planting Materials (Lakh Nos)	1.0		1.0		0.34	

Total Estt.of Scion Banks						
Production of Planting	3	15.000	3	15.000	3	15.000
Materials	3.5		3.5		2.96	

The details of production of vegetatively propagated planting material for cocoa during the IX Plan is given in Table 9.8

Table 9.8 Procurement and distribution of vegetative propagated plants

Physical – Lakh Nos.

Financial- Rs. in lakhs

State	IX Plan target Year to year		<u>1997-98 to 2000-01</u>			
	Phy.	Fin.	Sanction		Achievement	
			Phy.	Fin.	Phy.	Fin.
Kerala	1.940	20.350	1.940	20.350	2.038	22.420
Karnataka	3.800	25.950	3.800	25.950	7.749	47.379
Goa	0.340	3.740	0.340	3.740	NI	NI
Maharashtra	0.300	2.310	0.300	2.310	0.210	2.200
Tamil Nadu	0.800	3.850	0.800	3.850	0.332	3.652
Andhra Pradesh	0.500	4.510	0.500	4.510	0.563	6.200
Pondicherry	0.340	3.740	0.340	3.740	NI	NI
Total	8.020	64.450	8.020	64.450	10.892	81.851

NI – Not Implemented

1.15 Tea

As far as propagation of tea is concerned, several advances have been made from the mere usage of seeds. This includes release of high yielding clones, bi-clonal seed stocks and grafted plants. These planting materials have shown extremely satisfactory results. In order to ensure that right kind of planting material is used by the small farmers, the Board is extending financial assistance to various nodal agencies in all the tea growing states to establish tea nurseries in important areas of small growers concentration.

1.16 Coffee

The Coffee Board has been supplying good quantity coffee seeds of improved plant material. On an average, the Coffee Board distributes about 15 tonnes of seed coffee per annum to the growers. The Board is maintaining its own seed plots in Research and Demonstration farms as well as in private holdings which are being regularly monitored by its Botany Division. The applications from the growers are received through various extension officers

and seeds are distributed against indents through these officers. The Board is also engaged in distributing seedlings and clones in a limited manner through its Research Stations and Demonstration farms.

However, there is a need to augment the facilities to supply vegetatively propagated robusta clones to meet the demand from the growers and the Board proposes to establish more green houses for this purpose. The Board is also planning on setting up private nurseries for supplying seeds under a certification system.

1.17 Rubber

As there is a well organized network of private nurseries in the traditional area, availability of quality planting material has not been a problem in the case of rubber. However, the Board has been maintaining a limited number of nurseries in order to ensure reliable supply of recommended types of planting material. Nurseries have also been established by the Rubber Board in all the District Development Centres. Apart from this, two regional nurseries are functioning, one each in Hillara in Assam and Mendipathar in Meghalaya.

2. REGULATORY MECHANISM

The Government of India set up the National Seed Corporation, a public sector undertaking in the year 1963 to organise the development of a sound seed industry in India. In the initial stages, the primary responsibility of the corporation was to serve as a foundation seed production, storage and supply organisation of the released hybrids of maize. Later, hybrids of other crops, viz., sorghum, bajra were added in the list and seed multiplication of high yielding strains of wheat and paddy was taken up besides seeds of selected vegetable varieties, fibre and fodder crops. As the seed industry grew and since the progressive seed growers and seed producers in the private sector were associated with the NSC in the seed multiplication programme, the task of certification was maintained by National Seeds Corporation. Keeping in view the increased requirement of seeds, need was felt to establish a large number of

seed producing and supplying organisations in the public as well as private sector.

In order to regulate the growing seed industry, Government of India enacted the Seeds Act in the year 1966. The Seed Rules framed under the Seeds Act were notified in 1968. With experiences gained in the application of various provision of the Seeds Act and Rules made thereunder and the suggestions received by the Government from concerned quarters, several amendments have been carried out in the Seeds Act and Rules from time to time. Government of India declared seeds as an essential commodity under the Essential Commodities Act, 10 of 1955 and Seed (Control) Order was issued in December, 1983.

The Essential Commodities Act, 1955(10 of 1955) was amended by an Order of the Government dated 24th February, 1983, thereby, declaring that the seeds used for sowing or planting (including seedlings and tubers, bulbs, rhizomes, roots, cuttings and all types of grafts and other vegetatively propagated material, of food crops or cattle fodder) to be essential commodities for the purposes of the Act, namely: (i.)seeds of food crops and seeds of fruits and vegetables; (ii.)seeds of cattle fodder; and (iii.)jute seeds.

The Seeds (Control) Order, 1983 prohibits to carry on business of selling, exporting or importing seeds at any place except under and in accordance with the terms and conditions of the license granted to any person under this order. Certification agency shall ensure that the seed conforms to the standards laid down in the manual known as "Indian Minimum Seed Certification Standards" published by Central Seed Committee and amended from time to time. DAC has, however, formulated a proposal for revising the Seed Act. The proposal aims at setting up a National Seeds Board to advise the Govt. on matters connected with seeds sector, to facilitate supply of quality seed to farmers and regulate sale, import & export of seeds.

At present, there is no legislation to regulate production and sale of vegetatively propagated planting material of most horticulture crops by

nurseries. A mechanism to ensure the quality of planting material needs to be developed through registration and quality control. This could be achieved by establishing an Apex Body for the purpose.

2.1 Need for Regulatory Authority

At present, there is no legislation to regulate production and sale of planting material by the Govt. and private nurseries. Some of the States have enacted Nursery Registration Act. In these States, nurseries are being registered under the Act but quality aspect of the vegetatively propagated planting material is not ensured. Therefore, it is needed to develop a mechanism to ensure quality of the planting material supplied to farmers, produced vegetatively both in open through vegetative means and micropropagation. In order to ensure supply healthy disease free and elite planting material to farmers and regulate sale, import & export it would be necessary to constitute a Regulatory Authority in the DAC.

CHAPTER X

HI-TECH INTERVENTIONS

The Indian Council of Agricultural Research (ICAR) and the State Agricultural Universities (SAUs) have been generating technologies, which are being transferred to the farmers through the developmental departments and the state Extension machinery. Some of the Hi-Tech technologies, though cost intensive, have become indispensable for horticulture development in recent years.

'Hi-tech Horticulture' may be defined as the deployment of any technology, which is modern, less environment dependent, capital intensive and has the capacity to improve the productivity and quality of horticultural crops. In the present day context, adoption of hi-tech horticulture is necessary to ensure nutritional security of a population of one billion, besides attaining self-sufficiency and generating surplus for exports.

1. GENETICALLY MODIFIED CROPS

The world population is now 6 billion, 1/6th of which is in India. For most of the crops the yields have attained a plateau and the abuse of chemicals for fertilizer and for pest control have only resulted in destroying the already frail agro-ecological systems. The challenge now is to grow more food, with higher nutritional quality than ever before, on a continually shrinking agricultural land area. There has been a paradigm shift in the perceptions of the farmers from production (total quantity) to productivity (quantity/unit area) to profitability (quantity/unit area/unit time/man). The solution to many of the above issues lies in developing and adopting newer techniques to boost productivity in an eco-friendly way. Genetic engineering is one of them.

The new technology of genetic engineering was ushered in with the discovery of restriction enzymes in 1979. The first transgenic plant was

generated in 1983 and the first commercial release of a transgenic plant was done in 1995. Today more than 5600 trials have been conducted in USA alone since 1987. The advancements made in India are by no means very exciting and remarkable nevertheless lots of work is going on around the country on many aspects. Genetically modified organisms (GMOs) are still in infancy stage in India, through first field experiments using transgenics began in 1995. Now, India would stand to gain considerably by developing new varieties through genetic engineering, particularly to increase productivity with improved shelf life of the produce.

2. MICROPROPAGATION

Micro-propagation is perhaps the most popular and widely commercialized global application of Plant Biotechnology in horticulture. A large number of plants are being cloned and exploited commercially worldwide. Novel germplasm in horticultural crops, created using various biotechnological tools, also needs to be multiplied rapidly for quick dissemination. This is possible only by integrating in vitro culture and molecular biology techniques. Therefore, micropropagation will be the cornerstone of all new biotechnologies that are developed. Micropropagation is well-known as a means of producing millions of identical plants ('clones') under aseptic conditions, in a relatively short period of time, independent of seasonal constraints. An added advantage is production of pathogen-free planting material. Propagation of plants through tissue culture, including sophisticated techniques of meristem culture and molecular indexing of diseases, are of immense use in making available healthy propagules. Besides its several uses, micropropagation is also applied advantageously to national and international germplasm conservation and exchange, obviating quarantine-related problems.

The global biotech business is estimated at around 150 billion US dollars. Around 50-60% of this constitutes Agribusiness. The annual demand of tissue cultured products constitutes nearly 10% of the total, amounting to 15

million US dollars. The estimated annual growth rate is about 15%. Among the developing countries, India is in an advantageous position to exploit this market.

The Govt. of India identified micro-propagation of plants as an industrial activity under the I (D&R) Act of 1951, made effective in 1991 and several subsidies and incentives were offered. Large scale promotion of this technology was taken up during the VIII plan under the Centrally Sponsored Scheme on Integrated Development of Horticulture. Under this scheme assistance is being provided @ Rs.2.1 million for establishing TC labs under the public sector and for the private Sector the assistance is 20% of the cost subject to a maximum ceiling of Rs.1.1 million per unit. The TC units established in the private sector has only done demonstrative work. Large scale multiplication has not been a reality. However, there has been some success in the private sector.

In order to strengthen the programme, contract micropropagation can be taken up by smaller entrepreneurs in the already existing commercial laboratories. Also, a nodal agency like the BCIL (Biotechnology Consortium of India Limited) can bring together all the PTC industries and help them work out crop-production schedules so that glut in a particular crop plant is avoided. To commercialize a highly technology-driven venture, several aspects need to be analyzed before embarking on large-scale production especially since the industry deals with a product that is a highly perishable, i.e. live plant. There is a need to promote this technology for production of planting material. Considering the high capital investment and long gestation period, moratorium period on the industry has to be increased. Further, capital subsidy upto a maximum of 20% of the cost or Rs.2.5 million, whichever is less, may be extended both for modernization and establishment of new units. Many State Govt. of the Union of India, prominent among them the State of Karnataka, have given the status of Thrust Sector Industry to Plant Tissue Culture ventures.

The constitution of the Department of Biotechnology (DBT) and the subsequent 'Hi-Tech Industry' status given to Plant Tissue Culture encouraged several corporate houses to venture into this greenfield area. However, most of

these ventures were export-oriented, having a buy-back arrangement with the foreign companies that the Indian counterparts were tied-up with. A large volume of the export trade is confined to ornamental foliage plants. The first commercial micropropagation laboratory was set up in 1987. As per a recent study, there are about 130 small, medium and large tissue culture units in India. Their combined installed capacity is around 300 million plantlets per annum. However, not all units are functioning at their full production potential, with a combined capacity utilization of 25-30% only. As a result many of the units have become non-viable. Some of the problems encountered by the Indian micropropagation industry are long gestation period; non-availability of skilled operators; high overhead costs; systems development needed for each new cultivar; problems of scaling up; genetic instability; greenhouse design and management expertise scarce; overproduction of a number of classical crops; difficulties in penetrating new markets; poor market intelligence and expertise; export bottlenecks and poor domestic base.

A major handicap in the Indian scenario is the unorganized nature of the Indian farming community, followed by region preferences in crops. However, elite planting material in horticultural, plantation and agroforestry crops like the banana, cardamom, vanilla, bamboo, etc., enjoys a good domestic market. Today, virus-free clones of cardamom and microtubers of potato, obtained through meristem culture, are a reality. A PCR-based technique for indexing micropropagated banana for the Banana Bunchy Top Virus (BBTV) has also been developed. Potato microtuber production has been scaled-up using the bioreactor technology. The BARC, Mumbai, and Center for Plant Molecular Biology (CPMB), Hyderabad have developed the synthetic seed (synseed) technology for Banana. This technology involves the use of shoot apex, nodal microcuttings or somatic embryos encapsulated in an alginate-based gel matrix, serving as 'synthetic seeds'. The advantage of these 'synseeds' is that they can be stored and used when needed, and, are more easily transportable. Unfortunately, tree crops like cashew, mango, walnut and date which would immensely benefit from micropropagation are still intractable.

3. MICRO-IRRIGATION

Out of the total cultivated area of 172 million ha. in the country, only 65 million hectare (37%) is irrigated. The quantum of utilisable water is estimated to be nearly 105 m.ha meters of which right now only 70m.ha is utilized for irrigation. Even if the entire water is harvested by 2025 A.D, by present methods of irrigation, 45 percent of the cultivated area will still remain rainfed.

India's crop production suffers not only from drought but also from unscientific use of the available irrigation water. Enormous quantity of water is wasted with the present methods of irrigation, which are in vogue. It is becoming increasingly clear that with the advent of high yielding varieties the next major advance in our agricultural production is expected to come through efficient soil and water management practices, like adoption of water saving methods like drip irrigation.

Micro-irrigation system is irrigation system with high frequency application of water in and around the root zone of plant system. The micro-irrigation system consists of a network of pipes along with a suitable emitting device. In drip irrigation system, water is applied at a low rate for a longer period at frequent intervals near the plant root zone and through a lower pressure delivery system (0.5-2.0-kg/ cm²) to a plant. It has been very successful for irrigating horticultural crops like mango, banana, grapes, pomegranate, guava, citrus, brinjal, cucumber, okra capsicum etc.

Some of the advantages of micro irrigation are saving of fertilizer upto 30%; increase in yield upto 100%; saving of water upto 70%; prevention of weed growth; saving of energy; improving in quality of produce.

As per the estimates, the total cropped area suitable for micro irrigation in the country is to the tune of 27 million ha. (Table-10.1)

Table-10.1: Theoretical potential for drip irrigation
(Area in Million Ha.)

Crop	Total	Area suitable
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	Cropped Area	for micro Irrigation
1. Cereals & Millets	100.4	00.00
2. Pulses	22.50	00.00
3. Sugarcane	4.10	4.10
4. Condiments & Spices	2.19	1.40
5. Fruits	3.40	3.40
6. Vegetables	5.30	5.30
7. Coconut	1.90	1.90
7. Oilseeds	26.20	1.90
8. Cotton	9.00	9.00
9. Others	1.40	00.00
Total	176.39	27.00

On the other hand, besides several advantages, there remain many problems requiring further research like realistic methods for predicting the temporal and spatial variation of soil moisture, the minimal and optimal fraction of the soil volume to be wetted, and management system in different horticultural crops under varying weather and soil conditions are not known. Some of the reasons for the uneven development in the drip irrigation are inadequate awareness about the advantages of micro irrigation; sufficient availability of surface and ground water in some of the states, particularly in northern and eastern India; lack of trained manpower; inadequate credit facilities for the farmer; the availability of the system and its spares are not uniform in the country. The distribution networks at rural areas have inadequate facilities in terms of material availability and technical know how.

Drip irrigation was promoted under the Centrally Sponsored Scheme on Use of Plastics in Agriculture since the VIII Five Year Plan. The programme was continued during the IX Plan under the Centrally Sponsored Scheme on Development of Horticulture through Plasticulture Interventions with an outlay of 3750 million. However, with effect from the year 2000-01, the programme has been amalgamated under the Centrally Sponsored Scheme on macro

management in agriculture. The assistance for micro irrigation was extended on the following lines:

The unit cost of Drip Irrigation system varies with respect to plant spacing. Moreover, the cost of the drip system varies from state to state depending upon the existing demand and marketing net work. Accordingly, the states have been categorized into three categories, viz. Category "A", "B", and "C". The major states where more than 4000 hectares have been brought under drip irrigation as on 1.4.1998 come under 'A' Category. This includes the states of Andhra Pradesh, Gujarat, Karnataka, Kerala, Maharashtra and Tamil Nadu. All the States except those covered under Category 'A' and those falling in the Himalayan belt come under Category 'B'. Similarly, all the States falling under the Himalayan belt including all the North Eastern States, Sikkim, Himachal Pradesh, Jammu & Kashmir and Hills of Uttar Pradesh, Darjeeling district of West Bengal come under Category 'C'. Keeping in view the level of awareness, proximity to the manufacturing units, distance involved in transportation, potential for drip irrigation, the cost of drip system in Category 'B' states is estimated to be 15% higher than Category 'A' states while for Category 'C' States it is estimated to be 25% higher than Category 'A' states.

The assistance for drip irrigation will be 50% of cost for Small, Marginal, SC, ST and Women Farmers and for other category of farmers the assistance is 35% of total cost of the prevailing competitive market rate of the system subject to the maximum as indicated in table below. The maximum ceiling is Rs.28,500/- per ha for Category 'C' States for a crop spacing of 1.5x1.5 metres. The assistance is provided for a maximum area of 4.0 ha per beneficiary family in whose name the land belongs. The pattern of assistance and maximum ceiling for different category of farmers is as given in Table-10.2

Table-10.2: Cost Ceiling for Drip Irrigation

State Category	Small, Marginal, SC, ST and Women Farmers (Rs./ha.) (50% of cost)	Other category farmers (Rs./ha.) (35% of cost)
A	22,500	16,000
B	26,000	18,200
C	28,500	20,000

In the last 20 years, the area under micro- irrigation increased from around 1500 ha in 1985 to around 0.3 million ha. Compared to the available potential and in view of the growing concern over the decreased availability of water, much more needs to be done to promote micro irrigation in the country. An independent study conducted by the Agricultural Finance Corporation Ltd. has indicated the need for bring one million ha under drip irrigation during a period of five years.

4. FERTIGATION

For intensive and economical crop production, the best solution for higher productivity is fertigation, where both water and fertilizers are delivered to growing crops through drip irrigation system. Fertigation provides essential elements directly to the active root zone, thus minimising losses of expensive nutrients, which ultimately helps in improving productivity and quality of farm produce.

Fertigation ensures higher and quality yield along with savings in time and labour which makes fertigation economically profitable. This has been already experienced by large number of farmers in grape, pomegranate, and banana. Fertigation is ideally suited for high-tech horticultural production systems since it involves not only the efficient use of the two most precious inputs i.e., water and nutrients but also exploits the synergism of their simultaneous availability to plants. Though drip irrigation has found widespread use in plantation and horticultural crop production in India, fertigation is confined

to mainly cut flower production under polyhouse and some field production of fruit crops. Significant yield response is possible if drip irrigation is practiced for fertigation.

One of the main reasons for non-adoption of fertigation wherever drip system has been installed is the non-availability of totally water soluble fertilizer materials at affordable cost. Due to the non-availability of good fertigation compatible soluble NPK fertilizers, imported fertilizers are being used which escalates the cost to Rs.50- to Rs.60 per kg cost of nutrients, whereas, the average per kg cost of nutrients in India is around Rs.4-Rs.6 per kg. Another important reason for lack of enthusiasm in fertigation is the investment in machinery's /tools for injecting the nutrients into the drip, and lack of information on the frequency of fertigation like whether it is daily affair or has to be cycled at particular time interval.

Polyhouse cultivated cut flower industry is totally dependent on fertigation for its water and nutrient supply but the problem is the huge cost per kg of nutrient which is around Rs.50 to 60 per kg. This affects the competitiveness of the industry. Intensive research efforts are needed to at least partially substitute imported liquid fertilizers with locally available fertilizers. Moreover, all these materials are invariably supplied as NPK complexes and freedom to choose required ratios is very limited. The form of N also is important. Excessive use of $\text{NO}_3\text{-N}$ has resulted in iron deficiency in rose. The grape, pomegranate and banana growers in Maharashtra have also adopted fertigation to some extent and the cost of fertilizer is the major inhibiting factor for further extension of fertigation. Therefore, to encourage fertigation, conducive policy environment has to be created in terms of production of soluble fertilizer in such a manner that the savings made in the fertilizers is not neutralized by cost.

5. PROTECTED CULTIVATION / GREEN HOUSE TECHNOLOGY

For optimum growth of plants, natural resources of land, water and sunlight are essential. Although nature has bestowed these resources to us, climatic variations often tend to have adverse effect on the yield and production

of crops. Efforts have, therefore, been on for harnessing these natural resources through artificial means for increasing crop productivity. One such technology is protected cultivation/green house cultivation.

Green houses are framed or inflated structures covered with plastic material or glass in which crops could be grown under partially controlled environment which is large enough to permit normal cultural operation manually.

Considering the advantages of green house, there is ample scope for encouraging area under protected cultivation of high value flowers and vegetables out of season, both in the temperate and tropical climate. However, profitability in green house cultivation will depend upon the choice of green house structure, selection of crops and varieties and production technologies adopted.

Constraints, particularly during the initial phase of development are common for any industry and horticulture industry has been no exception. The constraints in adoption of green houses are high investments and non-availability of cost-effective technology for many crops. The package of practices for green house cultivation is yet to be standardized. There is need to take up studies for perfecting the agro-techniques for cultivating inside green house.

Under the Plasticulture Scheme, an outlay of Rs.2.20 million was earmarked for green house cultivation during the VIII Plan. Besides, the National Horticulture Board provided assistance in the form of soft loan with a maximum ceiling of Rs.100.00 lakhs per organisation subject to 40% of term loan @ 4% service charges. Cooperative societies, registered associations of growers/ NGOs, Agri./Hort. Corporations and Private Limited Companies could avail the assistance for setting up of integrated projects. In all 37 floriculture projects with an area of 120 ha (mostly Export Oriented Units), were financed by the NHB. About 400 ha have been covered under the DAC scheme, about 80% of which are in the Leh & Ladakh region of Jammu & Kashmir. A large number of greenhouses have come up around Bangalore and Pune for export

of roses. States like Maharashtra, Madhya Pradesh, Karnataka, Kerala and the North Eastern States have also brought significant area under green houses.

The initial cost of the greenhouse generally depends upon cost of structure, cladding and temperature control mechanism. The operational cost of the greenhouse depends upon the mechanism used for maintenance of temperature or relative humidity in the greenhouse. In naturally ventilated greenhouse, the temperature is maintained 10° to 30° C above ambient conditions due to wind and thermal buoyancy and these do not need any electric power or generators for maintenance of temperature and RH. Under Indian conditions, naturally ventilated greenhouses are most suitable due to low initial cost and operating costs. The cultivation under greenhouses is economical under climates of southern peninsula. The naturally ventilated greenhouses are also economical for cultivation in northern hilly regions during summer. Hence during the IX Plan, assistance is being extended for construction of naturally ventilated green houses involving a financial assistance of 40% of the total cost of Rs.200/- per M² for a maximum area of 500 M² per beneficiary. In the case of green houses for floriculture purpose, with some provision for temperature control, the assistance is limited to Rs.1.50 lakhs for a maximum area of 500 M² per beneficiary.

A FAO assisted Project entitled "Greenhouse Floriculture Technology for Small-Scale farmers" was initiated in 1999 with the objective to demonstrate the simple cost-effective greenhouse technology to small-scale traditional flower growers, who are mostly women. The project was implemented in three locations in India i.e. Bangalore (Karnataka), Pune (Maharashtra) and Srinagar (Jammu & Kashmir). The project has enabled to refine the available technology in terms of crop diversification based on local climate, skill upgradation of project officials as well as farmers, design development suiting to Indian conditions and management of crops in greenhouses.

6. PLASTIC MULCHING

Plastic mulching is a practice of covering the soil surface around the plants to make conditions more conducive for plant growth through in-situ moisture conservation and weed control. Use of dry leaves, straw, hay, stones etc. as a mulching material has been prevalent for ages. However, the introduction of plastic film as mulch increases the efficiency by improved moisture conservation, increased soil temperature and elimination of weed growth and hence increases in crop yield. LDPE and LLDPE plastic films are commonly used for mulching. LLDPE black colour mulch films are more popular owing to the twin properties of possible down-gauging and better puncture resistance. Down gauging leads to the availability of thinner films at lower cost and puncture resistance with opacity to check the weed growth under the film.

Plastic films on account of its non-biodegradable nature tend to pollute the fields. Hence it will be necessary to educate the farmers for its safe disposal after use.

The durability of the plastic films are usually 12-20 months. Hence availability of plastic films at reasonable cost for replacement is a limiting factor.

Assistance for promoting plastic mulching was provided during the VIII Plan under the 'Plasticulture' scheme @ 50% of cost subject to a maximum ceiling of Rs.5000/- per ha. for a maximum of one ha per beneficiary. An area of about 3000 ha was covered under plastic mulch during this period. The assistance has been revised to 50% of the cost subject to a maximum ceiling of Rs.7000/- per ha during the IX Plan period. It is proposed to cover about 5700 ha during the IX Plan with an outlay of Rs.3.17 crores.

Greenhouses, plastic mulching, low tunnels form supportive system of peri-urban agriculture where the agricultural land is limited and the demand for horticultural produce is very high throughout the year. This technology could be employed usefully in the regions where the normal growing season is limited to four to six months. During the Tenth Plan a target of 0.5 million ha could be targeted for bringing under protected cultivation.

7. BIO-FERTILIZERS

Addition of inorganic fertilizers constitutes one of the most expensive inputs in agriculture. It is energy intensive, its excessive and indiscriminate use in commercial horticultural crops like banana, grape, mango, papaya, cabbage, cauliflower, tomato, and ornamental crops has rendered the soil sick, polluted the ground water and made it unsuitable for cultivation and consumption. Nitrate in groundwater is a major health concern in intensively cultivated areas. Production of chemical fertilizers is an energy intensive process requiring renewable energy resources and also importing fertilizers is draining our foreign exchange reserve to a greater extent. For a developing country like India, it is essential to strengthen and harness the soil source effectively. Besides, various field studies have indicated that gradually yield potential of many soils is declining and there is a stagnation in crop productivity. Under these circumstances, use of cost effective and eco-friendly bio-fertilizers with suitable integration of organic manure will restore the soil health and keep the soil productive and sustainable.

The decline in crop yield due to continuous use of inorganic fertilisers has been observed through out the world. Therefore increasing need is being felt to integrate nutrient supply with organic sources to restore the health of soil. Bio-fertilisers offer an economically attractive and ecologically sound means of reducing external inputs and improving the quality and quantity of internal resources. Bio-fertilizers are inputs containing microorganisms, which are capable of mobilizing nutritive elements from non-usable form to usable form through biological processes. They are less expensive, eco-friendly and sustainable. The beneficial microbes in the soil, which are of greater significance to horticultural situations, are the biological nitrogen fixers, phosphate solubilisers and the mycorrhiza fungi.

7.1 Biological nitrogen fixers

The nitrogen fixing organisms associated with horticultural crops are the Rhizobium species which live in symbiotic relationship with the leguminous plants and the free living fixers belonging to the *Azotobacter* family and the

Azospirillum Sps. which live in association with the root system of crop plants.

7.1.1 *Rhizobium*

Utilization of *Rhizobium* culture for leguminous vegetable crops is in practice among farmers. *Rhizobium* forms symbiotic association with roots of leguminous crops forming nitrogen fixing bodies called nodules on the root system. There are two types of rhizobia; (a) the slow growing belonging to genus *Bradyrhizobium* and (b) the fast growing rhizobia belonging to genus *Rhizobium*.

7.1.2 *Azospirillum*

Azospirilla are a group of bacteria found in loose association with the root system of many crop plants. It is a type of symbiosis where the bacterial cells are found colonizing the root cortical cells or the intercellular spaces in the cortex. These bacteria grow better under reduced oxygen levels. They fix nitrogen from 10 to 40 kg per hectare. They are found colonizing the root system of many vegetable plants. *Azospirillum* inoculation helps the plants in better vegetative growth and also in saving inputs of nitrogenous fertilizers by 25-30%.

7.1.3 *Azotobacter*

Azotobacter are another free living aerobic nitrogen fixing bacteria which can substitute part of inorganic fertilizers. *Azotobacter* inoculation saves addition of nitrogenous fertilizers by 10 to 20%.

7.2 Phosphate Solubilising Microorganisms

Phosphorus is a very important nutrient of plants required in large quantities. Inorganic forms of this nutrient are compounds of Ca, Fe, and Al. Large amount of phosphorus applied to various soils gets fixed which is unavailable to the plants. Several soil bacteria, particularly those belonging to the genera *Pseudomonas* and *Bacillus* and fungi belonging to the genera *Penicillium* and *Aspergillus* possess the ability to bring insoluble phosphates in soil into soluble forms by secreting organic acids such as acetic, formic, propionic, lactic, glycolic, fumaric and succinic acids. These acids lower the pH and bring about dissolution of bound form of phosphate. Some of the hydroxy

acids may chelate with Ca and Fe resulting in effective solubilisation and utilization of phosphates by crops.

7.3 The Mycorrhizal fungi

Mycorrhizal fungi are the most common fungal association among angiosperms. The vesicular arbuscular mycorrhizae (VAM) are formed by the non-septate phycomycetes fungi belonging to the genera *Glomus*, *Gigaspora*, *Acaulospora* and *Sclerocystis* in the family Endogonaceae of the order Mucorales. They produce vesicles and arbuscules inside the root system. Arbuscules are highly branched fungal hyphae while vesicles are the bulbous swellings of these hyphae. These VAM fungi are beneficial to the plant which they colonise. They make more nutrients available to the plant, improve soil texture, water holding capacity, improve disease resistance and help in better plant growth. Besides, mycorrhizae are also helpful in the biological control of root pathogen.

7.4 Vermiculture

Harnessing earthworms as versatile natural bioreactors is vermiculture. The process of composting organic wastes through domesticated earth worms under controlled conditions is vermicomposting. Earthworms have tremendous ability to compost all biodegradable materials. Wastes subjected to earthworm consumption decompose 2-5 times faster than in conventional composting. During composting the wastes are de-odourised, pathogenic micro-organisms are destroyed and 40- 60% volume reduction in organic wastes takes place. This technology depends on the feeding, excreting and breeding potentialities of the worms. Fast growing species of worms are voracious feeders and prolific breeders. They are also surface dwellers, organic matter feeders and surface casters. These worms feed on partially decomposed organic matter. their digestive tracts act as grinding mills converting the wastes into granular aggregates, which are egested as worm cast. It is estimated that the earthworms feed about 4-5 times their own weight of material daily. Thus one kg of worms decompose approximately 4-5 kgs of organic waste in 24 hours.

8. Mechanisation of Horticulture Operations

8.1 Nursery

The prices of vegetable seeds especially F1 hybrids are very high. These need proper environment for better germination. Greenhouses for different agro-climatic conditions need to be developed for raising the nursery. Healthy and disease free seedlings can be raised in shorter duration under greenhouse conditions.

Necessary root media can be pulverized, mixed, pasteurized and filled in the pot or tray. For this necessary equipment need development. The root media can be mixed in batches by modifying the concrete mixer. The pasteurization can be done by applying steam to the rooting media by maintaining the media at 60⁰C to 82⁰C for the required duration. Different diseases and weeds can also be controlled in this way. Portable steam generator can be used to generate the steam and the aerated steam can be passed through perforated pipes buried below the media or beds. The potting media can be filled in the seedling tray or pots for transplanting, using screw augurs. The seeds can be sown using precision planters, which need development for Indian conditions. The fertilizer can be applied to nursery beds or trays can be done through drip irrigation. The irrigation can be done through drippers or micro-sprinklers.

In place of selling seeds, the seed industry can raise healthy nursery and sell the seedlings to the farmers. The farmers can also grow the healthy nursery on their own.

For ensuring this, the nurseries will need to be equipped with modern facilities for micro irrigation, green houses, equipment for molecular analysis and virus detection, plant health clinics etc. Initial support for establishing such nurseries in the public as well as private sector would be needed.

8.2 Greenhouse

The rooting media for transplantation of floricultural plants can also be mixed, sterilized and filled in pots or trays as explained above. The rooting

media in the greenhouse needs pasteurization at least once in a year which can be done by steam or formalin.

8.3 Transplanting

The transplanting of nursery in the field is very labour intensive and seedling transplanters for different crops are required. Crops like onion, which need close spacing need bare root transplanter development. Widely spaced crops like cabbage, cauliflower, brinjal, etc. need tray type or block type seedling transplanter. The raising of seedlings in blocks and transplanting increases the accuracy and efficiency of transplanting along with healthy crop. Necessary systems for transporting the seedlings, filling in the transplanter and transplanting systems needs development.

8.4 Pesticides Spraying

Mostly the spraying of fruit, vegetable and floricultural crops are being done by manual sprayers. These operations are labour intensive and can be mechanized by using power-operated sprayers. The efficient orchard sprayers need development. Tall tree sprayers are also required for old plantations of mango and for other plantation crops like coconut.

8.5 Harvesting and transporting

Horticultural crops like fruits and vegetables give very high yield and need very careful harvesting and transporting. The high capacity harvesters for different fruit crops like mango, guava, sapota, orange, pineapple, etc. need to be developed. The harvesters for reduction of labour for vegetable crops like onion, cabbage, cauliflower, tomato etc. are required.

8.6 Grading

The better quality and grade of fruits or vegetables get a premium price in the market. For export of fruits there are different grades based on weight of individual fruits. The electronic fruit grader is required to be tested and adopted by the export houses. The size grader for different fruits like sapota, orange, mango, pineapple etc is required for local market.

8.7 Packaging

Around 30 % of the produce get spoiled during the marketing chain from farm to the retailer under Indian conditions. The proper packaging for fruits, flowers and vegetables for internal trade and export needs development.

9. ORGANIC FARMING

As per FAO/WHO Codex Alimentarius Commission, "Organic Farming/Agriculture" is a holistic production management system which promotes and enhances agro-ecosystem health, including bio-diversity, biological cycles and soil biological activity. The organic production system is designed to enhance biological activity within the whole production system, increase soil biological activity, maintain long-term soil fertility duly relying on renewable resources in the locally organized agricultural systems.

The farm is the unit for development under organic farming requiring thorough documentation of soil characters, water quality, climatic conditions, availability of organics and maintenance of records. Without adequate organic matter content, soil gets poorer due to reduced nutrient and water holding capacity. Deteriorated structures and the associated problems by air and water, cause soil erosion. Adopting organic farming could effectively arrest all these situations.

There has been increasing demand for organic products, particularly in the developed countries. This has increased the prospects of exports. Since the demand for a variety of products year-round makes it impossible for any country to satisfy all its organic food needs domestically, many developing countries have started to tap the lucrative export markets for organically grown products of which organic spices of India is one of products. The organic products fetch premium price, often at prices 20% higher than identical products produced non-organically.

Since the organic products are grown with commitment to respect biological and ecological processes, the foods which are sold must be legally certified that they are organically produce. It would be necessary to create accrediting agencies in India who could issue such certificates at nominal cost. Besides, adoption of organic farming techniques would require some incentives to the farmers in the initial stages.

10. SOILESS CULTURE

In order to circumvent the heterozygosity of soil search for alternative substitute resulted in usage of natural substrates like cocopeat, rock wool, gravel, sand, saw dust, groundnut and paddy husk, vermiculite, perlite etc. Media constituent like cocopeat is successfully used for better management in both vegetables and flowers.

It is already proven that crop grown on cocopeat and rock wool have better growth and development compared to soil grown plants. It has a special advantage due to high retention of water and coupled with good aeration

because of lesser bulk density and higher porosity. Besides this the flowers and vegetables are lighter in weight when grown on these media which is of great significance in exports. Hydroponic techniques using deep flow technique, nutrient film technique is used to limited extent for commercial cultivation of vegetables and flowers.

11. BIOLOGICAL CONTROL

Biological control is use of organisms to regulate a pest or pathogen below its economic threshold level. It assumes importance in sustainable agriculture and organic farming. However, it has several inherent disadvantages like the availability of natural enemies in sufficient numbers to utilise on a large scale. Secondly, almost all parasitoids and predators do not integrate with insecticides. Therefore, there is a tremendous need to develop natural enemies tolerant to multi-pesticidal groups. It is further, necessary to encourage commercial insectaries, which can supply quality natural enemies to farmers at a very short notice. This also calls for developing appropriate shipment technologies and stage of transportation.

The use of commercial nuclear polyhedrosis virus (NPV) is gaining importance all over the world. In India too, private industries are bringing out field compatible formulations. It has been found that using NPVs at early stage brings in excellent control of *Helicoverpa armigera* on tomato. NPV is further, compatible with *Trichogramma* egg parasitoids, endosulfan and pheromone traps. These, in turn would constitute an ideal IPM. One of the advantages of NPV is its specificity. However, NPV of *Autographa californica* Speyer is known to infect several lepidopterous pests. It is necessary, therefore, to test specificity using restriction endo-nuclease analysis of viral DNA.

Safe and sound technologies for IPM in several crop pest situations like tomato fruit borer and mealy bugs of several fruit crops are available. The private and public sectors presently involved in mass production activities will not be in a position to meet the demand for supplying the biotric agents. There is a need to encourage production units to meet the demand.

Biological suppression is a skilled job. The increasing demand for natural enemies combined with inadequate skill for producing, release and maintaining of bioagents has to be tackled. Limited financial resources are also coming in the way of mass production. Under these circumstances, it is worthwhile to consider providing one time grant to unemployed graduates to take up the mass production of natural enemies near the application sites. Each district should have at least 3 units. Persons can be well trained and can be given a suitable grant to establish biological control units near the cropped areas.

12. PRECISION FARMING

Precision Farming involves the application of technologies and principles to manage spatial and temporal variability associated with all aspects of agricultural production for the purpose of improving crop performance and environmental quality. This technology would involve application of inputs and use of resources for deriving maximum outputs. The technology will involve integration of different systems involving computers, Global Positioning System (GPS), GIS, Sensors and application control. The concepts are of recent origin; but have immense prospects for application improving production and productivity of horticultural crops. Some applications like fertigation are already in vogue.

13. USE OF REMOTE SENSING IN HORTICULTURE

There is vast potential for growing a large variety of horticultural crops for which identification of land and other resources would be necessary. One of the major constraints for developing effective plans in the horticulture sector is the lack of reliable and upto date data. While agricultural crops are being covered under crop estimation surveys, there is no such mechanism for the horticultural crops. Hence, there is an urgent need to create reliable data base through a system of acquisition through satellite imageries which can be updated periodically. Remote

sensing data having capability of providing regular, synoptic, multi-temporal and multi-spectral coverage of the country can generate such information for crops and other natural resources. India has its own remote sensing satellites (IRS), which provide world class multi-spectral and multi-resolution data.

Keeping in view the urgent need for developing data base in the horticulture sector, a core group on Horticulture Crop acreage and production estimation was constituted in the Ministry of Agriculture in September, 1996. The core group has identified the potential for estimation of area as well as forecast of production of major horticultural crops using remote sensing and Geographical Information System (GIS) based techniques. It has also recommended the need for creating a National Horticultural Information Centre (NHIC) in the Ministry of Agriculture.

CHAPTER XI

INFRASTRUCTURE

1. INTRODUCTION

Out of the total horticulture crops produced in the country, approximately 60% is consumed by the local population or marketed in the nearby market yards and only about 40% of the produce is channelised in the regulated markets for the consumption of the urban population in the large cities. Export markets account for approximately 10% of the total production. What to talk of rural marketing, the bare minimum infrastructural facilities are lacking even in the regulated markets. Handling of horticulture crops still becomes worse because of tropical climate available in most parts of India, under which physiological spoilage and microbial damages take place quite fast.

2. POST HARVEST LOSSES

The horticulture produce suffers heavy post-harvest losses in the absence of adequate post-harvest and marketing infrastructure viz; pre-cooling units, packing and grading sheds, short and long term cold storage facilities, refrigerated containers, storage and phytosanitary facilities at airports. Further, in spite of having varied agro-climatic conditions, abundance of natural resources like sunlight and water, sufficient labour availability, multiple produce, our country is trailing behind in productivity, export and processing of horticultural products as compared to other horticulturally advanced countries. There is considerable loss in the amount of fruits & vegetables produced in India due to improper post-harvest operations, these results in a wide gap between the gross production and net availability. Assuming an average loss of 25% (though the range varies between 8-37 per cent in various

crops during different stages after harvest) in all the horticultural crops together, the losses are phenomenal. To minimize these losses, it is essential to analyse the contributing factors which result into these losses. According to the “Economic Assessment Project” under the Indo-US Programme, which was initiated by ICAR in 1986, losses occur at the following stages:

- Harvesting and pre-harvesting: - due to spoilage, spoilage and trimming.
- Transport: - due to bruising, breakage and infection as a result of dust, heat, rain and humidity.
- Storage: - due to over ripening or under ripening.
- Processing and packing: - due to inefficiency and contamination.
- Marketing: - due to loss of weight and quality with multi-level handling.
- The problem is further complicated due to the fact that there are no storage facilities at the farm level and the farmers are forced to dispose off the entire produce immediately on harvesting. This creates a glut situation in the market. Thus, the margins of the wholesalers and retailers are much higher than in the advanced countries.

3. TRADE AND MARKETING SETUP

3.1 Set up

In India, presently due to the absence of appropriate infrastructure for handling of produce in the areas of production, transportation, storage, trade and marketing, the pre-harvest contractors play an important role in terms of connecting the produce with retail network and consumers. Some efforts have been made by State organizations in Andhra Pradesh, Punjab and Tamil Nadu in creating ‘*Raitu Bazaars*’, ‘*Uzhavar Santhai*’ and ‘*Apni Mandis*’ respectively. But the impact of these efforts has not been substantial so far.

The Agriculture Produce Market Committees (APMC) have created fruit, vegetables and tendernut markets in some of the cities. However, there are two major problems in this set up. Firstly, such markets are not available in all areas of production and consumption and secondly, they are insufficient even at the places where they exist both in terms of physical facilities and trade practices.

Presently the marketing structure is available in following forms :-

1. Marketing Boards/APMCs,
2. Wholesale markets,
3. Retail markets,
4. Apni Mandi,
- (i) HPMCs(Himachal Pradesh,Uttar Pradesh and Jammu & Kashmir)
- (ii) NDDDB (in Delhi),
- (iii) HOPCOMS (Karnataka),
- (iv) Raitu bazars(Andhra Pradesh),
5. Tenhops (Tamil Nadu),

However, the links in the chain from producer to the consumer are missing at many points in most areas. Therefore, a broken chain is the end product, which has been responsible for the interest of producers and consumers not being served appropriately. As per surveys conducted recently, the farmer is getting only one rupee out of every Rs.3.50 paid by the consumer. The share of various levels of middle men are as shown below: -

Table. 11.1 Share of different agencies during marketing of fruits & Vegetables

S.No.	Agency	Function	Share in Final Price
I	Retailer	Retailing	75
II	Wholesaler	Breaking Bulk	50
III	Commission Agent	Market/Making	25
IV	Trader	Packing/Transportation/	75

		Making	
V	Commission Agent	Market/Making	15
VI	Large farmer	Consolidation	10
VII	Small Farmer	Production	100
	Total		350

To improve upon this performance and to help the farmer and consumer get value for money, a concept of supply chain needs to be created.

3.2 Trading and Marketing bottle necks

The horticulture marketing practices lack systems approach. The trading and marketing structure is very traditional and consists of a long chain of intermediaries. The farm-gate price available to the farmers is only 25% of the retail price under Indian conditions whereas the same is 70% in case of Dutch and US farmers, where more efficient marketing system is in place.

3.3 Sale of the Produce by Small and Marginal Farmers

About 75% of the farmers sell their produce at the farm level to the village merchants, retailers, big producers or pre-harvest contractors. They can not afford to transport their produce to the distant “Mandies” on account of non-availability of transport facilities, high transportation cost, malpractices in the market such as heavy deductions, free samples of the produce etc.

3.4 Market Distortions

Trade and market distortions are many and some of these are high and unjust trading and market charges levied on producer-sellers, delayed payment, pooling by traders and lack of open bid system. Malpractices are rampant and the national market operates in a highly segmented manner.

3.5 Bargaining Power

Small growers are un-organized and lack group action and bargaining power, as a result these farmers are exploited by the traders.

3.6 Banking Facilities

Branches of banks have been located in the market area but their mode of operation is similar to other Banks and they are not giving any preference to farmers/traders. In addition, there is no organized concessional credit available to these farmers.

3.7 Market Intelligence

Information regarding demand, supply, price, market outlook, knowledge of consumers' preference, marketing channels and practices are important for marketing of produce, which is limited to the terminal markets only at the moment. There is also lack of knowledge and equipment for grading and packaging of fruits and vegetables.

3.8 Exploitation by Commission Agents/Traders

The small and marginal farmers are not attended to properly by the commission agents. Small and marginal farmers have to wait for a long period for auction of their produce.

4. ROLE OF STATE LEVEL APMC'S

4.1 Organisational Setup

Agriculture Produce Marketing Act of the Central Govt. is a model act, which has been adopted by most of the State Govt. At the level of district and major Municipal Bodies, Agriculture Produce Market Committees (APMCs) have been setup under this Act to regulate the marketing of agriculture commodities including horticulture produce. In the case of horticulture produce, this set up has limitation on the following:

- (i) **Ownership** – Private investment is not allowed.

- (ii) **Physical Facilities** – Facilities are inadequate for handling and storage of horticulture produce
- (iii) **Practices** – The practices followed at these markets are not transparent and are inherently unfavorable to the farmer.

The following amendments in the model Act are suggested:

- Horticulture as a separate segment for deregulation
- Creation of suitable infrastructure
- Allowing private investment

The State APMCs with revised structure of ownership and having suitable facilities can play a vital role. The centres in the new form should be linked with the farmers in the region. A cooperative structure would be very ideal. These centres apart from providing services of the nature mentioned above could also act as a hub of various other important activities. These activities are:

- (i) Gathering market and commercial intelligence data and feeding them to the farmers, to enable them to plan their operations for better returns.
- (ii) Inform the farmers about the price trends of various products in the markets within and outside the country. This would enable the farmers to decide about cropping patterns, improving quality of their produce, to get better returns.
- (iii) Maintains formal linkages with markets and inform them about the quality of produce from the farms. This could expand into a market promotion exercise for marketing the products from the associated farms and also establish exclusively in terms of quality. Indian Products can earn exclusive names like Nasik Grapes, Madurai Grapes, Punjab Kinnows etc. This could possibly be extended upto farm level as well.

(iv) Maintain an interface with Research Institutions and the farm so that the research works are related to field requirements and the results of research get translated into field.

5. FUTURE STRATEGY

To combat the wide spectrum of spoilage, National Horticulture Board (NHB), besides few other agencies like APEDA, MFPI, NCDC, etc. started schemes during the IX Plan on the commercial production and management of post harvest related infrastructural facilities at various levels of operation. The results shown by these programmes in a short span of time are indicative of the fact that the infrastructure so created has not only helped in reducing the losses to a significant level, but avenues of export have also been strengthened. The type of infrastructure created so far is the combination of individual components like grading/packing centres, pre-cooling units, cold storages, platform for collection of produce, transport vehicle and plastic crates/CFB boxes, etc.

For an integrated development of horticulture industry and also to achieve our targets for feeding the population as well as for meeting the requirements of the processing industry and exports, emphasis on quality production needs to be integrated with post-harvest management of the highly perishable horticultural crops. Considering the role horticulture has to play and the constraints in its development and the mandate of doubling food production and reducing the gap between requirement and availability, the following thrust areas are identified to be given due consideration and weightage for better post harvest infrastructure :-

- To act as a catalytic organisation for providing technical/financial support for all round development of horticulture sector, i.e. fruits, vegetables, floriculture, medicinal plants, etc. Emphasis should be laid on increasing production with an objective of achieving complete nutritional security.
- Encouraging adoption of appropriate post-harvest management technologies, which include grading, packing, storage, transportation, marketing, etc. for maximizing return to the farmers/growers.

- Feasibility studies for setting up the marketing, processing plants, cold storage, transportation system for raw and processed perishable horticultural products and other related fields and undertake designing, planning and execution of projects on their basis.
- Promotional activities to give boost to the process of employment generation, increase income of small and marginal farmers and social engineering aspects like involvement of women and backward communities in the horticulture development process.
- To encourage shifting food habits from quantity food to quality food through increased availability and mass media promotion of health oriented benefits of the consumption of fruits and vegetables.
- To stimulate private investment particularly in the fields of infrastructure, marketing and research and development with particular emphasis on the special needs of processing industry and exports.

6. INVESTMENT BY PRIVATE SECTOR

Due emphasis on developments on above lines, therefore, deserve more emphasis in the post WTO era.

Huge investment is required for promoting and maintaining the quality of horticulture produce from farm till the time it reaches the consumers in various forms. In the present approach followed for developing cold chain linkages, the govt. policies, implemented by organizations like NHB, NCDC, APEDA, etc., primarily assist private entrepreneurs to set up cold chain facilities in their respective units. This approach has been followed by these organizations for the last 5-6 years, resulting in introduction of cold chain facilities amongst a number of units in the agro sector. However, a look at the performance of these units, clearly indicates that the investment for cold chain linkages has not been found to be very viable.

It is recommended that a strategy be adopted for providing facilities collectively for a region having potential strengths for production of horticulture crops throughout the year or for most of the year. This would enable the facility to be utilized throughout the year making the

activity an economically viable. For cold chain and other areas of infrastructure & conversion of produce into marketable form, the investment requirements have been formulated hereunder.

7. CORE AREAS OF INVESTMENT

With a view to establish complete supply chain, from farm to the market, the infrastructure facilities will have to be created at the following levels: -

- (i) Small pre-cooling units and/or evaporatively cooled chambers in the production areas where the field heat of the produce is to be removed at fast rate to bring down the temperature of the produce to the desired level before putting the product in the cold storages. The refrigerated transport units from the farm to the cold storages are also utilized as mobile pre-cooling units for this purpose.
- (ii) Collection Centre near to the farms.
- (iii) Medium to small cold storages having multi-product, multi-chamber facilities are the most popular segment where horticulture produce is a stored in transit godown.
- (iv) Specialized cold storage with facility of built in pre-cooling, high humidity and controlled/modified atmosphere are required for storage of the produce for a longer period. These specialized storages are essential for extending shelf life of the produce and without these facilities proper storage of the produce to meet the demand in the off season is not feasible.
- (v) Other components like ripening chambers close to the markets and display cabinets at retail outlets.
- (vi) Linkages for conversion of fresh produce in other marketable forms.

8. INTEGRATED PACK HOUSES

These centres may serve farms in respective regions having an area of around 5,000-10,000 ha. Farms associated with each of the centers would collect farm produce and bring them to common cold storage centres, where this produce would be given treatments, such as washing, sorting, grading, waxing and packaging. The treated products will then be preserved in the appropriate cold storage facility. The services of these centres will not only increase the value of the farm products, but will also remove most of the unwanted bio-degradable bio mass from the horticulture products, which can be utilized as farm manure or even as cattle feed.

The infrastructure for other components is estimated to involve an expenditure of about Rs.25 billion and it is recommended that the Govt. of India should play the role of catalyst to ensure that the supply chain for horticulture produce is created expeditiously. Based on the pattern of the present schemes of NHB, which are recommended for continuation during the Xth Plan Period also, an amount of Rs.5.116 billion would be required for provision of back-ended capital investment subsidy @ 20% of the total projected investment.

CHAPTER XII

HUMAN RESOURCE DEVELOPMENT

1. INTRODUCTION

Horticulture sector has emerged as a key sector in agriculture, which is highly technology driven coupled with hi-tech interventions. For meeting the growing demands of this sector, it is necessary to have skilled manpower at different levels. Moreover, the acquired skills require to be updated periodically. In the expanded scenario of horticultural development during the VIII and IX Plan, acute shortage of trained manpower has been a serious constraint. Horticulture production technology witnessed the introduction of hi-tech measures like micro irrigation, protected cultivation, micro propagation etc. Moreover, in the scenario of limited availability of natural resources like land and water, the focus would be on precision farming for deriving maximum returns per unit of area. Organic farming is another area, which is receiving attention globally. In order to face the challenges of rapid development in the horticulture sector, it would be necessary to generate adequate number of trained manpower.

2. LIMITATIONS OF EXISTING TRAINING PROGRAMMES IN HORTICULTURE

A number of Agricultural Universities and Training Institutions in the country are turning out a large number of graduates with specialization in horticulture. But the courses offered by these institutions tend to be theoretical with very little practical input. The students receive little or no hands-on experience. Nor are they trained adequately in the management aspects of horticultural plantations and farms. As such there is absence of campus recruitment as has been the case with Management and I.T. trained students. Prospective employers look for people trained in the practical aspects of horticulture, capable of performing supervisory and managerial functions.

Horticulture is now turning to be a high technology activity. The gardeners or the malis who actually work in the fields and their immediate supervisors have also to be

trained in the advanced methods of cultivation and use of various technically superior and efficient equipment and implements.

The present courses being offered to the gardeners are not only numerically few but also highly inadequate content-wise. Consequently, age old practices continue to be adopted, resulting in low productivity.

The estimated requirement of different categories of skilled manpower in the horticulture sector was reported by Pandit Sunderlal Sharma, Central Institute of Vocational Education, Bhopal in 1996 as follows:

Table 12.1 Requirement of skilled manpower for horticulture

Sl. No	Area Projected	Increase in Area /Production (million ha.)	Additional Manpower required (000 no)
1.	Fruits	1.00	25.00
2.	Vegetables	0.50	50.00
3.	Mushroom cultivation		15.00
4.	Floriculture	0.08	8.00
5.	Landscaping		1.00*
6.	Med.& Aromatic Plants		5.00
7.	Plantation Crops		10.00
8.	Spice crops	100 m. plants	1.00 5.00*
9.	Plant/Seed Production		1.50
10.	Nursery Management		2.00
11.	Tissue Culture		1.00
12.	Post Harvest Handling & Marketing		1.00
13.	Fruit & Vegetable Preservation	30,000 tonnes	2.00
	Total		127.50

* Category of Gardeners or equivalent

Presently there is a wide gap between the demand for trained managers and supervisors as also malis, and their supply. This gap is only likely to widen with further developments in this field.

If the initial push given in the VIII Plan by way of larger outlays is to help horticulture take off in a big way and realize its full potential then the aforesaid gap needs to be bridged.

3. INFRASTRUCTURE FOR HRD IN HORTICULTURE

The research infrastructure available in the field of horticulture has been detailed in chapter v. This infrastructure in the National Agriculture Research System comprising of 26 State Agricultural Universities which offer course curriculum at U.G/P.G. level in horticulture along with a network of institutes and National Research Centers constitute the available infrastructure for HRD in horticulture. In addition ICAR Crop/Commodity Institutes/NRCs offer various types of training programmes.

4. SCHEME ON HRD IN HORTICULTURE

Keeping in view the urgent need to fill the gap in the availability of trained manpower in the horticulture sector, a Central Sector Scheme on Human Resource Development in Horticulture was launched in the Department of Agriculture & Cooperation (DAC) during the IX Plan (with effect from 1999-2000) at an outlay of Rs.50 million. The scheme aims at promoting rapid growth of horticulture by bridging the gap of knowledge and skill both managerial and technical by training individuals to become entrepreneurs or self-employed in the horticulture sector and to create skills for employability in the horticulture units / farms and upgrade the knowledge of departmental staff in the field of horticulture. Emphasis has, therefore, been laid on more hands-on training rather than theory classes. The training programmes are being organised through selected State Agricultural Universities (SAUs) / ICAR Institutes, Krishi Vigyan Kendras and NGOs.

The scheme has four components viz.

- Training of supervisors
- Training of gardeners

- Training of entrepreneurs and
- Training of departmental staff.

4.1 Training of Supervisors

The training programme for the Supervisors is for a duration of one year for 25 participants, which is being organised through six Institutes (Table 12.2.)

Table 12.2 Institutes where supervisor level training is imparted

Sl.No.	Name of Institute	Place
i.	Acharya N.G. Ranga Agricultural University	Hyderabad, A.P.
ii.	Dr.Y.S.Parmar University of Horticulture & Forestry	Solan, H.P.
iii.	Indian Institute of Horticultural Research	Bangalore, Karnataka
iv.	Mahatma Phule Krishi Vishva Viyalaya	Rahuri, Maharashtra
v.	Birsa Agricultural University	Ranchi, Jharkhand
vi.	N.D.University of Agriculture & Technology	Faizabad, U.P.

The minimum qualification for availing Supervisory level training programme is Higher Secondary.

4.2. Entrepreneur's Training

The entrepreneur level training is for a duration of three months for 10 participants. Presently the training programmes are being organised through three Institutes which are involved in the training of Supervisors. The minimum qualification for availing this training is Higher Secondary. The list of Institutes is given in Table 12.3

Table 12.3 Institutes offering entrepreneur's training programme

Sl.No.	Name of Institute	Place
i.	Dr. Y.S. Parmar University of Horticulture & Forestry	Solan (Himachal Pradesh)
ii.	Indian Institute of Horticultural Research	Bangalore (Karnataka)
iii.	Mahatma Phule Krishi Vishva Vidyalyaya	Rahuri (Maharashtra)

4.3 Gardener's Training

Gardener's training programmes are being organised through five Institutes (Table 12.4).

Table 12.4 Institutes offering gardener's training course

Sl.No.	Name of Institute	Place
i.	Ramakrishna Mission, Divyayan Krishi Vigyan Kendra	Ranchi (Bihar)
ii.	Punjab Rao Deshmukh Krishi Vidyapeeth	Akola (Maharashtra)
iii.	Rajendra Agricultural University	Samasthipur (Bihar)
iv.	Agri-Horti Society, Public Gardens	Hyderabad (Andhra Pradesh)
v.	Punjab Agricultural University	Ludhiana (Punjab)

The minimum qualification for availing Gardener's training is Class-VIII (Middle) standard.

4.4. Training of Departmental Staff

Under the HRD Scheme assistance is being extended to the State Governments to get their Departmental staff trained on the latest developments in horticulture. The Staff can be deputed to selected training institutes within the State or outside the State for which cost on training course as well as TA/DA can be met from the Scheme. Assistance is also available for training of trainers and departmental staff in other countries for gaining knowledge about the latest techniques in horticultural development there.

4.5 Modalities of Implementation

An indicative course structure for different training programmes at Supervisory level as well as Gardener's level has been worked out by a committee under the chairmanship of Deputy Director General (Extension), ICAR.

The training institutions have been given the option to draw up the course details within this structure in consultation with the DAC. The main thrust of the scheme will, however, be to provide hands on practical training to the participants.

In order to attract the candidates and more importantly retain them and prevent their drop out, a monthly stipend is being provided to them in the form of Boarding & Lodging charges in the concerned Institute. The courses are residential. At the end of the training, Supervisors are awarded a Diploma in horticulture and Gardeners and Entrepreneurs a Certificate of training in horticulture.

A Project Approval Committee constituted in the DAC under the chairmanship of Horticulture Commissioner scrutinizes the project proposals received from various institutes for imparting Supervisory level, Entrepreneur and Gardener level training. The States which already have a strong horticultural production base and have institutional set up for training in horticulture have been included in the Scheme for organizing the training programmes in horticulture.

The institutions identified for training have the basic infrastructure facilities like class rooms, staff, hostel facilities etc. Having regard to this fact, the training Institutions will be provided assistance for strengthening their infrastructure for conducting the training programmes under the scheme. Based on the willingness of the participating Institutions, proposals are invited directly from these institutions. Funds to the tune of 1.8 million for supervisory level training and 1.3 million for gardeners training have been released to them after getting the Memorandum of Understanding.

For availing the training programme for the Departmental Staff, the State Governments are allocated funds during the beginning of the Financial Year. They are required to maintain a panel of candidates. The candidates are to be nominated for training based on the training programme which are announced by the Training Institutes. The State Governments furnish the details such as the type of training, venue, number of participants, date of commencement and duration of course to the DAC for releasing the funds.

In case the States wish to organize specialized training courses on horticulture related subjects, assistance could be provided for the same to the concerned Institutes directly based on the recommendation of the concerned State (s). Such training would generally be of short duration of 7 - 10 days for 20 to 25 participants.

5. HRD FOR TEA, COFFEE, RUBBER

Under the Tea sector, a Scheme on Human Resources Development was approved for the IX Plan. The main objective of the Scheme has been to train the personnel, from workers to Managers, on various technologies on tea development. Under the coffee sector the following activities were taken up during the IX Plan:

- One hundred and twenty field personnel have been trained at the Indian Institute of Plantation Management and other National Institutes.
- Cyber Extension training was provided to 63 Extension Officers
- 115 participants from small grower sector attended the stipendiary training course.
- 30 workshop/seminars were organised.

- 10 Research scientists and 5 extensionists attended training on Extension and R&D aspects at MANAGE, Hyderabad.
- 80 scientists and extension personnel attended short term executive programme on Management of R&D in Plantation at IIPM, Bangalore.
- Two delegations of Extension officers visited coffee areas of Kenya, Uganda, Tanzania, Vietnam and Indonesia.
- Over 300 women labourers participated in 7 programmes on vocational training conducted by Krishi Vigyan Kendra, Coorg (Kodagu).

In the rubber sector, there are 23 Tappers' Training Schools run by the Board at different plantation centres for imparting training to small growers and their workers in tapping. The training and technical assistance scheme for rubber was implemented as a component of the World Bank Project during the period 1993-94 - September 2000. The main objective of the Scheme was upgradation of skills by providing training to be scientists, extension officers and other technical personnel of the Board to enable them to keep abreast of the latest developments in research and extension methods on need basis in various fields of relevance for NR production, processing and marketing.

The scheme also aimed at providing exposure visits of opinion leaders among small rubber growers to major rubber producing countries as a part of the Board's efforts to ensure capacity building. Programmes for training trainers were also envisaged under the project besides helping technical officers in participating in international conferences. The scheme also aimed at increasing the in-house training capabilities by establishing two major training centres, one each at Kottayam (the headquarters of the Board) in Kerala and at Agartala in Tripura in NE Region. Yet another major objective under the scheme was consultancy studies by experts on various aspects concerning the rubber industry.

During the project period 142 officers and 77 growers were given overseas training. Various studies were conducted by consultants on 23 topics. Renowned scientists specialized in biochemistry and molecular biology, genetic engineering, rubber economics and extension specialists also visited the Board under the programme.

6. FUTURE THRUST

During the X Plan, it will be necessary to continue the programmes to upgrade the skills at the gardeners and supervisor level with focus on hands-on training. Besides, the departmental staff and field functionaries would require periodic updating of knowledge and thorough training within the country as well as abroad. The infrastructure created and momentum generated during the IX Plan in the development of human resources in horticulture needs to be fully utilized during the next Plan period. The programme would cover additional activities such as managerial training, advanced training to field functionaries, etc. The strategy for development of HRD in horticulture during the X Plan would involve:

- Strengthening of the on-going HRD programmes of the IX FYP and addition of few new centres.
- The HRD programmes would cover all developmental aspect of horticulture viz. quality oriented high production, protection, post-harvest management and application of hi-tech horticulture covering:
 - Protected Cultivation of Vegetables and Flowers (PVF)
 - Hybrid Seed Production of Vegetables and Flower Crops (HVF)
 - Mass Propagation of Horticultural Crops (MPH)
 - Postharvest Management & Value Addition in Horticultural Crops (PVA)
 - Production and Processing Technologies of MAP (TAP)
 - Training on Landscape Gardening (TLG)
 - Transfer of Technology Through T&V System for Orchardists (TOT)
 - Advance Training for Field Functionaries and Trainers (ATS)
 - Financial Assistance to the Trainees of Specialised Entrepreneurs (FAT)

CHAPETR XIII

SMALL AND MARGINAL FARMERS

1. INTRODUCTION

Out of the 190 million ha of land under operational holdings, horticultural crops cover about 8% of this area. More than 80% of the area is held by small and marginal growers. These growers being poor, have neither adequate storage facilities nor adequate funds and normally go for distress sale for getting immediate cash. Most of them to borrow money to ensure proper up keep of the crops and are thus always in the clutches of traders and commission agents. Therefore, development strategies in horticulture need to be designed to suit the needs of the small and marginal of farmers. The holding pattern of some of the horticultural crops is discussed below.

2. HOLDING PATTERN IN HORTICULTURE CROPS

While reliable data on the size of holding of fruits, vegetable crops is available, fairly good information is available in plantation crops. The pattern of holding in different crops is discussed below.

2.1 Fruits, Vegetables and Spices

About 80 to 85 % of the farmers involved in the cultivation of fruits are estimated to be under this category of small and marginal holding. Similarly, vegetable cultivation in India has been mainly a traditional activity of backyard farming or small land holders in the proximity of large town. About 90% of the vegetable growers are small & marginal farmers. Similarly, more than 60 % of the holdings in the case of pepper and ginger are less than one ha. However, authentic figures of land holdings in spices are not available at present.

2.2 Plantation Crops

In plantation crops, more reliable estimates are available with respect to small and marginal farmers. It is estimated that more than 5 million coconut holdings are available in the country with 98% of them having a size of less than two ha. In Kerala alone there are more than 2.5 million holdings of which 90% fall in the category of less than one ha. The size of land holdings under coconut in different States is given in Table 12.1.

Table 12.1 Land Holding Size under Coconut

Size of holding (ha)	Percentage of holding in different states			
	Kerala	Tamil Nadu	Karnataka	Andhra Pradesh
Less than 0.2	37.1	69.1	52.5	56.5
0.2 – 1.00	52.8	26.0	42.9	41.7
1.00 – 2.00	7.9	3.2	3.6	1.8
2.00 and above	2.2	1.7	1.0	-

More than 60% of the holdings under arecanut cultivation are in the hands of small and marginal farmers and about 50 % of the production is from such holdings. Cashew is mainly a crop of the small & marginal farmers. The breakup of land holding size is given in Table 12.2. Nearly 70% of the holding are in the size range of 1-2 ha.

Table 12.2 Land Holding Size under Cashew

Holding Size (ha.)	Percentage of farmers engaged
Less than 1.00	43.0
1.00 to 2.00	36.0
2.00 to 5.00	14.00
More than 5.00	7.00

The detailed breakup of the share of the holdings under the tea, coffee and rubber sectors are given in Table 12.3.

Table 12.3 Land holding Size under Tea, Coffee & Rubber

	Tea	Coffee	Rubber	Total
No. of small holdings	106,000	137,643	986,489	1,2301,32
Area of the small holdings (ha)	1,00,000	221000	490277	786277
Share in total area (%)	25	65	87	64
Production ('000 tonnes)	150	180	552	882
Share in total production (%)	17	60	87	50

2.3 Tea

Co-existence of a substantial number of small growers side by side with large corporate holdings and medium proprietary gardens is a unique feature of the Indian tea scenario, particularly in the Southern States. In the case of tea, the farmers having tea area of up to 10-12 ha are considered as small tea growers. At present there are more than 100 thousand growers mostly concentrated in Nilgiris District of Tamil Nadu, Idukki District of Kerala and Kangra Valley of Himachal Pradesh. During the course of 8th and 9th Plan periods substantial number of agricultural farmers in Assam and North Bengal have switched over to tea cultivation. The contribution from the small grower sector, which used to be around 5% of the all India production, has gone up to 20% during the 9th plan period.

2.4 Coffee

The Indian coffee industry is dominated by the small grower sector. Of the total number of 0.140 million holdings, 0.137million holdings (98%) belong to small grower category having less than 10 ha. Similarly out of a total of 0.34 million hectares under coffee cultivation, the share of small grower is nearly 0.2 million ha (65 %). However, the small growers sector contributes only 60 % of the total production compared to the large grower sector, which contributes 40% to production and 35% of land area.

2.5 Rubber

Organized rubber planting in India started in 1902 mostly in the large estate sector. However, it underwent drastic transformation and today, 87 per cent of the area and production is accounted for by small holdings with an average holding size of less than 0.5 hectare. The sector has several socio-economic implications in the growing states particularly Kerala, which accounts for 92 per cent of the production and 85 per cent of the total area. The plantation sector employs about 0.35 million people directly and almost the same number is engaged in the industrial sector. The crop provides livelihood to almost one million small grower families in the country and of late it has been extensively and successfully utilized for the rehabilitation of the tribal shifting cultivators. The crop also has the potential for several ancillary activities such as intercropping, apiculture, and utilization of seed oil and oil cake and rubber wood.

3. CONSTRAINTS OF SMALL GROWER SECTOR

The productivity gap between the large grower and small grower is over 200 Kg/ha. The major constraints for lower productivity in the small grower sector are: -

- Presence of large number of tiny growers with less than 2ha.
- Existence of old moribund plant material due to reluctance to replant with new varieties.
- Lack of quality awareness.
- Inadequate technology adoption.
- Inadequate financial resources.
- Lack of infrastructure like pulpers/ drying yard etc. due to high capital investment.

4. INITIATIVES TAKEN

Several initiatives have been taken particularly in the plants sector for the small and marginal farmers. Although in terms of production, the contribution from this segment is nominal, having regard to the fact that there is considerable scope for not only increasing the yield per hectare in the existing area but also for bringing large area

under tea in the near future, the Tea Board has been attaching greater importance to this sector. Tea Board's initiatives in collaboration with UPASI TRI, CSIR COMPLEX (Palampur) and Assam Agricultural University (Jorhat) have taken the form of organizing training programmes on modern aspects of tea growing and manufacture, establishment of demonstration plots in the important areas of small growers concentration and supply of high yielding planting materials at subsidized rates. These efforts need to be strengthened in the coming years.

In order to step up the productivity and quality improvement in the small grower sector, the Coffee Board formulated a Small Sector Development Scheme (SSDS), which has 25% subsidy element backed with 75% loan under NABARD refinance to take up activities involving Water augmentation, Replanting and Quality Upgradation.

While, the scheme on Water Augmentation cleared by the planning commission was implemented, the other two components could not be implemented, as approvals from the Planning Commission/ Finance Ministry were delayed till the end of 2000-'01. As such, these two components could not get off the ground in the first few years of plan. The impact of implementation of water augmentation scheme especially in robusta coffee was evident from the increase in the productivity levels for small grower sector from 650 Kg to 850 Kg/ha.

Because of the substantial increase in the number of small holdings a change in policy had been adopted by the Rubber Board during mid '80s and a shift in focus from individuals to groups, was made.

The Board promoted voluntary organizations of growers on a ward/village basis with an average of 100-150 growers and these organizations were registered under the Charitable Society's Act to minimize governmental/political control.

Earlier, the Board had promoted rubber marketing cooperative societies in 1960s to facilitate better processing and marketing of rubber and to protect the small growers from being exploited by middlemen. However, these societies were formed under the Cooperative Society's Act and the membership of these societies grew larger as a result of which the contact between the growers and the societies became weak.

The need for supporting the formation of voluntary organizations as mentioned earlier was felt necessary and the Rubber Producers' Societies (RPS) have been promoted in this backdrop. These RPSs are envisaged to undertake group processing and marketing, distribution of inputs and also to function as an extension arm of the Rubber Board. There are about 2,100 societies at the moment and regular. Extension service is being dispensed through a good number of these societies. The Board also has adopted participatory extension management. The uses of farmer resource persons have also been tried extensively during the last couple of years, the results of which are quite encouraging. As a result of these efforts the productivity of natural rubber increased from 284 kg to 1,576 kg/ha during the last 5 decades, which is a remarkable achievement considering the nature of the sector, which is dominated by small holdings.

The institutional development resulting in a good network of marketing channels also has helped the farmers to realize almost 94% of the terminal market price within the producing state.

In the case of rubber, the small holder sector is reasonably well organized through the formation of the Rubber Producers' Societies (RPS). The initiative taken by the Rubber Board for introducing group processing in RPS is a welcome step, which is absent in other crops such as coconut, coffee, arecanut and spices. Formation of such societies encouraged by the respective Boards will lead to organized marketing of the crops and in establishing storage facilities at reasonable costs. Right from raising quality-planting materials, organizing input supply like fertilizers, pesticides, water management etc. can be jointly organised and utilized, even by arranging credit facilities.

5. NEED FOR EMPHASIS ON SMALL OR MARGINAL FARMERS

Since majority of the old senile unproductive plantation of coffee, rubber, coconut, arecanut, spices are with small farmers, group approach will greatly help. Some of the developmental schemes where financial assistance to individual farmers are available can be scientifically modified to suit group farming.

CHAPTER XIV

DEMAND PROJECTIONS

1. OVERALL DEMAND SCENARIO

Despite emphasis made on horticulture crop production during the VIII and IX Plans, there is still a large gap between the demand and supply of several horticultural commodities. The demand further expected to rise in the coming years on account of the following factors:

- Need to provide minimum per capita requirements of various horticultural commodities to increasing population to ensure nutrition security.
- With emphasis on value addition, the demand of raw materials of several commodities for the processing industry will increase.
- India has a great potential for improving its export of horticultural commodities.
- Change in dietary pattern and rise in average income is expected to accelerate demand for horticulture commodities.
- Changing scenario in life style will demand more processed and half cooked products.

The past growth in the horticulture production has been a direct result of two major policy initiatives of the Government of India, namely, promotion of diversification of Indian Agriculture and introduction of far reaching economic reforms. However, the emerging worldwide trend, which is also reflected in our country, indicates a paradigm shift in dietary needs of people. This means that the demand for horticultural produce will continue to rise with rise in income.

Since growth of horticultural crops is economically rewarding, this sector is expected to grow and contribute to food and nutritional security, provided the sector is nurtured with focussed attention for infrastructural development having conducive policy

environment. The sector has received proper attention in the formulation of Agricultural Policy of Government of India, which aims at systematic development of horticulture. The future demand projections in different horticultural commodities are discussed in this Chapter.

2. FRUITS

According to Recommendatory Dietary Allowance (RDA) of the Indian Council of Medical Research (ICMR), the per capita consumption of fruits should be 120 gms. The demand of fruits has thus been worked out keeping this as the basis.

Table 14.1 Demand projection of Fruits in India End of X Plan

S. No.	Item	Quantity (million tonnes)
1.	Population	1200 million
2.	Recommended Dietary Allowance (RDA) as per ICMR	120 grams/ day/person
3.	Requirement to meet dietary needs per year	52.56
4.	Requirement to meet additional demand of affluent strata of society (30% of population @ additional 120 grams per day)	15.77
5.	Requirement for processing	5.00
6.	Requirement for exports	2.00
7.	Total requirement (3 + 4+5+6)	75.33
8.	Present production (1998-99)	44.04
9.	Gap	31.29
10.	Target for X Plan	55

The above quantity does not take into account the post harvest losses. If we account for the post harvest losses (25%), the total requirement of fruits would be to the tune of 94 million tonnes by 2007, thus leaving a gap of about 50 million tonnes. It would, thus, be realistic to achieve a target of 75 million tonnes of fruits by the end of the Tenth Plan.

The growth of fresh fruit export has also been increasing. However, the total quantity exported is likely to be only a small fraction of the total production. Same is the

case with use of fruits in the processing industry. The current amount utilised by the processing industry is estimated at 2% of total final production. Though with change in food patterns, more fruits are expected to be processed, the quantities are again going to be very high.

The average productivity of fruits has been of the order of 11.80 tonnes/ha during 1998-99. The productivity will have to be increased to the level of 15 tonnes/ha by the end of the Tenth Plan through measures like production and distribution of improved seeds and planting material, improving productivity of senile orchards, judicious use of natural resources like land, water and light, use of recent technologies eg; integrated pest management, mechanization of farm operations, disease surveillance, plant health clinics etc. Assistance for these activities will have to be extended to the Public as well as Private sector.

To achieve the target production, the area under fruits will have to be increased to about five million ha from the level of 3.73 million ha; an increase of 1.27 million ha, involving a coverage of about 0.22 million ha annually. The requirement of planting material for area coverage alone will be to the tune of 317.5 million (@ 250 plants/ha).

3. VEGETABLES AND TUBER CROPS

3.1 Vegetables

The present production is estimated at 87 million tonnes from a cropped area of 5.8 million ha with this level of production per capita net farm availability (consumption at farm level) is 225 g/day and actual net availability comes down to 155. Thus the daily consumption is lower than the recommended daily allowance (RDA) of 280 g per capita. For reaching this goal, in 2007-08 when the population is expected to be 1200 millions, the production of vegetable crops has to attain 155 million tonnes and cropped area must increased to 8 million ha with the post harvest losses remaining at 20%. If we can work towards reduction of post harvest losses from 15 to 20% the targeted production can be 140 million tonnes in 2007-08.

One of the predisposing factor for net per capita availability is low productivity of 14.9 t/ha, which is below the world average of 17.41 t/ha is almost all the vegetable

except cauliflower. To reach the level of 140 million tonnes the productivity level has to go upto 17.5 t/ha and for 155 million tonnes target, the productivity has to reach 19.3 t/ha, the later is a more different target to attain over a period of 5 years. Further the present productivity ranges from 13.13 t/ha in Maharashtra, 15.96 t/ha in Karnataka, 14.8 t/ha in West Bengal. Hence to lift the productivity level to about 17.5 t/ha, may be more feasible and practicable, with the existing level of technology available (Table 14.2). Thus, carefully selected and precise parameters of demand and supply and required to be more realistic to enable plan projections with scientific formulation of achievable target.

Table : 14.2 Projected demand of vegetable crops by 2007-08

Year	Area (m ha)	Productivity (m t)	Productivity (t/ha)	Consumption Farm level (g)	Per capita net availability
1999	6.71	81.89	12.19	225.0	155
2007-08	8.0	155.00	19.30	417.5	278.4

3.2 Potato

In recent years, the demand for processed potatoes has risen at a fast rate. The two new processing varieties of CPRI, Shimla, Kufri Chipsona-1 and Kufri Chipsona-2 are expected to meet the requirements of the processing industry. Further, the increase in the area and consequent additional tonnage has to be planned more judiciously to spread the potato cultivation to other regions, where the present consumption of potato is low and needs to be upgraded. To achieve higher production targets, India has to develop new technologies to suit higher temperature and humidity conditions prevalent in western and southern regions and improve productivity in existing potato growing areas significantly.

3.3 Tropical Tuber Crops

Andhra Pradesh and Tamil Nadu are the two states where cassava is used for industrial purpose. There are 29 sago industries in Andhra Pradesh. These operate for 60 days even though they can crush tubers, if available, for 180 days. Crushing capacity of each industry is taken as 40 tonnes of raw tubers per day. In Tamil Nadu, there are nearly 1000 factories producing sago and starch with an average crushing capacity of 40 t/day of raw tubers and the factories operate for 120 days requiring 4 to 8 million tonnes of raw tubers. Also, it is essential to increase the crushing period to 180 days from the present 120 days. Keeping these facts in view, Tamil Nadu requires 4.2 million tonnes of additional tuber production for meeting the industrial demand alone. To produce 4.2 million tonnes at an average productivity of 25 t/ha, an additional area of 0.17 million ha has to be brought under cultivation. For meeting the food needs of people in the states of Kerala, Andhra Pradesh, Tamil Nadu, Karnataka, Bihar an additional area of 70,000 to 80,000 ha can be brought under the crop.

It is envisaged that in the present situation, the demand for cassava can be met from an additional area of 0.26 million ha. Thus the total area under cassava has to be 0.5 million ha to meet the demand in different sectors.

3.4 Mushroom

The demand-supply gap for button mushroom (*Agaricus bisporus*) at the global level is quite considerable and has been estimated to be around 0.27 million tonnes in the current year which may increase to 0.65 million tonnes in the next five years, i.e. increase by more than double. At the domestic level also, demand for local consumption of mushroom is increasing by leaps and bounds as mushroom has emerged as a preferred item in soups and for vegetable purpose all over the country. With rise in living standards and acceptance of mushroom. With rise in living standards and acceptance of mushroom, if the production and productivity is increased making this commodity as a vegetable, its demand is expected to pick-up fast.

4. SPICES

The demand for the spices at the end of X Plan is estimated to be around 5.4 million tonnes. The break up of various spices upto the end of X Plan is given in table 14.3.

The proposed production level can be achieved through an integrated approach in crop development, considering area expansion to the extent of 3% annually, coverage of more area under high yielding varieties, intensive productivity and quality improvement programmes streamlining the marketing network, value addition etc.

Table 14.3 Projected demand of spices by 2006-07.

Spices	1998-99 Production	IX Plan Target 2001-02	Demand 2006-07
Pepper	65.99	85.32	125.36
Ginger	263.17	331.52	487.11
Chillies	921.30	1160.57	1705.26
Turmeric	598.40	753.81	1107.60
Coriander	290.00	365.32	536.77
Garlic	517.70	652.15	958.23
Cumin	108.74	138.22	203.08
Fennel	24.08	30.46	44.76
Fenugreek	80.48	100.78	148.07
Clove	2.86	3.53	5.18
Nutmeg	2.09	1.93	2.83
Others	23.55	51.55	75.75
Total	2907.15	3675.15	5400.00

5. PLANTATION CROPS

5.1 Coconut

The present production of coconut is 15000 million nuts. The growth rate in coconut production experienced in the past 4.5 years is 4.5 percent. At this rate productions will touch 16300 million nuts by the end of IX Plan period. The trend in consumption pattern in various sectors and the anticipated increase in population and standard of living the project demand for coconut by the end of the X Plan is estimated

at 20,000 million nuts. Thus, a gap of 5000 million nuts from the present level of production. Similarly, the area under coconut is expected to reach the level of 2.0 million ha from the present area of 1.91 million ha. The approach for achieving the production level would be to give more emphasis on productivity level of 7821 nuts to 10,000 nuts per ha.

The gap in demand and supply is proposed to be bridged by dovetailing the programmes of the board in such a way that the targeted production and productivity of coconut is achieved through the programmes envisaged for the X plan.

Coconut related industries like oil, coir, desiccated coconut and coconut shell, demands more concerted efforts to meet the needs of market and avoid the wastage of by products like coir and shell.

5.2 Oil Palm

The country is importing vegetable oil to a large quantity of 4.67 million tonnes during 1999-2000 of which palm oil alone is nearly 1.2 million tonnes. There is huge demand for vegetable oil in general and palm oil in particular being a cheaper oil. The country has just started producing a small quantity of palm oil, which is practically negligible and used for vanaspatty and soap making. There is good scope for producing palm oil in the country which can be exploited to bring 1 million ha under oil palm to produce 3 million tonnes of crude palm oil and 0.3 million tonnes of kernel oil 2025.

5.3 Palmyrah Palm

Palmyrah as neera and jaggery along can contribute largely besides its other products. The products can fetch a very good demand in the country in the coming years.

5.4 Arecanut

Taking 1980–81 as base year, the compound growth rate in consumption of arecanut has been 3%. At this rate, the projected demand of arecanut by 2020 is estimated to be 0.617 million tonnes provided there is persistent demand for processed arecanut in the form of *gutka*, *panmasala* etc. At the current rate of productivity, an area of 518, 487 ha is required to reach that level of production by the year 2029. Even if the

productivity is raised to 2000 kg / ha, an area of 308,500 ha is required to reach the estimated production of 0.617 million tonnes which could be reached by 2005. This indicates that unless the productivity of arecanut is increased, a considerable area of fertile land will be put under arecanut which otherwise would have helped the people of this country to reach food and nutrition security by raising more useful essential commodities / crops such as cereals, pulses, oilseeds, fruits, vegetables and other export oriented horticultural crops.

5.5 Cashew

The export performance and indigenous consumption of cashew kernels has been growing at the rate of 10% and 4% per annum respectively. Based on this yardstick 0.15 million tonnes of kernels for export and 75,000 tonnes of kernels for local consumption will have to be attained by 2006-2007. This will require raw-nuts to the level of 1 million tonnes . At present in India there are 1098 processing units with an installed capacity of 1 million tonnes of rawnuts. With the presently available production of 0.52 million tonnes and import of 0.2 million tonnes, the available capacity is getting utilised to the extent of 70% only, leaving an unutilized capacity of 30%.

5.6 Cocoa

The current domestic production of cocoa beans is not sufficient to meet the demand, Industry has been importing to make good the short fall from 1995 onwards. The annual demand of cocoa is around 16,700 tonnes against which the supply level as of 2001-02 is only 9,000 tonnes leaving a gap of 7700 tonnes. A market growth rate of 15% has been assumed for the projection upto 2003 A.D.

5.7 Tea

As per a recent study conducted by Indian Institute of Management, Calcutta (IIMC), and world export demand as estimated by FAO and consequent on the removal of Quantitative Restrictions as an important obligation under the Agreement of Agriculture of WTO, the estimated production and export targets of tea up to the end of the X Plan period are given in Table 14.4.

Table 14.4 Targets of tea production upto 2007

(million kg)

Targets	2002-03	2003-04	2004-05	2005-06	2006-07
1.Domestic Consumption*	693	714	735	757	780
2.Export ++	234	241	248	256	264
TOTAL Production	927	955	983	1013	1044

* Based on IIMC study

++ According to FAO, Export availability is projected to reach 1600 million kg in 2005, it is targeted to achieve a share of 16% of the total global exports.

The production for the terminal year of the IX plan period is estimated to be around 875 m.kg. Considering the fact that newly planted areas especially in the small holding sector in Assam, North Bengal, Bihar are likely to come into full bearing in the next few years, the growth rate in production witnessed during IX plan period (1.36%) would continue during the X Plan also. At this growth the estimated production in the terminal year of the X plan would be in the region of 930 million kg. Thus, there will be a gap of about 114 m.kg between the supply and demand in the last year of the X plan period. This gap can be bridged either by importing the entire shortfall or by balancing it through part import and part increased production through additional developmental measures. The anticipated imports mainly for re-exports would be in the region of 39 mkg (which would be equivalent to 5% of the domestic demand) in the last year of the X Plan Period. The balance shortfall of 75 m kg is proposed to be made good by taking up additional development measures.

6. COFFEE

Due to escalation of International prices on account of frost in Brazil and subsequent reduced supply, there was a significant export pull at the cost of domestic market. As such, contemplated increase in domestic market could not be realised during the IX Plan. However, given the compulsion to increase global consumption to absorb excess production, there is an immediate need for expansion of the domestic market in all the producing countries in general and India in particular. Initial results of

the ongoing market research indicate, the potential for growth, despite challenges of competition from the soft drinks and other beverages, specially in the Urban markets. Hence, an optimistic consumption growth rate of 7% in the case of arabica and 13% in the case of robusta is envisaged with a base level of 55,000 tonnes as depicted in Table 14.5

Table 14.5 X Plan Domestic Consumption targets for Coffee

(Qty. in Tonnes and in million bags in brackets)

Year	Arabica (Growth rate 7%)	Robusta (Growth rate 13%)	Total
2002-03	38000 (0.63)	23000 (0.38)	61,000 (1.02)
2003-04	41000 (0.68)	26000 (0.43)	67,000(1.12)
2004-05	44000 (0.73)	30000 (0.50)	74,000 (1.23)
2005-06	47000 (0.78)	35000 (0.58)	82,000 (1.37)
2006-07	50000 (0.83)	40000 (0.66)	90,000 (1.50)

7. RUBBER

Natural rubber has been attaining highest growth rate in term of production, productivity and expansion of area. The production and productivity of natural rubber increased from 15,830 tonnes and 284 kg/ha in 1950-51 to 635000 tonnes and 1576 kg/ha at the end of 2001, respectively. The expected production of rubber by the end of X plan would reach to the level of 717000 tonnes. The targets for X plan production and consumption are given in table 14.6.

Table 14.6 X Plan Domestic Consumption targets of NR in India

(000 tonnes)

Year	Production	Consumption	Gap (Production - Consumption)
2002-03	660	683	-23
2003-04	678	717	-39
2004-05	694	752	-58
2005-06	706	790	-84
2006-07	717	830	-113

8. OVERALL DEMAND PROJECTION

The overall demand projection worked out for various horticultural crops is summarized in the Table 14.7

Table 14.7 Projected Demand of Horticulture Produce

(million tonnes)

Commodity	Production		Projection	
	1997-98	1998-99	2001-02	2007-08
Fruits	43.26	44.04	62.50	74.40
Vegetables	72.70	87.53	146.50	175.20
Spices	2.76	2.91	4.50	5.40
Coconut *	8.75	10.27	15.60	18.10
Cashew nut	0.36	0.46	1.00	1.80
Cocoa, others	1.5	0.005	0.016	0.03
Sub-total	129.33	146.82	183.70	265.50
Tea	0.82	0.86	0.73	1.04
Coffee	0.23	0.265	0.32	0.42
Rubber	0.58	0.605	0.67	0.90
Grand Total	130.96	148.55	185.42	268.22

* 10,500 nuts = 1 tonne

CHAPTER XV

X PLAN – THRUST AND STRATEGIES

Burgeoning population, shrinkage of arable land for agriculture due to urbanization and industrial growth and global competition have limited the possibilities for horizontal expansion. The answer, therefore, lies in vertical growth in term of appropriate location-specific high value crops with maximum productivity and cost effectiveness.

After attaining food security, our efforts have been focussed on achieving nutritional security by laying emphasis on production, protection and post harvest management of horticulture crops e.g., fruits, vegetable, potato and tuber crops, plantation crops and spices. We now have the mandate to increase per capita availability of these crops and meet the domestic and export needs, besides the needs of the processing industries. The overall demand for horticultural produce is estimated at 268.22 million tonnes, as detailed in Chapter XIV. The strategy for X Plan programmes is aimed to achieve the above goals.

Horticultural crops have already demonstrated their role in terms of their potential in increasing income per unit area, generating additional employment opportunities, providing sustainable income to small, marginal and tribal farmers and earning sizeable foreign exchange through exports and savings through import substitution. The VIII and IX Plan programmes have greatly helped the development of horticultural crops, resulting in a considerable increase in production, productivity, as well as export. Still there are several crops and areas which need strengthening, so that horticulture sector could be more competitive to face the present situation of global trade.

The development strategy for horticulture would addresses all the issues starting from the production activities to marketing of the final produce is essential and vital to augment production and provide on farm and farm employment. Therefore, thrust of the X Plan should be on the integrated

development of horticulture in Mission Mode to ensure adequate appropriate, timely and concurrent attention to all the links in production, post-harvest and consumption chain which should maximise ecological and social benefit from investment and promise ecologically sustainable intensification, ecologically desirable diversification and employment

The following thrusts and strategies are proposed to achieve the above goals during the X Five Year Plan.

- Improving production.
- Improving productivity.
- Reducing cost of production.
- Improving quality of products for exports.
- Value addition.
- Marketing and Export.
- Price stabilization.
- Strengthening of organizational support.
- Human Resource Development and
- Addressing relevant policy issues.

1. IMPROVING PRODUCTION

The projected demand of horticultural commodities, worked out based on the norms and trends, increase considerably as projected in the earlier chapter. To achieve the targets set for X Plan and beyond, it would be necessary to increase production which has to be largely achieved through increase in productivity of various horticultural crops. The following strategies would be required for achieving the same:

- i) Utilizing available arable land by changing crop priorities
- ii) Promoting use of wastelands for growing suitable horticulture crops
- iii) Since dry land region accounts for more than 60 per cent of area, strategies without focussed attention to these areas may not yield desired results. Thus, there is a need for infrastructural development of horticulture in dry land area in a Mission Mode.
- iv) Emphasizing horticulture crop production in states having potential for area expansion.

- v) Promotion of cost effective poly houses in the arid temperate regions of Lahaul & Spiti, Leh & Ladakh.
- vi) Promote the production of off season vegetables using greenhouse.
- vii) Take technological advances to smaller plantation where potential for improvement is the largest.
- viii) Better utilization of area through inter-cropping/mixed cropping in existing orchards, through identification of synergic crops e.g. growing of crops in vacant space, growing of shade loving crops in grown up orchards. Some examples of inter-cropping are given below:
 - a. Mango, cashew, sapota, jack fruit etc Inter-cropping with suitable crops of the region
 - b. Coconut, arecanut, oil palm gardens Cocoa, banana, pineapple, bush pepper, flowers, medicinal and aromatic plants, black pepper, tree spices, ginger, turmeric can be planted in the inter-spaces and mixed farming of growing grasses and rearing animals can also be practiced.
 - c. Coffee, tea, rubber Black pepper, medicinal plants, pineapple, ginger, turmeric, bush pepper can be inter-cropped.
- ix) Adopting a Mission Mode approach for integrated development of medicinal & aromatic plants.
- x) Eastern and North Eastern India have potential for horticulture development, which has not been utilised. Thus, Integrated Development of Horticulture in North Eastern and Eastern India need to be taken up in a Mission Mode.
- xi) Giving special thrust to increase the production of raw cashew in the country, which is presently inadequate to meet the requirements of the processing capacity installed in the country.
- xii) Give special thrust to develop horticulture in island ecosystems.
- xiii) Lay emphasis on nut crop development in the North Western Himalayas.

2. IMPROVING PRODUCTIVITY

The average productivity of most horticultural crops in India is low. A wide gap thus exists between yields obtained and potential yields with improved varieties and technologies. Programmes, therefore, need to be taken up to reduce the yield gap by improving productivity. The following strategy is suggested for this purpose during X Plan:

- i) Production of disease free, quality planting material of only released and recommended varieties / hybrids both in the public and private sector.
- ii) Improving orchard efficiency by gap filling and rejuvenation of old, unproductive, senile plantations through substitution of old varieties with improved high yielding varieties in crops like mango, apple, cashew, rubber, tea, coconut.
- iii) High density planting by reduction in planting distance or use of plant growth inhibitors and dwarfing rootstocks as recommended in crops like mango, citrus and apple.
- iv) Use of protected cultivation under controlled conditions using Hi-tech horticulture for growing fruits like strawberries, vegetables like cucumber, cabbage, capsicum, tomato and temperate vegetables in plain areas and high value cut flowers for domestic use and export.
- v) Promoting cultivation of crops, which produce higher biomass/unit area/unit time e.g., banana, pineapple, papaya, potato, sweet potato, tapioca, elephant foot yam in areas requiring poverty alleviation and nutritional security.
- vi) Use of plant growth regulators and chemicals for improving productivity, for example;
 - Mango : use of Paclo butrazol for regular flower production.
 - Grape : use of GA₃ for improving fruit size, shape and quality.
- vii) Application of frontier technologies (Hi-tech horticulture) e.g. micro-irrigation, fertigation, integrated nutrient management etc for improving productivity of high value crops.
- viii) Use of honeybees for pollination thus increasing fruit set and productivity in most of the cross-pollinated horticulture crops.

3. REDUCING COST OF PRODUCTION

In view of the global competition as a result of implementation of WTO provisions w.e.f. April 1, 2001, reduction in unit cost of product, particularly of horticultural commodities, which are exported, has become inevitable. Further there is danger of large-scale imports of horticulture commodities from abroad if our local production costs are not lower / comparable. Appropriate programmes are therefore, required to be up taken during X Plan to reduce cost of production.

The following thrust areas are suggested:

- i) Reducing cost of planting material by mass multiplication of horticulture crops using micro-propagation, wherever feasible e.g., banana, cardamom, vanilla, ornamental and medicinal plants.
- ii) Reduction in cost of fertilizer by determination of plant needs through leaf nutrient standards and applying only required quantities.
- iii) Efficient utilization and conservation of water and applied nutrients through drip / micro irrigation and fertigation, weed control, moisture conservation and solarization techniques.
- iv) Integrated nutrient management through cover cropping with leguminous crops in perennial plantations and incorporating to improve soil fertility, thus supplementing the fertilizer needs; growth thereby reducing cost of production.
- v) Promotion of integrated pest and disease management thus reducing costs of chemical pesticides and fungicides.
- vi) Reduction in post harvest losses by proper pre and post harvest handling, proper packaging and creating suitable infrastructure e.g. low cost cold storage for fruits and vegetables storage for potato and onion cold chain transport and other technologies.
- viii) Enhancing the shelf life of fruits and vegetables such as mango, grape, litchi through use of pre-cooling units controlled/ modified atmosphere/ refrigerated containers, particularly for transport by sea and reduce transport losses.

4. IMPROVING QUALITY OF PRODUCTS FOR EXPORTS

In the post liberalization period, the main thrusts should be on improving quality of various horticultural crops, so as to make our produce competitive in the world market. At present, various products being produced in India do not conform to standards prescribed by major importing countries. The following strategy is suggested for improving quality of produce.

- i) Popularization of improved agro-technique as well as improved implements e.g. mango harvester seed / fertilizer drill etc..
- ii) Due emphasis on cultivation of specific varieties for table, processing and export purpose should be given.
- iii) Emphasis needs to be laid on harvesting horticultural produce at optimum maturity.
- iv) Setting up of quality control laboratories to help exporters ensure that commodities being exported meet international quality standards.
- v) International quality standard for various commodities should be made known widely to ensure quality produce both for domestic and export market.
- vi) Although India's share in the export market of flowers is still insignificant, it has registered a sharp increase. The cut flower exports have shown a tremendous increase during the period 1991-92 to 1998-99 from Rs. 40 lakh to Rs. 25.3 crores. This has come about with the establishment of a large number of export oriented cut flower units around Bangalore, Pune, Delhi and Hyderabad during the last five years. Hence, quality parameters for various flowers need to be standardized and popularized.

5. VALUE ADDITION

Value added products are now attracting more of export market like oleochemicals, oleoresins, essential oils and hence development of new value added products in spices, coconut, cashew, tea, coffee will go a long way in export promotion. Newer technologies need to be developed. Similarly newer processed fruits, vegetables, ready to serve food items need to be developed and popularised. Further following aspects also need immediate attention:

- i) Processing capacity of existing units needs to be augmented.
- ii) Existing facilities need to be modernized.
- iii) Product diversification needs to be encouraged.
- iv) The prescribed international and domestic SPA standards should be disseminated and adhered to.

6. MARKETING AND EXPORT

In case Indian horticulture has to make a mark both in the domestic and export market due emphasis will be required to be given to the following thrusts areas: -

- i) Promoting introduction and commercial cultivation of varieties having established export value.
- ii) Better understanding of the domestic & export trade, and to identify potential areas of marketing. All major towns / mandi dealing with marketing of horticulture commodities need to be linked through Market Information Service, preferably through the internet.
- iii) Creation of infrastructure facilities like cold chain e.g., pre-cooling units, grading and packing sheds, cold storage, refrigerated trucks & wagons, refrigerated containers, adequate cargo space both through sea and air at appropriate places like APMCs and ports of dispatch.
- iv) Establishment of plant clinics in the private sector for soil, water, tissue analysis, identification of pest, disease, nutrient status and suggest control/remedial measures. Providing financial assistance for the same.
- v) Promotion of organic farming in selected export oriented commodities. To achieve this, adoption of vermiculture, use of bio-fertilizers, use of mycorrhizae and use of farm yard manure (FYM) / compost / enriched compost need to be promoted. An agency for accelerating certification for organic farming for different crops needs to be established.
- vi) Concept of alternate market, having backward and forward linkages which is being tested on pilot scale should be promoted vigorously.
- vii) The potential for export and earning foreign exchange from medicinal and aromatic plants is estimated to be over U.S. \$ 3000 million per annum. Since, India is one of richest source of medicinal plants as well as traditional systems of medicines, it is necessary to make sustainable use

and export of such plants or plant products in which India has the competitive advantage.

- viii) The increase in value of exports of tea between 1991-92 and 1998-99 indicates a decline in export volume to the extent of 24.24 million kg and export earnings has only been marginal. The Indian share in global tea exports has got a set back when the share of 18.5 % in 1990-91 declined to 14.3 % in 1998-99. Efforts need to be focused to regain the lost position in case of tea.
 - ix) Marketing of coconut and coconut products is greatly influenced by the copra making for coconut oil which also has a influence on the price of coconut. There is an urgent need for diversification of products and value addition so that there should be shift in the marketing of coconuts. Tender nut sales promotion is yet another area which needs popularisation in an organised manner.
4. While a wide variety of germplasm is available in most of the horticultural commodities, varieties most suited for exports have not been adequately identified in several crops. Similarly many well-known varieties having demand in the international market have not been introduced and tried. Arrangements have to be made to identify the items and importing the same into the country on priority basis either on exchange basis or outright purchase basis.

7. PRICE STABILIZATION

Horticulture crops suffer price fluctuations due to overproduction, underproduction, fluctuation in exports, lack of short and long term storage facilities, lack of market intelligence besides inadequate database. The following strategy is suggested:

- i) Collection of reliable database in horticultural crops.
- ii) Developing long-range export policy.
- iii) Timely introduction of market Intervention Scheme (MIS), Minimum Support Price (MSP), creation of Price Stabilization fund needs to be considered.

8. STRENGTHENING OF ORGANIZATIONAL SUPPORT

Eventhough lot of initiatives have been taken to strengthen the organizational support for horticulture development e.g., creation of National

Horticulture Board and Coconut Development Board etc., there is scope to further supplementing organizational changes in case fullest potential of horticulture has to be exploited. The following specific recommendations are made.

- i) Fresh review of the proposal approved earlier by the Cabinet Secretariat for forming a Department of Horticulture under the Ministry of Agriculture keeping in view the large financial allocation, vast expansion made and the future scope which horticultural crops offer in alleviating poverty, improving employment potential, nutritional security and above all earnings of foreign exchange.
- ii) The Post of Horticulture Commissioner needs to be upgraded and made equivalent to Agriculture Commissioner to ensure effective co-ordination of horticulture with different organizations at the central and state level.
- iii) New Directorate of Fruits, Directorate of Vegetables with regional stations, Directorate of Medicinal plants on the lines of Directorate of Arecanut and Spices, and Cashew and Cocoa, need to be created for monitoring the integrated development of these commodities.
- iv) The Posts of Directors (Cashew & Cocoa, Arecanut & Spices) and Chief Coconut Development Officer (in Coconut Development Board) need to be made equivalent to the post of Director existing in the headquarters of the Ministry of Agriculture.
- v) The Coconut Development Board needs to be reorganised as Palms Board to take care of development of all the palms namely coconut, arecanut, oil palm, palmyra palm.
- vi) A Horticulture Planting Material Regulatory Authority needs to be constituted to ensure production and sale of healthy, disease free planting material of elite varieties by various public and private nurseries. Also to channelize import/ export of all horticulture sector planting materials.
- vii) The National Horticulture Board needs to be strengthened to enable it to play an important role in marketing of fruits, vegetables and flowers by creating suitable infrastructure.
- viii) In many of States, Directorates of Horticulture have been created but they do not have adequate manpower and infrastructure to support the development of horticulture. In the absence of adequate manpower,

neither programmes implementation nor technical support could meet the pace of development. Therefore, strengthening Department of Horticulture in the State, in terms of manpower and infrastructure is vital. Model of Department of Horticulture in Karnataka should be replicated with financial support to the States Governments for an initial period of five years.

- ix) Hi-tech horticulture, wherein Plasticulture intervention has to play an increasing role i.e. fertigation, protected cultivation etc. Precision farming, which aims at efficient utilization of inputs and time have major components of plastics. National Committee on Plasticulture Applications in Horticulture has played a significant role in the promotion of plasticulture technology in the country. It is, therefore, strongly felt that this Committee may be formed as a Board or Society with autonomy to provide institutional support for the development of high-tech Horticulture.
- x) A National Committee for Product and process standards should be formulated under the umbrella of Ministry of Agriculture The role of this committee would be to formulate different subject-wise sub-committees namely Sub-Committee on Fresh Fruits and Vegetables, Sub-Committee on Processed Products, mandatory standards and inspection bodies for strict adoption of standards.

10. HUMAN RESOURCE DEVELOPMENT

Emphasis on Human Resource Development to ensure efficient transfer of technologies on the following lines are suggested: -

- i) Development of strong data base in horticultural crops.
- ii) Organizing management training programmes for plantation managers at suitable Horticulture and Plantation Crops Institutes.
- iii) Organizing study tours for small and marginal farmers
- iv) Organizing training programmes on modern aspects of horticultural crop production and post harvest management.
- v) Setting up of large / compact block demonstrations of latest technologies on various horticultural crops.
- vi) Conduct of integrated training of horticulture producers for some identified fruits such as grape, mango, litchi, kinnow in the selected regions where farmers will be provided training in integrated pre and post harvest management practices for better handling of the produce both for domestic and export market.

11. OTHER ISSUES

The following policy issues need to be considered for implementation during X Plan period for fully exploiting potential of horticultural crops which are earning valuable foreign exchange and also providing livelihood security to the vast population of the country:

- i) Create facilities for enhancing shelf life of fruits such as mango, grape, litchi through use of controlled / modified atmosphere / reefer containers .
- ii) Horticultural produce should also be taken under Hazard Analysis Critical Control Points (HACCP) Certification programme, e.g., APEDA for certification under the HACCP Quality Management tool in Andhra Pradesh and Tamil Nadu.
- iii) Coffee is the largest traded commodity in international trade next to petroleum products. As such it plays a very important role in our national economy. However India's share in world export of coffee was only 2.0 and 4.7 % during 1991-92 and 1998-99 respectively. Concerted efforts need to be made for a sustained export growth of coffee.
- iv) Spices exports have been consistently moving up during the last one-decade with an increase of 210% in quantity and 622% in value during this period. However the export has shown a decrease of 10 per cent in volume. During 1998-99, in the total spices export earnings, pepper contributed about 36.3 per cent followed by spice oils and oleoresins in terms of value. The value added products in the export basket constitute 37% of the total. More emphasis should be laid on export of value added spice products in which India has competitive advantage.
- v) The basic principles of WTO agreement are, non-discrimination, reciprocity, market access and fair competition. Since, India is signatory to WTO agreement, it has to fulfil certain agreements under WTO regime. Hence, emphasis needs to be given on creating awareness and implications of WTO regime among horticulture entrepreneurs as well as small and marginal farmers.
- vi) As per the agreement on agriculture, the gain or loss of a country as a result of liberalization will largely depend on achieving the market accessibility through providing the green box subsidies, which can be allowed under the agreement. In case of manufacturing products, there are serious problems of competition relating to high cost, inefficiency in production, outdated technology, and problems related to delivery schedule and product specification. As a long-term measure, focused attention needs to be paid to efficient horticultural cropping zones not only

- to achieve cost efficiency in production but also to attain international quality standards prescribed by the various importing countries.
- vii) Sanitary and Phyto-sanitary standards already available in India for fresh horticulture produce should be immediately harmonised with the international guidelines and if higher level of measures is required, the scientific justification for the same should be documented at the earliest.
 - viii) Japan, Australia and China have banned imports of mango and grape from India on account of presence of certain fruit flies. China has imposed a ban on grape import for a species of fruit fly that does not even exist in India. Australia desires to have complete details about pest management practices in India and a ban can only be lifted after signing of a MoU on mutual recognition of pest management practices. US rules governing import of fresh fruits and vegetables are very stringent. USDA gives clearance only after detailed tests involving inspection of the production areas. Efforts should be made to resolve such issues with mutual consultations.
 - ix) Various chemicals and their residue levels have been prescribed, differ from country to country within the EU with the result that there are no harmonized regulations in this regard and no intra-EU trade exist for horticulture commodities like gherkins. This is restricting free flow of trade in horticultural products. Such non-tariff barriers are required to be resolved.
 - x) The EU has prescribed maximum levels of pesticide residues in honey and these are required to be tested before exports to the EU. This is practically difficult keeping the Indian conditions in mind where honey is required to be collected from different sources before being packed. One may not be surprised if India sees a ban on exports of honey to the EU sooner than later. Such issues need to be suitably resolved so that export requirements are met.
 - xi) In the context of removal of quantitative restrictions and WTO regime there are a number of factors, which govern the competitiveness in the global trade, they are - lack of range of varieties; pre harvest practices to control post harvest losses; loss of produce at the primary level; lack of adherence to maturity indices; lack of facilities for physical and chemical treatment after harvesting; lack of post harvest infrastructure and logistics.
 - xii) Lack of data and awareness of such factors greatly hampers the process of withstanding global competition in terms of price and quality of horticultural produce. Efforts are, therefore, needed to document the data and create awareness on these issues.
 - xiii) New opportunities like organic farming, import substitution, Import intimation system and the products, which have edge in international market, need to be promoted for sustained advantage and profit.

- xiv) Indian standards in the agricultural sector have been framed by various organizations of the Government most of which are under Ministry of Agriculture and Commerce. These organizations are responsible not only for production and product standards, but also for their inspection and quality control. Some of the major organizations involved are; Directorate of Marketing Inspection (Agmark), Directorate of Plant Protection, Quarantine & Storage, State Seed Certification Agencies (SSCA), Food Products Order (FPO) Department of Food Processing Industries (DFPI), Bureau of Indian Standards (BIS), Agricultural and Processed Food Export Development Authority (APEDA), the standards developed under these organizations for the various products need to be harmonized to meet the standards of importing countries under one authority with wider participation.

- xv) There is also multiplicity of standards in several horticultural products. There is, therefore, an urgent need to not only rationalize standards fixed by various organizations but also to harmonize this with ISO standards for different commodities. Standards for growing and package requirements of international markets are also not available in a large number of commodities. The standards developed by Directorate of Marketing and Inspection are old and outdated. There is, therefore, an urgent need to fix standards to promote domestic as well as international trade in agricultural / horticultural commodities.

- xvi) In the present scenario of globalization, it has become important to understand the implications of the IPR. As a result, many of the foreign nurseries do not encourage the supply of horticultural crop varieties to India since their rights are not fully protected. Thus, India does not have access to many useful materials due to non-protection of plant breeder's right. For accelerated growth of horticulture industry it is necessary to give emphasis to IPR in the context of WTO regime and competition.

- xvii) The strength of Indian horticulture needs to be capitalised to provide leadership for overall development of horticulture in the region with the involvement of other countries and organizations like FAO.

CHAPTER XVI

X PLAN PROGRAMMES

1. INTRODUCTION

The strategy during the X Plan will be to consolidate the gains made during the Ninth Plan, and implement programmes which would ensure holistic development of horticulture sector. In this context, it would be necessary to give focused attention to increasing production, replanting of old senile and unproductive plantations/orchards, supply of quality planting material, development of cost effective technologies, development of infrastructure for post harvest management, promotion of crops having export potential, dissemination of technology, market promotional activities and use of Information technology in various horticulture and plantation crops. Accordingly the programmes have been identified in two categories viz. Special Thrust Programmes and Crop Specific Programmes. While most of the Special Thrust Programmes would be new interventions, the Crop Specific Programmes would comprise of ongoing as well as some new components. The proposed programmes are detailed in this Chapter.

2. SPECIAL THRUST PROGRAMMES

2.1 Programmes for Improving Production

2.1.1 *Replanting Old, Senile and Unproductive Orchards/Plantations*

Very old orchards like mango orchards and plantations of cashew, tea, coconut and arecanut exist for years with low yield potential. It is now the time to replant these area with planting material/hybrids of latest varieties so that per direction and increased. Therefore, replanting of old plantations would form an integral component of the respective crops, for this earmarked under respective crop.

2.1.2 *Rejuvenation and Consolidation of Orchards / Plantations*

Many of the orchards e.g., mango, sapota and plantations like coconut, cashewnut, arecanut, spices , tea etc have old planting material as well as a large number gaps relating in poor orchard efficiency. Consolidation by gap filling,

upgrading with top working/grafting will have to be done so that the production from these areas is increased. The outlay for this programme has been included under the respective crops.

2.1.3 *Technology Mission for Horticulture Development in North Eastern and Eastern India*

The Technology Mission for North Eastern India including Sikkim was introduced during the Ninth Plan with effect from the year 2001-02. The mission mode approach was conceived particularly for the North Eastern States of the country on account of the vast potential for horticulture development in the region and lack of infrastructure facilities. The analogy would apply to other States of the Eastern India including Bihar, Jharkhand, Orissa and West Bengal. The Technology Mission would comprise of four Mini Missions covering research, development, post harvest management and marketing. The Mission would encompass the development of all horticultural crops, which have potential in the region. Existing programme under the technology mission in North Eastern states should continue with suitable strengthening, and a new programme for integrated development of horticulture in Eastern India should be started in X Plan. The details of outlay are given in Table 16.1.

Table 16.1 Outlay for Technology Mission for NE & Eastern India
(Rupees in million)

S. No	Name of Mission	North Eastern States (Rs. in million)	Eastern States (Rs. in million) (new)
1	Mini Mission-I		
	Technology Development	80.0	90.0
	Technology Refinement	50.0	80.0
	Nuclear Seeds and Plants	90.0	100.0
	Sub-Total	220.0	270.0
2	Mini Mission –II		
	Production of Seeds and Planting Material	500.0	600.0
	Creation of Water Source and Onfarm water management	700.0	800.0
	Area Expansion	750.0	900.0
	Transfer of Technology	500.0	600.0
	Rejuvenation of Orchids plantations	200.0	700.0
	Organic Farming	300.0	600.0
	Mechanization	300.0	400.0
	Integrated Pest Management	200.0	450.0

	Plant Health Clinic and quality Control Laboratory	300.0	500.0
	Remote sensing and Data-base	150.0	350.0
	Emergent Requirement	50.0	150.0
	Information Technologies	150.0	250.0
	Support for Association and Strengthening of Department	150.0	250.0
	Technical Support	80.0	110.0
	Development of Bee Keeping	100.0	150.0
	Seminar/ Symposium External Evaluation	150.0	150.0
	Sub-Total	4580.0	6960.0
3	Mini- Mission –III		
	Post Harvest Management	500.0	900.0
	Commercial Horticulture	300.0	600.0
	Marketing Infrastructure	400.0	500.0
	Alternate Marketing	100.0	250.0
	Price Stability Fund	100.0	250.0
	Sub-Total	1400.0	2500.0
4	Mini Mission-IV		
	Promotion of New Units	200.0	300.0
	Market Promotion	100.0	200.0
	Human Resource Development	30.0	50.0
	Research Development	70.0	100.0
	Sub-Total	400.0	650.0
	TOTAL	6600.0	10380.0

2.1.4 Technology Mission for Dryland Horticulture

The dry-land/rainfed areas of the country account for more than 70 per cent of the cultivable area in the country. These areas would require focussed attention during the Tenth Plan. To tap the potential of dry-land horticultural, crops, area under fruits like ber, aonla, date palm, pomegranate, citrus, sapota etc., dry-land vegetables, medicinal & aromatic plants, spices like chilly and cashew will be increased. The programme would cover all the States & UTs of India with major focus to the States in the Western India. The details of outlay are given in Table 16.2.

Table 16.2 Outlay for Technology Mission for Dryland Horticulture
(Rupees in million)

Sl.No	Activity	Outlay
1.	Mini Mission I (Research)	500.00
2.	Mini Mission II (Development)	5000.00
3.	Mini Mission III (PHM)	4000.00
4.	Mini Mission IV (Marketing)	4000.00
	Total	13500.00

2.1.5 Horticulture Development in Wastelands

The unproductive lands belonging to the farmers, particularly those affected by salinity / alkalinity and other erosion and land degradation problem can be utilised profitably by introducing horticulture in these areas. This will not only help in increasing the production of the much needed horticultural produce but also help in rehabilitating the degraded area thereby providing remuneration to the farmer. An outlay of Rs.1000.00 million has been proposed for the programme on Horticulture Development in Wastelands.

2.1.6 Horticulture Development in Tribal/Hilly Areas

The programmes which were introduced during the Ninth Plan would be continued with due strengthening to cover more tribal & hilly areas. The outlay for this programme would be Rs.600 million.

2.1.7. Horticulture Development in Island Ecosystems

The island ecosystems provide a good potential for development of horticulture because of its isolation from the mainland with minimum impact of pests and diseases. Besides the nutritional demands of the local population is met largely by importing fruits and vegetables from the mainland. The Andaman & Nicobar Islands, located in the Bay of Bengal is a natural habitat for a variety of horticultural crops like coconut, cashewnut, jamun etc. In fact one island viz Car Nicobar island is fully under coconut plantation. Besides, oil palm has been introduced in Katchal Island which is coming up well. Pandanas, a plant grown in the wild provides staple food to the aboriginal of the A & N Islands. Similarly, there is scope to improve the production of horticultural crops in the Lakshadweep Islands. Development of horticulture with focussed attention would result in the supply of horticultural commodities, both for the mainlanders and the local tribal population. The emphasis would be for creating infrastructure facilities for supply of quality planting material, on farms handling & storage facilities, refrigerated boats for inter island transport of

horticulture commodities, air lifting of horticultural produce. An outlay of Rs.500.00 million has been envisaged for the purpose.

2.1.8 International Horticulture Programmes

India's strength in the horticulture sector presently remain confined within the four walls of the country. Even small countries like Malaysia have launched international programme like International Tropical Fruits Network (TFNet). Despite India being a leader in the production and exports of many horticultural crops, our stature in the international arena is negligible, Hence, efforts will have to be initiated during the X plan to boost our image by aggressive participation in the International events, besides creating the infrastructure for hosting International horticulture related programmes. An outlay of Rs.500.00 million has been envisaged to this purpose.

2.2 Programmes for Improving Productivity

2.2.1 *Development of Quality Planting Material*

Planting material constitute the basic ingredient of horticulture. Therefore, it is essential to ensure the availability of quality planting material for all horticultural crops by deploying modern techniques like tissue culture as well as through conventional nurseries. The activities under this programme would include development of nucleus stock through ICAR Institutes/ SAUs, setting up of large nurseries, establishment of small nurseries, establishment of hi-tech nurseries having green house & automated micro irrigation facilities, establishment of tissue culture units in the public and private sector. A system of self accreditation would be introduced to ensure the supply of good quality planting material. The outlays for the programme have been included under the respective crops.

2.2.2 *Promotion of Horticultural Cropping Systems*

Many of the horticultural crops can be cultivated as inter crops or companion crops without compromising on the yield. Annual crops like vegetables, cassava and other root & tuber crops could be cultivated with the perennial tree crops like fruits, tree spices, coconut arecanut Inter-cropping of coconut, cocoa and oil palm particularly in the irrigated areas could increase in the initial year returns per unit of area. Therefore, these concepts would be promoted during the X Plan under the respective crops.

2.2.3 Hi-Tech Interventions in Horticulture

Hi-tech interventions in horticulture would cover activities like micro-propagation, micro irrigation, fertigation, protected cultivation, biological control, bio-fertilizers, organic farming, high density planting, precision farming, use of remote sensing and GIS applications in horticulture and establishment of Precision Farming Development Centres. The details of outlay are given in Table 16.3.

Table 16.3 Outlay for Hi-tech Horticulture during X Plan

Sl. No.	Item	Target	Outlay (Rs. in million)
A.	Micro-propagation		
1.	Technical auditing of existing labs (No.)	25	5.00
2.	Promotion of GMP/Accreditation (No.)	10	5.00
3.	Demonstration of Tissue Culture Plants(100 ha per State for 10 States) (ha)	1000	100.00
B.	Plasticulture Applications		
4.	Micro-irrigation (lakh ha)	10	25,000.00
5.	Fertigation (ha)	10,000	100.00
6.	Green house (ha)	1000	2000.00
7.	Plastic mulching (lakh ha)	1	800.00
8.	Other Plasticulture applications		100.00
9.	Precision Farming Development Centres (No.)	20	100.00
10..	Integrated Nutrient Management in horticulture (lakh ha)Promotion of bio-fertilizers and		
	a) Vermiculture in horticulture (Lakh ha)	1	100.00
	b) Use of Bio-fertilizers (ha)	70,000	350.00
11.	Hi-tech Mechanization in Horticulture		100.00
12.	High Density Planting (ha)	50,000	750.00
13.	Organic farming		200.00
14.	Integrated Pest Management (with emphasis on Biological Control) (No.)		150.00
15.	Use of Remote Sensing & GIS Applications		130.00
16.	Infrastructure support for National Body to oversee Hi-tech Applications in Horticulture		10.00
17.	Precision farming in horticulture	25,000	1000.00
	Total		31,000.00

2.3 Programme for Improving Horticultural Database

Horticultural database is presently in a poor shape. It is well reflected from the fact that the planning process for the X Plan has to be made from the available area, production and productivity figures for the year 1998-99. By the times the programmes come into implementation stage at least one to two years would be required, a gap of three to four years. Many countries as well as the FAO are publishing the data on production of crops while Indian data are outdated or sometimes not available. Hence, there is need for evolving a system for carrying our bench mark survey and regular updating of horticultural data base. This will involve the engagement of personnel for collection of data, documentation and publishing. An outlay of Rs.200.00 million has been earmarked for this purpose.

2.4 Programme for Improving Manpower Efficiency

2.4.1 *Human Resource Development in Horticulture*

During the Ninth Plan the programme was launched only on a pilot scale covering six institutes for organising training to supervisors, five institutes for gardeners training besides three institutes for imparting training to the entrepreneurs. In view of the growing demand of the horticulture sector, the programme will have to be expanded to cover a large number of States. Efforts would be continued to impart training to the in-service personnel within the country as well as abroad. The details of outlay during the Tenth Plan are given in Table 16.4.

Table 16.4 Programmes and Outlays for HRD in Horticulture

Sl.No.	HRD Programmes	Total Outlay (Million Rs.)
A.	Strengthening of On-Going Programmes	
	i. Gardener's Training	45.00
	ii. Vocational Training for Horticultural Supervisors	50.00
	iii. Specialised Training for horticultural Entrepreneurs	20.00
B.	Newly Proposed Programmes	
1.	Protected Cultivation of Vegetables & Flowers (PVF)	17.50
2.	Hybrid Seed Production of Vegetables and Flower Crops (HVF)	15.00
3.	Mass Propagation of Horticultural Crops (MPH)	17.50
4.	Post-harvest Management & Value addition in Horticultural Crops (PVA)	20.00
5.	Production & Processing Technologies of Medicinal & Aromatic Plants (TAP)	15.00
6.	Training on Landscape Gardening (TLG)	15.00
7.	Transfer of Technology Through T&V System for Orchardists (TOT)	20.00
8.	Advance Training for Field Functionaries and Trainers (ATS)	15.00
	Total	250.00

3. CROP SPECIFIC PROGRAMMES

3.1 Horticultural Crops

3.1.1. Fruits

A composite programme on **Integrated Development of Fruits** is proposed to be implemented during X Plan with the following objectives:

- Generate quality planting material of fruit crops through nurseries and micro-propagation techniques.
- Bring more area under fruit crops with focus on location specific fruits in the country.
- Provide critical inputs for improving the productivity of old orchards/neglected orchards as well as by rejuvenation of senile orchards.
- Educate the farmers about the efficacy of improved techniques for increasing productivity and quality maintenance.

- Provide assistance for establishing plant health clinics and leaf nutrient analysis labs for fruit crops.
- Provide support for integrated management of insects, pests and diseases including disease forecasting.
- Provide infrastructure support for post harvest handling and marketing.

The total outlay envisaged during the X Plan is of the order of Rs.4269.50 million as per the following breakup (Table 16.5)

Table 16.5 Activities proposed under fruits scheme during X Plan

Sl.No.	Activity	Physical	Financial (Million Rs.)
A.	Special Thrust Programmes		
	Establishment of Nurseries (No.)		
	a) Large Nurseries in Public Sector	60.00	120.00
	b) Large Nurseries in Private Sector	120.00	120.00
	c) Small Nurseries in Private Sector	500.00	250.00
	d) Hi-tech Nurseries in Pvt. Sector	100.00	125.00
2.	Establishment of Tissue Culture Units (No.)		
	a) Public Sector	20.00	40.00
	b) Private Sector	20.00	20.00
3.	Creation of Accreditation Facilities (No.)	200.00	50.00
B.	Production Improvement		
4.	Area expansion (Ha.) in important fruit belts (lakh ha.)	2.00	2050.00
C.	Productivity Improvement		
5.	Productivity improvement/ Rejuvenation (Ha.)	5.00	875.00
D.	Technology Upgradation		
6.	Upgrading of technical know-how		
	ii) Skill upgradation		900.00
	(iii) Front line demonstrations		30.00
	(iv) Media support and publicity		90.00

E.	Infrastructure Development		
7.	Disease forecasting units (Public)		15.00
8.	Horticulture Mechanization		25.00
9.	Tissue/leaf Analysis labs (Public) (No.)		25.00
10.	Establishment of Plant Health clinics (No.)		20.00
11.	On farm handling of Fruits		50.00
12.	Tackling emergent requirements		14.00
13.	Information Technology		15.00
14.	Technology Development and Application		25.00
15.	Central Ministry Headquarters& Evaluation		16.00
	Total		5000.00

3.1.2 Nut Crops

There is a vast scope for increasing the production of a variety of nut crops, which are high value and low volume crops, particularly in the North Western Himalayan belt. India is a exporting walnuts. Besides, implementation of FAO project on Walnut has helped India to gain experience and knowledge in scientific production of walnuts including its vegetative propagation which could be transferred to other parts of the country. Similarly, there is need to improve the production of nuts like almond and pistachio nuts, which are presently being imported to meet the local demand. Hence, it is proposed to implement an **Integrated Project on Development of Nut Crops** during the X Plan with an outlay of Rs. 100.00 million.

3.1.3 Date Palm

Date palm is an important fruit grown under arid climatic conditions. Presently, the local demand for date palm is being met through imports from the Middle East. There is good potential to develop production of this crop in India if adequate plant material can be produced or bulk material imports. Hence it is proposed to implement a programme on Integrated Development of Date Palm during the X Plan with an outlay of Rs.50.00 million.

3.1.4. Vegetables

By the end of the X Plan, the gap in vegetable availability and requirement will increase significantly vegetable programmes will that need considerable strength in

the X Plan emphasis will be required to be given in popularization of leafy vegetable rich in iron and vitamin A rich carrot, tomato besides onion, garlic, potato. Programme for popularization of high yield of carrot, sweet potato, and variety will as have to be taken up. The programmes will be mainly for onion, potato, mushroom and root & tuber crops involving an outlay of Rs.1400 million as per the following breakup (Table 16.6).

Table 16.6 Outlay for Development of Vegetables During X Plan

Sl. No.	Item	Outlay (Million Rs.)
A.	Special Thrust Programme	
	Off Season Production of Vegetables	400.00
1.	Integrated Development of Onion	500.00
2.	Integrated Development of Potato	400.00
3.	Integrated Development of Tomato	600.00
4.	I Integrated Development of Cucurbits	400.00
5.	Integrated Development of Melons	300.00
6.	Integrated Development of Parwal	50.00
7.	Integrated Development of Cole crops	600.00
8.	Integrated Development of Mushroom	800.00
9.	Development of Root & Tuber Crops	200.00
10.	Seed production	100.00
11.	Information technologies	50.00
12.	Transfer Technology	100.00
	Total	4500.00

3.1.5. Floriculture

The components along with physical and financial targets for the **Integrated Development of Commercial Floriculture** during the X Plan are given in Table 16.7.

Table 16.7 Programme for Development of Floriculture during X Plan

Sl. No	Component	Physical	Total (Rs in million)
1.	Data Base Generation	Collection data from different parts of the country	2.50
2.	Developmental activities		
	a) MFCs in public sector	10	100.00
	b) Strengthening of existing MFCs	11	11.00
2.	c) Area expansion		
	i) Protected	100 Ha Green House 100 Ha shade net	20.00 5.00
		25,000 Ha	625.00
	ii) Open cultivation	40 % seed grown crops 20% bulb grown 30 % grafted plants 10 % foliage ornamental plants Farm equipment, fertilizers, chemicals etc	1.00 1.00 1.00 0.50 1.50
	iii) Other inputs	100 ha	
3.	Infrastructure development	Setting up of Pack house (Five units) Provision of refrigerated wagon in railways (Three units) Setting up of Co-operative markets (Five units)	1.00 1.50 2.50
4.	Market Promotion and advertisement	Flower festivals / Work shops (10) Advertisements/ Publication/Audio/ Video	5.00 4.00
5.	Monitoring and Evaluation	Technical services External Evaluation	1.00 1.50

7.	Value addition	Pigment extraction Dry flower production Etc. (50)	5.00
8.	R & D activities	Development of New products, Packages (Region specific packaging including Post Harvest Techniques)	10.00
	Total		800.00

3.1.6. Medicinal & Aromatic Plants

The programme for the **Development of Medicinal and Aromatic** plants would involve an outlay of Rs.250 million during the Tenth Plan as per the following details (Table 16.8):

Table 16.8 Outlay for Medicinal & Aromatic Plants

Activity	Outlay (Rs. in million)
A. Establishment of gene banks for Medicinal & Aromatic Plants	5.00
B. <u>Aromatic Plants</u>	
i) Development of quality plant material & its distribution.	50.00
ii) Cultivation of aromatic plants	100.00
iii) Setting up modern distillation units & facilities for value addition	75.00
iv) On farm handling	10.00
C. <u>Medicinal Plants</u>	
i) Establishment/maintenance of herbal gardens	15.00
ii) Establishment/maintenance of nurseries for medicinal plants	20.00
iii) Cultivation of medicinal plants / Contract farming	375.00
iv) Establishment of Analytical laboratories	20.00
v) On farm handling & storage	10.00
vi) Primary processing	10.00
D. Transfer of Technology, demonstrations	10.00
E. Establishment of Tissue/Leaf Analysis labs, Disease Forecasting Centres, Plant Health Clinics	50.00
F. Information Technology, Data base & Market Intelligence for Medicinal & aromatic Plants	50.00
G. Technology Development & Application	50.00
G. Technical Support	15.00
TOTAL	865.00

3.1.7 Spices

The programmes for **Integrated Development of Spices** during the X Plan would involve an outlay of Rs.4750 million as per the breakup given in Table 16.9.

Table 16.9 Programme for development of spices during X Plan

Sl.No	Activity	Outlay (million Rs.)
1.	Development of Black pepper, ginger, turmeric and chillies	5900.00
2.	Dev. of Tree spices	100.00
3.	Dev. of Seed Spices	500.00
4.	Dev. of Garlic, vanilla & saffron	100.00
5.	Development of Herbal spices	20.00
6.	Maintenance of Demonstration-cum-progeny gardens	60.00
7.	Technology transfer, etc	500.00
8.	Monitoring	20.00
9.	Infrastructure	300.00
	Total	7500.00

3.2. PLANTATION CROPS

3.2.1. Coconut

The programme on **Integrated Development of Coconut** would cover production & productivity improvement programmes, production of planting material, removal of diseased palms, Integrated management of nutrients, pests, water (drip), technology demonstration programmes, market infrastructure and administration of CDB. The details of outlay required during the Tenth Plan is given in Table-16.10.

Table 16.10: Outlay for Coconut Development During X Plan

No.	Activity	Physical (Ha.)	Financial (Rs. million)
I.	Production and Productivity		
1.	Area Expansion Scheme (ha)	25000	200.00
2.	Seedlings production (in lakh nos)	140	235.00
3.	Removal of disease palms (lakh nos)	1250	312.50
4. a.	Integrated Management (ha)	10000	350.00
b.	Irrigation - Drip (ha)	10000	150.00
c.	Pumpsets / irrigation (Nos.)	10000	150.00
d.	Integrated Pest Management		93.50
5.	Maintenance / establishment of DSP Farms (Nos.)	9	9.00
II.	Technology Demonstration		
1.	Assistance to coconut based industries		
a.	Grant in aid for small units (Including processing of copra processing of copra) (Nos)	100	25.00
b.	For big units (Nos.)	20	100.00
2.	Establishment of Pilot Testing plants for integrated processing of coconut by-products	5	100.00
	a) By Board (No. of units)		
	b) State Govt. (No. of units)	20	100.00
3.	Grant in aid		
a.	Research project for development of technologies	10	10.00
b.	Machinery Fabrication	20	10.00
c.	Technical service fee for product diversification		3.00
4.	Research on Quality upgradation		2.00
III	Market infrastructure & Market promotion	On need basis	300.00
IV	Technology transfer & H R D		150.00
V	Infrastructure & Administration		200.00
	Total		2500.00

3.2.2. Arecanut

The programmes for development of arecanut during the X Plan would involve an outlay of Rs.620.00 million.

3.2.3. Oil Palm

The programmes for the development of Oil Palm will involve an outlay of Rs.1500 million during the X Plan as per the following breakup (Table 16.11).

Table 16.11 Programme for Development of Oil Palm During X Plan

Sl.No	Programmes	Physical (Ha.)	Financial (Rs. million)
I.	Production and Productivity		
II.	Area Expansion Scheme (ha)	40000	620.00
III.	Seedlings production (in lakh nos)	40.00	216.00
IV.	Intercropping/mix cropping (ha)	10000	350.00
V.	Wasteland utilisation development for oil palm cultivation		50.00
VI.	Watershed management in the uplands of oil palm growing region.		50.00
VII.	Maintenance of seed garden		55.00
VIII.	Irrigation – Diesel engine(no)	8000 units	64.00
IX.	Drip irrigation (Nos.) Setting up of plant health clinic by strengthening leaf nutrient analytical lab in Ap and Karnataka an	2000 ha 8000 units	30.00
X.	Technology transfer (Publicity, extension, training etc.	On need basis	45.00
XI.	Establishment		20.00
	Total		1500.00

3.2.4 Development of Palmyrah

An outlay of Rs.100.00 million has been envisaged during the X Plan for taking up activities like nursery development, micro irrigation, demonstration of cropping system involving medicinal and aromatic plants, development of Neera Products, packaging and market promotion.

3.2.5 Cashew

The **Integrated Development Programme for Cashew** during the Tenth Plan would include development of new plantations with clones of high yielding varieties, replanting/rejuvenation of uneconomic cashew gardens, Technology dissemination, development of infrastructure for marketing and processing, and strengthening of Directorate of Cashew & Cocoa. The details of outlay required during the Tenth Plan is given in Table 16.12.

Table 16.12 Outlay for Cashew Development During X Plan

Sl.No.	Activity	Financial (million Rs.)
A.	Special Thrust Programme	
1.	Development of New plantations with clones of high yielding varieties and maintenance	1200.00
2.	Replanting/rejuvenation	100.00
3.	Technology dissemination	
a)	Farmers participatory demonstration	50.00
b)	Training of farmers and field functionaries	20.00
c)	Plant Protection campaign	30.00
d)	Publicity measures	15.00
4.	Infrastructure for marketing and processing of cashewnut	15.00
5.	Processing of cashew apple	10.00
6.	Infrastructure to States	50.00
7.	Infrastructure to Directorate of Cashew	35.00
	Total	1525.00

3.2.6 Cocoa

The **Integrated Development Programme on Cocoa** would include development of new plantations, replanting/rejuvenation of uneconomic cocoa plantations, establishment of regional nurseries, technology dissemination and development of infrastructure for marketing and processing. An outlay of Rs.250 million have been earmarked for the development of cocoa during the Tenth Plan.

3.2.7 Tea

It is proposed to continue the scheme existing in IX Plan during the X Plan. However, in doing so some scheme are proposed to be enlarged. As a result the following 5 scheme would be taken up in the X five year Plan:

The **Tea Development Programme** contemplated during the X Plan are given hereunder:

1. Plantation development including area expansion, replanting, rejuvenation, irrigation, drainage and productivity increase.
2. Quality upgradation and product diversification
3. Strengthening the research and Development on tea

4. Market development -Market promotional activities like participating in trade fair, publicity and propaganda of Board, assisting Indian exporters in all export promotional activities like publicity, brand promotion etc.
5. Human resource management.

In addition the following measures are proposed to be taken for the development of small tea growers:-

- Setting of demonstration plots in each of the NE States for demonstrating all steps of tea growing.
- Setting up of central nursery for supply of right kind of planting material to the small growers.
- Arranging training programmes for farmers.
- Setting up of advisory service for periodic field visits and advice.
- Arranging study tours for growers to visit developed areas in the South and abroad in countries like Kenya and Indonesia.
- Considerable work done for small growers.

The programme for the development of tea during the X Plan would involve an outlay of Rs. 23050 million as per the following breakup (Table 16.13 and Table 16.14):

Table 16.13 Outlay for Development of Tea during X Plan

(Rupees in million)

Sl.No.	Item	Amount
1.	Tea Board	
	i) Loan	530.0
	ii) Subsidy	5350.0
2.	33AB a/c under Tea Development Account scheme	6550.0
3.	Tea Industry's own resources	4400.0
4.	Bank/Institutional loan	6220.0
	Total	23050.0

The estimated outlay and source of fund for each of the scheme is summarized in Table 16.14.

Table 16.14 Outlay and source of funding for Tea development during X plan.

Sl. No	Name of the Scheme	Estimated fund requirement	Tea Board*		33 AB	Industry's resources	Bank/ institutional finance
			Loan	Subsidy			
1	Plantation development scheme	9390.0	290.0	1300.0	4050.0	810.0	2940.0
2	Quality upgradation and product diversification scheme	8110.0	240.0	1000.0	2500.0	1090.0	3280.0
3	Market promotion scheme	3000.0		1500.0		1500.0	
4	Research and development	2250.0		1250.0		1000.0	
5	HRD	300.0		300.0			
	Total	23050.0	530.0	5350.0	6650.0	4400.0	6220.0

* X Plan outlay would be Rs.5880.00 million.

3.2.8 Coffee

The **Coffee Development Programme** proposed to be taken up during the X Plan are:

- I. Shifting in the products of in farm of arabica.
- II. Improving productivity of arabica plantations through replanting of old gardens.
- III. Converting suitable area with arabica.
- IV. Providing irrigation facilities and drainage.
- V. Coffee development in North Eastern and non traditional regions.
- VI. Develop cost effective technology.
- VII. Develop and expand market information system/export promotional activities.
- VIII. Human Resource Development.

The development of coffee would involve an outlay of Rs.10490.00 million as per the breakup given in Table 16.15.

Table 16.15: Outlay for Development of Coffee During X Plan

(Rupees in million)

Sl. No.	Programme	Plan grant (A)	Subsidy (B)	Total (A+B)*	Industry share ©**	Grand total (A+B+ C)
1.	To step up production and productivity	650.0	400.0	1050.0	1200.0	2250.0
2.	Quality Upgradation	150.0	200.0	350.0	600.0	950.0
3.	Area Expansion & Development	250.0	750.0	1000.0	2250.0	3250.0
4.	Infrastructure Devt.	500.0	-	500.0	-	500.0
5.	Market Devt.	570.0	-	570.0	1050.0	1620.0
6.	Sustainable Coffee production	150.0	200.0	350.0	600.0	950.0
7.	HRD programme	180.0	100.0	280.0	300.0	580.0
	Total	2450.0	1650.0	4100.0	6000.0	10100.0

* Includes internal fund generation by the Board

** Loan/own investment component in the subsidy schemes.

3.2.9 Rubber

Rubber Development Programme during the X Plan envisages globally competitiveness, quality improvement & cost effective. Market development, product diversification, and promotion of rubber board and socio- economic development.

The following technical programmes are outlined: -

- I. Production and planting strategies.
- II. Productivity enhancement.
- III. Strengthening the research.
- IV. Processing and quality improvement.
- V. Infrastructure development in post harvest management.
- VI. Marketing strategies, market promotion system.
- VII. Human Resource Development.

VIII. Community development and farmers participatory approach in development and extension through strengthening.

The programme for the development of rubber would be with an outlay of Rs.4703.50 million during the X Plan as per the breakup given in Table 16.16:

Table 16.16: Outlay for Development of Rubber during X Plan

Sl. No.	Schemes	Outlay proposed (Rs in millions)
1.	Rubber Plantation Development Scheme	1290.00
2.	Extension, productivity enhancement and primary processing	644.00
3.	SCP/TSP	150.00
4.	Research programmes	575.00
5.	Rubber development in NT area	473.50
6.	Research programmes in NE region	150.00
7.	Improving processing and market development	1077.00
8.	Labour welfare	90.00
9.	Infrastructure development	200.00
10.	Training and technical assistance	54.00
	Total	4703.50

4. INPUTS FOR PRODUCTIVITY IMPROVEMENT

4.1 Beekeeping

The programme for Development of **Beekeeping for Improving Crop Productivity** during the Tenth Plan would involve a financial outlay of Rs. 445 million as per the breakup given in Table 16.17.

Table 16.17 Target and Outlay for Beekeeping during X Plan

No.	Activity	X Plan outlay (Rs. in million)
I.	Promotion of research and development and Nucleus stock production	10.00
II.	Production of bee colonies (5.00 lakh No.)	125.00
III.	Assistance to bee breeders	15.00
IV.	Training	20.00
V.	Promotion	10.00
VI.	Assistance for beekeeping equipment (5.00 lakh hives honey extractor, etc)	200.00
VII.	Apiculture demonstrations	5.00
VIII.	Assistance for migration of honeybees	10.00
IX.	Support for manufacture of hives and equipment	15.00
X.	Support to SDAs for consortium on beekeeping	10.00
XI.	Support to SDAs for meeting overhead expenses	10.00
XII.	National Beekeeping Development Board	5.00
XIII.	Development of data base and use of IT	5.00
XIV.	Evaluation, conduct of studies & surveys on apiculture	5.00
	Total	445.00

5. POST HARVEST MANAGEMENT

5.1 Infrastructure for Post Harvest Management

The investments for development of infrastructure would include construction/modernization of cold storage, establishment of collection centres, ripening chamber, evaporatively cooled, Retail Outlets, Special Transport Vehicles, and Primary processing equipment. The details of outlay are given in Table 16.18.

Table 16.18 Outlay for horticulture infrastructure during X Plan
(Rupees in million)

Unit	Outlay
I. Cold Storage	
I. New/Expansion	2500.00
II. Modernization	2000.00
III. Onion Storage	1500.00
II. Other Components	
(Related to PHM, cool-chain and primary processing of products)	
I. Collection Centres	1500.00
II. Ripening Chamber	1000.00
III. Zero Energy Cool Chamber	100.00
IV. Retail Outlets	1000.00
V. Special Transport Vehicles	1000.00
VI. Primary processing equipment	400.00
Total	11000.00

6. SUPPORT FOR STRENGTHENING HORTICULTURE ORGANIZATIONS

The success of the horticulture development programmes during the X Plan will depend a great deal on the availability of trained manpower and organizational support to monitor the programmes. Hence, it would be necessary to strengthen the existing organizations and set up additional agencies as per the details given in Table 16.19.

Table 16.19 Details of Outlay for Organizational Support

Sl. No.	Activity	Outlay (Rs. in million)
I.	Strengthening of Horticulture Division, DAC	100.00
II.	Establishment of Directorate of Fruits	100.00
III.	Establishment of Directorate of Vegetables	100.00
IV.	Establishment of Directorate of Medicinal & Aromatic Plants	50.00
V.	Establishment of Directorate of Floriculture	50.00
VI.	Creation of Palm Board	50.00
VII.	Strengthening of National Horticulture Board	50.00
VIII.	Precision Farming Development Centres	150.00
IX.	Establishment of Horticulture Planting Material Regulatory Authority	100.00
X.	Strengthening of State Departments of Horticulture	150.00
	Total	900.00

7. SUMMARY OF OUTLAY FOR TENTH PLAN

The overall requirement of funds for the development of horticulture during the tenth Plan would be to the tune of Rs 107614.87 million. The detailed breakup is given in Table 16.20.

Table 16.20 Summary of Outlay for Horticulture Development During X Plan

Sl. No.	Programme	X Plan outlay (Rs. in millions)
I.	Technology Mission on Horticulture for North Eastern India	6600.00
II.	Technology Mission on Horticulture for Eastern India	10380.00
III.	Technology Mission for Dryland Horticulture	13500.00
IV.	Horticulture Development in Wastelands	1000.00
V..	Horticulture Development in Tribal / Hilly Areas	600.00
VI.	Development of Horticulture in Island Ecosystems	500.00
VII.	International Horticulture Programme	500.00
VIII.	Hi-tech Horticulture (Drip)	
	a) Micro propagation	110.00
	b) Drip irrigation, Fertigation etc.	26000.00
	c) Green house	2000.00

	d) Organic farming	200.00
	e) Other Hi-tech application	2690.009
IX.	Horticulture Database	200.00
X.	HRD in Horticulture	250.00
XI.	Integrated Development of Fruits	5000.00
XII.	Integrated Development of Nut Crops	100.00
XIII.	Development of Date Palm	50.00
XIV.	Integrated Development of Vegetables	4500.00
XV.	Development of Floriculture	800.00
XVI.	Integrated Development of Medicinal & Aromatic Plants	865.00
XVII.	Integrated Development of Spices	7500.00
XVIII.	Integrated Development of Coconut	2500.00
XIX.	Development of Arecanut	620.00
XX.	Development of Oil Palm	1500.00
XXI.	Development of Palmyrah	100.00
XXII.	Development of Cashew	1525.00
XXIII.	Development of Cocoa	250.00
XXIV.	Development of Tea*	5880.00
XXV.	Development of Coffee	10100.00
XXVI.	Development of Rubber**	4704.00
XXVII.	Bee-keeping for Improving Crop Productivity	445.00
XXVIII.	Post Harvest Management	11000.00
XXIX.	Organizational Support for Horticulture	900.00
	TOTAL	122869.00

* Which includes increase generation of Tea Board

** It is expected to collect 4930 million from cess.

The breakup of outlays for new interventions to be launched during the X Plan and for continuing the ongoing programmes of the IX Plan are given in Table 16.21.

Table 16.21 Breakup of New and Continuation of Ongoing Programmes

No.	Programme	X Plan outlay (Rs. in millions)
A.	New Programmes	
1.	Technology Mission on Horticulture for Eastern India	10380.00
	Technology Mission for Dryland Horticulture	13500.00

	Horticulture Development in Wastelands	1000.00
	Development of Horticulture in Island Ecosystems	500.00
	Horticulture Database	200.00
	International Horticulture	500.00
	Organic farming	200.00
	Integrated Development of Nut Crops	100.00
	Development of Date Palm	50.00
	Development of Arecanut	620.00
	Development of Palmyrah	100.00
	Organizational Support for Horticulture	900.00
	Sub-Total New Programmes	28050.00
B.	Ongoing Programmes with New Components	
	Technology Mission on Horticulture for North Eastern India	6600.00
	Hi-tech Horticulture	30800.00
	HRD in Horticulture	250.00
	Integrated Development of Medicinal & Aromatic Plants	865.00
	Bee-keeping for Improving Crop Productivity	445.00
	Post Harvest Management	11000.00
	Sub-Total B	49960.00
C.	Continuation of Ongoing Programmes	
	Horticulture Development in Tribal / Hilly Areas	600.00
	Integrated Development of Fruits	5000.00
	Integrated Development of Vegetables	4500.00
	Development of Floriculture	800.00
	Integrated Development of Spices	7500.00
	Integrated Development of Coconut	2500.00
	Development of Oil Palm	1500.00
	Development of Cashew	1525.00
	Development of Cocoa	250.00
	Development of Tea	5880.00
	Development of Coffee	10100.00
	Development of Rubber	4704.00
	Sub-Total C	44859.00
	Grand Total A + B + C	122869.00

CHAPTER XVII

SUMMARY OF RECOMMENDATIONS

While the VIII Plan marked the period of initiation of horticulture development programmes in a focused manner, the IX Plan was a period of consolidation. Evident from changing scenario, a growth rate of 8 per cent is envisaged to achieve production level of 281.00 million tonnes from the current level of 147 million tonnes. To achieve the production target of horticultural produce and boost the growth of flower, medicinal and aromatic plants, honey, tea, coffee and rubber, the X Plan would concentrate on capitalising the past experiences in boosting the horticulture production conforming to world quality as well as productivity standards. Accordingly the following recommendations are made for accomplishing the desired objectives.

A. CROP RELATED

1. **Fruits:** The average productivity of fruits has been of the order of 11.80 tonnes/ha during 1998-99. The productivity will have to be increased to the level of 15 tonnes/ha by the end of the X Plan through measures like production and distribution of improved seeds & planting material, rejuvenation of senile orchards, judicious use of natural resources like land, water and light, integrated pest management, mechanization of farm operations, disease surveillance, plant health clinics etc. Assistance for these activities will have to be extended to the public as well as private sector.

1.1 To achieve the production target, a two pronged approach of replanting and rejuvenating old orchards and bringing new areas under fruits has to be adopted. The purpose shall be to increase the area under fruits to 5 million ha from the existing level of 3.73 million ha through an annual increment of 0.22 million ha. The requirement of planting material for area coverage alone will be

around 317.5 million (@ 250 plants/ha). Assistance for establishment of new nurseries in the private sector will be required while the nurseries in the public sector will have to be strengthened with modern facilities like micro-propagation units, green houses, micro irrigation units etc.

1.2. Emphasis has to be given to minimize the cost of production by improving productivity and wasteful expenditure for maximizing the income from existing orchards. Special emphasis should be given on proper irrigation and drainage of areas under fruit crops.

1.3. Area expansion by promoting use of wasteland and dry-land for growing suitable fruit crops.

1.4. Proper research support is needed for identification/promotion of cultivation of native under exploited fruits of commerce, management of problematic diseases like malformation, alternate bearing, spongy tissue of mango, decline in citrus, wilt in guava etc.

1.5. Research is needed to develop fool proof leaf analysis standards and setting up of at least a state level fully equipped plant health clinic and tissue nutrient analysis laboratory for fruits crops, in each states.

1.6. Quality improvement, product diversification/ value addition will also have to be encouraged.

1.7. Special efforts are needed for promoting organic fruit cultivation for reducing the cost of cultivation and to catch up global market of organic products. To achieve this adoption of vermiculture, bio-fertilizers, mycorrhiza and FYM /compost/enriched compost need to be promoted.

1.8. There is vast scope of increasing production of a variety of nut crops, particularly in the North Western Himalayan belts.

1.9. Special efforts are needed for data base management of fruits i.e. area, production, exports, etc.

1.10. Promotion of frontier technologies (Hi-Tech horticulture) like high-density planting, use of micro-irrigation, fertigation, integrated nutrient pest and disease management for improving productivity with some kind of assistance to the growers needs emphasis.

1.11. Training programmes for the farmers to educate them about the efficacy of improved/ modern techniques for increasing productivity and quality maintenance have to be taken up.

1.12. Assistance for technology dissemination through demonstrations, training of farmers, publicity through print and electronic media, use of Information Technology will have to be continued on the lines of the 'Fruits' scheme for the IX Plan.

2. **Vegetables Crops:** Vegetable crops are rich sources of phytonutrients which have protective and disease preventing properties. They contain antioxidants, and render anticarcinogenic and cardiovascular protection. The nutrients include vitamins (A, B₆, C, E, etc.), carotenoids (*beta carotene*), glucosinolates, allylic sulfides, terpenes, phytosterols, phenols, isoflavones flavanoids, thiols and indoles. Hence vegetable farming needs to be developed on commercial scale. Similarly ,efforts will have to be intensified for increasing the production of root and tuber crops and increased consumption of vegetables.

2.1 Vegetables have season of production while the consumption is all the year round. Thus, there is need for developing an integrated approach for production and availability of fresh vegetable for a longer period. Climatic variability, hi-tech

production systems, use of greenhouses etc. will be fully utilised to enhance all round availability of vegetables.

2.2 In recent years, the demand for processed potatoes has risen at a fast rate. The increase in the area and consequent additional tonnage has to be planned more judiciously to spread the potato cultivation to other regions, where the present consumption of potato is low and needs to be upgraded. To achieve higher production targets, there is need to develop new technologies to suit higher temperature and humidity conditions prevalent in western and southern regions and improve productivity in existing potato growing areas significantly. Replacement of cultivars should be taken up in targeted manner to improve productivity.

3. Mushrooms are rich source of nutrients besides being dependable source of income to the farmers. This also provides employment to landless labourers besides providing rich nutrients to vegetarian diet. Efforts have resulted in increased production but there is a wide gap in utilisation of potentiality. Further, mushroom is highly perishable and needs to be marketed with care. An integrated approach therefore needs emphasis.

4. Promoting cultivation of crops which produce higher biomass/unit area/unit time e.g. sweet potato, tapioca, elephant foot yam in areas requiring poverty alleviation and nutritional security need emphasis.

Promotion of integrated pests and disease management need to be encouraged for reducing the use of pesticides for providing safeguards against health hazards and requisite quality for export.

5. One of the officers associated with different crop projects may be designated as a Nodal Officer to monitor the progress of the programmes. The officers presently associated with such projects are Director, Indian Institute of Vegetable Research, Varanasi, Director, Central Potato Research Institute, Shimla, Director, Central Tuber Crops Research Institute, Trivandrum Crop Project Coordinator, Director, National Research Centre on Mushroom, Solan

Director, 6. National Research Centre of Onion and Garlic, Rajguru Nagar, and Director, National Horticulture Research and Development Foundation, Nasik.

7. **Floriculture:** An annual growth rate of 5% in area and 10% in production of flowers are achievable during X Plan. For this, programmes devoted to productivity improvement have to receive priority attention which would need research support for Identification of native and novelty flowers and cut foliage plants from indigenous flora for commercialization; Post harvest technology; Indeginization of greenhouse technology; Standardization of agro-techniques for exotic and domestic flowers.

7.1 Assistance for infrastructure development such as setting up of cold chain, pack house facilities, marketing network and for procurement of plant protection and farm equipment and quality planting material will have to be extended to the farmers.

7.2. Problems encountered in the domestic marketing and export trade of flowers should be addressed separately. Product diversification/value addition like extraction of pigments, essential oils, production of dry flowers, flower crafts etc. should be encouraged.

7.3. Market promotion and exploration of new markets abroad will have to be an integral component of a specialised marketing strategy. Concept of common branding of floriculture products should be promoted.

7.4. Flower-Shows should be organized regularly to strengthen domestic market. This activity needs more emphasis.

Setting up of flower grower co-operatives for co-operative marketing and input supply in flower growing areas should be encouraged.

7.5. Involvement of tribal population in the identification, conservation and exploration of novel types of flower and foliage plants is necessary.

7.6. The Model Floriculture Centres (MFC) have helped in promoting floriculture in selected states in the country. The existing ones need to be strengthened and new MFC set up in other potential areas.

8. **Medicinal & Aromatic Plants:** Out of nearly 4000 species of plants in the country that have been identified to have medicinal value, only about 20 to 30 species are being cultivated. These species are to be protected from over exploitation and the resultant problems. Sustainable production of selected medicinal plants has to be promoted on a commercial scale and those plants which are not amenable to commercial farming should be conserved in their natural ecosystem for regulated utilisation. A mission mode approach needs to be adopted for developing the sector.

8.1 Efforts should be made to promote good laboratory practices (GLP) and good manufacturing practices (GMP) of medicinal and aromatic plants for ensuring quality of the medicinal preparation.

8.2. The endangered or rare or threatened medicinal plants should be conserved in well-established gardens. Medicinal Plants Conservation Areas (MPCA) need to be identified at different regions of the country.

8.3. Database on medicinal and aromatic plants need to be developed with regards to area, production, uses, export, import, etc.

8.4. The efforts of different agencies involved in the development of these plants should be integrated. The Committee of Conservation & Cultivation of Medicinal Plants constituted under the chairmanship of Horticulture Commissioner in the Medicinal Plants Board should be entrusted with the overall responsibility of coordinating the cultivation of medicinal & aromatic plants in the country. Efforts should be made to intensify the cultivation of species of medicinal plants, which are in great demand on contract farming.

8.5. Proper training needs to be imparted to the collectors of medicinal plants from the wild. The electronic and print media should be used vigorously for the

medicinal plants so that they are not cheated by the pharmaceuticals/industrialists. The Forest Department should regulate the extraction and transportation of medicinal plants from the wild. The forest regulations which discourage the cultivation of medicinal plants need to be replaced.

8.6. The herbal gardens established during the VIII & IX Plan should serve as a repository of information as well as source of supply of good quality planting material to the cultivators. More efforts should be made for strengthening planting material and seed production system to meet growing needs.

8.7 Network of regional analytical labs should be established to facilitate the analysis of the constituents of the medicinal plants. Facilities for on farm handling, disease forecasting, plant health clinics, etc. should be created for these groups of plants.

8.8. Cultivation of medicinal & aromatic plants in green houses as well as inter-crops needs to be popularized.

Contract farming of medicinal plants needs to be promoted to safeguard against price fluctuation and ensure remunerates.

9. **Spices** : Spices/varieties available in the country, which have high production potential and better export demand, should be promoted selectively.

9.1 The availability of quality planting material should be ensured by adopting the latest technologies including tissue culture techniques through Departments, Research Institutes, Voluntary, Private Organisations and Entrepreneurs.

9.2. The unproductive gardens should be rejuvenated by replanting and adopting scientific cultivation methods.

9.3. Farmers need to be motivated to follow improved cultivation methods, including plant protection measures through field demonstration and supply of inputs.

9.4. Production of organically grown spices should be promoted and for this adequate research and development support must be ensured for its large-scale adoption at different levels and a certification programme should also be strengthened.

9.5. Statistics on area and production, market arrivals, prices, etc., need to be compiled from within and outside the country, and disseminated to the public.

9.6. Studies on cost of production and productivity, quality improvement and storage need to be conducted.

10. **Coconut:** Coconut being an important source of dietary energy, cooking media, shelter and cash income requires to be supported through programmes aimed at improving crop production, productivity and protection. Thus existing programme should be continued, and reorganised in Mission Mode.

10.1. Area expansion in conventional coconut growing areas like Kerala, Tamil Nadu, Karnataka and Andhra Pradesh is having limited scope. The emphasis in these state shall be on productivity improvement. The programme for area expansion shall, however, be continued in the North Eastern States and other non-traditional states where it could be successfully implemented.

10.2. Productivity improvement programme shall assign importance to inter/mixed cropping and mixed farming in order to augment the total income from the gardens devoted to coconut.

10.3. Soil and water conservation measures should be assigned high priority in the management of coconut garden in order to strengthen the productive capacity of the soil resource.

10.4. Special efforts are needed for promoting organic farming of coconut gardens for reducing cost of production and also to tap the growing market for organic food. Marketing support shall be extended for the profitable marketing of organically produced coconut products.

10.5. Product diversification and by-product utilisation need greater attention for enhancing the profitability of coconut farming. Special schemes are to be introduced for on-farm and community level utilisation of coconut products.

10.6. Market infrastructure and related promotional measures are to be strengthened for the marketing of traditional and non-traditional coconut products both in the domestic and export markets.

10.7. Technology transfer & HRD which will interalia cover publicity and extension activities for transfer of modern technologies to the farming community, creating awareness on coconut and its multiple products through various measures including training programmes will have to be taken up.

11. **Arecanut:** Area expansion in arecanut has to be discouraged and priority should be given for productivity improvement of the existing garden. Over a period of time the existing area under the crop should be reduced looking to market trend and vacated and used for crops which will contribute to food/nutritional security of the people.

11.1. Available technologies on cropping / farming system aspects of arecanut may be transferred to the farming community so that productivity per unit area of land is increased through diversification of crops to avoid dependency on a single crop with a limited potential for export and is dependent on chewing habit of the people. Large number of demonstration plots or multicropping /mixed farming system need to be taken up.

11.2. The farmers should be made aware of the limited scope for the crop on a long run so that they can slowly shift to equally remunerative and socially beneficial perennial / annual crops on a competitive advantage basis in the context of trade liberalization and WTO regime.

11.3. In order to minimize the harmful effects of arecanut consumption in the form of pan masala, pan parag, gutka, etc. The industry involved in the manufacture of these items should be taxed substantially. Statutory warning should be displayed on these products as in the case of cigarette and alcohol.

11.4. There is steep price fluctuation in the crop which needs to be moderated. Market promotional activity has to be strengthened. Godown/storage facilities to co-operative societies shall be extended.

12. **Oil Palm** : Oil palm area can be expanded to the extent of 40,000 ha in potential States only. Planting material production of 8 million seedlings over a period of 5 years should be taken up in a staggered manner.

12.1. Waste land utilization for oil palm cultivation which is an approved item needs simplification of procedures. Watershed management in the uplands of oil palm growing region may be confined with soil conservation programme.

12.2. Drip irrigation should be promoted in all the oil palm growing areas to avoid excessive use of water and achieve higher productivity.

12.3. Maintenance of seed gardens should be entrusted with only competent people through capacity building.

12.4. Setting up of plant health clinics and strengthening leaf nutrient analytical laboratory in Andhra Pradesh, Karnataka and Tamil Nadu need consideration.

12.5. Oil Palm cultivation has to be promoted to narrow down the existing deficit in the availability of vegetable oils. This is possible if a price assurance mechanism for farmers is in place. Mechanism adopted in the tea by providing subsidy, should be adopted. Mechanism of MIS operation has some limitation, of time.

12.6. Processing facilities in Tamil Nadu, Goa, Gujarat and Orissa should be set up on a priority base. Since there is long delay the farmers are loosing confidence and fruits are not procured from farmers thereby causing loss to farmers as well as industries.

13. **Cashewnut:** Steps will have to be taken to increase the raw nut production by area expansion and productivity improvement programmes to bridge the gap in the local industrial demand of 1 million tonnes, about 50 per cent of which is being imported now.

13.1. The productivity increase should be aimed at by rejuvenation of old orchards and replanting unproductive plantations and consolidation of area by gap filling with high yielding varieties both in the public and private sectors.

13.2 The qualitative aspects of processing will have to be attuned to modern trends, consumer preference and branded packages.

14. **Cocoa:** Cocoa has to be promoted as a companion crop in coconut, oil palm and arecanut plantations. Private farmers have to be encouraged to establish seed garden/progeny orchards so that adequate quality planting material becomes available for fresh planting.

14.1. Adequate steps would be needed for technology dissemination in the production and processing areas. Farm level processing of beans to be demonstrated and devices need to be popularised.

15. **Tea:** With the world supply position steadily increasing, our target should no longer be production oriented, but on improving productivity, value addition and marketability. Special emphasis has to given for enhancing productivity in the small holder sector.

15.1 In the post liberalization period, the main thrust should be on quality improvement so as to make Indian tea competitive. Apart from this, there should be a continued effort towards further increasing the profitability of tea gardens through replanting/rejuvenation & mechanization of operations. Special emphasis needs to be given on irrigation and drainage in tea gardens.

15.2. Special efforts have to be made for improving the market promotion and marketing capabilities, improving the packaging and reducing package cost and for value addition to Indian tea and tapping overseas market.

15.3. Conversion to organic system of tea growing will have to be encouraged.

15.4. Information technology needs to be used effectively for making available ready information to the tea industry and for promotion of our produce in other markets.

15.5. Vigorous support will be needed to the promotion of Indian value added teas in overseas markets.

15.6. Tea-processing facilities need to be augmented by construction of new tea factories to meet the processing needs of additional products. Product diversification, creation of facilities for dual manufacture of tea (orthodox and CTC) need to be encouraged. The existing factories require modernization in order to ensure production of clean tea without any trace of foreign material in the end product.

15.7. The competitive advantage of tea industry depends primarily on the quality of human resource. Therefore, HRD inputs need to be augmented for the future developments of the tea industry.

16. **Coffee:** With 80% of the Indian coffee being exported, an export oriented growth strategy will have to be pursued in the next few years. In order to gain more market share in the export market, it will be necessary to change the production mix of arabica and robusta in favour of arabica where India could be more competitive.

16.1. Even though, India produces the best *robusta* in the world, it will find difficult to compete with its Asian neighbours, i.e. Vietnam and Indonesia in respect of cost of production. Hence steps will have to be taken to increase the productivity and lower the cost of production. Similarly, R&D efforts supported with aggressive extension approach would be necessary to improve the production of arabica, Promotion of on-farm and off-farm processing would be necessary.

17. **Rubber:** Efforts would be needed to achieve global competitiveness with respect to quality and cost and market development for the domestically produced rubber. It would also be necessary to promote natural rubber as a green commodity *vis-à-vis* its synthetic counterparts.

17.1 Agroclimatic zoning, enhanced productivity, better disease/stress management, sustainable farming systems, higher ancillary income, environmentally sound processing methods and improved product quality would be needed for achieving competitiveness and sustainability.

17.2. It would be necessary to generate additional income from rubber plantations through tapping ancillary products such as rubber wood, honey, rubber seed and also by resorting to inter-cropping with annual and perennial crops. Productivity increase through replanting and rejuvenation with better varieties has more scope than horizontal area expansion.

17.3. In the field of processing and marketing, thrust will have to be given for quality improvement, reduction in cost of processing, value addition and for promoting environmentally sound processing methods while providing market information on rubber and rubber wood. Strengthening of research and development and also providing testing support to the manufacturing industry and providing market information on rubber products will be necessary.

17.4. Promotion of rubber wood as an eco-friendly timber and improving processing and marketing of the same are important for improving the economic viability of rubber plantations.

17.5. As market development for rubber is considered very important in the present context, it will be necessary to encourage manufacturing of export-oriented products having locational advantages. Price stabilisation fund which could be used to protect growers at the time of crisis to ensure fair price needs to be established.

17.6. Increased community participation would be necessary for creation of infrastructure and strengthening of existing processing and marketing channels in order to cater to the needs of export sector.

17.7. Sanitary and phytosanitary measures play an important role as non-tariff barriers in the WTO regime. With the liberalized import and export of commodities, the risk of entry of new pests and disease is higher and hence steps to be taken to avoid such risks.

18. **Bee-keeping:** The Bee-keeping programme will have to be implemented on a Mission Mode approach with due emphasis on crop pollination.

18.1. A National Bee-keeping Development Board constituted to oversee the implementation of bee-keeping programme and to coordinate the bee-keeping activities in the country need to be strengthened with statutory status having secretarial assistance for the same.

18.2. The Khadi and Village Industries Commission (KVIC) took major initiatives for the development of bee-keeping in the country. It has an extensive network of State Khadi and Village Industries Boards, Bee-keeping Cooperative Societies and registered Institutions. The KVIC has nearly 50 years experience in extension bee-keeping. It also has a fairly developed R & D Wing and also extension system of training and education in bee-keeping. However, their thrust is on rural employment and get less focus on crop pollination. Whatever infrastructure and expertise is thus available with KVIC should be utilized. Appropriate strategies are needed for

effective coordination among different agencies involved in bee-keeping and prevent duplication and overlapping of efforts.

18.3. Adequate efforts need to be made to popularise the use of honey bee both for pollination as well as for producing honey not only in the field of horticulture but also in all other areas like crop production and Agro forestry.

18.4. An accurate method of registering beekeepers should be adopted so that no beekeeper come more than once in the list and no beekeeper is deleted. Registration should be done to the beekeepers on selected criteria. A person having honeybee colonies for more than three years or a person having more than 25 bee colonies or to whom bee-keeping and bee-keeping related activity is a full time job should be treated as a registered beekeeper.

18.5. Adequate flora for sustaining honey bee colonies is essential. Therefore, nectar bearing plants should be encouraged for plantation purposes by the agencies involved in raising of plantations.

18.6. Plant species like *Plectranthus regosus* which is available in the hills of Jammu and Kashmir, Himachal Pradesh and Uttaranchal yield finest quality of honey. Such species need to be conserved and promoted. The Rubber Board has been promoting bee-keeping as a part of their development programme for tapping rubber honey.

18.7. Floral maps should be prepared in consultation with the Agricultural Universities, KVIC by the State Designated Agencies (SDA).

18.8. Awareness should be created about the harmful effect of indiscriminate use of insecticides and pesticides on honeybees. The concept that honeybees are the friends of the farmers need to be promoted and the farmers advised to safeguard the honeybees.

18.9. Since information on wild bees (*Apis dorsata*) in terms of domestication and honey harvest is not sufficient, research on these bees need to be conducted.

18.10. The good work on the development of bee-keeping done by the Central Bee research & Training Centre (CBRTI), Pune need to be disseminated for the benefit of the beekeepers. The Institute needs to be strengthened in terms of staff and infrastructure for addressing the emerging research and development problems on bee-keeping. ICAR may closely work with CBRTI for development of technology.

18.11. Better coordination and linkage will have to be developed with all user agencies and training facilities to be created at different levels.

18.12. Suitable bee species to be identified and colonies to be distributed among farmers. It is also necessary to maintain registers of bee colony keepers.

18.13. Market promotional activities require major emphasis to make bee keeping remunerative, which would finally enhance the productivity.

18.14. Standard specifications for honey and other bee products have to be developed, and popularised so that proper standard are maintained.

B. ISSUES RELATED

19. **Exports & Imports:** Among horticultural commodities, India is exporting fresh fruits, vegetables, processed products of fruits and vegetables, cut & dried flowers, medicinal and aromatic plants, seeds, spices, cashew kernels and their products, tea and coffee. Steps will have to be taken to capitalize the strengths of Indian horticulture for increasing the foreign exchange earnings and better remuneration to the farmers.

19.1. Since most the Indian potatoes are harvested in spring, when fresh potatoes are not available in Europe, with a large production base and a sound

export strategy, India has opportunities to exploit fresh potato as well as seed potato exports.

19.2. For promoting exports of flowers, additional cargo facilities should be created at the airports with special provision for flowers. Air connection with subsidized air freight rates from production zones would be necessary, particularly to capture the European Market.

19.3. The regions around Bangalore, Pune and foot hills of Himalayas are suitable for growing flowers in greenhouses. Efforts should be made to encourage the development of export oriented floriculture in these regions.

19.4. The potential for foreign exchange earning by India from the exports of medicinal and aromatic plants is estimated to be over U.S. \$ 3000 million per annum. The exports of these plants and their products have a tremendous potential particularly to advanced countries in Europe, U.S.A. and Japan. The demand for such plants is increasing both in developing and developed countries. The international market of medicinal plants related trade is estimated at US \$ 60 billion per year having a growth rate of 7 per cent per annum. Since, India is one of richest source of medicinal plants as well as traditional systems of medicines, it is necessary to make sustainable use and export of such plants or plant products in which India has the competitive advantage. Steps will have to be taken to promote the exports in value added forms / formulation of these plants.

19.5. India has a long history of producing and exporting spices. The world trade in spices is estimated around 0.45 million tonnes. In India, spices exports have been consistently moving up during the last one-decade with an increase of 210% in quantity and 622% in value during this period. All out efforts would be necessary to sustain the growing trend of export of spices.

19.6. India is presently importing commodities like arecanut and cashewnut and cocoa, which is draining the foreign exchange. Since ample potential exist in the

country for the production of these crops, efforts need to be made to improve their productivity.

19.7. The Country is importing huge quantity of vegetable oils, of which palm oil accounted for nearly 1.2 million tonnes. Besides, there is huge demand for vegetable oil in the country. Hence, efforts will be needed to improve the production of oil palm in the country.

19.8. The Indian tea industry will have to evolve strategies in terms of quality improvement, market intelligence and market promotion to counter the competing forces unleashed by globalisation.

19.9. Quality control laboratories should be set up to help exporters to ensure that the commodities being exported meet international quality standards.

19.10. International quality standard for various commodities should be made known widely to ensure quality produce both for domestic and export market.

19.11. Value added products are now attracting more of export market like oleochemicals, oleoresins, essential oils and hence development of new value added products in spices, coconut, cashew, tea, coffee will go a long way in export promotion. Newer technologies need to be developed. Similarly newer processed fruits, vegetables, ready to serve food items need to be developed and popularized.

19.11. Better understanding of domestic and export trade, and to identify potential areas of marketing. All major towns / mandi dealing with marketing of horticulture commodities need to be linked through Market Information Service, preferably through the Internet.

20. **WTO Issues:** Since, India is a signatory to the WTO and bound by the agreements, it is obligatory to abide by the regulations of WTO. In the field of horticulture in which India has the competitive advantage focussed attention

should be paid to exploit such advantages to compete in the world market in terms of price and quality.

20.1. The agreement on agriculture seeks to liberalise the world trade in agriculture so as to make it free from Government measures that inhibit the trade movement thereby leading to inefficiency of the sector. Under this agreement there are different ways of subsidising farmers through Government interventions, which need to be looked into.

20.2. In order to deal with the export interest of horticulture produce, it would be necessary to identify few commodities which have potential for exports from India such as litchi, mango, guava, grapes, etc. As a first phase in this direction, the pest commonly found in these commodities with respect to their areas of production of export quality goods could be listed out.

20.3. Under SPS Agreement the Government may choose measure to provide higher level of protection and relevant international standard subject to conformity with the risk assessment and risk management approach. In view of this it would be necessary to collect sufficient information regarding the pest infestation and the risk i.e. the potential of causing hazard to human health. Similarly to encounter the import threat of apples and strawberries, similar data could be used in scrutinizing the application before granting permission for import to member countries.

20.4. Indian export basket consisting of agro-based products and manufacturing items suffers from considerable supply related problems. So far as the agro based products are concerned, the question of surplus is the most critical. In case of manufacturing products, there are serious problems of competition relating to high cost, inefficiency in production, outdated technology, problems related to delivery schedule and product specification. These issues need to be addressed and resolved.

20.5. The bound rate on natural rubber should be increased to a reasonably higher level to be on par with other agricultural products. It should be examined if this could be done through the provisional safeguard measures, in the wake of the QR removal.

20.6. Japan, Australia and China have banned imports of mangoes and grapes from India on account of presence of certain fruit flies. China has imposed a ban on grapes for a species of fruit fly that does not even exist in India. These issues should be taken up with the concerned Governments so that Indian exporters are not harassed unnecessarily.

20.7. The European Union (EU) has introduced regulations on pesticide residue levels in fruits and vegetables imported from different countries. Indian exporters are required to comply with the maximum pesticide residue levels for exporting their products to the EU. The exporters should be made aware of the regulations and steps should be taken to ensure that the norms are adhered to in the production areas.

20.8. The major problem which is being presently found in mango is stone weevil, oriental fruit fly. In case of grapes the problem related to mediterian fruit fly is one of the factors for influencing the grape export to European countries. Necessary steps need to be taken to address these problems. It would be necessary to identify pest free areas with respect to the economically important crops.

20.9. Presently the system of issuing phytosanitary certificate includes a statement that the product is free from the relevant pests and diseases. In this regard it would be necessary to generate data in terms of the pests and diseases presently found in Indian horticulture produce. This data should include the geographical area, management procedure of the same along with the method of

detection of the above pest. Once the system is established the data could be forwarded to the other member countries which may be interested in importing Indian products.

20.10. The final quality of any horticulture produce is the outcome of practices being followed at primary production, harvesting and post harvesting level. Under Codex Alimentarius, various hygienic codes have been developed for dealing with the primary production, harvesting and post harvesting of fresh fruits and vegetables. As a first step these codes should also be implemented through the extension network for the identified crops having export potential.

20.11. An institutional mechanism need to be evolved to ensure that there is a continuous interaction between the ICAR institutions NHB, DFPI, APEDA, etc. so that latest developments are brought to their notice and research is carried out in an objective manner.

20.12. There is also need to develop a Quality Assurance Machinery which ensures compliance with food safety & consumer protection requirements to have a system to identify supplier and products not complying with food safety laws.

India should effectively participate in the meetings of Codex Alimentarius, UN/ECE etc where the standards for horticultural products are finalised.

20.13. There is an increasing demand for organically produced commodities in the international market. Hence, there is a need to promote organic farming in production of different horticultural commodities, particularly in crops like spices, cashew and commodities where our export trade is sizeable.

21. **Infrastructure for Horticulture:** The National Horticulture Board should act as a catalysing organisation in the efforts to achieve all-round development of horticulture sector, i.e. fruits, vegetables, floriculture and medicinal plants. Emphasis should be laid on increasing production by providing technical and

financial support to the agencies involved with the objective of achieving complete nutrition security of the people.

21.1. Adoption of appropriate post-harvest management technologies like grading, packing, storage, transportation, marketing, etc. should be encouraged for maximizing returns to the farmers/growers.

21.2. Feasibility studies should be conducted for creating marketing infrastructure, setting up of processing plants, cold storage, transportation system etc. for raw and processed horticultural products and other related fields. Based on these studies viable projects are to be developed and executed on a time bound basis.

21.3. Promotional activities need to be taken up through mass media for encouraging the consumption of horticultural products as protective food. There is need to stimulate private investment in the fields of infrastructure, marketing and research and development and also in the production sector to ensure the availability of produce for efficient processing and exports.

21.4. There is need to develop horticultural produce tailored to specific end uses like table consumption, liquids, beverages (alcoholic and non-alcoholic), health drinks, pulp & other semi-liquids, culinary products, pharmaceuticals, oleoresins, cosmetics, perfumery and confectioneries. In India, so far the entire emphasis has been only for table consumption.

21.5. For commercialization of horticulture production (quality production with scientific and technology inputs), the post-harvest management (development of infrastructure, information dissemination, extension, etc.), backward linkages through contract farming, etc. and marketing related programmes, with value addition and product formulation would be required.

22. Standards For Horticulture Produce: The existing standards for horticulture produce should be reviewed and updated / harmonized with the latest/ international standards and also to be implemented strictly.

22.1. India should ensure its presence during the finalization of standards relating to the horticulture products at the international level such as Codex, UN/ECE to safeguard our interest in finalising international standard.

22.2. Wherever IPR has not been granted it needs to be addressed on priority so that the country will draw all benefits out of it.

22.3. Full fledged Quality Assurance Machinery should be developed to exploit the potential for export of horticultural crops, and to safeguard against the import of sub standardised material.

23. HRD in Horticulture: Since horticulture sector is highly technology driven it will be necessary to upgrade the skills of the farmers, field functionaries as well as entrepreneurs. Besides in order to generate skilled manpower at the lower and middle levels it will be necessary to import training programmes at the gardeners and supervisors level with focus on hands-on training.

23.1. The departmental staff and field functionaries would require periodic updating of knowledge and through training in country as well as abroad. Therefore, there is an urgent need to establish central training institute for horticulture

23.2. The infrastructure created and momentum generated during the Ninth Plan on the development of human resources in horticulture need to be fully utilised during the next Plan period.

23.3. Since , horticulture is technology driven and there is demand for technically competent manager. Therefore, it would be appropriate to start a management course in horticulture as started for agriculture in IIM, Ahmedabad.

24. Organizational set up in Horticulture

24.1. Strengthening of Horticulture Division, Ministry of Agriculture:

Considering the need for horticulture development the financial allocation of Division of Horticulture has been increased many fold and is far more than some Departments. These are likely to further swell during X Plan. There is also a need for compatible support in emerging scenario. Therefore, a separate Department of Horticulture needs to be created under the Ministry of Agriculture like DARE, DFPI etc. Till such time the above proposal is agreed to and implemented, need based strengthening of the Division of Horticulture may be taken up on urgent basis.

24.2. Fresh review of the proposal approved earlier by the Cabinet Secretariat for forming a Department of Horticulture under the Ministry of Agriculture keeping in view the large financial allocation, vast expansion made and the future scope which horticultural crops offer in alleviating poverty, improving employment potential, nutritional security and above all earnings of foreign exchange.

24.3. The Post of Horticulture Commissioner needs to be upgraded and made equivalent to Agriculture Commissioner to ensure effective co-ordination of horticulture with different organizations at the central and state level.

25. Setting up of Palms Development Board: At present, Coconut Development Board is looking after the work relating to policy planning, formulation & implementation of programmes for promoting coconut cultivation, product diversification and by-product utilisation, marketing, technology development and transfer, training, etc. The Board has infrastructure spread over in various states and is concentrating only on a single crop. In order to

effectively and efficiently utilise the available infrastructure and human resources the Board could be assigned the role of development of all palms, such as, coconut, arecanut, oilpalm and palmyra palm and renamed as 'Palms Development Board'. Most of these tree crops are grown in similar agro-climatic conditions and have commonalties in product and post harvest management. The required additional technical support and infrastructure may also be considered to strength it adequately. For facilitating this, it would be necessary to modify the Coconut Development Board Act, 1979 as has been done by the Commerce Ministry in reorganising Cardamom Board into Spices Board. The existing technical personnel of the Board who are specialised in the field of coconut may be imparted required training so that they acquire necessary skills/expertise in the field of other palms. In the event of consideration of this Board the Arecanut and Cocoa will have to be deliked from the respective Directorates. Cocoa is a crop usually grown under coconut and / or arecanut.

26. **Creation of Separate Commodity Directorates:** Fruits and vegetables being important horticultural crops contributing to the nutritional security of our population and occupying nearly two thirds of the total area under horticultural crops have major programmes for development all over the country. To give these crops focussed attention, it would be necessary to create a Directorate of Fruits, Directorate of Vegetable and a Directorate of Medicinal & Aromatic plants.

26.1. Commercial floriculture has emerged as an important crop diversification option in horticulture through the developments in the IX Plan. Several programmes by different agencies are being implemented in various states besides the programmes of Govt. of India. Therefore, it would be necessary to create a separate Directorate of Floriculture to be set up during X Plan to act as the nodal agency for development programmes in this sector.

27. **Strengthening of NHB:** In view of the major role being played by NHB for integrated development of horticulture and particularly for infrastructure and technology development for post harvest management, the set up of NHB needs to be suitably strengthened. It would be necessary to open field offices in the

newly created states viz., Chattishgarh, Jharkhand and Uttranchal. There is also an urgent need to review the function and priority for reorientation so that board can meet all challenges.

28. Setting up of Horticulture Planting Material Development Authority: Most of the planting material of horticulture crops is vegetatively propagated, which involves the risk of disease transmission. Added to this, result of poor quality, genetically inferior varieties is also assurable only after 3-5 years when all the investments have been made. Therefore, it is essential to ensure the quality of planting material and seeds of horticultural crops. At present, there is no legislation to regulate production and sale of planting material. Some of the states have enacted Nursery Registration Act, but enforcement of all is also not adequate in absence of a suitable mechanism. Therefore, there is an urgent need to develop a mechanism to ensure quality of the planting material of different crops both for domestic market and export at national level. For this purpose, a statutory body Horticulture Planting Material Development Authority (HPMDA) should be established which should view all the aspect of planting material and seeds of horticultural crops.

29. Setting up of Standing Committee/Councils: Standing Advisory Councils with members drawn from Research institutes, SAUs, Central & State Development Departments, farmers representatives, other central agencies working in the field of post harvest handling, processing and export may be set up separately for (i) Fruits (ii) Vegetables (iii) Floriculture (iv) Palm, Cocoa and Cashew (v) Tea, Coffee and Rubber (vi) Spices and Medicinal & Aromatic Plants, for advising the Government on policy planning formulation & monitoring.

30. Creation of National Board for Hi-Tech Horticulture (NBHH): Hi-tech horticulture and precision farming have to adopted to improve productivity in time frame which include fertigation, green house cultivation, etc. National Committee on Use of Plastics in Horticulture (NCPH) has been providing support for drip irrigation, green house etc. with 17 plastic development centres located in most of agroclimatic regions.

30.1. The efforts have succeeded in creating awareness, which has improved productivity. The secretariat of National Committee on Use of Plastics in Horticulture (NCPH) is ill equipped and is unable to provide required support being demanded. Therefore, to safeguard the interest and make hi-tech horticulture more adaptable it would be essential to strengthen NCPH giving a statutory status of Board and all the existing Plastic Development Centre (PDC) could be entrusted with responsibility of hi-tech horticulture and precision farming by redesigning them as Centre for Development of Precision Horticulture (CDPH)

31. **Organisations under Ministry of Commerce:** The programmes relating to research and development of cardamom is presently being handled by the Spices Board. Since cultivation is the responsibility of the Ministry of Agriculture, the work relating to research & development of cardamom should come under the purview of the Ministry of Agriculture. Recommendation to this effect was made by the Standing Parliamentary Committee of Ministry of Commerce & Industry during 1999-2000. The Spices Board should concentrate on post-harvest handling of the spices, quality control, processing and export promotion. Hence, there is need for redefining the allocation of work to this Board.

32. Assessment of the existing **regulatory framework of seed and planting material** required for horticulture and plantation crops, indicates that the Seeds (control) Order, 1983 of the Govt. of India has become out dated. In view of the growth of the sector and to make the systems more user friendly, it would be necessary to replace the earlier order of 1983.

33. As all the major programmes for horticulture development are being implemented at field level by the state directorates, it is absolutely necessary that a separate Directorate of Horticulture is created in the states. The present structure of the Directorate of Horticulture, Govt. of Karnataka can be adopted as the model.

34. **Planting Material:** At present, there is no legislation to regulate production and sale of vegetatively propagated planting material of most

horticulture crops by nurseries. A mechanism to ensure the quality of planting material needs to be developed through registration and quality control.

34.1. Availability of quality planting material is essential for the growth of the horticulture sector. It is all the more relevant for tree crops with long gestation period.

34.2. Latest hi-tech measures like tissue culture need to be promoted for making available good quality planting material in large quantity at different locations.

34.3. There are several commercial micro-propagation laboratories existing in India which are not being utilised fully either due to lack of marketing or high cost of production. Lack of market is due to high capital cost and high running cost of the existing labs. The functioning of the existing units need to be evaluated for technology auditing, energy auditing and production auditing.

34.4. In many of horticultural crops, excellent cultivars are available abroad thus in selected cases import of planting material of proven quality should be encouraged for trial in local conditions.

35. **Hi-Tech Horticulture:** Hi-tech horticulture refers to the technology requiring high investment with potential to provide high returns, is inevitable to meet the challenge of increasing the productivity levels of horticultural crops having improved quality standards, to meet both domestic and export demands. Hi-tech interventions includes micro-propagation, micro-irrigation, fertigation, protected cultivation, organic farming, application of GIS and remote sensing, bio-intensive integrated pest management, precision farming, etc. To achieve the success in high-tech horticulture vertical integration, effective linkage, credit support and policy are essential. Hi-tech interventions should be closely linked with marketing arrangements for the horticultural produce.

35.1. Micro-propagation for large scale production of quality planting material of horticultural crops have been practiced but several commercial micro-propagation labs, existing in India, are not viable. Lack of market coupled with

high capital cost added with high running cost have attributed to poor performance of some commercial units. However there are successful units also producing plants in large scale. Thus, functioning of the existing units needs to be evaluated for Technology auditing, energy auditing and Production auditing, these auditing could be conducted by reputed agencies having specialisation in the field.

35.2. At present, over 25 labs need revival and correction of the existing problems. This would help the nation in producing more number of plants at a lower price, making the plants affordable by farmers. This also increases the capacity of production without additional investment and serves the industry better. Necessary steps should be taken in the existing laboratories to ensure quality control of the planting material.

35.3. With the increase in awareness and demand for tissue culture plants, it is most likely that many laboratories will be mushrooming in India in the private sector. In order to maintain certain level of quality, it would be essential to follow a system of accreditation. The first accreditation system can grade the labs into four categories such as A, B, C & D based on the defined parameters essential for Good Manufacturing Practice (GMP). Due care should be taken to maintain the health of the mother plants. Freedom from virus and other disease causing organisms should be ensured through periodical testing. Since electricity charges account for a substantial percentage of the overall cost, it would be necessary to provide the energy on competitive cost so that industry could be competitive.

35.4. There is need to promote elite nurseries at extensive location in the country to ensure the availability of quality planting material. Support for establishing hi-tech nurseries in the Public as well as Private sector need to be provided. High density planting need to be encouraged for crops which have responded favourably in terms of yield and management measures.

35.5. Micro irrigation has proved, beyond doubt that it enhances the yield, reduces water need, improves overall quality of water and the system is best option for vertical growth. Interestingly, saving of water through drip is to the tune of 50 per cent meaning thereby doubling of area under irrigation with same quantity of water. Saving of water is creation of water. Thus, investment for this technology would be saving on cost of irrigation, which is currently Rs. 50, 000 per hectare. Therefore, this technology require to be fully supported which would increase productivity.

35.6. Efforts should also be made to integrate all the programmes which aim for water harvesting as well as the water conservation.

35.7. Since the availability of good quality materials is essential for efficient functioning of micro-irrigation systems, it would be necessary to ensure the manufacture and supply of drip components which have BIS certification. Similarly, there should be adequate facilities for post-installation maintenance of the systems. There is need for encouraging cost effective automated micro irrigation systems for enhancing the efficiency of micro irrigation technologies. In developing automation devices special attention would need to be given to water application problems in heavy and salt effected soils. To ensure that quality aspect is not compromised by the Industry, there is need for establishing testing facilities on an adequate scale.

35.8. Productivity level can be pushed further by 30 to 70% through fertigation which applies water along-with fertilizers and other nutrients through drip-Irrigation.

35.9. The fertilizers which use nitrate as resource of nitrogen, phosphate as the source of P and potassium nitrate as the source of K and N are chloride free fertilizers which are expensive (cost 5 to 6 times the cost of water soluble conventional fertilizers) but still are cost effective for high value crops like grape, strawberry and crops grown in green houses. The manufacturing plants for such fertilizers require large capital investment and require large production capacities.

Therefore, it will be necessary to continue to import such fertilizers, and encourage manufacturing in the country.

35.10. Water soluble fertilizers in different grades can easily be produced in liquid form using conventional solid fertilizers available in the market (Urea, D.A.P., Potash) such as 8 : 8 : 8, 12 : 6 : 6 etc. grades and supplied to farmers in cans which could be applied through water very easily. Since, these fertilizer grades are not included in the Fertilizer Control Order it cannot be manufactured and marketed. Alternatively, fertilizer grade Phosphoric Acid can be made available to be used for the production of liquid fertilizers with high concentration of N, P and K. This will bring down the cost of Liquid Fertilizers. Presently fertilizer grade Phosphoric acid is imported in bulk by the large fertilizer manufacturers and is not available to small manufacturers of water soluble liquid fertilizers. Further, subsidies are available on fertilizer but not on liquid fertilizer which reduces the cost effectiveness although fertigation provides 50 per cent savings of fertilizer. Therefore, there is a need to review the Fertiliser Control Order and promote support.

35.11. With the increasing pressure on land and other natural resources, deployment of greenhouse technology as well as protected cultivation through plastic mulching, low tunnels etc. has become inevitable. There is ample scope for promoting this technologies. For promoting green houses, it would be necessary to ensure the availability of plastic films of the right quality to the farmers. Technology require high investment and produces 4-5 times yield, and make it possible to grow crop out of season. This technology require to be supported with financial assistance to farmers.

35.12. Organic farming is a holistic approach for eco-friendly production system, is emerging as a potential sector in the horticulture. Market for organically grown produce is growing more than 15 per cent annually. The weakness, low use of fertiliser and pesticide, could be converted onto opportunity by adoption of the system. This system also ensures sustainability coupled with soil health, human health and environmental health. Therefore, there is an urgent need to promote

organic farming in horticultural crops by providing technological and financial support.

35.13. Precision Farming, which involves the judicious use of inputs like water, fertilizers, plant protection chemicals and also time will have to be promoted during the Plan period for optimizing the use of resources for better output in sustainable manner.

35.14. Bio-control measures can be promoted in the horticultural sector profitably. There is need for developing a mechanism where the farmers can produce the bio-control agency locally.

35.15. Applied research as well as imparting training on hi-tech horticulture should be pursued for rapid development and dissemination of the technology to meet the demands of the horticulture sector. In doing so the network of Plasticulture Development Centres should be strengthened, expanded and should emerge as Precision Farming Development Centres (PFDC).

35.16. Remote sensing technology and Geographical Information System should be adopted for generating database of coverage and production of horticultural crops. Pilot scale studies can be taken up for crops like mango, apple, banana, coconut, potato, onion, chilli and litchi.

36. **Credit Support Risk Management:** Efficient credit management is vital in horticulture considering the high investment, longer gestation period, etc. Currently, most of the horticultural crops have competitive advantage but under continued open economy, more competition is expected. To be competitive, level playing field is essential, where credit support system on competitive cost has to play a vital role. Current support system of credit is not only costly but inefficient, inadequate and untimely. Therefore, there is need for efficient credit support which should encourage investment to achieve higher production.

37. A comprehensive **Crop Insurance Scheme**, presently being implemented for agriculture has plan to cover more and more horticultural crops

in future. But this scheme is area based and covers the risk in area uniformly which do not encourage investment. Horticultural crops which are more cost intensive require risk coverage on individual basis. Therefore, insurance for horticulture need different approach which should encourage investment and coverage as per the capacity of an individual

38. X Plan Thrusts And Strategies: Horticultural crops have already demonstrated their role in terms of their potential in increasing income per unit area, generating additional employment opportunities, providing sustainable income to small, marginal and tribal farmers and earning sizeable foreign exchange through exports and savings through import substitution. The VIII and IX Plan programmes have greatly helped the development of horticultural crops, resulting in a considerable increase in production, productivity, as well as export. Still there are several crops and areas which need strengthening, so that horticulture sector could be more competitive to face the present situation of global trade.

38.1. The development strategy for horticulture would addresses all the issues starting from the production activities to marketing of the final production is essential and vital to augment production and provide on farm and of farm employment. Therefore, thrust of the X Plan should be on the integrated development of horticulture in Mission Mode to ensure adequate appropriate, timely and concurrent attention to all the links in production, post-harvest and consumption chain which should maximise ecological and social benefit from investment and promise ecologically sustainable intensification, ecologically desirable diversification and employment

38.2. The thrusts and strategies proposed to achieve the above goals during the X Five Year Plan would include Improving production, Improving productivity, Reducing cost of production, Improving quality of products for exports, Value addition, marketing and export, price stabilization, strengthening of organizational support, human resource development and addressing relevant policy issues.

39. **Other Issues:** The following policy issues need to be considered for implementation during X Plan period for fully exploiting potential of horticultural crops which are earning valuable foreign exchange and also providing livelihood security to the vast population of the country:

39. 1. Create facilities for enhancing shelf life of fruits such as mango, grape, litchi through use of controlled / modified atmosphere / reefer containers .

39.2. Horticultural produce should also be taken under Hazard Analysis Critical Control Points (HACCP) Certification programme, e.g., APEDA for certification under the HACCP Quality Management tool in Andhra Pradesh and Tamil Nadu.

39.3. Coffee is the largest traded commodity in international trade next to petroleum products. As such it plays a very important role in our national economy. However India's share in world export of coffee was only 2.0 and 4.7 % during 1991-92 and 1998-99 respectively. Concerted efforts need to be made for a sustained export growth of coffee.

39.4. Spices exports have been consistently moving up during the last one-decade with an increase of 210% in quantity and 622% in value during this period. However the export has shown a decrease of 10 per cent in volume. During 1998-99, in the total spices export earnings, pepper contributed about 36.3 per cent followed by spice oils and oleoresins in terms of value. The value added products in the export basket constitute 37% of the total. More emphasis should be laid on export of value added spice products in which India has competitive advantage.

39.5. The basic principles of WTO agreement are, non-discrimination, reciprocity, market access and fair competition. Since, India is signatory to WTO agreement, it has to fulfil certain agreements under WTO regime. Hence, emphasis needs to be given on creating awareness and implications of WTO regime among horticulture entrepreneurs as well as small and marginal farmers.

39.6. As per the agreement on agriculture, the gain or loss of a country as a result of liberalization will largely depend on achieving the market accessibility through providing the green box subsidies, which can be allowed under the agreement. In case of manufacturing products, there are serious problems of competition relating to high cost, inefficiency in production, outdated technology, and problems related to delivery schedule and product specification. As a long-term measure, focused attention needs to be paid to efficient horticultural cropping zones not only to achieve cost efficiency in production but also to attain international quality standards prescribed by the various importing countries.

39.7. Sanitary and Phyto-sanitary standards already available in India for fresh horticulture produce should be immediately harmonised with the international guidelines and if higher level of measures is required, the scientific justification for the same should be documented at the earliest.

39.8. Japan, Australia and China have banned imports of mango and grape from India on account of presence of certain fruit flies. China has imposed a ban on grape import for a species of fruit fly that does not even exist in India. Australia desires to have complete details about pest management practices in India and a ban can only be lifted after signing of a MoU on mutual recognition of pest management practices. US rules governing import of fresh fruits and vegetables are very stringent. USDA gives clearance only after detailed tests involving inspection of the production areas. Efforts should be made to resolve such issues with mutual consultations.

39.9. Various chemicals and their residue levels have been prescribed, differ from country to country within the EU with the result that there are no harmonized regulations in this regard and no intra-EU trade exist for horticulture commodities like gherkins. This is restricting free flow of trade in horticultural products. Such non-tariff barriers are required to be resolved.

39.10. The EU has prescribed maximum levels of pesticide residues in honey and these are required to be tested before exports to the EU. This is practically difficult keeping the Indian conditions in mind where honey is required to be collected from different sources before being packed. One may not be surprised if India sees a ban on exports of honey to the EU sooner than later . Such issues need to be suitably resolved so that export requirements are met.

39.11. In the context of removal of quantitative restrictions and WTO regime there are a number of factors, which govern the competitiveness in the global trade, they are - lack of range of varieties; pre harvest practices to control post harvest losses; loss of produce at the primary level; lack of adherence to maturity indices; lack of facilities for physical and chemical treatment after harvesting; lack of post harvest infrastructure and logistics.

39.12. Lack of data and awareness of such factors greatly hampers the process of withstanding global competition in terms of price and quality of horticultural produce. Efforts are, therefore, needed to document the data and create awareness on these issues.

39.13. New opportunities like organic farming, import substitution, Import intimation system and the products, which have edge in international market, need to be promoted for sustained advantage and profit.

39.14. Indian standards in the agricultural sector have been framed by various organizations of the Government most of which are under Ministry of Agriculture and Commerce. These organizations are responsible not only for production and product standards, but also for their inspection and quality control. Some of the major organizations involved are; Directorate of Marketing Inspection (Agmark), Directorate of Plant Protection, Quarantine & Storage, State Seed Certification Agencies (SSCA), Food Products Order (FPO) Department of Food Processing Industries (DFPI), Bureau of Indian Standards (BIS), Agricultural and Processed

Food Export Development Authority (APEDA), the standards developed under these organizations for the various products need to be harmonized to meet the standards of importing countries under one authority with wider participation.

39.15. There is also multiplicity of standards in several horticultural products. There is, therefore, an urgent need to not only rationalize standards fixed by various organizations but also to harmonize this with ISO standards for different commodities. Standards for growing and package requirements of international markets are also not available in a large number of commodities. The standards developed by Directorate of Marketing and Inspection are old and outdated. There is, therefore, an urgent need to fix standards to promote domestic as well as international trade in agricultural / horticultural commodities.

39.16. In the present scenario of globalization, it has become important to understand the implications of the IPR. As a result, many of the foreign nurseries do not encourage the supply of horticultural crop varieties to India since their rights are not fully protected. Thus, India does not have access to many useful materials due to non-protection of plant breeder's right. For accelerated growth of horticulture industry it is necessary to give emphasis to IPR in the context of WTO regime and competition.

39.17. The strength of Indian horticulture needs to be capitalised to provide leadership for overall development of horticulture in the region with the involvement of other countries and organizations like FAO.

40. **X Plan Investments:** The X Plan investments would be to the tune of Rs. 122869.00 million including Rs.20684.00 million for the sector on tea, coffee and rubber which would be implemented through 29 schemes. In all 12 new schemes would to be launched during the X Plan.

No.M.12043/6/2000-Agri
Government of India
Planning Commission
(Agriculture Division)

**Yojana Bhavan, Parliament Street,
New Delhi, the November 13, 2000**

ORDER

Sub: **Constitution of a Working Group on Horticulture Development including Spices, Aromatic and Medicinal Plants and Plantation Crops for formulation of the Tenth Five Year Plan (2002-2007).**

It has been decided to constitute a Working Group on Horticulture Development including Spices, Aromatic and Medicinal Plants and Plantation Crops in the context of the formulation of the Tenth Five Year Plan(2002-2007). The Composition and Terms of Reference of the Working Group will be as follows:

(A) Composition

- i. Dr. K.L.Chadha, National Professor** - **Chairman**
Former DDG (Horticulture)
Division of Horticulture , IARI Campus
Pusa, New Delhi.
- ii. Dr. Manmohan Attawar,** - **Member**
Chairman & Managing Director,
Indo- American Hybrid Seeds (India Pvt./ Ltd.
17th Cross , 2nd A Main, BSK, 2nd stage
Bangalore- 560070.
- iii. Dr. Vishnu Swaroop,** - **Member**
Indo- American Hybrid Company,
M-56, Palika Bhavan, Sector-13,
R.K.Puram, New Delhi- 110 066.
- iv. Dr. P.Pushpangadan, Director,** - **Member**
National Botanical Institute, Lucknow.
- v. Dr. S.P.Ghosh, DDG (Horticulture)** - **Member**
ICAR, Krishi Bhavan, New Delhi.

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|-------|--|---------------------------|
| vi. | Chairman, Tea Board | - Member |
| vii. | Chairman, Coffee Board | - Member |
| viii. | Chairman, Rubber Board | - Member |
| ix. | Director(Plantation Crops)
Department of Commerce | - Member |
| x. | Shri J.K.Thomas, former President
United Planters Association of
South India (UPASI)
Malankara Rubber & Produce Co. Ltd.,
Malankara Building, Kodimata,
Kottayam – 686039 | - Member |
| xi. | Shri N.Bose Mandanna
(Vice Chairman, Coffee Board)
Subramanya Estate, PB No.12,
Sunti Coppa Post- 571237 Kodagu District
Karnataka. | - Member |
| xii. | Shri M.H.Ashraf
President
United Planters Association of
South India (UPASI)
& M.D. Tata Coffee Limited,
N- 502, North Block Manipal Centre
47 Vickenson Road, Bangalore- 560052 | - Member |
| xiii | Dr. H.P.Singh, Horticulture Commissioner
Deptt. Of Agriculture & Cooperation
Ministry of Agriculture
Krishi Bhavan, New Delhi. | - Member Secretary |

(B) Terms of Reference

- I) To review the progress and performance of horticulture and plantation crops in terms of objectives, strategies and thrust given during Ninth Five Year Plan.
- II) To study present status of research and development in Horticulture and Plantation crops, supply of seed and planting materials, their quality and adequacy on a large scale and strategies for area expansion for diversification of Indian agriculture.

- III) To identify the constraints in implementation of programmes of development of horticulture and plantation crops, suggest modifications and remedial measures with a view to make horticulture and plantation sub-sector more vibrant and efficient.
- IV) To review the existing status of small and marginal farmers of horticulture crops and small growers of plantation crops and identify their basic needs for development of these sub-sectors including backyard horticulture and formulate an appropriate strategy so as to make them active participants in the overall development.
- V) To assess the progress in recent techniques in horticulture and plantation (micro-propagation , hybrid seed production and seedlings, high density planting, integrated nutrient management, use of bio- fertilizer, micro-irrigation, fertigation, organic farming, integrated pest management and use of bio-pesticides, molecular diagnostics, pesticides residues, etc.)
- VI) To assess and study the present status of infrastructure development for post harvest management of horticulture and plantation crops such as washing, cleaning, grading/sorting, packaging, transportation, storage and marketing, besides identifying constraints and recommended suitable measures for strengthening the infrastructure and positioning the same in strategic locations to meet the challenges of growing population in the domestic market and expanding scope of exports in the international market.
- VII) To assess the impact of World Trade Organization (WTO) Regime on horticulture and plantation sub-sectors, identify the factors governing competitiveness and suggest appropriate measures for level playing field in the international market.
- VIII) To study and recommend suitable measures for production for export of spices, aromatic and medicinal plants, floriculture products and suggest suitable measures for increasing the exports of these products.
- IX) To critically review the Indian standards for quality and purity of the products derived from horticulture and plantation sub-sectors and to suggest suitable measures for upgrading, so

as to meet the quality standards at par with available international level.

- X) To study the need and urgency for promotion of human resource development in horticulture and plantation sub-sectors.
 - XI) To study the status of the existing organization, both formal and informal, dealing with horticulture and plantation sub-sectors, review their effectiveness in promoting the growth and development of these sectors and suggest measures for increasing their effectiveness for the cause of development of these sub-sectors, including promotion of human resource development.
 - XII) To assess the status of existing regulatory framework of seed and planting material required for horticulture and plantation crops.
 - XII) To study the modes and methods for establishing the complementarity of public and private sector investment in horticulture and plantation sub-sectors.
2. In order to assist the Working Group in its task, separate Sub-Groups on specific aspects may be formed by the Chairman of Working Group. These Sub-Groups will furnish their reports to the Working Group.
 3. The Chairman of the Working Group may co-op officials and experts as he considers necessary.
 4. The Working Group will submit its report to the Planning Commission latest by **31st March, 2001**.
 5. Non-officials shall be entitled to TA/DA as permissible to Grade-I officers of Government of India and the expenditure will be borne by Planning Commission. The TA/DA of Government and Public Sector officials will be borne by their respective organisations.

(T.R.Meena)
DeputySecretary (Admn)

- i) Chairman, Working Group
- ii) Member-Secretary of the Working Group

Copy to: All Members of the Working Group.

(T,R.Meena)
Deputy Secretary (Admn.)

Copy for information to :

- 1. PS to Deputy Chairman
- 2. PS to member (SP)
- 3. Sr. PPS to Secretary
- 4. All Head of Divisions
- 5. S.O. Admn. I Branch/Accounts I Branch
- 6. P.C. Division (2 copies)
- 7. P.A. to Dy.Secretary. (Admn.)

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

Subject:- Constitution of Sub-Group on Fruits to assist the Working Group on Horticulture Development including Spices, Aromatic & Medicinal Plants and Plantation Crops for formulation of the Tenth Five Year Plan (2002-07)- Regarding.

In accordance with letter No.M-12043/6/2000-Agri. Dated 13th November, 2000 regarding the constitution of Working Group on Horticulture Development including Spices, Aromatic & Medicinal Plants and Plantation Crops for formulation of the Tenth Five Year Plan (2002-07) and the powers vested with the Chairman it has been decided to constitute a Sub-Group on Fruits to assist the Working Group. The composition and terms of reference of the Sub-Group are as follows:

Composition:

- | | | | |
|-----|---|-------|----------|
| 1. | Dr. I.S. Yadav, XIII/4350, Gali Bahuji
Sadar Bazar, Delhi-110006 | | Chairman |
| 2. | Dr. A.K. Mishra, Addl. Commissioner(Hort), DAC,
New Delhi-110001 | | Member |
| 3. | Dr. Jose C. Samuel, Dy. Commissioner(SWC-E)
DAC, New Delhi-110001 | | " |
| 4. | Mr. K. Arya, MD, State Farms Corporation of India,
Farm Bhavan, 14-15, Nehru Place, New Delhi | | " |
| 5. | Dr. D.S. Rathore, ADG(Fruits), ICAR, Krishi Bhavan,
New Delhi-110001 | | " |
| 6. | Dr. G.B Raturi, Director, Institute of Arid Fruit,
10 Milestone, Gandhinagar Road, Beechwal Industrial
Area, Bikaner-334006 | | " |
| 7. | Dr. B.M.C. Reddy, Project Coordinator, AICRP-Fruits,
Indian Institute of Horticultural Research,
P.O. Hessaraghatta Lake, Bangalore, 560089 | | " |
| 8. | Mr. U.N. Choubey, Director of Horticulture,
Government of Bihar, Patna. | | " |
| 9. | Mr. Kukoo Wazir, Director of Horticulture,
Government of Jammu & Kashmir | | " |
| 10. | Dr. Jagmohan Singh, Director of Horticulture,
Government of Himachal Pradesh, Shimla. | | " |
| 11. | Mr. J.P. Mahalle, Director of Horticulture,
Government of Maharashtra, Pune. | | " |
| 12. | Mr. P.B. Ramamurthy, Director of Horticulture,
Government of Karnataka, Bangalore. | | " |
| 13. | Mr. S.Y. Ayemi, Director of Horticulture,
Government of Nagaland, Kohima. | | " |
| 14. | Mr. S.S. Mehta, The Nursery, 256, Advaita Ashram Road
Fairlands, Salem, Tamil Nadu-636016 | | " |
| 15. | Mr. Ravishankar Prasad Singh, Pusa, Samastipur | | " |
| 16. | Mr. Dharam Vir Singh Rana, President Grape Growers,
Council U.P., 84, Subhash Nagar, Badouth-250611 | | " |
| 17. | Dr. Haracharan Das, 27C, Sidhartha Extension,
New Delhi-110014 | | " |

18. Mr. K.N. Reddy, 113, Kashavayanigunta, Tirupati-517501 "
19. Dr. R.K. Pathak, Director, Central Institute of Sub-Tropical
Horticulture, Rehmankhara, P.O. Kakori, Luknow-226002 Member
- Secretary

Terms of Reference:

- i) To review the progress and performance of the programmes for the development of fruit crops in terms of objectives, strategies and thrust given during Ninth Five Year Plan.
- ii) To study present status of research and development in fruit crops, supply of seed and planting material, their quality and adequacy on a large scale and strategies for area expansion for diversification.
- iii) To identify the constraints in implementation of programmes of development of fruit crops, suggest modifications and remedial measures with a view to make the fruits sub-sector more vibrant and efficient.
- iv) To review the existing status of small and marginal farmers cultivating fruit crops and small growers of fruit crops and identify their basic needs for development of these sub-sectors and formulate an appropriate strategy so as to make them active participants in the overall development of fruits.
- v) To assess the progress in recent techniques in cultivation of fruit crops (micro-propagation, hybrid seed production and seedlings, high density planting, integrated nutrient management, use of bio-fertilizers, micro-irrigation, fertigation, protected cultivation, organic farming, integrated pest management and use of bio-pesticides, molecular diagnostics, pesticides residues etc.)
- vi) To work out production targets for fruits during the Tenth Plan and suggest suitable strategies and programmes for achieving the targets.
- vii) Prepare an action plan with details of physical and financial outlays.

2. The Chairman of the Sub-Group may co-opt Officials and Experts as considered necessary with under intimation to the Chairman of the Working Group. Dr. K.L. Chadha,
National Professor, IARI, New Delhi-1100012 (Tele/ Fax No. 011-5784877)

3. The Non-Official Members shall be entitled to TA/DA as permissible to Grade-I Officers of the Government of India and the Expenditure will be borne by the Planning Commission. The TA/DA of Government and Public Sector Officials will be borne by their respective organizations.

4. The Sub-Group will submit its report to the Working Group latest by 28th of February, 2001.

Subject:- Constitution of Sub-Group on Vegetables (Root & Tuber Crops and Mushroom) to assist the Working Group on Horticulture Development including Spices, Aromatic & Medicinal Plants and Plantation Crops for formulation of the Tenth Five Year Plan (2002-07)- Regarding.

In accordance with letter No.M-12043/6/2000-Agri. Dated 13th November, 2000 regarding the constitution of Working Group on Horticulture Development including Spices, Aromatic & Medicinal Plants and Plantation Crops for formulation of the Tenth Five Year Plan (2002-07) and the powers vested with the Chairman it has been decided to constitute a Sub-Group on Fruits to assist the Working Group. The composition and terms of reference of the Sub-Group are as follows:

Composition:

- | | | | |
|-----|--|-------|----------|
| 1. | Dr. Vishnu Swaroop,
Indo-American Hybrid Co.
M-56, Palika Bhavan,
Sector 13, R.K. Puram, ND-110066 | | Chairman |
| 2. | Dr. A.K. Mishra, Addl. Commissioner(Hort.), DAC,
New Delhi-110001 | | Member |
| 3. | Dr. D.N. Awasthi, Dy. Commissioner(Hort)
DAC, New Delhi | | " |
| 4. | Dr. O.P. Dutta, Head (Ole.), Indian Institute of
Horticultural Research, P.O. Hesaraghatta Lake,
Bangalore, 560089 (To continue
as Non official Member after retirement) | | " |
| 5. | Mr. Govindan Nair, Managing Director, National Seed
Corporation, Beej Bhavan, Pusa Complex, New Delhi | | " |
| 6. | Mr. Sudhir Kumar, Managing Director, Small Farmers
Agri-business Consortium, PHD House, Khel Gaon Marg,
New Delhi | | " |
| 7. | Mr. M.L. Pandita, Advisor Vegetable, National Dairy
Development Board, Mangolpuri, Delhi | | " |
| 8. | Dr. R.N. Verma, Director, National Centre for Mushroom
Research Training, Solan, Himachal Pradesh. | | " |
| 9. | Dr. G.S. Sekhawat, Director, Central Potato Research
Institute, Shimla-171001 | | " |
| 10. | Dr. K.E. Lawande, Director, National Research Centre
for Onion & Garlic, Rajgurunagar, Pune-410505. | | " |
| 11. | Mr. U. B. Pande, Director, National Horticulture Research
Development Foundation, 2954-E, Kanda Batata Bhavan,
Nasik-422001. | | " |
| 12. | Director of Horticulture, Government of
Chhattisgarh, Raipur. | | " |
| 13. | Mr. J.N. Das, Director, Horticulture, Government of | | " |

	Orissa, Bhubaneswar.	
14.	Mr. Surjit K. Choudhary, Commissioner (Horticulture), Government of Tamil Nadu, Chennai.	"
15.	Dr. P.G. Rajendran, Project Coordinator, Central Tuber Crops Research Institute, Trivandrum-695017	"
16.	Dr. P.G. Adsule, Pr. Scientist, ICAR Complex, Panaji, Goa	"
17.	Mr. K.S. Sandhu, Director, Horticulture, Government of Punjab	"
18.	Mr. J.P. Mahalle, Director, Horticulture, Government of Maharashtra, Pune	"
19.	Mr. P.B. Ramamurthy, Director, Horticulture, Government of Karnataka, Bangalore	"
20.	Director of Horticulture, Government of Uttaranchal, Dehra Dun.	"
21.	Mr. A.A. Sofi, Director, Central Institute for Temperate Horticulture, Sanatnagar, Srinagar-190005	
22.	Mr. Surinder Pal Singh, Thamanwal , P.O. Bilga, Distt. Jullundhar, Punjab	"
23.	Mr. Priyadarshni Thakur, Managing Director, National Agricultural Cooperative Marketing Federation of India Ltd., NAFED House, Ashram Chowk, New Delhi-110014.	"
24.	Dr. Bramha Singh, Director, Defense Research and Development Organisation, Sena Bhavan, New Delhi	"
25.	Dr. G. Kalloo, Director, Directorate of Vegetable Crops, Res. 1, Gandhinagar, Naira, P.B. 5002, Varanasi-221005	"
26.	Dr. B.S. Dhankar, ADG (Vegetable), ICAR Krishi Bhavan, New Delhi-110001	Member Secretary

Terms of Reference:

- i) To review the progress and performance of programmes for the development of vegetables including root & tuber crops and mushroom in terms of objectives, strategies and thrust given during Ninth Five Year Plan.
- ii) To study present status of research and development in vegetables including root & tuber crops and mushroom, supply of seed and planting material, their quality and adequacy on a large scale and strategies for area expansion for diversification of Indian agriculture.
- iii) To identify the constraints in implementation of programmes of development of vegetables including root & tuber crops and mushroom, suggest modifications and remedial measures with a view to make the vegetables sub-sector more vibrant and efficient.
- iv) To review the existing status of small and marginal farmers of vegetables including root & tuber crops and mushroom crops and small growers of these crops and identify their basic needs for development of these sub-sectors including backyard cultivation and formulate an appropriate strategy so as to make them active participants in the overall development of this sector.
- v) To assess the progress in recent techniques in cultivation of vegetables including root & tuber crops and mushroom (micro-propagation, hybrid seed production

and seedlings, high density planting, integrated nutrient management, use of bio-fertilizers, micro-irrigation, fertigation, protected cultivation, organic farming, integrated pest management and use of bio-pesticides, molecular diagnostics, pesticides residues etc.)

- vi) To work out production targets for vegetables including root & tuber crops and mushroom during the Xth Plan and suggest suitable strategies and programmes for achieving the targets.
- viii) Prepare an action plan with details of physical and financial outlays.

2. The Chairman of the Sub-Group may co-opt Officials and Experts as considered necessary with under intimation to the Chairman of the Working Group. Dr. K.L. Chadha,
National Professor, IARI, New Delhi-1100012 (Tele/ Fax No. 011-5784877).

3. The Non-Official Members shall be entitled to TA/DA as permissible to Grade-I Officers of the Government of India and the Expenditure will be borne by the Planning Commission. The TA/DA of Government and Public Sector Officials will be borne by their respective organizations.

4. The Sub-Group will submit its report to the Working Group latest by 28th of February, 2001.

Subject:- Constitution of Sub-Group on Floriculture to assist the Working Group on Horticulture Development including Spices, Aromatic & Medicinal Plants and Plantation Crops for formulation of the Tenth Five Year Plan (2002-07)- Regarding.

In accordance with letter No.M-12043/6/2000-Agri. Dated 13th November, 2000 regarding the constitution of Working Group on Horticulture Development including Spices, Aromatic & Medicinal Plants and Plantation Crops for formulation of the Tenth Five Year Plan (2002-07) and the powers vested with the Chairman it has been decided to constitute a Sub-Group on Floriculture to assist the Working Group. The composition and terms of reference of the Sub-Group are as follows:

Composition:

- | | | | |
|-----|--|------|----------|
| 1. | Dr. Manmohan Attawar
Chairman & Managing Director,
Indo-American Hybrid Co.
M-56, Palika Bhavan,
Sector 13, R.K. Puram, New Delhi-110066 | | Chairman |
| 2. | Mr. J.S. Negi, Dy. Commissioner(Hort), DAC, New Delhi | | Member |
| 3. | Mr.I. Irulappan, Natural Synergy, 3Century Court,
II nd Street, Kasturi Estate, Chennai-600086 | | " |
| 4. | Mr. S.K. Gutgutia, Florence Flora, 9/3/2/, 4 th Cross
Laxmi Road, Bimanna Garden, Santinagar, Bangalore-560027" | | " |
| 5. | Mr. S.K. Gurung, Director of Horticulture, Government of
Sikkim, Gangtok. | | " |
| 6. | Dr. Kartar Singh, Director of Horticulture, Government of
Haryana, Panchkula. | | " |
| 7. | Mr. J.P. Mahalle, Director of Horticulture, Government of
Maharashtra, Pune. | | " |
| 8. | Mr. P.B. Ramamurthy, Director of Horticulture,
Government of Karnataka, Bangalore. | | " |
| 9. | Dr. R.C. Upadhaya, Director, National Research Centre on
Orchid, Pakyong, Sikkim | | " |
| 10. | Dr. P. Das, Director, Natural Resource Centre, Bhubaneshwar " | | " |
| 11 | Mr. P.S. Ahuja, Director, Himalaya Institute Environment
Development, Palampur, H.P. | | " |
| 12. | Dr. J.S.Arora, 269 Bhai Randhir
Singh Nagar, Ludhiana | | " |
| 13. | Dr. N.K. Dadlani, Hortitech Pvt. Ltd., F-7, Lajpat Nagar,
New Delhi | | " |
| 14. | Mr. Chandramohan Das, MD, Siroz Consultancy, Pune | | " |
| 15. | Ms. K. Meenakshi Devi, President, Ohara Shool of Ikebana,
Srinagar Colony, Hyderabad 500073 | | " |
| 16. | Mr. G. Kasturi Ranjan, K.S. Gopalswamiengar Son,
177, 5 th Main Road, Chamrajpet, Bangalore-560018 | | " |

17. Dr. M.L. Chaudhury, Project Coordinator & Head,
Division of Floriculture, IARI, New Delhi-110012.

Member-
Secretary

Terms of Reference:

- i) To review the progress and performance of programmes for the development of floriculture in terms of objectives, strategies and thrust given during Ninth Five Year Plan.
- ii) To study present status of research and development in floriculture, supply of seed and planting material, their quality and adequacy on a large scale and strategies for area expansion for diversification.
- iii) To identify the constraints in implementation of programmes of development of floriculture, suggest modifications and remedial measures with a view to make floriculture sub-sector more vibrant and efficient.
- iv) To review the existing status of small and marginal farmers engaged in floriculture and small growers of flowers and identify their basic needs for development of these sub-sectors and formulate an appropriate strategy so as to make them active participants in the overall development.
- v) To assess the progress in recent techniques in the floriculture sector (micro-propagation, hybrid seed production and seedlings, high density planting, integrated nutrient management, use of bio-fertilizers, micro-irrigation, fertigation, protected cultivation, organic farming, integrated pest management and use of bio-pesticides, molecular diagnostics, pesticides residues etc.)
- vi) To work out production targets for floriculture during the Xth Plan and suggest suitable strategies and programmes for achieving the targets.
- vii) Prepare an action plan with details of physical and financial outlays.

2. The Chairman of the Sub-Group may co-opt Officials and Experts as considered necessary with under intimation to the Chairman of the Working Group. Dr. K.L. Chadha,
National Professor, IARI, New Delhi-1100012 (Tele/ Fax No. 011-5784877).

3. The Non-Official Members shall be entitled to TA/DA as permissible to Grade-I Officers of the Government of India and the Expenditure will be borne by the Planning Commission. The TA/DA of Government and Public Sector Officials will be borne by their respective organizations.

4. The Sub-Group will submit its report to the Working Group latest by 28th of February, 2001.

Subject:- Constitution of Sub-Group on Medicinal & Aromatic Plants to assist the Working Group on Horticulture Development including Spices, Aromatic & Medicinal Plants and Plantation Crops for formulation of the Tenth Five Year Plan (2002-07)- Regarding.

In accordance with letter No.M-12043/6/2000-Agri. Dated 13th November, 2000 regarding the constitution of Working Group on Horticulture Development including Spices, Aromatic & Medicinal Plants and Plantation Crops for formulation of the Tenth Five Year Plan (2002-07) and the powers vested with the Chairman it has been decided to constitute a Sub-Group on Medicinal & Aromatic Plants to assist the Working Group. The composition and terms of reference of the Sub-Group are as follows:

Composition :

- | | | | |
|-----|---|-------|----------|
| 1. | Dr. P. Pushpangadan, Director,
National Botanical Research Institute,
Rana Pratap Marg Lucknow-226001. | | Chairman |
| 2. | Adviser (Ayurveda and Sidha), DISMH,
Red Cross Building, New Delhi. | | Member |
| 3. | Dr. Rajender Gupta,
B-1/46, Paschim Vihar, New Delhi. | | " |
| 4. | Mr. Prakash, Central Food & Technology Research
Institute, Mysore-570013 | | " |
| 5. | Mr. Shankar Narayanan, General Manager,
Kottakal PO, Malappuram District, Kerala-676503 | | " |
| 6. | Secretary Agriculture, Government of
Kerala, Trivandrum. | | " |
| 7. | Mr. J.P. Mahalle, Director of Horticulture, Government of
Maharashtra, Pune. | | " |
| 8. | Mr. D.B. Masih, Director of Horticulture, Government of
Arunachal Pradesh, Itanagar | | " |
| 9. | Dr. Jose C Samuel, DC(SWC-E), DAC | | " |
| 10. | Dr. K. Sivaraman, Director, Directorate of Spice &
Areca nut, Calicut | | " |
| 11. | Director of Horticulture, Government of
Chhattisgarh, Raipur. | | " |
| 12. | Director, Central Institute of Medicinal &
Aromatic Plants, Kukrail, Lucknow | | " |
| 13. | Dr. A.A. Farooki, Professor, Medicinal & Aromatic Plants
University of Agricultural Sciences, GKVK, Bangalore | | " |
| 14. | Dr. J. Thomas, Associate Professor & Head, Aromatic &
Medicinal Plants Research Station, Odakkali, Asmanoor PO,
Ernakulam Distt., Kerala-683562 | | " |
| 15. | Mr. Bayaru Raju, Thadepalligudam, West Godavari Distt,
Andhra Pradesh | | " |
| 16. | Mr. V.R. Pusalkar, Botanist, Aruna Planta Medica, 'Shriman'
5/96 Q, Netaji Street, Alayapuram, Salem-636016 | | " |

17. Dr. S. Maiti, Project Coordinator,
National Research Centre on Medicinal and
Aromatic Plants, Anand

Member- Secretary

Terms of Reference:

- i) To review the progress and performance of programmes for the development of Medicinal & Aromatic Plants in terms of objectives, strategies and thrust given during Ninth Five Year Plan.
- ii) To study present status of research and development in Medicinal & Aromatic Plants, supply of seed and planting material, their quality and adequacy on a large scale and strategies for area expansion for diversification.
- iii) To identify the constraints in implementation of programmes of development of Medicinal & Aromatic Plants, suggest modifications and remedial measures with a view to make Medicinal & Aromatic Plants sub-sector more vibrant and efficient.
- iv) To review the existing status of small and marginal farmers of Medicinal & Aromatic Plants small growers of these crops and identify their basic needs for development of these sub-sectors and formulate an appropriate strategy so as to make them active participants in the overall development.
- v) To assess the progress in recent techniques in the cultivation of Medicinal & Aromatic Plants (micro-propagation, hybrid seed production and seedlings, high density planting, integrated nutrient management, use of bio-fertilizers, micro-irrigation, fertigation, protected cultivation, organic farming, integrated pest management and use of bio-pesticides, molecular diagnostics, pesticides residues etc.)
- vi) To work out production targets for Medicinal & Aromatic Plants during the Xth Plan and suggest suitable strategies and programmes for achieving the targets.
- vii) Prepare an action plan with details of physical and financial outlays.

2. The Chairman of the Sub-Group may co-opt Officials and Experts as considered necessary with under intimation to the Chairman of the Working Group. Dr. K.L. Chadha,
National Professor, IARI, New Delhi-1100012 (Tele/ Fax No. 011-5784877)

3. The Non-Official Members shall be entitled to TA/DA as permissible to Grade-I Officers of the Government of India and the Expenditure will be borne by the Planning Commission. The TA/DA of Government and Public Sector Officials will be borne by their respective organizations.

4. The Sub-Group will submit its report to the Working Group latest by 28th of February, 2001.

Subject:- Constitution of Sub-Group on Spices to assist the Working Group on Horticulture Development including Spices, Aromatic & Medicinal Plants and Plantation Crops for formulation of the Tenth Five Year Plan (2002-07)- Regarding.

In accordance with letter No.M-12043/6/2000-Agri. Dated 13th November, 2000 regarding the constitution of Working Group on Horticulture Development including Spices, Aromatic & Medicinal Plants and Plantation Crops for formulation of the Tenth Five Year Plan (2002-07) and the powers vested with the Chairman it has been decided to constitute a Sub-Group on Spices to assist the Working Group. The composition and terms of reference of the Sub-Group are as follows:

Composition:

- | | | | |
|-----|--|------|------------------|
| 1. | Dr. R.N. Pal, DDG (Hort.), ICAR, New Delhi | | Chairman |
| 2. | Mr. V. Jaishankar, Chairman, Spices Board, Cochin | | Member |
| 3. | Secretary, Government of Kerala, | | " |
| 4. | Mr. Paramjit Singh, DC (H), DAC, New Delhi | | " |
| 6. | Mr. Surender Kumar, Director of Horticulture, Government of Rajasthan, Jaipur. | | " |
| 7. | Mr. Ar. Sukumar, Commissioner (Horticulture), Government of Andhra Pradesh, Hyderabad. | | " |
| 8. | Mr. N.M. Shah, Director of Horticulture, Government of Gujarat, Gandhinagar. | | " |
| 9. | Mr. Sanjay Mariwala, Kanoor Flavour & Exports Ltd., P.B. No. 3, Anjamally South, Kerala, 683573 | | " |
| 10. | Mr. M.K.K. Menon, Harmoni & Spices Ltd., 12/597 & 598, Jawahar Road, Koovapadam, Cochin-682002 | | " |
| 11. | Mr M.E. Velappan, Saravel, 71 Bapuji Nagar, Microwave Lane, Medical Colony PO, Trivandrum-696011 | | " |
| 12. | Mr. N. Bose Maidena, Subramanya Estate, P.B. No-12 Suntikoppa, Kodaja Distt-571237 | | " |
| 13. | Mr. A.K. Sadanandan, 2/18, Divya Estate Hill Calicut-673005 | | " |
| 14. | Dr. Sharma, College of Agriculture, Jobner | | " |
| 15. | Dr. K. Sivaraman, Director, Directorate of Spices and Arecanut, Calicut. | | " |
| 16. | Dr. S.R. Sharma, Director, Indian Spices Research Institute, P.B. No. 1701, P.O. Marikunnu, Calcutt-673012 | | Member Secretary |

Terms of Reference:

- i) To review the progress and performance of programmes for the development of spices in terms of objectives, strategies and thrust given during Ninth Five Year Plan.

- ii) To study present status of research and development on spices, supply of seed and planting material, their quality and adequacy on a large scale and strategies for area expansion for diversification.
- iii) To identify the constraints in implementation of programmes of development of spices, suggest modifications and remedial measures with a view to make spices sub-sector more vibrant and efficient.
- iv) To review the existing status of small and marginal farmers of spices and identify their basic needs for development of these sub-sectors including backyard horticulture and formulate an appropriate strategy so as to make them active participants in the overall development.
- v) To assess the progress in recent techniques in the cultivation of spices (micro-propagation, hybrid seed production and seedlings, high density planting, integrated nutrient management, use of bio-fertilizers, micro-irrigation, fertigation, organic farming, integrated pest management and use of bio-pesticides, molecular diagnostics, pesticides residues etc.)
- vi) To work out production targets for fruits during the Xth Plan and suggest suitable strategies and programmes for achieving the targets.
- vii) Prepare an action plan with details of physical and financial outlays.

2. The Chairman of the Sub-Group may co-opt Officials and Experts as considered necessary with under intimation to the Chairman of the Working Group. Dr. K.L. Chadha,
National Professor, IARI, New Delhi-1100012 (Tele/ Fax No. 011-5784877).

3. The Non-Official Members shall be entitled to TA/DA as permissible to Grade-I Officers of the Government of India and the Expenditure will be borne by the Planning Commission. The TA/DA of Government and Public Sector Officials will be borne by their respective organizations.

4. The Sub-Group will submit its report to the Working Group latest by 28th of February, 2001.

Subject:- Constitution of Sub-Group on Plantation Crops-I (Palms, Cashew & Cocoa) to assist the Working Group on Horticulture Development including Spices, Aromatic & Medicinal Plants and Plantation Crops for formulation of the Tenth Five Year Plan (2002-07)- Regarding.

In accordance with letter No.M-12043/6/2000-Agri. Dated 13th November, 2000 regarding the constitution of Working Group on Horticulture Development including Spices, Aromatic & Medicinal Plants and Plantation Crops for formulation of the Tenth Five Year Plan (2002-07) and the powers vested with the Chairman it has been decided to constitute a Sub-Group on Plantation Crops-I (Arecanut, Cashew, Cocoa, Coconut, Oil Palm) to assist the Working Group. The composition and terms of reference of the Sub-Group are as follows:

Composition:

- | | | | |
|-----|--|------|------------------|
| 1. | Dr. P. Rethinam
Chairman, Coconut Development Board,
Kera Bhavan, Cochin. | | Chairman |
| 2. | Dr. K.U.K. Nampoothiri, Director, Central Plantation
Crops Research Institute, Kasaragod, Kerala-671124 | | Member |
| 3. | Mr. K.D. Sinha, Joint Secretary (TMOP), New Delhi | " | |
| 4. | Dr. E.V.V. Bhaskar Rao, Director, National Research Centre
For Cashew, Puttur-574202 | | |
| 5. | Mr. Ar. Sukumar, Commissioner (Horticulture),
Government of Andhra Pradesh , Public Gardens,
Hyderabad | | " |
| 6. | Chairman, Cashew Export Promotion Council of India,
Cochin -682 016, Kerala | | " |
| 7. | Chairman, CAMPCO | | |
| 8. | Mr. N.S. Katoch, Managing Director, Cadburys India Ltd,
Mercantile House, 6 th Floor, 501, Connaught Place,
15, K.G. Marg, New Delhi-110001 | | " |
| 9. | Mr. Vishwanath Singh, Director of Horticulture,
Government of Kerala, Trivandrum. | | " |
| 10. | Mr. P.B. Ramamurthy, Director of Horticulture,
Government of Karnataka, Bangalore. | | " |
| 11. | Mr. Sujit Kumar Choudhary, Commissioner (Horticulture),
Government of Tamil Nadu, Chennai. | | " |
| 12. | Mr. R. Sundarama Raju, Itikalagunta, Kunghana Halli PO
Thadepalligndam-534101, Andhra Pradesh | | " |
| 13. | Dr. J.S. Reddy, Managing Director, M/s Simhapuri Agro
Products (P) Ltd., Gandhi Nagar, Near Gati Transport,
Nellore-524004 | | " |
| 14. | Mr. O.V.R. Somasundaram, Odayakullam, Pollachi (TK)
Coimbatore-642129 | | " |
| 15. | Mr. P.P. Balasubramunium, Director, Directorate of
Cashew & Cocoa, Kochi | | „ |
| 16. | Dr.K. Sivaraman, Director, Directorate of | | Member Secretary |

Arecanut & Spices, Calicut

Terms of Reference:

- i) To review the progress and performance of programmes for the development of plantation crops in terms of objectives, strategies and thrust given during Ninth Five Year Plan.
- ii) To study present status of research and development in Plantation crops, supply of seed and planting material, their quality and adequacy on a large scale and strategies for area expansion for diversification of Indian agriculture.
- iii) To identify the constraints in implementation of programmes of development of plantation crops, suggest modifications and remedial measures with a view to make Plantation crops sub-sector more vibrant and efficient.
- iv) To review the existing status of small and marginal farmers of plantation crops and identify their basic needs for development of these sub-sectors including backyard horticulture and formulate an appropriate strategy so as to make them active participants in the overall development.
- v) To assess the progress in recent techniques in cultivation of plantation crops (micro-propagation, hybrid seed production and seedlings, high density planting, integrated nutrient management, use of bio-fertilizers, micro-irrigation, fertigation, protected cultivation, organic farming, integrated pest management and use of bio-pesticides, molecular diagnostics, pesticides residues etc.)
- vi) To work out production targets for plantation crops during the Xth Plan and suggest suitable strategies and programmes for achieving the targets.
- vii) Prepare an action plan with details of physical and financial outlays.

2. The Chairman of the Sub-Group may co-opt Officials and Experts as considered necessary with under intimation to the Chairman of the Working Group. Dr. K.L. Chadha,
National Professor, IARI, New Delhi-1100012 (Tele/ Fax No. 011-5784877).

3. The Non-Official Members shall be entitled to TA/DA as permissible to Grade-I Officers of the Government of India and the Expenditure will be borne by the Planning Commission. The TA/DA of Government and Public Sector Officials will be borne by their respective organizations.

4. The Sub-Group will submit its report to the Working Group latest by 28th of February, 2001.

Subject:- Constitution of Sub-Group on Plantation Crops-II (Coffee, Tea, Rubber etc.) to assist the Working Group on Horticulture Development including Spices, Aromatic & Medicinal Plants and Plantation Crops for formulation of the Tenth Five Year Plan (2002-07)- Regarding.

In accordance with letter No.M-12043/6/2000-Agri. Dated 13th November, 2000 regarding the constitution of Working Group on Horticulture Development including Spices, Aromatic & Medicinal Plants and Plantation Crops for formulation of the Tenth Five Year Plan (2002-07) and the powers vested with the Chairman it has been decided to constitute a Sub-Group on Plantation Crops-II (Coffee, Tea, Rubber etc.) to assist the Working Group. The composition and terms of reference of the Sub-Group are as follows:

Composition:

- | | | |
|-----|--|----------|
| 1. | Mr. S.M. Desalphine, Chairman, Rubber Board,
P.B. No. 1122, Kottayam-686002 | Chairman |
| 2. | Mr. N.K. Das, Chairman, Tea Board, 14, Biplabi Trailokya
Maharaj, Sarani, (Barbourne Road) Calcutta-700001 | Member |
| 3. | Ms. Lakshmi Venkatachalam, Chairperson, Coffee Board
No.1, Dr. Ambedkar Veedhi, Bangalore-560001 | Member |
| 4. | Mr P.K.. Mohanty, Secretary, Agriculture, Government of
Kerala, Trivandrum. | " |
| 5. | Mr. Amar Das, Director of Horticulture, Government of
Tripura, Agartala | " |
| 6. | Mr. B.K. Meha, ABC House, Figure of 8 Road, Coonoor-643101 | " |
| 7. | Mr. W.P. Nagarajan, Pattiviranpatti, Tamil Nadu | " |
| 8. | Mr. W.P.A. Nagaraju, Director, Tribal Development,
Government of Tripura, Agartala | " |
| 9. | Dr. Subhash Sharma, Director, Indian Institute of Plantation
Management, Bangalore | " |
| 10. | Mr. J.K. Thomas, Former President,
United Plantation Association of South India (UPASI),
Malankasa Rubber & Produce Co. Ltd., Malankasa Building,
Kodimata, Kottayam-686039 | " |
| 11. | Mr. Jacob Thomas, Former President,
United Plantation Association of South India (UPASI) | " |
| 12. | Dr. N.M. Mathew, Director of Research, Rubber Research Institute
of India, Rubber Board PO, Kottayam-686009, Kerala | " |
| 13. | Mr. Boriah, Director, Tea Development, Tea Board HQ, Calcutta | " |
| 14. | Mr. R. Naidu, Director, Coffee Board, Bangalore. | " |
| 15. | Mr. N. Bose Mandanna, Vice Chairman, Coffee Board,
Subramanya Estate, P.B.No. 12, Suniti Coppa Post-571237
Kodagu Distt., Karnataka | " |
| 16. | Mr. M.H. Ashraf, President, | " |

United Plantation Association of South India &
MD, Tata Coffee Ltd., N-502, North Block Manipal Centre
47 Vickenson Road, Bangalore-560052

"

17. Mrs Amita Prasad, Director (Plantation Crops) Member Secy.
Department of Commerce, Udyog Bhavan, New Delhi

Terms of Reference:

- i) To review the progress and performance of programmes for the development of plantation crops in terms of objectives, strategies and thrust given during Ninth Five Year Plan.
- ii) To study present status of research and development in Plantation crops, supply of seed and planting material, their quality and adequacy on a large scale and strategies for area expansion for diversification of Indian agriculture.
- iii) To identify the constraints in implementation of programmes of development of plantation crops, suggest modifications and remedial measures with a view to make Plantation crops sub-sector more vibrant and efficient.
- iv) To review the existing status of small and marginal farmers of plantation crops and identify their basic needs for development of these sub-sectors including backyard horticulture and formulate an appropriate strategy so as to make them active participants in the overall development.
- v) To assess the progress in recent techniques in cultivation of plantation crops (micro-propagation, hybrid seed production and seedlings, high density planting, integrated nutrient management, use of bio-fertilizers, micro-irrigation, fertigation, protected cultivation, organic farming, integrated pest management and use of bio-pesticides, molecular diagnostics, pesticides residues etc.)
- vi) To work out production targets for plantation crops during the Xth Plan and suggest suitable strategies and programmes for achieving the targets.
- vii) Prepare an action plan with details of physical and financial outlays.

2. The Chairman of the Sub-Group may co-opt Officials and Experts as considered necessary with under intimation to the Chairman of the Working Group. Dr. K.L. Chadha,
National Professor, IARI, New Delhi-1100012 (Tele/ Fax No. 011-5784877).

3. The Non-Official Members shall be entitled to TA/DA as permissible to Grade-I Officers of the Government of India and the Expenditure will be borne by the Planning Commission. The TA/DA of Government and Public Sector Officials will be borne by their respective organizations.

4. The Sub-Group will submit its report to the Working Group latest by 28th of February, 2001.

Subject:- Constitution of Sub-Group on Infrastructure for Horticulture to assist the Working Group on Horticulture Development including Spices, Aromatic & Medicinal Plants and Plantation Crops for formulation of the Tenth Five Year Plan (2002-07)- Regarding.

In accordance with letter No.M-12043/6/2000-Agri. Dated 13th November, 2000 regarding the constitution of Working Group on Horticulture Development including Spices, Aromatic & Medicinal Plants and Plantation Crops for formulation of the Tenth Five Year Plan (2002-07) and the powers vested with the Chairman it has been decided to constitute a Sub-Group on Infrastructure for Horticulture to assist the Working Group. The composition and terms of reference of the Sub-Group are as follows:

Composition:

- | | | | |
|-----|--|------|----------|
| 1. | Mr. J.P. Negi, Executive Director,
National Horticulture Board,
85, Institutional Area, Sector-18, Gurgaon-122015 | | Chairman |
| 2. | Mr. D. Rajgopalan, Chairman, Agriculture &
Processed Food Products
Export Development Authority,NCUI Building,
Khelgaon Marg, New Delhi. | | Member |
| 3. | Mr. Priyadarshani Thakur, Managing Director,
National Agricultural Cooperative Marketing Federation
of India Ltd., NAFED House, Ashram Chowk, New Delhi. | | " |
| 4. | Mr. M.K. Mandal, Agricultural Marketing Adviser to GOI
Nirman Bhavan, New Delhi 110011. | | " |
| 5. | Mr. P.K. Mishra, Managing Director, National Cooperative
Development Corporation, Hauz Khas, New Delhi | | " |
| 6. | Dr. S.B. Mani, Principal Scientist, Indian Agriculture
Research Institute, New Delhi | | " |
| 7. | Dr. S.C. Mandar, Principal Scientist, Indian Institute of
Horticultural Research, PO-Hessarghatta Lake, Bangalore | | " |
| 8. | Dr. (Mrs) Vibha Puri Das, Joint Secretary, Deptt of Food
Processing Industries, Panchsheel Building, Khel Gaon
Marg, New Delhi | | " |
| 9. | Dr. B.S. Bisht, Director, Central Institute of Post Harvest
Engineering & Technology, PAU Campus, Ludhiana-141004 | | " |
| 10. | Dr. R.P. Kachru, ADG (Ag. Eng.), ICAR, Krishi Bhavan
New Delhi-110001 | | " |
| 12. | Shri K.P. Sareen, Secretary, All India Food Professor
Association, 206, Arbindo Place Market, Hauz Khas,
New Delhi-110016. | | " |
| 12. | Mr. P.K. Thakur, MD, Litchica International &
Litchica Prod. Pvt. Ltd., Kalambagh Chowk,
Muzaffarpur-842001 | | " |

13. Mr. M.R. Sharma, Chief General Manager , National Bank for Agricultural And Rural Development (NABARD),
C-24, G Block, Bandra, Khurla Complex, Bandra East
Mumbai-401051 "
14. Mr. H.K. Sharma, Director (Hort), DAC, New Delhi Member-Secretary

Terms of Reference:

- i) To assess and study the present status of infrastructure development for post harvest management of horticulture and plantation crops such as harvesting, grading, packaging, transportation, storage and marketing, besides identifying constraints and recommend suitable measures for strengthening the infrastructure and positioning the same in strategic locations to meet the challenges of growing population in the domestic market and expanding scope of exports in the international market.
- ii) To work out targets for infrastructure development during the Xth Plan and suggest suitable strategies and programmes for achieving the targets.
- iii) Prepare an action plan with details of physical and financial outlays.

2. The Chairman of the Sub-Group may co-opt Officials and Experts as considered necessary with under intimation to the Chairman of the Working Group. Dr. K.L. Chadha,
National Professor, IARI, New Delhi-1100012 (Tele/ Fax No. 011-5784877).

3. The Non-Official Members shall be entitled to TA/DA as permissible to Grade-I Officers of the Government of India and the Expenditure will be borne by the Planning Commission. The TA/DA of Government and Public Sector Officials will be borne by their respective organizations.

4. The Sub-Group will submit its report to the Working Group latest by 28th of February, 2001.

Subject:- Constitution of Sub-Group on Exports, WTO Issues, Quality Control of Horticultural Produce to assist the Working Group on Horticulture Development including Spices, Aromatic & Medicinal Plants and Plantation Crops for formulation of the Tenth Five Year Plan (2002-07)- Regarding.

In accordance with letter No.M-12043/6/2000-Agri. Dated 13th November, 2000 regarding the constitution of Working Group on Horticulture Development including Spices, Aromatic & Medicinal Plants and Plantation Crops for formulation of the Tenth Five Year Plan (2002-07) and the powers vested with the Chairman it has been decided to constitute a Sub-Group on Exports, WTO Issues, Quality Control of Horticultural Produce to assist the Working Group. The composition and terms of reference of the Sub-Group are as follows:

Composition :

- | | | | |
|-----|---|------|------------------|
| 1. | Mr. D. Rajagopalan, Chairman, APEDA
NCUI Building, Khelgaon Marg, New Delhi. | | Chairman |
| 2. | Mr. K.D. Sinha, Joint Secretary (Trade), DAC,
Krishi Bhavan, New Delhi | | Member |
| 3. | Mr. S.M. Desalphine, Chairman Rubber Board, "
Kottayam-686002, Kerala | | " |
| 4. | Dr. V.S. Mathur, Director, Bureau of Indian Standards,
Manak Bhavan, Bahadurshah Zafar Road, New Delhi-2. | | " |
| 5. | Dr. J.P. Mishra, Asstt. Director General, ICAR,
Krishi Bhavan, New Delhi | | " |
| 6. | Dr. S.R. Gupta, Asstt. Director General,
Directorate General of Health Services,
Nirman Bhavan, New Delhi. | | " |
| 7. | Mr. J.P. Negi, Executive Director, National
Horticulture Board, 85, Institutional Area, Sector 18
Gurgaon-122015 | | " |
| 8. | Mr. M.K. Mandal, Agriculture Marketing Advisor
Nirman Bhavan, New Delhi-110001 | | " |
| 9. | Mr. Sopan Kanchan, President, Maharashtra State Grape
Growers Association, Draksha Bhawan, E-4,
Market Yard, Pune-411037 | | " |
| 10. | Mr. B.K. Khosla, M-64, Connought Circus, New Delhi-110001 | | " |
| 11. | Mr. B.A. Cahnappa Gowda, Managing Director,
Horticulture Producers Coop. Marketing & Processing
Society Ltd., Lal Bagh, Bangalore, 560004 | | " |
| 12. | Mr. Arvind Gupta, Additional Executive Director,
National Horticulture Board, 85, Institutional Area,
Sector 18, Gurgaon-122015 | | Member-Secretary |

Terms of Reference:

- i) To assess the impact of World Trade Organization (WTO) Regime on horticulture and plantation sub-sectors, identify the factors governing competitiveness and suggest appropriate measures for level playing field in the international market.
- ii) To study and recommend suitable measures for production for export of spices, aromatic and medicinal plants, floriculture products and suggest suitable measures for increasing the exports of these products.
- iii) To critically review the Indian standards for quality and purity of the products derived from horticulture and plantation sub-sectors and to suggest suitable measures for upgrading, so as to meet the quality standards at par with available international level.
- iv) Prepare an action plan with details of physical and financial outlays.

2. The Chairman of the Sub-Group may co-opt Officials and Experts as considered necessary with under intimation to the Chairman of the Working Group. Dr. K.L. Chadha,
National Professor, IARI, New Delhi-1100012 (Tele/ Fax No. 011-5784877).

3. The Non-Official Members shall be entitled to TA/DA as permissible to Grade-I Officers of the Government of India and the Expenditure will be borne by the Planning Commission. The TA/DA of Government and Public Sector Officials will be borne by their respective organizations.

4. The Sub-Group will submit its report to the Working Group latest by 28th of February, 2001.

Subject:- Constitution of Sub-Group on Organisational Support for Horticulture to assist the Working Group on Horticulture Development including Spices, Aromatic & Medicinal Plants and Plantation Crops for formulation of the Tenth Five Year Plan (2002-07)- Regarding.

In accordance with letter No.M-12043/6/2000-Agri. Dated 13th November, 2000 regarding the constitution of Working Group on Horticulture Development including Spices, Aromatic & Medicinal Plants and Plantation Crops for formulation of the Tenth Five Year Plan (2002-07) and the powers vested with the Chairman it has been decided to constitute a Sub-Group on Organisational Support for Horticulture to assist the Working Group. The composition and terms of reference of the Sub-Group are as follows:

Composition :

- | | | | |
|-----|---|------|----------|
| 1. | Mr. Satish Chandra, Joint Secretary,
Deptt. of Agriculture and Coop., Krishi Bhavan, New Delhi | | Chairman |
| 2. | Dr. P. Rethinam, Chairman, Coconut Development Board, Kera Bhavan, Cochin | | " |
| 5. | Mr. K. Sivaraman, Director, Directorate of Spices & Aracanut, Calicut. | " | " |
| 4. | Shri P.P. Balasubramaniam, Director, Directorate of Cashew and Cocoa, Kera Bhavan, Cochin | | " |
| 5. | Mr. Jai Shankar, Chairman, Spices Board, Cochin | | " |
| 6. | Mr. Sudhir Kumar, Managing Director, SFAC, PHD House, Khelgaon Marg, New Delhi. | | " |
| 7. | Mr. D. Rajgopalan, Chairman, Agriculture and Processed Food Products Export Development Authority, NCUI Building, August Kranti Marg, Hauz Khas, New Delhi. | | " |
| 8. | Mr. P.K. Mishra, Managing Director, National Cooperative Development Corporation, Agust Kranti Marg, Hauz Khas, New Delhi. | " | " |
| 9. | Chief General Manager, National Bank for Agricultural & Rural Development (NABARD), C-24, G Block, Bandra Kurla Complex, Bandra (East), Mumbai-51. | " | " |
| 10. | Ms. Vibha Puri Das, Joint Secretary, Deptt. of Food Processing Industries, Panchsheel Bhavan, Khelgaon Marg, New Delhi. | | " |
| 11. | Dr. A.K. Mishra, Addl. Commissioner (Hort) DAC. | " | " |
| 12. | Mr. J. S. Negi, Dy. Commissioner (Hort), DAC, New Delhi | | " |
| 13. | Mr. A.K. Sood, Joint Secretary, National Committee on Use of Plastics in Agriculture(NCPA), Himalaya House, K.G. Marg, New Delhi-110001 | " | " |
| 14. | Dr. B.S. Dhankar, Assistant Director General (VC), ICAR, | | " |

Krishi Bhavan, New Delhi-110001

15. Director, Horticulture, Central Public Works
Department (CPWD), Nirman Bhavan, New Delhi. "
16. Mr. Paramjit Singh, Dy. Commissioner (H), DAC
New Delhi-110001 Member Secretary

Terms of Reference:

- i) To study the status of the existing organizations, both formal and informal, dealing with horticulture and plantation sub-sectors, review their effectiveness in promoting the growth and development of these sectors and suggest measures for increasing their effectiveness for the cause of development of these sub-sectors, including promotion of human resource development.
- ii) To assess the status of existing regulatory framework of seed and planting material required for horticulture and plantation crops.
- iii) To study the modes and methods for establishing the complementarity of public and private sector investment in horticulture and plantation sub-sectors.
- iv) Prepare an action plan with details of physical and financial outlays.

2. The Chairman of the Sub-Group may co-opt Officials and Experts as considered necessary with under intimation to the Chairman of the Working Group. Dr. K.L. Chadha,
National Professor, IARI, New Delhi-1100012 (Tele/ Fax No. 011-5784877).

3. The Non-Official Members shall be entitled to TA/DA as permissible to Grade-I Officers of the Government of India and the Expenditure will be borne by the Planning Commission. The TA/DA of Government and Public Sector Officials will be borne by their respective organizations.

4. The Sub-Group will submit its report to the Working Group latest by 28th of February, 2001.

Subject:- Constitution of Sub-Group on Hi-Tech Horticulture to assist the Working Group on Horticulture Development including Spices, Aromatic & Medicinal Plants and Plantation Crops for formulation of the Tenth Five Year Plan (2002-07)- Regarding.

In accordance with letter No.M-12043/6/2000-Agri. Dated 13th November, 2000 regarding the constitution of Working Group on Horticulture Development including Spices, Aromatic & Medicinal Plants and Plantation Crops for formulation of the Tenth Five Year Plan (2002-07) and the powers vested with the Chairman it has been decided to constitute a Sub-Group on Hi-Tech Horticulture to assist the Working Group. The composition and terms of reference of the Sub-Group are as follows:

Composition :

- | | | | |
|-----|---|------|----------|
| 1. | Dr. H.P. Singh, Horticulture Commissioner,
Deptt. of Agriculture & Coop., Krishi Bhavan. | | Chairman |
| 2. | Dr. P. Parvata Reddy, Director, Indian Institute of
Horticultural Research, PO- Hessarghatta Lake, Bangalore. | | Member |
| 3. | Dr. P.L. Gautam, Director, National Bureau of Plant
Genetic Resources, IARI Campus, Pusa New Delhi. | | " |
| 4. | Mr. A.K. Sood, Joint Secretary (NCPA), Himalaya House,
K.G. Marg, New Delhi-110001. | | " |
| 5. | Dr. S. Natesh, Deptt. of Bio-Technology,
CGO Complex, New Delhi. | | " |
| 6. | Dr. Sant Ram, Dean, Pantnagar Agriculture University,
Pantnagar | | " |
| 7. | Dr. S.D. Sikhamani, Director, National Research Centre
for Grapes, P.B. No. 3, Solapur Road, Pune-412307 | | " |
| 8. | Ms. Vibha Dhawan, Sr. Fellow & Dean, Bioresources &
Biotechnology, TERI, Darbari South Block, Habitat Place,
New Delhi-110003 | | " |
| 9. | Dr. N. Bharti, Growmore, Bio-Tech Pvt. Ltd., 41-B,
SIPCOT Phase-II, Bangalore-635109 | | " |
| 10. | Mr. J.S. Parihar, Director, NE-Space Application Centre,
C/O NEC Secretariat, Shillong 793001 | | " |
| 11. | Director, Bio-tech, Tamil Nadu Agricultural University,
Coimbatore-641003 | | " |
| 12. | Mr. P.K. Thakur, MD, Litchica International &
Litchica Prod. Pvt. Ltd., Kalambagh Chowk,
Muzaffarpur-842001 | | " |
| 13. | Dr. S.P. Singh, Project Director, Directorate of Biological
Control, Hebbal, Bangalore | | " |
| 14. | Mr. Vijay Singh, Dy. Commissioner (Hort), DAC, New Delhi | | " |
| 15. | Mr. Ajit Jain, Jain Irrigations System Limited,
Jalgaon. | | " |

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|-----|--|------------------|
| 16. | Dr. Ashwani Kumar, Project Coordinator, All India Coordinated Project on Plastics, PAU Campus, Ludhiana-141004 | " |
| 17. | Mr. T.G.K. Menon, 46 Samvad Nagar, Navlakha Indore-452001, Tel. No. 403013, Fax No. 401083 | " |
| 18. | Mr. S.S. Ranade, Ranade Micronutrients, Sri.Krishna Krishna Keval Nagar, 1-A Kondhwa Khurd, Pune-48. | " |
| 19. | Dr. Jose C. Samuel, Dy. Commissioner (SWC-E), DAC | Member-Secretary |

Terms of Reference:

- i) To assess the progress in recent techniques in the horticulture sector such as micro-propagation, hybrid seed production and seedlings, high density planting, integrated nutrient management, use of bio-fertilizers, micro-irrigation, fertigation, green house cultivation, mulching, organic farming, integrated pest management and use of bio-pesticides, molecular diagnostics, pesticides residues etc.
 - ii) Prepare an action plan with details of physical and financial outlays.
2. The Chairman of the Sub-Group may co-opt Officials and Experts as considered necessary with under intimation to the Chairman of the Working Group. Dr. K.L. Chadha,
National Professor, IARI, New Delhi-1100012 (Tele/ Fax No. 011-5784877).
 3. The Non-Official Members shall be entitled to TA/DA as permissible to Grade-I Officers of the Government of India and the Expenditure will be borne by the Planning Commission. The TA/DA of Government and Public Sector Officials will be borne by their respective organizations.
 4. The Sub-Group will submit its report to the Working Group latest by 28th of February, 2001.

Subject:- Constitution of Sub-Group on Human Resource Development in Horticulture to assist the Working Group on Horticulture Development including Spices, Aromatic & Medicinal Plants and Plantation Crops for formulation of the Tenth Five Year Plan (2002-07)- Regarding.

In accordance with letter No.M-12043/6/2000-Agri. Dated 13th November, 2000 regarding the constitution of Working Group on Horticulture Development including Spices, Aromatic & Medicinal Plants and Plantation Crops for formulation of the Tenth Five Year Plan (2002-07) and the powers vested with the Chairman it has been decided to constitute a Sub-Group on Human Resource Development in Horticulture to assist the Working Group. The composition and terms of reference of the Sub-Group are as follows:

Composition :

1.	Dr. R.P. Awasthi, Vice-Chancellor, Y.S. Parmar University of Horticulture and Forestry, Solan, Himachal Pradesh.	Chairman
2.	Dr. R.M. Pandey, E-29E, DDA Flats, Mayapuri, New Delhi		Member
3.	Dr. Rita Sharma, Joint Secretary (Extension), DAC.		"
4.	Dr. L. Venkat Rathnam, Chairman, Agri-Horticultural Society 1-2-597/B, Gagan Mahal Colony, Hyderabad-29.		"
5.	Vice-Chancellor, Birsa Agricultural University, Ranchi-834006		"
6.	Vice-Chancellor, Mahatma Phule Krishi Vishwa Vidyalaya, Rahauri, Maharashtra-	"	
7.	Vice-Chancellor, ND University of Agriculture and Technology, Faizabad, U.P.	"	
8.	Mr. P.K. Barua, Director of Horticulture, Government of Assam, Dispur.		"
9.	Mr. Surender Kumar, Director of Horticulture, Government of Rajasthan, Jaipur.	"	
10.	Dr. Kartar Singh, Director of Horticulture, Government of Haryana, Panchkula.		"
11.	Director of Horticulture, Government of Kerala, Trivandrum.	"	
12.	Dr. B.S. Chandawat, Former Vice-Chancellor, C-45, Partap Nagar, Udaipur, Rajasthan-313001		
13.	Dr. P. Parvatha Reddy, Director, Indian Institute of Horticultural Research, P.O. Hessarghatta Lake, Bangalore-560089		"
14.	Dr. K.K. Jindal, Director, Research, Y.S.P.K.V.V. Solan		Member Secretary

Terms of Reference:

- i) To study the need and urgency for promotion of human resource development in horticulture and plantation sub-sectors.

- ii) To work out targets for human resources development in horticulture during the Xth Plan and suggest suitable strategies and programmes for achieving the targets.
- iii) Prepare an action plan with details of physical and financial outlays.

2. The Chairman of the Sub-Group may co-opt Officials and Experts as considered necessary with under intimation to the Chairman of the Working Group. Dr. K.L. Chadha,
National Professor, IARI, New Delhi-1100012 (Tele/ Fax No. 011-5784877).

3. The Non-Official Members shall be entitled to TA/DA as permissible to Grade-I Officers of the Government of India and the Expenditure will be borne by the Planning Commission. The TA/DA of Government and Public Sector Officials will be borne by their respective organizations.

4. The Sub-Group will submit its report to the Working Group latest by 28th of February, 2001.

Subject:- Constitution of Sub-Group on Bee-Keeping to assist the Working Group on Horticulture Development including Spices, Aromatic & Medicinal Plants and Plantation Crops for formulation of the Tenth Five Year Plan (2002-07)- Regarding.

In accordance with letter No.M-12043/6/2000-Agri. Dated 13th November, 2000 regarding the constitution of Working Group on Horticulture Development including Spices, Aromatic & Medicinal Plants and Plantation Crops for formulation of the Tenth Five Year Plan (2002-07) and the powers vested with the Chairman it has been decided to constitute a Sub-Group on Bee-Keeping to assist the Working Group. The composition and terms of reference of the Sub-Group are as follows:

Composition :

- | | | | |
|-----|---|------|----------|
| 1. | Dr. H.P. Singh, Horticulture Commissioner
Deptt. of Agriculture & Coop. | | Chairman |
| 2. | Project Coordinator, AICRP- Honey Bee,
ICAR, HAU, Hissar. | | Member |
| 3. | Chairman, APEDA, August Kranti Marg, New Delhi | " | |
| 4. | Prof. B.N. Mitra, Department of Agri. & Food Engineering
IIT, Karagpur, West Bengal-721302 | " | |
| 4. | Mr. U.N. Chaubey, Director, Horticulture, Government of
Bihar, Patna, Bihar | " | |
| 5. | Dr. Jagmohan Singh, Director of Horticulture, Government
of Himachal Pradesh, Shimla, Himachal Pradesh | " | |
| 7. | Dr. Naresh Pal, Director (Bee Keeping),
KVIC, Mumbai. | " | |
| 8. | Director,
Central Bee Research & Training Institute, Pune | " | |
| 9. | Dr. A.K. Krishna Kumar, Rubber Production Commissioner,
Rubber Board, P.B. No. 1122, Kottayam-686001, Kerala | " | |
| 10. | Prof. B.S. Chahal,
Punjab State Bee Keepers Federation,
Bassi Pathan, Ludhiana-142027 | " | |
| 11. | Managing Director,
U.P. State Agro Industrial Corporation,
Lucknow | " | |
| 12. | Mr. Ashok Kumar, Manager, Gramudyog Sahayog Samiti
Gram & Post –Mirja Nagar, District. Baishali, Bihar | " | |
| 13. | CEO, Mizoram KVIB, Aizawl | " | |
| 14. | President, National Honey Board, PHD House,
Khelgaon Marg, New Delhi. | " | |
| 15. | Mr. Yogeshwar Singh, Chief Editor, Bhartiya Madvi Palam,
Shivanadan, 7/ Phase II, Pushanjali Bagh, Agra-285005 | " | |
| 16. | Mrs. Samparveen Kaur, Honey Bee Natural Products
193 B, Sainik Farm, New Delhi-110062 | " | |

17. Mr. Lalit K. Raina, Ambrosia Apiaries Pvt. Ltd, K-128,
Ranjit Sadan, Mohammadpur, Bhikaji Cama Place,
New Delhi-110066
18. Dr. Jose C. Samuel, Dy. Commissioner (SWC-E), DAC Member Secy.

Terms of Reference :

- i) To assess the performance of bee keeping programme for improvement of crop productivity.
- ii) To work out targets for development of bee-keeping during the Xth Plan and suggest suitable strategies and programmes for achieving the targets.
- iii) Prepare an action plan with details of physical and financial outlays.

2. The Chairman of the Sub-Group may co-opt Officials and Experts as considered necessary with under intimation to the Chairman of the Working Group. Dr. K.L. Chadha,
National Professor, IARI, New Delhi-1100012 (Tele/ Fax No. 011-5784877).

3. The Non-Official Members shall be entitled to TA/DA as permissible to Grade-I Officers of the Government of India and the Expenditure will be borne by the Planning Commission. The TA/DA of Government and Public Sector Officials will be borne by their respective organizations.

4. The Sub-Group will submit its report to the Working Group latest by 28th of February, 2001.

MINUTES OF THE MEETING OF THE WORKING GROUP ON HORTICULTURE DEVELOPMENT FOR FORMULATION OF TENTH FIVE YEAR PLAN HELD UNDER THE CHAIRMANSHIP OF DR.K.L.CHADHA ON 29TH DECEMBER 2000 AT KRISHI BAWAN, NEW DELHI

The first meeting of the Working Group on Horticulture Development including Spices, Aromatic and Medicinal Plants and Plantation Crops for formulation of the Tenth Five Year Plan was held under the Chairmanship of Dr. K.L. Chadha, National Professor, IARI, New Delhi on 29th December, 2000 at Krishi Bhawan, New Delhi. The list of participants is given at Annexure-1.

2. At the outset, the Chairman welcomed the participants. Thereafter, he explained about the constitution of nine various Working Groups in the Agriculture Sector. He welcomed the fact that all the horticultural crops including tea, coffee and rubber have been placed under the Working Group on horticulture. He requested for personal participation of all the Members of the Working Group for formulating the recommendation in accordance with the standards contemplated by the Planning Commission for horticultural development programmes for the Tenth Plan. He also gave a brief History about the progress in the Horticulture Sector and mentioned that it was only during the 7th Plan that a separate Working Group on Horticulture was constituted. The Horticulture Sector witnessed a rapid growth during the Eighth Five Year Plan and the outlay for this sector was increased to Rs. 1,000 Crores against of Rs. 25 Crores during the 7th Plan. This tempo has been maintained during the 9th Plan also with an allocation of about Rs. 1,300 crores.

3. He further highlighted the significant progress achieved in research as well as development in Horticulture in the country. Adequate emphasis was given for the development of quality planting material besides developing infrastructural facilities for minimising post harvest losses of horticultural produce. However, he felt that much needs to be done particularly replanting the old and senile orchards with good quality planting material. The involvement of the private sector for meeting the demands of horticultural produce for the community and also ensuring quality produce would be crucial keeping in view the open market under WTO regime. The small farmers also will have to be reached in an effective manner to achieve the desired goals. An integrated approach will have to be adopted to strengthen the horticulture in specified areas for specified crops. Moreover, the unirrigated areas and wastelands will have to be tapped for diversifying the sector. Medicinal and aromatic plants have immense potential in the country for which there is considerable increase in the demand world over and could be exploited profitably. Moreover, for meeting the growing demands of technical manpower, Human Resource Development will require to be strengthened in the horticulture sector. Dr. Chadha further stressed that each of the terms of reference identified by the Planning Commission for the Working Group would require to be addressed in depth.

4. Dr. H.P. Singh, Horticulture Commissioner explained that the programmes for development of horticulture during the Ninth Plan included most of the aspects for integrated and holistic development of this sector. However, the Ninth Plan schemes became operative as per the new guidelines only from the year 2000-01 while during the first three years of the Ninth Plan, the programmes were implemented in accordance with the Eighth Plan guidelines. With the launching of the Centrally Sponsored Scheme in Macro Management in Agriculture during the

year 2000-01, most of the schemes of the horticulture sector have been amalgamated in the same and the State Governments have to take up the activities through their Work Plan as per priority needs of the State. He also mentioned that the National Agriculture Policy, which has been announced and is being debated in the Parliament, lays great emphasis on horticulture development in the rainfed and irrigated areas. In order to achieve the goal, a mission mode approach duly addressing the issues right from seeds to the marketing of the final product will be necessary. In this context, maintenance of quality standards would require high priority. The research support in horticulture would need re-orientation with more involvement of the private sector. Attention will have to be focused on infrastructure development, human resource development besides introducing precision farming techniques for best utilisation of resources.

5. Dr. R.N. Pal, DDG(Hort.) mentioned that research efforts have resulted in the development of new improved varieties of horticultural crops and the country is in a comfortable position in terms of planting material for many crops like cashew, and a number of fruit crops. Attention would be needed to introduce horticulture on a large scale in the wastelands. Moreover, marketing system will have to be strengthened for horticultural produce in the pattern of Riyatu Bazars in Andhra Pradesh. The new varieties being developed by the ICAR need to be popularised for large scale adoption.

6. Mr. Desalpine, Chairman, Rubber Board stressed that processing and marketing of horticultural produce needed priority attention. With the opening up of the markets under the WTO regime we will have to face stiff competition since cheap products from other countries will be marketed in India. He also felt that medicinal and aromatic plants was a promising sector which needed to be developed. Presently, many medicinal plants are being grown as an inter crop with rubber, but there is problem in their marketing.

7. Dr. Vishnu Swaroop, Director of Research Indo-American Hybrid Co. stated that it would be necessary to address the backward and forward linkages. The results of the research findings in terms of improved varieties and good quality planting material will have to be made available to the farmers. Information Technology on horticulture will have to be promoted vigorously for market intelligence and dissemination of other related information upto the district and block levels. Infrastructure for cool chain and cold storages will need to be developed. In the scenario of dwindling water availability, it will be necessary to adopt improved techniques like drip irrigation, Human Resource Development should be accorded high priority, particularly for middle level management courses on horticulture.

8. Shri R.S. Kanade, Director (Agri.), Planning Commission suggested that it would be worthwhile to identify selected pockets in the country for holistic development of horticulture by removing all possible constraints coming in the way.

CONSTITUTION OF SUB-GROUPS

9. During the deliberations, it was decided to constitute separate sub-groups to assist the main working groups. Accordingly, 13 sub-groups were constituted for addressing the following sub-sectors of horticulture:

<u>Sl. No.</u>	<u>Sub-Group</u>
1.	Fruits
2.	Vegetables including Root and Tuber crops and mushroom
3.	Floriculture
4.	Medicinal and Aromatic Plants
5.	Spices
6.	Plantation Crops I (Palms, Cashew and Cocoa)
7.	Plantation Crops II (Coffee, Tea, Rubber etc.)
8.	Infrastructure for Horticulture
9.	Exports , WTO issues, Quality control of Horticultural Produce
10.	Organisational Support for Horticulture
11.	Hi-Tech Horticulture
12.	Human Resource Development in Horticulture
13.	Bee-keeping.

10. It was decided to Co-opt Shri R.S. Kanade, Director (Agriculture), Planning Commission as a Member of the Working Group.

11. The official and non-official members to be included in the above mentioned sub-groups and term of reference were also discussed and finalised. The details of the composition and Terms of Reference are given in Annexure-2 to Annexure-14 respectively.

NEXT MEETING OF WORKING GROUP

12. It was decided that the next meeting of the Working Group will be held on 25th of January, 2001 at Krishi Bhawan. It was also decided that all the Chairman and Member Secretaries of the Sub-Groups will also be invited to the meeting on 25th January. It was decided to procure notes indicating the current status, programmes of Ninth Plan, progress made, constraints, emerging issues, interventions needed for the development of horticulture from National Horticulture Board, Coconut Development Board, Tea Board, Coffee Board, Rubber Board, DAC and DDG (Hort.), ICAR.

FORMAT OF THE REPORT OF WORKING GROUP

13. It was decided that the Final Report of the Working Group would comprise of Executive Summary and detailed chapters on Specific sectors of horticulture. The reports submitted by the Chairmen of various Sub-groups would form a part of the main report as Annexures. The Chairmen of all Sub-groups will submit their reports duly addressing each of the Terms of Reference assigned to them latest by February 28, 2001.

14. It was also decided to address a letter to all the State Governments to furnish details about the current status of horticultural crops, progress of Central and State Sector programmes on horticultural development during the last three years, constraints in production and issues which require to be addressed during the Tenth Plan.

The meeting ended with a Vote of Thanks to the Chair.

**LIST OF PARTICIPANTS OF THE MEETING OF THE WORKING GROUP ON
HORTICULTURE HELD ON 29.12.2000**

1. Dr. K.L. Chadha,
National Professor (Horticulture),
IARI, Pusa Campus
New Delhi-110012.
2. Dr. H.P. Singh,
Horticulture Commissioner
Department of Agriculture & Cooperation
Krishi Bhavan,
New Delhi-110001.
3. Dr. R.N. Pal,
DDG (Hort.)
ICAR, Krishi Bhavan,
New Delhi-110001
4. Shri S. Maria Desalphine,
Chairman,
Rubber Board,
Kottayam,
Kerala
5. Shri R. S. Kanade,
Director (Agriculture),
Planning Commission,
Yojana Bhavan,
New Delhi-110001.
6. Shri A.K. Sood,
Joint Secretary (NCPA),
Himalaya House,
23, K.G. Marg,
New Delhi-110001
7. Dr. Jose C. Samuel,
Deputy Commissioner (SWC-E),
Department of Agriculture & Cooperation,
Krishi Bhavan, New Delhi.
8. Dr. Vishnu Swaroop,
Indo-American Hybrid Co.
214 Palika Bhavan,
R. K. Puram, Sector 13,
New Delhi-110066.
9. Shri B.R. Natesh,
Liaison Officer,
Coffee Board,
H-11, Kailash Colony,
New Delhi-110048.

10. Shri Asit Sen,
Special Officer for NMI,
Tea Board,
26, K.G. Marg,
New Delhi-110001

MINUTES OF THE SECOND MEETING OF THE WORKING GROUP ON HORTICULTURE DEVELOPMENT FOR FORMULATION OF TENTH FIVE YEAR PLAN HELD UNDER THE CHAIRMANSHIP OF DR.K.L.CHADHA ON 25TH JANUARY, 2001 AT NATIONAL HORTICULTURE BOARD, GURGAON

The second meeting of the Working Group on Horticulture Development including Spices, Aromatic and Medicinal Plants and Plantation Crops for formulation of the Tenth Five Year Plan was held under the Chairmanship of Dr. K.L. Chadha, National Professor, IARI, New Delhi on 25th January, 2001 at National Horticulture Board (NHB), Gurgaon. The list of participants is given at Annexure-1.

2. The meeting commenced with a formal welcome by Shri J.P. Negi, Executive Director, NHB. This was followed by a brief introduction of the participants. Thereafter, the Chairman explained about the constitution of various Working Groups in the Agriculture Sector and observed that some of these Working Groups had relevance to the horticulture sector also, particularly on issues relating to statistics in agriculture, infrastructure, W.T.O. etc. Referring to his comments made during the first meeting of the WG on 29th December, 2000 he complemented the Planning Commission for framing a comprehensive terms of reference on horticulture. He welcomed the fact that all the horticultural crops including tea, coffee and rubber have been placed under the Working Group on horticulture. Dr. Chadha, further informed the participants about the constitution of 13 Sub-groups covering different sectors of horticulture duly introducing the Chairmen and Member Secretaries of each sub-group. He mentioned that seven sub-groups would cover different crops while six would address various issues relating to the horticulture sector. He further expressed satisfaction that the Chairmen/Member Secretaries of all the Sub-groups except for the Sub-group on Plantation Crops-II (Tea, Rubber, Coffee) were present during the meeting. He requested for personal participation of all the Members of the Working Group for formulating the recommendation in accordance with the standards contemplated by the Planning Commission for horticultural development programmes for the Tenth Plan. With regard to the constitution of the sub-groups, he emphasised that all attempts should be made to keep the number of non-official members at a minimum level due financial commitments for meeting their TA/DA etc.

Dr. Chadha gave a brief history about the progress in the Horticulture Sector and mentioned that the outlay for horticulture development was Rs.3.48 crores during the 4th Plan which increased to the level of Rs.25.00 crores during the 7th Plan. The Horticulture Sector witnessed a rapid growth during the Eighth Five Year Plan and the outlay for this sector was increased to Rs. 1,000 Crores. This tempo has been maintained during the 9th Plan also with an allocation of about Rs. 1,400 crores. He also elaborated the current status under each sector of horticulture. He expressed that supply of good quality planting material, popularisation of horticulture among the small & marginal farmers, minimizing post harvest losses, development of quality produce, upgrading of human resources, development of data base in horticulture developments of wastelands by horticulture crop replanting of old plantation which have outlived their economic age are some of the areas which need greater attention. Back yard farming and adoption of cluster approach should receive priority attention. He also stressed the need for focusing the attention on potential crops like litchi in Bihar and nut crops grown in the temperate regions of the country.

Dr. Chadha called upon the Chairmen of the sub-groups to convene their meeting as early as possible and submit their reports to the WG. He also suggested that all the sub-groups should cover each of the TOR assigned to them. They may also touch upon other related issues which they consider as essential even though not included in the TOR. The first seven sub-groups dealing with horticultural crops may address all the 13 TORs of the WG. In this context a draft proforma for formulating the report of the sub-groups was circulated to the participants. A copy of the same is given at Annexure-II. The Chairmen of the sub-groups should submit the report by the first week of March, 2001. The Chairmen may use the facilities of the NHB or DAC, Krishi Bhavan or Planning Commission to convene the meetings.

Dr. H.P. Singh, Horticulture Commissioner & Member Secretary of the WG gave an elaborate presentation of the background of horticulture in the country. He elaborated on the Strengths, Weaknesses, Opportunities and Threats (SWOT) of Indian horticulture and explained the efforts made by the Horticulture Division and the concerned organizations in bringing horticulture to the forefront. The following issues were highlighted by him in the context of Tenth Plan programmes on horticulture development:

1. Production & distribution of quality seeds and planting material of horticultural crops.
 2. Development of standards of horticultural produce in accordance with international standards and regulations.
 3. Adoption of food safety standards and measures.
 4. Promotion of bio-technological approaches for improving productivity.
 5. Improving the risk management capability and credit support for horticulture.
 6. Reorientation of research support to address the issues related to field problems.
 7. Adoption of a mission mode approach for promoting rainfed horticulture.
 8. Integration of programme of various Departments and Ministries with mission mode approach.
 9. Development of human resources on horticulture with emphasis on team work.
 10. Infrastructure development for post harvest management and marketing of horticultural products.
 11. Promotion of environmental horticulture in and around cities and townships to ward off pollution threats.
- Adoption of Eco-friendly technology and Organic farming for sustainable production.
Adoption of precision farming techniques for efficient use of natural resources.

Shri R.S. Kanade, Director (Agri.), Planning Commission informed that the facilities of Planning Commission could also be availed for convening the meetings of the sub-groups. He stressed the need to keep the non-official members to the minimum. He also informed about the constitution of a Working Group on Agricultural Statistics and welcomed the recommendations of this Working Group, if any, which could be incorporated by the Working Group of Agricultural Statistics. He expressed the need to explore the potential for horticulture development in the coastal and saline belts of the country. Referring to the TOR, he stated that developmental issues relating to small cardamom should also be discussed by the WG. He also informed that the meetings of the sub-groups could be arranged at Planning Commission. He requested to inform about the meeting at least one week in advance for making the necessary arrangements.

Dr. Manmohan Attawar, Chairman, M/s. Indo-American Hybrid highlighted that with the signing of WTO agreement, considerable difficulties are being experienced by the horticulture industry as well as the farmers. The cost of production has gone up and a number of commodities have started entering the Indian market at cheaper rates from other countries which is an area of concern. The farmers do not have a level playing field as the interest rates on commercial lending are high with short pay back period. In the floriculture sector the freight rates are high and our flowers do not meet international quality standards. It would be necessary to develop infrastructure facilities in hinterlands around Bangalore, Delhi, Bagdogra etc. where the minimum required facilities will have to be developed. He cited the examples of countries like Chile, Columbia, Sri Lanka and Holland who could progress well due to Governmental support. In the USA the repayment period of credit is 14-15 years while in India it is 5-7 years. The RBI and NABARD should be moved to increase the pay back period. There is also need to provide insurance cover for horticultural crops. HRD is another area which needs urgent attention..

Mr. Nitin Gokarn, Secretary, Coffee Board emphasized the need for creating accrediting facilities for organically produced coffee and other horticultural products. On this, the Hort. Commissioner informed that a Screening Committee has been constituted by the Ministry of Commerce which is going into the details. Mr. Gokarn, also suggested the need for taking up replanting of old coffee plantations, particularly robusta, which is more than 100 years old. He also informed that Vietnam has emerged as a serious competitor to Indian in the coffee sector. Their unit cost of production is Rs.17-Rs.22/- per kg. against Rs.30/- per kg. of Indian Coffee. Moreover, the domestic demand for coffee has been stagnant. We need to develop our own standards for coffee to prevent large scale imports. Indian coffee has low okratoxin A which should be exploited advantageously. There is also need to promote marketing of coffee.

Dr. P. Rethinam, Chairman, CDB highlighted the following issues:-(i) Area expansion programme for all pre-revised crops should be at a low key, (ii) More emphasis should be given for rejuvenating the old and senile Plantations, (iii) Compact blocks of 20-30 ha. should be taken up for demonstration purpose; (iv) Multi-crop system of farming should be promoted and (v) Arecanut should also receive attention for development; (vi) Market promotion should be augmented; (vii) Organic farming should be promoted and accrediting agencies; (viii) HRD in horticulture should receive priority attention. The network for technology transfer need to be strengthened; and (ix) The database on horticulture need to be improved and made available without much time lag.

Dr. Vishnu Swarup, M/s. Indo-American Hybrids explained that development of horticulture with reference to the hills would require attention in two aspects viz,(i) seed production for temperate region and (ii) off season production of vegetables from hills. The minor vegetables are also a source of nutrition, which need attention for development. He further expressed that the chilly is being treated both as a vegetable as well a spices. Dr. K.L. Chadha suggests that such crops should receive the attention by the sub-groups on spices as well as vegetables. Dr. Swarup emphasized the need to conserve the bio-diversity, while taking up area expansion programme with improved varieties..

Dr. Sharma, Director, IISR stressed upon that i) development of

quality planting material should receive priority attention; ii) the production programmes should be based on demand; iii) more emphasis should be given on value addition; iv) organic farming and bio-control measures should receive priority attention; v) the technology transfer programme should receive more emphasis.

Dr. R.P. Awasthi, Vice Chancellor, Y.S. Parmar University of Horticulture & Forestry, Solan stressed the following issues:- i) establishment of mother tree orchards should be taken up in an organized manner for producing quality planting material; ii) the nurseries should be modernized with latest facilities like polyhouses, micro irrigation etc; iii) high density planting should be promoted and availability of planting material should be ensured; iv) emphasis should be for producing good quality products which can meet international standards; v) some crops like walnut are difficult to propagate. Hence special programmes need to be taken up for promoting such crops; vi) many of the orchards have become old and senile Hence, they need to be rejuvenated on priority basis; and vii) seed production programme for temperate vegetables and hybrid seeds should receive greater attention.

Dr. B.S. Dhankar, ADG (Veg.Crops), ICAR emphasised that seed production of temperate crops and cole crops should receive priority attention. India has competitive advantage over Europe in this sector as they are protected cultivation in Europe, is proving to be costly. The NSC is involved in the production of seeds. However, there is need for a separate programme on seed production for horticulture sector. There is also a need to promote vegetable cultivation in the peri-urban areas. The nursery production techniques need improvement. model.

During the discussions, it emerged that while food security has been achieved to some extent, we are still far from achieving nutritional security. The rural population of India is suffering from deficiency of Vitamin A, Iodine, Calcium etc, which is causing health problems. Attention is needed to promote cultivation of green leaves /vegetables to combat anemia. Similarly, cultivation of other horticultural crops like papaya, pineapple, carrot, mango etc. need to be linked with health care programmes. The State Governments are weak in terms of resources and technical manpower. Shortage of quality planting material is a serious concern. The infrastructure available in the states are inadequate and needs to be strengthened. There is also need to take up need/area based research. There is good potential in Tamil Nadu for getting mangoes in the off season, particularly, in the coastal belt. The infrastructure for training need to be strengthened. Stone weevil is a serious problem in Tamil Nadu for which no answer has been found. On this, Dr. Chadha informed that the problem is mainly on account of the fact that the mangoes are sold to the pre-harvest contractor as a result of which both the orchardist and contractor do not follow plant protection measures at appropriate time.

Dr. M.L. Chaudhary emphasised the need for introducing certification mechanism of seeds and planting material.

Dr. I.S. Yadav, former Director (IIHR) stressed that i) HRD in horticulture should receive priority attention; ii) infrastructure development needs adequate attention; iii) area specific approach should be adopted; iv) nursery act should be modified and implemented; and v) the database on horticulture should be strengthened.

Dr. Jagmohan Singh, Director of Horticulture, Himachal Pradesh mentioned that Water harvesting, particularly, in the hills should receive due attention. More infrastructural support for establishing plant health clinics, integrated pest management, information technique and value addition are also areas which require focussed attention.

Dr. Jagtar Singh Mann, Joint Director of Horticulture, Govt. of Punjab stated that the State Government have carried out the survey of the horticultural area in the State according to which the area under horticultural crops is observed to be only 1/3rd of the reported area. Marketing is one of the most difficult tasks in the state. There is need to create airport facilities at Amritsar to cater to the needs of exports of horticulture produce. There was also need to establish road linkage to adjacent countries. Crops like potato are fetching low price, hence need support price and processing facilities.

Dr. S. Maiti, Director, NRC on Medicinal & Aromatic Plants, Anand emphasized that i) the land use planning should be oriented to tap the international market; ii) umbrella guidelines should be developed for adoption by the Implementing agencies; iii) organic farming should be promoted; iv) seed production of medicinal plants should receive focussed attention; v) about 30 varieties of medicinal and aromatic plants have been developed which need to be popularised for large scale cultivation.

Dr. K.K. Jindal, Director of Research, Y.S. Parmar University of Hort. & Forestry stressed upon the need for developing horticulture in the Hindukush Himalayas. Weather forecasting needed attention in this region.

Shri P.M. Chauhan, Joint Director of Horticulture, Govt. of Rajasthan expressed that export standards for seed spices need to be developed. There is a dearth of quality planting material. Rajasthan also needs to be included under the programme for development of horticulture in Tribal/Hilly areas. He also informed that with the launching of the 'Macro Management' scheme, the State Government has to bear 10% and repay 20% loan portion, which is a difficult proposition for the State, and will have adverse effect on horticulture development. The extension research linkage and HRD need to be improved in the State. Shri Madan Lal, AARO suggested the need for allowing the farmers to visit different districts within the state under the Training & Visit Programme of the NHB.

Shri S.B. Singh, Joint Director of Horticulture, Govt. of Uttar Pradesh informed that the potato price had crashed in the State which is causing problem to the farmers. There is a need to reduce the cost of production and increase the yields to gain competitive advantage.

In conclusion, the Chairman thanked the participants for their valuable suggestions. He requested the Chairmen / Member Secretaries of the Sub-groups to incorporate these suggestions and recommendations in their reports. He also thanked Shri J.P. Negi, Executive Director, National Horticulture Board for extending all the necessary facilities for conducting the meeting of the Working Group. Dr. Jose C. Samuel, Deputy Commissioner (SWC-E), proposed a formal Vote of Thanks.

Decision Points

- Report by Sub-Groups should be submitted in agreed proforma on or before 28th February
- Chairman/Member Secretary shall present the Report in the first week of March, 2001.
- Draft Report should be finalized before 31st March, 2001.

Annexure-1

LIST OF PARTICIPANTS OF 2ND MEETING OF THE WORKING GROUP ON
HORTICULTURE HELD ON 25.01.2001.

1. Dr. K.L. Chadha, Chairman
National Professor (Horticulture),
IARI, Pusa Campus
New Delhi-110012.
2. Dr. H.P. Singh, Member Secretary
Horticulture Commissioner
Department of Agriculture & Cooperation
Krishi Bhavan,
New Delhi-110001.
3. Shri Satish Chander
JS (NHB),
Department of Agriculture & Cooperation
Krishi Bhavan,
New Delhi-110001.
4. Shri J.P. Negi,
Executive Director,
National Hort. Board,
Gurgaon.
5. Shri P. Rethinam
Chairman, CDB, Kochi.
6. Shri B.S. Dhankhar,
ADG (Veg. Crops)
ICAR, Krishi Bhavan
7. Dr. Manmohan Attawar,
Chairman & Managing Director,
Indo-American Hybrid Co.
M-56, Palika Bhavan,
Sector 13, R.K. Puram, New Delhi-110066
8. Shri Nitin R. Gokarn,
Secretary,
Coffee Board
Bangalore-560001
9. Shri Vishnu Swarup,
Indo American Hybrid Seeds,
M-56, Palika Bhavan,
Sector 13, R.K. Puram, New Delhi-110066
10. Shri R.S. Kanade;
Director (Agri.),
Planning Commission
Yojana Bhavan,
New Delhi
11. Shri R.P. Awasthli,
Vice Chancellor,
Y.S. Parmar University for Hort. & Forestry

Solan

12. Shri A.K. Gupta,
Addl. Executive Director,
NHB, Gurgaon
13. Shri M.L. Choudhary,
IARI, New Delhi.
14. Shri Surjit K. Chaudhary,
Commissioner of Horticulture,
Madras.

15. Dr. I.S. Yadav,
XIII/4350, Gali Bahuji
Sadar Bazar, Delhi-110006
16. Shri Y.R. Sarma,
Director,
IISR, Calicut.
17. Shri K. K. Jindal,
Director of Research,
Y.S. Parmar University for Hort. & Forestry
Solan
18. Shri Jagmohan Singh,
Director (Hort.), Shimla, H.P.
19. Shri R. Chidambaram,
SE/AE
Department of Agri. Engineering Department,
Nandanam,
Chennai
Tamil Nadu.

20. Shri B.R. Natesh,
Liaison Officer,
Coffee Board,
New Delhi.

21. Shri Rajesh Prasad,
Deputy Director (Plg.)
Horticulture & Food Processing,
U.P.

22. Dr. S. B. Singh,
Jt. Director (Hort.),
Dte. of Horticulture,
U.P.

23. Shri P.M. Chauhan,
Jt. Director, (Hort.)
Deptt. of Hort.
Rajasthan,
Jaipur.

24. Shri Madan Singh,
AARO,
Deptt. of Horticulture,
Rajasthan,
Jaipur.
25. Shri Jagtar Singh Mann,
Jt. Director (Hort.)
Punjab, Chandigarh
26. Shri A.K. Kapur,
Deputy Director (Hort.)
Punjab, Chandigarh.
27. Dr. E. Saoipan,
Dy. Director, Dte. of Hort.
Mizoram.
28. Shri Paramjit Singh,
DC,DAC
29. Shri K. Sivaraman,
Director,
Directorate of Spices & Arecanut Development,
Calicut.
30. Dr. Jose C. Samuel,
DC (SWC-E), DAC.
31. Dr. Sant Lal,
Dy. Sirector (Hort.)
Dte. of Cashew & Cocoa Deptt.,
Cochin.

MINUTES OF THE THIRD MEETING OF THE WORKING GROUP ON HORTICULTURE DEVELOPMENT FOR FORMULATION OF TENTH FIVE YEAR PLAN HELD UNDER THE CHAIRMANSHIP OF DR.K.L.CHADHA ON 22ND AND 23RD MARCH, 2001 AT NATIONAL HORTICULTURE BOARD, GURGAON

The third meeting of the Working Group on Horticulture Development including Spices, Aromatic and Medicinal Plants and Plantation Crops for formulation of the Tenth Five Year Plan was held under the Chairmanship of Dr. K.L. Chadha, National Professor, IARI, New Delhi on 22nd and 23rd March, 2001 at National Horticulture Board (NHB), Gurgaon. The list of participants is given at Annexure-1.

At the outset, Shri J.P. Negi, Executive Director, NHB welcomed the Chairman and requested him to conduct the proceedings of the meeting.

Dr. K.L. Chadha, Chairman of the Working Group welcomed the participants. Thereafter, he mentioned that out of 13 Sub-Groups, most of them have met once or twice and have furnished the draft report. On inquiring whether the Sub-group on Plantation Crop-II were ready with their report, Mr. Desalpine, Chairman, Rubber Board mentioned that they had held a preliminary meeting on the 17th of March and will have to meet again to finalise the report. The Chairman reiterated the need to submit the reports on time and stressed that the reports should have uniformity. The format for the final report of the Working Group would be developed and circulated to the Chairmen of the Sub-Groups. He also suggested that one chapter of the report would contain details of technologies available for horticulture development. There will be two types of recommendations viz. i) General and (ii) Crop Specific. He also stressed the need for indicating the strategies and action plan in the respective reports with broad indication of the outlays. The area and production details should have a reference year. Since for most of the horticultural produce, the data is available upto the year 1998-99, the reference year could be 1998-99. In case where the details are available for 1999-2000, then the figures for both 1998-99 and 1999-2000 may be mentioned. As far as possible efforts should be made to indicate the GDP contribution, our share in the world scenario, organisational set up available, for promotion of crops salient achievements of plan schemes, constraints and thrust areas. Estimation of requirement of planting material may also be given. The report should be scientific in nature. Measure for productivity improvement such as, high density planting, micro irrigation, fertigation, leaf nutrient analysis, mixed cropping, IPM, market promotion are important aspects which need to be addressed. Organic farming including vermiculture and composting are emerging as potential technologies which can be tested and promoted for horticultural crops. Similarly, automation and mechanization in horticulture are important aspects to be covered. HRD is yet another area which is very important for the farmer as well as implementing functionaries. Demonstration of new technologies is also necessary at strategic locations. Horticultural crops which have potential for developing the wastelands need to be identified. The District Magistrates and the District Hort. Officers could be involved for the development of these areas. Efforts should be made to develop a strong database on horticulture. Medicinal and Aromatic Plants constitute a very important sector in Horticulture. Holistic development of this sector in terms of crop, marketing and processing would be necessary. The newly constituted States of Chattisgarh, Jharkhand and Uttranchal should be kept in view for development of

horticulture. Homestead farming is yet another neglected area, which needs attention. Byproduct utilization of horticultural produce such as banana peel could help in keeping the area/processing factories clean. He also mentioned that a Drafting Committee will be constituted, if necessary, for finalising the report of the Working Group. He requested the Chairman of the Sub-Groups to submit their final reports latest by 15th of April so that the main report could be finalised by the end of April for presentation to the Steering Committee of Planning Commission. He then requested the Chairmen of the Subgroups to make their presentation.

Dr. H.P. Singh, Hort. Commissioner suggested that the targets for each commodity may be indicated separately. Since we have gained sufficient experience in research and development efforts should be made to identify the gaps and failures and suggest action plan which is implementable.

Shri R.S. Kanade, Director (Agri.) Planning Commission mentioned that the TORs as provided by the Planning Commission may be addressed. He also stated that the allocations for horticulture development programmes during the Tenth Plan will have a bearing of Zero Based Budgeting. However, indicative outlay for the Tenth Plan based on minimum estimated requirements may be provided. He also suggested that in the case of area expansion, the closely competing crops should be mentioned. All the interventions should have proper justification.

Dr. P. Rethinam, Chairman, Coconut Development Board, presented the report on Plantation Crops-I covering coconut, Cashew, Cocoa, Oil palm. After the presentation discussions were held on the draft report and the following action points emerged:

- i) The interventions proposed for the plantation crops need to be justified.
- ii) Extent of coverage and the impact of the past efforts need to be indicated.
- iii) Comparative analysis about market promotion in terms of advantages and disadvantages need to be given.
- iv) For cashew, the available processing capacity is skewed in terms of location. Modalities of developing cashew processing facilities need to be indicated in all parts of the country.
- v) Special mention need to be made about the development of cashew in the reserve forest areas.
- vi) The Revolving Fund of ICAR could be availed to develop schemes for production of planting material.
- vii) Old plantations of cashew need replanting
- viii) Coconut provides not only edible oil but a variety of production like coconut water, coconut powder. Hence product diversification is important.
- ix) Bio-tech interventions would be needed for development of coconut.
- x) Byproduct utilisation like coconut shell liquid need to be promoted.
- xi) In the context of open market economy, it would be important to minimise the cost of production and maximise the quality of plantation crops.
- xii) The areas/pockets where the development of the crops can take place need be indicated. Moreover, the varieties suitable for different States should be indicated.
- xiii) IPM needs to be promoted in selected areas.

- xiv) The Private Sector could be encouraged to produce the parasites and predators.
- xv) Automation and mechanization needs like coconut tree climber need to be addressed.

The report of the Sub-group on Spices was presented by Dr. Y.R. Sarma, Director, IISR and Member Secretary of the Sub-Group. Following the presentation, Dr. P. Rethinam, Chairman, CDB mentioned that there is potential for developing perennial spices in different parts of the country. The yield of pepper is getting reduced over the years and Vietnam is emerging as a serious competitor. Single crops like cashew are earning about Rs. 2500 crores through exports whereas the total income from exports of a number of spices is about Rs. 1800 crores only. Hence, to retain the major share, it will be necessary to tap the non-conventional areas. In the conventional areas, improved varieties will have to be introduced.

The report of the Sub-group on Medicinal & Aromatic Plants was made by Dr. Pushpangadhan, Director, NBRI and Chairman of the Group. Dr. Chadha, Chairman of the WG pointed out that the report would need further strengthening so as to cover the developmental aspects already undertaken on medicinal & aromatic plants, gaps and the activities that need to be taken up during X Plan. The steps taken by DISMH in establishing Medicinal Plant Board and integration of efforts need to be indicated in the report. Moreover, the targets and financial outlay for the Tenth Plan need to be indicated for some of the essential activities which are to be taken up during the Tenth Plan. The Group should also suggest the limitations of Forest Conservation Act which is coming in the way of development of M&AP. Market support is essential for the medicinal plants, hence it will be necessary to promote contract farming. Planting techniques will have to be developed for planting the medicinal and aromatic plants in the forest areas by the Forest Department. Dr. H.P. Singh, Hort. Commissioner reiterated that the report should indicate concrete action plan. Efforts should be made to promote the plants which are competitive and can provide more remuneration to the farmer as compared to conventional crops.

The report of the Sub-group on Floriculture was presented by Dr. M.L. Choudhary, Head, Division of Floriculture, IARI, New Delhi and Member Secretary of the Group. Dr. K.L. Chadha, Chairman indicated that there was need to describe the existing open cultivation and the new system of protected cultivation. The demand for domestic consumption and exports will have to be kept in view while planning the development of this sector. The incentives which can be provided to the farmers need to be mentioned. Similarly, the infrastructure requirements will have to be specified. Dr. H.P. Singh indicated that the flowers should be competitive in terms of quality and price to tap the export market. Detailed analysis would be needed for each flower. This sector can provide employment for cultivation as well as flower arrangement / Ikebana.

Shri K.N. Reddy, Member of the group suggested that cultivation of flowers in controlled atmospheric conditions in India is expensive. Hence strategies would be required to minimise the cost of production. He also expressed that the horticultural produce should be exempted from all taxes.

The report on Beekeeping was presented by Dr. Jose C. Samuel, Deputy Commissioner (SWC-E) and Member Secretary of the Sub-group. The following action points emerged from the discussions which followed the presentation:

- i) Beekeeping should be promoted with vigour for crop pollination purpose. It would be appropriate for taking up beekeeping as a part of the crop development programme. Moreover, the Coconut Development Board could take up beekeeping for promoting cross pollination in coconut plantations.
- ii) The potential belts should be identified where beekeeping could be promoted with focussed attention.
- iii) It would be necessary to indicate the number of honey bee colonies distributed so far and the colonies which require to be distributed during the X Plan.

The report of the sub-group on Fruits was presented by Dr.I.S. Yadav, Chairman of the group. After the presentation, Dr. K.L. Chadha mentioned that the Chapter relating to the development of fruits would be the first chapter of the report of the Working Group. The report should indicate the advantages and disadvantages of the existing Nursery Act and suggest possible means of streamlining the procedure for distribution of quality planting material. The future R&D requirements need also to be indicated. The expertise available in the public and private sector may be indicated.

Shri K.N. Reddy suggested that a mechanism needs to be developed so that the funds reach the target group identified for development. The report should highlight the justification for each of the interventions proposed during the X Plan. The Chairman may incorporate the details in consultation with the Member Secretary while finalising the report.

The report of the Sub-group on Vegetables was presented by Dr. B.S. Dhankar, ADG (VC). The Chairman suggested that the importance of vegetables in fighting malnutrition need to be emphasised. Specific areas like strategy for development of TPS and development of vegetables in land locked areas need to be mentioned. Similarly, strategy need to be developed for ensuring vegetable production throughout the year. Need for low cost storages was also emphasised. Tropical tuber crops which were considered important food crop during famine need to be addressed. A separate section may be devoted on the requirement and development of viable seeds. The report may be supported with a table indicating the varieties of vegetables in different States of the country. Dr. H.P. Singh, Hort. Commissioner mentioned that many of the interventions which were introduced during the IX Plan have yet to reach the target group due to late takeoff. The ongoing programmes may be analysed critically and additional components proposed if required. Dr. R.P. Awasthi suggested that efforts need be made to introduce processable varieties.

The report of the Sub-Group on Infrastructure Development was presented by Shri J.P. Negi, ED, NHB. During the presentation Shri Negi indicated that most of the targets contemplated during the IX Plan have been achieved.

Shri K.N. Reddy pointed out that the farmers are facing considerable difficulty due to sharp decline in the price of tomato. There is an urgent need for an apex agency to provide catalytic support. The main problem is the lack of adequate working capital.

The NHB could function on the lines of NDDB for providing support to the farmers. He also stated that if the farmer is assured about the marketing of his produce, other assistance for development will become secondary in nature.

Dr. H.P. Singh, Hort. Commissioner suggested that the programmes need to be analysed in the changing scenario of policies. Moreover, viability of the project will have an important bearing on its success.

The report of the Sub-group on Exports & WTO issues was presented by Shri Arvind Gupta, Additional Executive Director, NHB. Further, Shri S. Dave, GM, APEDA supplemented. The following observations were made:

- i) Many countries like Australia, China raise many questions relating to the products exported from India before accepting the export commodity. India should also adopt similar strategy while accepting the import of horticultural produce from such countries.
- ii) Many a times, India has earned a bad name on account of mismatch of products when compared to the label mentioned on the package. Hence there should be a uniform policy for the export of all horticultural produce.
- iii) India should attend the meetings relating to setting up of standards for horticultural products.
- iv) The standards available in India for horticultural products are outdated and need review.
- v) Extension service would be needed on project mode, supported with regular monitoring.
- vi) States in India should be involved in the discussion on standards.

Dr. H.P. Singh, Horticulture Commissioner mentioned that India's competitive advantage needs to be capitalized for increasing export earnings from horticultural produce. Critical analysis would be needed of our successes and failures. Production programmes will be closely linked with export strategy. Shri K.N. Reddy suggested that generic promotion of Indian horticultural products should be taken up aggressively. Indian mango should be promoted for export. We should aim at the adjacent markets.

The report of the Sub-group on Organizational Support was presented by Shri Paramjit Singh, Deputy Commissioner (Hort.) and Member Secretary. He mentioned that due to lack of the participation of the Members of the Sub-group, particularly Rubber, Coffee, Tea Boards during the meetings the assessment of the requirement of the organizational set up for Tenth Plan could not be addressed adequately. The following suggestions emerged from the deliberations:

- i) The views of Coffee, Rubber & Tea Boards may be obtained on the proposal to merge the different Boards as Plantation Crop Board.
- ii) Horticulture Commissioner in the DAC should be in the rank of Additional Secretary like Agriculture Commissioner.
- iii) NHB need to be strengthened adequately to meet the increasing work load.

- iv) The possibility of creating a separate Department of Horticulture need to be explored by analysing the outlays being handled by other related Departments like DFPI vis-à-vis horticulture programmes.
- v) Commodity Development Councils could be formed for horticultural crops on the lines of Industrial Development Council.
- vi) Functioning of some of the successful societies like Mahagrape, Mahamango could be analysed for replication in other areas.
- vii) The proposed classification needs relook. Fruits, vegetables and floriculture will have to be dealt separately.
- viii) Mention may be made on States which do not have Deptt. of Horticulture.
- ix) A table indicating the name of the departments handing horticulture programmes in each State may be provided.
- x) An agency for regulating the supply of quality planting material would be necessary.

The report of the Sub-Group on HRD in Horticulture was presented by Dr.R.P. Awasthi, Vice Chancellor, Y.S. Parmar University of Horticulture & Forestry. During the discussions that followed the presentation, it emerged that the horticultural development interventions need much more skill and expertise as compared to the agricultural sector. This aspect needs to be emphasized adequately in the report. Moreover, the requirement of the manpower during the X Plan period needs to be indicated with justification. Training course on management aspects needs to be provided. The IIM, Ahmedabad/ Lucknow could be entrusted with the job.

The report of the Sub-group on Hi-tech Horticulture was presented by Dr. Jose C. Samuel, Member Secretary of the group. During the discussions it emerged that horticulture is highly technology driven. The Chairman requested the HRD Group to take note of the trained manpower requirements for hi-tech horticultural interventions. Shri K.N. Reddy suggested that new techniques which have been developed for scanning fruits should be promoted to check the internal and external damage of fruits. Dwelling on hi-tech horticulture, a presentation was made by Dr. J.S. Parihar, Group Director, SAC, Ahmedabad on the prospects of use of remote sensing & GIS technology in horticulture.

The summary of action points which emerged from the discussions are as follows:

1. The Sub-groups should revise the draft reports keeping in view the points which emerged during the meeting and on the lines of the format suggested.
2. The final report along with floppy diskette (MS Word) may be submitted to the Chairman by 15.04.2001.
3. Attempts would be made to finalise the report of the Working Group by the Drafting Committee for onward submission to the Planning Commission by the end of April, 2001.

In his concluding remarks, Dr. K.L. Chadha, Chairman thanked Shri J.P. Negi, Executive Director, NHB for extending the facilities for smooth conduct of the meeting of the Working Group for two days.

The meeting ended with a vote of thanks to the Chair.

Annexure-1

**LIST OF PARTICIPANTS OF THE MEETING OF THE WORKING GROUP ON
HORTICULTURE HELD ON 29.12.2000**

1. Dr. K.L. Chadha,
National Professor (Horticulture),
IARI, Pusa Campus
New Delhi-110012.
2. Dr. H.P. Singh,
Horticulture Commissioner
Department of Agriculture & Cooperation
Krishi Bhavan,
New Delhi-110001.
3. Shri S. Maria Desalphine,
Chairman,
Rubber Board,
Kottayam,
Kerala.
4. Shri N.K. Das,
Chairman,
Tea Board,
14, Biplabi Trailokya
Maharaj, Sarani, (Barbourne Road)
Calcutta-700001
5. Dr. P. Pushpangadhan,
Director,
NBRI, (CSIR),
Lucknow.
6. Mr. K.N. Reddy,
113, Kashavayanigunta,
Tirupati-517501
7. Dr. R.N. Pal,
DDG (Hort.)
ICAR, Krishi Bhavan,
New Delhi-110001
8. Shri J.P. Negi,
Executive Director,
National Hort. Board,
Gurgaon.
9. Shri P. Rethinam
Chairman,
Coconut Development Board, Kochi.

10. Shri B.S. Dhankhar,
ADG (Veg. Crops)
ICAR, Krishi Bhavan
New Delhi-110001
11. Shri R.P. Awasthi,
Vice Chancellor,
Y.S. Parmar University for Hort. & Forestry
P.O. Nauni, Solan, Himachal Pradesh.
12. Dr. I.S. Yadav,
XIII/4350, Gali Bahuji
Sadar Bazar, Delhi-110006
13. Dr. R.K. Pathak,
Director,
CISH, P.O. Rehmankheda,
Lucknow
14. Dr. S. Maiti,
Director,
NRC for M&A Plants, Boriavi,
Anand,
Gujarat.
15. Shri R. S. Kanade,
Director (Agriculture),
Planning Commission,
Yojana Bhavan,
New Delhi-110001.
16. Ms Priya Kumar,
Deputy Secretary (Plantation),
Ministry of Commerce,
Udyog Bhavan, New Delhi.
17. Dr. J.S. Parihar,
Group Director,
Agri. Resources Group,
Space Application Centre,
Ahmedabad-380015.
18. Dr. U.B. Pandey,
Director,
National Horticulture Research Development Foundation,
Nasik. Maharashtra
19. Shri S. Dave,
General Manager,
Agricultural Products Export Development Authority,
NCUI Building,
Khel Gaon Marg,
New Delhi

20. Shri B.R. Natesh,
Liaison Officer,
Coffee Board,
H-11, Kailash Colony,
New Delhi-110048.

21. Shri J.K. Thomas,
Managing Director,
Malankara Rubber Ltd..
Kottayam
(Representing UPASI)

22. Shri Asit Kala,
Special Officer,
Tea Board,
New Delhi.

23. Shri S.K. Arora,
NAFED,
Ashram Chowk,
New Delhi.

24. Shri A.K. Gupta,
Addl. Executive Director,
NHB, 85 Institutional Area,
Sector 18, Gurgaon

24. Shri M.L. Choudhary,
Head, Division of Floriculture,
IARI, New Delhi-110012

26. Shri Y.R. Sarma,
Director,
IISR, Calicut.

27. Shri K. K. Jindal,
Director of Research,
Y.S. Parmar University for Hort. & Forestry
P.O. Nauri, Solan, H.P.

28. Shri Paramjit Singh,
DC,DAC
Krishi Bhavan, New Delhi

29. Shri K. Sivaraman,
Director,
Directorate of Spices & Arecanut Development,
Calicut.

30. Dr. Jose C. Samuel,
Deputy Commissioner (SWC-E),
Department of Agriculture & Cooperation,
Krishi Bhavan, New Delhi.

MINUTES OF THE FOURTH MEETING OF THE WORKING GROUP ON HORTICULTURE DEVELOPMENT FOR FORMULATION OF TENTH FIVE YEAR PLAN HELD UNDER THE CHAIRMANSHIP OF DR.K.L.CHADHA ON 26TH APRIL, 2001 AT KRISHI BHAVAN, NEW DELHI

The fourth meeting of the Working Group on Horticulture Development including Spices, Aromatic and Medicinal Plants and Plantation Crops for formulation of the Tenth Five Year Plan was held under the Chairmanship of Dr. K.L. Chadha, National Professor, IARI, New Delhi on 26th April, 2001 at Krishi Bhavan, New Delhi. The list of participants is given at Annexure-1.

At the outset, Shri H.P. Singh, Hort. Commissioner and Member Secretary of the Working Group welcomed the Chairman Dr. K.L. Chadha and the other participants of the meeting. Thereafter, he briefly highlighted the salient features of the report and said that Executive Summary of the report of the Working Group, which were formulated based on the material provided by the Sub-Groups has been circulated and requested for suggestions to refine the report.

Dr. K.L. Chadha, Chairman informed the Members about the quick exercise carried out in terms of calling of meetings, formation of sub-group, most of whom have submitted their final report. The final report was, however, awaited from the sub-group on Plantation Crops II, from whom even the first draft has not been received so far. He requested the Chairman of the Sub-Group to provide atleast the executive summary as quickly as possible. The final report from the sub-group on Medicinal & Aromatic Plants and Spices were received on 26th April, 2001, while the Chairman of the sub-group on Plantation Crop-I said that the report will be submitted in a day. Dr. Chadha, further expressed that in the light of delay in submission of the final reports from various sub-groups, the submission of the report of the Working Group would get delayed by about a month. He also requested the participants to offer their suggestions on the draft Executive Summary within a weeks time. The members may give a brief note if they propose to add a new points.

On a query by Mrs. Lakshmi Venkatachalam, Chairperson, Coffee Board about the likely format of the final report of the Working Group, Dr. Chadha highlighted the chapters and sub-chapters that were planned in the report. He reiterated the need to provide the compative data with reference to the base year of 1991-92 and 1998-99. The data for 1999-2000 could be supplemented in the text. Drawing attention to the Executive Summary, he mentioned that it contains the essence of the report in general and would undergo some modifications depending upon the input received from the members.

Shri R.S. Kanade, Director, (Agri.) Planning Commission mentioned that a formal request may be made by the Chairman to the Planning Commission seeking extension of time. He also mentioned that such extension has been accorded to other Working Groups till the end of May, 2001. Shri Kanade informed that the research aspects in the plantation sector covering Tea, Coffee, Rubber are outside the purview of the ICAR. Hence, the Plantation Crop-I sub-group should highlight the research aspects in their report. He also requested the sub-group to give specific recommendation on the price

support mechanism for these crops, particularly on the aspect of price stabilization. Moreover, there was need to highlight the quality and reliability aspect of the data being collected and published in the plantation sector. There was also need to study the technological gaps, labour replacement and skill up-gradation. He also suggested the need for strong justification for continuation of the commodity boards as well as directorates under horticulture.

Mrs. Lakshmi Venkatachalam, Chairperson, Coffee Board mentioned that the plantation crops have a key role in biosphere preservation particularly in the Western Ghats, Eastern Ghats and the North Eastern Region. The plantation crops are supported with legislation under which taxation is a statutory obligation. As the plantation crops are in contiguous pockets, the enforcement of the Act is more effective as compared to other crops. Drawing attention about the remarks of Shri Kanade about the justification for continuation of the Boards etc., she mentioned that the views of the concerned organisation should be heard first by the Planning Commission before deciding their closure. She stressed the need for legislation on plant protection measures for all horticultural crops, pest risk analysis including strong quarantine measures to safeguard the interest of the country in the post WTO era. Dr. Y.R. Sharma, Director, IIHR, Calicut supported that since many of the horticultural products have come under OGL, there is increased risk of importing pests and diseases into the country. Dr. H.P. Singh, Horticulture Commissioner informed that India has one of the strictest quarantine regulations. However, the enforcement agency needs to act strictly. He cited the example of import of floriculture plant material for which considerable difficulties were faced to get the clearance. The need of the hour is to build scientific evidence on the pests and diseases of other exporting countries to safeguard our interest.

Shri K.N. Reddy mentioned that all the programme for horticultural development should be channelised through a single agency. The National Horticulture Board should take up the responsibility of marketing of horticultural produce. Moreover, the production programmes should be linked with market accessibility. There is need to introduce minimum support price, but the agency which will be responsible for operating the same need to be identified. The APMC regulations will have to be modified to allow the smooth market operations. On this, Shri Kanade mentioned that another sub-group is studying in depth the marketing aspects of agricultural commodities including horticulture which would take care of the issues relating to marketing of horticultural produce.

Dr. H.P. Singh, Horticulture Commissioner highlighted about the study conducted by NDDDB based on which proposals have been mooted for the establishment of alternate market having backward and forward linkages. He informed that NDDDB is taking up this project in Karnataka, where APMC regulations have been amended. There is group interest in their States too regarding this marketing system.

Dr. Bhaskar Rao, Director, NRC, Cashew mentioned the need for placing Indian representatives in the foreign embassies to keep track of the market trends of exportable commodities. Further, cultivation of Medicinal & Aromatic Plants needs to be taken up as inter-crop in cashew. Many plants could be inter-cropped along with coconut and cashew.

Dr. P. Rethinam, Chairman, CDB stated that the Macro-Management mode of implementation would not yield the desired results because of lack of focus and monitoring. He cited the example of Tamil Nadu State which was not willing to take up

the programmes of CDB on the plea that they can implement the desired programmes under the macro-management scheme with some diversion from the approved component. Dr. H.P. Singh requested Dr. Rethinam to provide the details for taking up the matter with the Government of Tamil Nadu. He also requested Dr. Rethinam to prepare a background note regarding the impact of macro-management on the horticultural development programmes. He also clarified that the monitoring of the programmes under various crops rests with the subject matter Division.

The main recommendations which emerged from the deliberation are as follows:

1. The matter will be taken up with the Planning Commission for extension of time till the end of May, 2001 for submitting the final report.
2. The Member would furnish their comments/suggestions on the Executive Summary, if any, within a week's time.
3. The Plantation Crops II Sub-Group will arrange to submit the final report by 10th May, 2001 to the Chairman. However, the Executive Summary will be made available within a week to facilitate the Working Group.
4. All the reports of the Sub-Groups would form a part of the report of the Working Group.
5. The draft report would be circulated to all the Members by the third week of May, 2001 for incorporating their comments, if any.
6. Meeting of the Working Group would be convened if necessary. A core group could, however, meet for authenticating the report before submission.

The meeting ended with a vote of thanks to the Chair.

Annexure-1**LIST OF PARTICIPANTS OF FOURTH MEETING OF THE WORKING GROUP ON
HORTICULTURE HELD ON 26.04.2001.**

1. Dr. K.L. Chadha, Chairman
National Professor (Horticulture),
IARI, Pusa Campus
New Delhi-110012.
2. Dr. H.P. Singh, Member Secretary
Horticulture Commissioner
Department of Agriculture & Cooperation
Krishi Bhavan,
New Delhi-110001.
3. Shri S.M Desalphine
Chairman,
Rubber Board,
Kottayam-2,
Kerala.
4. Shri N. K. Das,
Chairman,
Tea Board
14-8TH, SARANI,
Calcutta-1
5. Ms. Lakshmi Venkatachalam,
Chairperson, Coffee Board.
Bangalore
6. Dr. R.N. Pal,
ICAR,
Krishi Bhawan
7. Shri K.N. Reddy,
113, KESHAVAYANI,
GUNTA- THIRUPATHI,
Andhra Pradesh.
8. Shri R.S. Kanade;
Director (Agri.),
Planning Commission
Yojana Bhavan,
New Delhi
9. Shri P. Rethinam
Chairman, CDB, Kochi.
10. Shri B.S. Dhankhar,
ADG (Veg. Crops)
ICAR, Krishi Bhavan
11. Shri Y.R. Sarma,
Director,
IISR,
CALICUT.
12. Dr. K. Sivaraman,
Director,
Dte. of Spices,
Calicut.

13. Shri B.R. Natesh,
DO,
Coffee Board.
New Delhi.
14. Shri EVV Bhaskara Rao,
NRCC, Puttur.
Karnataka.
15. Dr. Jose C. Samuel,
DC (SWC-E)
Department of Agriculture & Cooperation,
New Delhi.