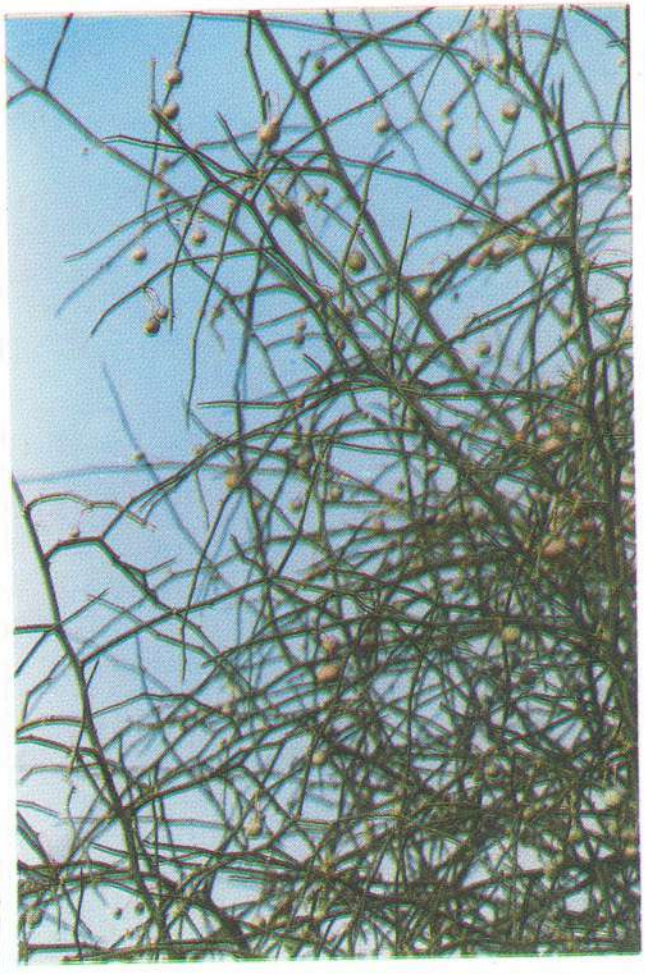
ANNUAL REPORT
1994-95

ICAR



NATIONAL RESEARCH CENTRE FOR ARID HORTICULTURE
BIKANER-334001, INDIA

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Citation

National Research Centre for Arid Horticulture
Annual Report for 1994-95

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Cover Photograph

Left : Prolific fruiting in *Prosopis cineraria.*
Right : *Capparis decidua* in fruiting.

CONTENTS

Introduction

The hot arid region occupies nearly 12% land surface of India in the States of Rajasthan, Gujarat, Haryana, Punjab, Andhra Pradesh, Karnataka and Maharashtra. The production of horticultural crops in this region is confined to a few small pockets having irrigation water. It is now realised that horticultural crops particularly perennial fruit trees, not only provide nutrition and income security to the people but can also ameliorate the harsh environment of the arid region. However, the geophysical and agroclimatological constraints for production of these crops in arid areas necessitated development of special production tecnologies. Since the available research set up for this purpose in the State Agricultural Universities and in the Institutes of the ICAR was inadequate, the Indian Planning Commission as recommended by the Working Group on Agricultural Research and Education, approved the establishment of National Research Centre for Arid Horticulture (NRCAH) during Seventh Five Year Plan.

Background

On approval of the Planning Commission for establishment of NRCAH, the ICAR constituted a Task Force (TF) on 23 April, 1987 with Dr. S.N.Rao, Retd. Director of Research, APAU and Chairman, Andhra Pradesh Forest Development Corporation as chairman, Dr. M.S. Manohar, Dean, S.K.N. College of Agriculture, RAU, Jobner and Dr. J.P. Bhatt, Prof. and Head of Horticulture, GAU, Junagadh as members and Dr. O.P. Pareek, Project Coordinator, All India Coordinated Research Project on Arid Zone Fruits as convenor. The TF received briefing on June 9, 1987 at ICAR, Krishi Bhawan, New Delhi and finalised programme in its first meeting. The TF visited the field experiments and laboratories of Central Arid Zone Research Institute, Jodhpur during 7-13 July, 1987 and held discussions with the scientists of the Institute. The report of the TF was finalised in the third meeting held at ICAR, New Delhi during August 24-25, 1987 which recommended to locate the NRCAH in arid part either of Rajasthan or Gujarat.

The ICAR, then constituted a Site Selection Committee with Dr. S.N. Rao as chairman, Dr. G.L. Kaul, Asstt. Director General (Hort.) as member and Dr. O.P. Pareek as member secretary on April 6, 1989 which submitted its report in July, 1989 recommending establishment of the NRCAH at the site offered by Government of Rajasthan at Bikaner on NH 15 in Chak No. 493.500 R.D.(R), 489.900 R.D.(R) and 496. 250 R.D.(R). Since this land was in possession of Forest Department, it could not be transferred for establishment of NRCAH. Consequently, the Vice Chancellor, Rajasthan Agricultural University (RAU) offered (125 ha) alternate site in Chak No. 1-2 BKM and 496.150 R.D.(R) for this purpose on January 9, 1991. A Committee con-

sisting of Dr. G.L. Kaul and Dr. O.P. Pareek visited Bikaner to see the new site on January 10, 1991 and recommended that this be accepted for establishment of NRCAH. The Government of Rajasthan endorsed the offer of the Vice Chancellor, RAU on 4.2.91. However, this land also could not be taken into possession because the RAU rescinded the memorandum of understanding earlier reached with the Council and offered a different site in Chak No. 3 BKM behind Beechwal village on March 21, 1991.

The Council constituted a team headed by Dr. K.L. Chadha, Dy. Director General (Hort.) with Dr. G.L. Kaul and Dr. O.P. Pareek to examine the site. The team visited Bikaner on August 19, 1992. The new site was not considered suitable by the Committee for establishment of NRCAH. Then the RAU agreed to hand over the site offered earlier with minor modifications, which lies in Chak No. 1-2 BKM, 489.900 R.D.(R) and 493.900 R.D.(R). This land was taken into possession in November, 1992. The offer of RAU was also endorsed by the Government of Rajasthan on October 14, 1993 for which memorandum of understanding and lease deed agreement were signed on March 17, 1994.

To make the Centre functional , Project Coordinator, All India Coordinated Research Project on Arid Zone Fruits (AICRP on AZF) located at CCS HAU, Hisar was assigned additional duties of its Officer on Special Duty (OSD) in November, 1990. After the land identified for the establishment of NRCAH was taken into possession, the Project Coordinator along with Coordination Unit of AICRP on AZF was shifted from Hisar to Bikaner in March, 1993 and merged with NRCAH.

Mandate

To conduct mission oriented research for improvement in productivity of horticultural crops and development of horticulture-based cropping system under arid environment; and to act as a repository of information related to arid horticulture.

Missions/Objectives

A. Long term missions

* To conserve and utilise the biodiversity of horticultural crops in the arid regions with special reference to developing stress (drought, salt and thermal) tolerant and disease and insect resistant plant types with better quality attributes.
* To study the ecophysiological parameters of the cropping system models for efficient utilization of high radiation and temperature.

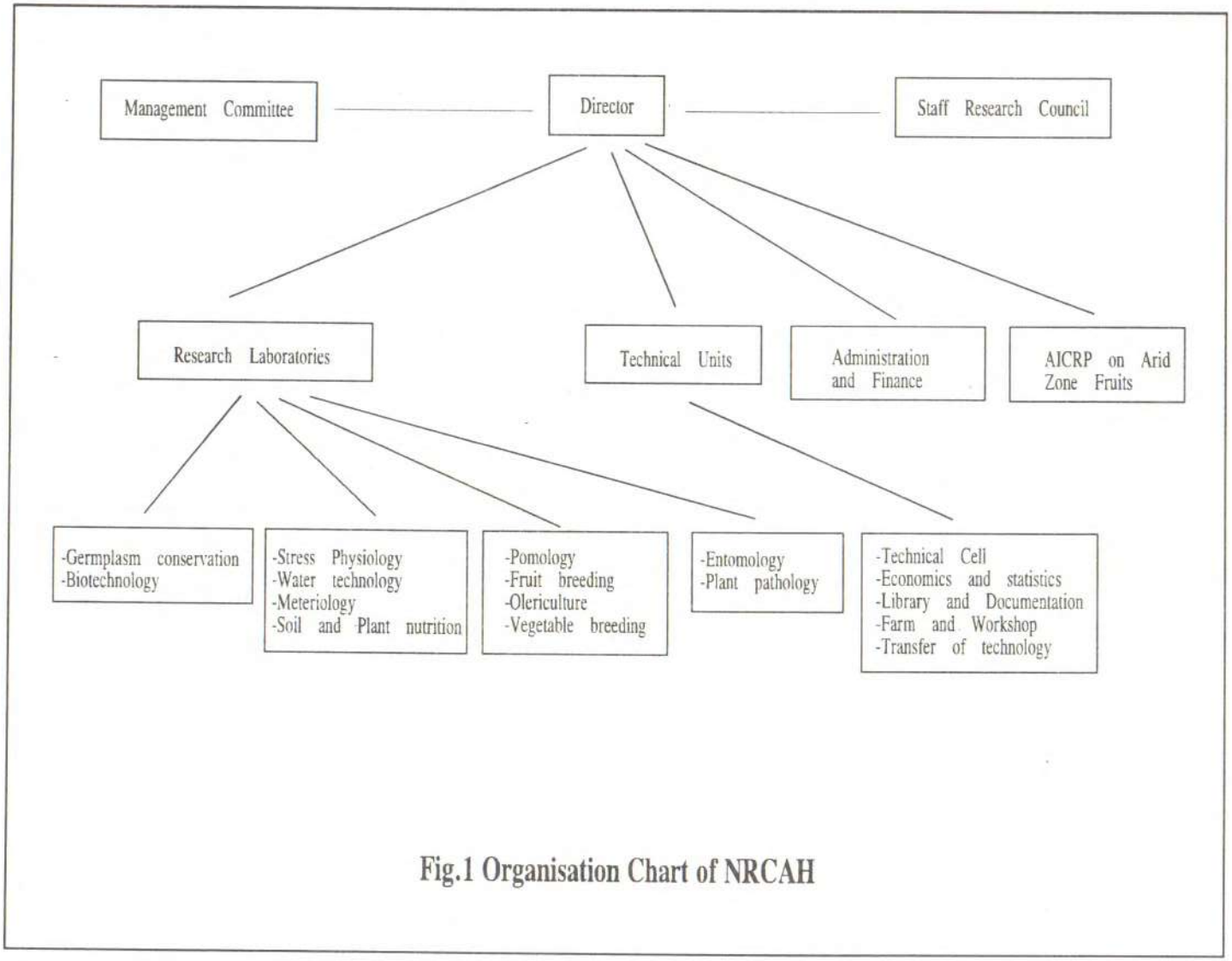

Fig.1 Organisation Chart of NRCAH

B. Short term missions

* Survey and conservation of genetic resources of fruits, vegetables and other horticultural crops having economic importance.
* Evaluation of *ber* germplasm to identify source of resistance to powdery mildew.
* Evaluation of germplasm of *ber (Ziziphus spp.),* pomegranate *(Punica granatum), aonla (Emblica officinalis), ker (Capparis-decidua), khejri (Prosopis cineraria), Citrullus* (e.g., *mateera,* tumba) and *Cucumis* (e.g. *kachari*) species under arid environment.
* Working out *ber*-based cropping systems.
* Devising water harvesting techniques for *ber* and *mateera* (watermelon).
* Devising efficient irrigation methods for *ber* and pomegranate.

Physiography

The site of the Centre at Bikaner is located on NH 15 (Bikaner- Ganganagar) which lies in Arid Western Zone, 28° N latitude, 73°18'E longitude and altitude of 234.84m above mean sea level. The Centre is at a distance of 10km from Bikaner city and 13km from Bikaner railway station. Its research farm is spread over an area of 124.58 hectares (Fig 2).

Soil

The soil of the research farm belongs to the Order Aridisol and is sandy desertic, very poor in fertility and water holding capacity, having pH 8.3 to 8.5, ECe 0.1 to 0.15 dSm^{-1} and 0.08 to 0.09% organic carbon.

Climate

The rainfall is confined to the period between July and September with 19-21 rainy days out of 12-31 in the whole year resulting both in soil moisture and atmospheric water stress to the plants after the rainy season. The precipitation is not only low (247mm) but is also erratic resulting in frequent droughts. The potential evapotranspiration (PET) is 1772.4mm with a moisture index value of -84.2. The occurrence of high wind speed, intense solar radiation and frost are common. The mean monthly minimum temperature is 2°C during January and the mean monthly maximum temperature during May is 45°C.

Rainfall during 1994-95 was 287.1mm of which 255.8mm occurred during the monsoon months (June to September). January was the coldest month recording average minimum temperature of 9.1°C and maximum temperature of 24.1°. The month of May with average maximum temperature of 44.2°C was the hottest and also recorded the fastest wind speed of 13.7km/h.

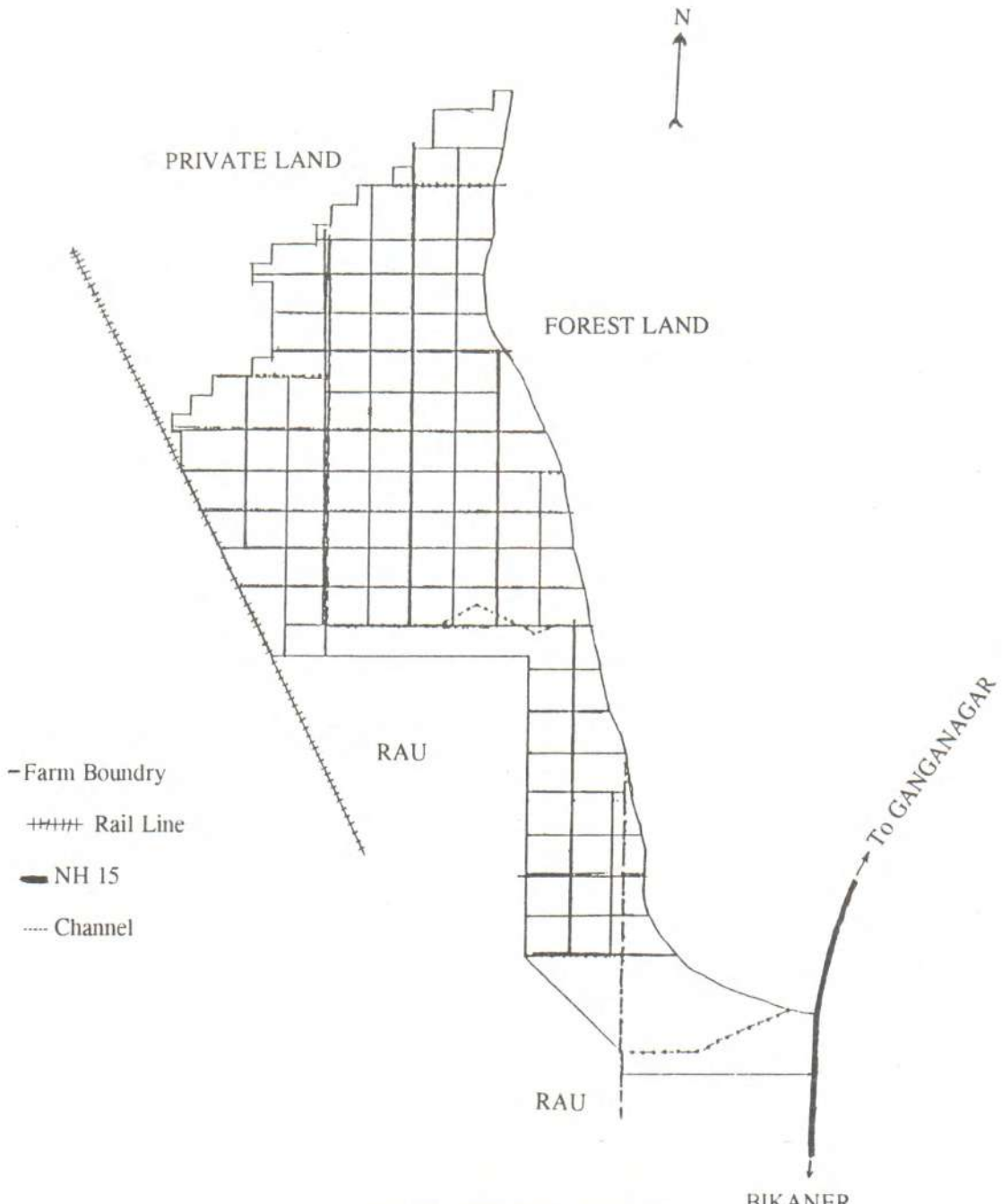

Fig.2 NRCAH FARM

Progress in Research

1.1 Collection of watermelon type Mateera *(Citrullus lanatus)* germplasm under arid conditions

Surveys were carried out during October-November, 1994 in Bikaner district and nearby area where Mateera is cultivated extensively as a mixed *kharif* crop. A total of 155 fruit samples were collected on which preliminary observations were recorded.

The local type exhibited variability in fruit shape (round, oval, oblong globose, subglobose in round type, and oblong and cylindrical in long type), fruit size (0.5-7.5kg), flesh content and colour (pinkish, reddish, whitish, whitish-yellow), flesh firmness (solid, semi-solid and loose), TSS (3-12), seed content and colour. A wide variability was also observed in morphological characters such as vine length, branching, leaf size, shape and coating, flowering and fruit bearing capacity.

Table 1 : Categorization of fruits of watermelon types

Fruit shape	Fruit size	TSS °Brix	Flesh Firmness	Flesh colour
Round type (Round-oval-globose-oblong shape (124)	Large (24)	6.0-10.0	Solid (2)	Red to red pink (24)
	Medium (57)	3.0-10.0	Semi-solid (32)	Pink to light red (54)
	Small (33)	3.8-08.8	Loose (62)	White pink to yellow pink (36)
Long type (Oblong-cylindrical shape) (27)	Large (13)	7.0-12.0	Solid (2)	Red to red pink (6)
	Small (11)	3.2-09.0	Semi-solid (9)	Pink to light pink (10)
			Loose (7)	White pink to yellow pink (1)

Figures in parentheses show number of samples

1.2 Collection of kachari *(Cucumis callosus)* germplasm under arid conditions.

Surveys were undertaken for collection of *Cucumis* sp. in Bikaner and Nagaur districts. A total of 201 fruit samples of kachari were collected from rainfed fields, wasteland areas and from the market during *kharif* season.

Wide genetic variability was observed for morphological characters such as vine length, growth, branching, leaf (size, shape, pubescence, colour and coating), flowering habit, fruit shape (oval, oblong, globose, subglobose ovate, round, long, cylindrical, etc) and fruit length (very small, small, medium and large) and other fruit characters (girth, weight, colour, surface, apex, pulp and seed content, flesh thickness and taste) and fruit bearing capacity.

Table 2 : Categorization of *kachari* collection

Fruit shape	Fruit size
Oblong (69)	Extra large (2)
Oval (61)	Big (48)
Obovate (26)	Medium (34)
Round (24)	Small (63)
Long (12)	Very small (56)
Spindle (6)	
Pear Shaped (5)	

Figures in parentheses show number of samples

1.3 Collection of snapmelon (*Cucumis melo* var. memordica) germplasm under arid conditions.

A total of 85 collections were made during Obtober-November from different rainfed fields and market in Bikaner and Nagaur districts.

Extensive genetic diversity in fruit shape (oblong, cylindrical, oval), fruit size (large, medium and small), pulp and seed content, cavity in fruit, taste, TSS, flesh firmness and texture, skin colour and fruiting capacity were recorded. Similar variations were also observed in vegetative growth characteristics.

Table 3 : Categorization of snapmelon collections

Fruit shape	Fruit size
Oblong (26)	Large (29)
Cylindrical (35)	Medium (33)
Round (9)	Small (19)
Oval (4)	
Obovate (1)	
Spherical (2)	
Pear shaped (4)	

Figures in parentheses show number of samples

Farm development

In order to finalise farm layout, demarcation of the existing irrigation channels and boundaries was done, besides land preparation for nursery and windbreak plantation.

Library

The library subscribes 8 periodicals and has nearly 100 reference books.

Staff (as on 31.3.1995)

1. Dr. O.P. Pareek	Project Coordinator and OSD
2. Dr. Vishal Nath	Scientist (Hort.)
3. Sh. D.K. Samadia	Scientist (Hort.)
4. Sh. R.P. Singh	Asstt. Adm. Officer
5. Sh. P.P. Pareek	Hindi Translator
6. Sh. V.K. Pandey	Assistant
7. Sh. Rajesh Daiya	Jr. Clerk
8. Sh. Kuldeep Pandey	Jr. Clerk
9. Sh. Bhoj Raj Khatri	T-1 (Computer)
10. Sh. Vinod Kumar	T-1 (Field Technician)
11. Sh. Satpal	Driver
12. Sh. Ghanshyam Khatri	SSG-1 (Messenger)

Management Committee

The Council constitued the following Management Committee for the Centre for a period of three years w.e.f. 13.1.95. The first meeting of the Committee held on 17.2.95 was attended by the following :

1. Dr. O.P. Pareek Project Coordinator and OSD	Chairman
2. Dr. S.P.Ghosh Asstt. Director General (Hort.) ICAR, New Delhi	Member
3. Dr. G.B. Raturi Head, Central Hort. Experiment Station (IIHR) Godhra, Gujarat	Member
4. Dr. B.B. Vashishtha Sr. Scientist (Hort.), CAZRI, Jodhpur	Member
5. Dr. Vishal Nath Scientist (Hort.), NRCAH, Bikaner	Member
6. Sh. D.K. Samadia Scientist (Hort.), NRCAH, Bikaner	Member
7. Sh. R.P. Singh Asstt. Adm. Officer, NRCAH, Bikaner	Member Secretary

Visitors

1. Dr. R.K. Arora, Coordinator, IPBGR, New Delhi, 26-28 July, 1994.
2. Dr. M.S. Manohar, Director of Research, Rajasthan Agricultural University, February 17, 1995.
3. Dr. S.P. Ghosh, Asstt. Director General, ICAR, New Delhi, February 17, 1995.
4. Dr. B.S. Chundawat, Principal and Dean, Aspee College of Forestry and Horticulture, GAU, Navasari Campus, Gujarat.
5. Dr. G.B. Raturi, Head, Central Horticulture Experiment Station (IIHR), Godhra, February 1995.
6. Dr. B.B. Vashishtha, Senior Scientist, CAZRI, Jodhpur, February 17, 1995.

Publication

A. Research/technical papers

1. Chadha, K.L. and Pareek, O.P. 1995. Horticultural crops for development of wastelands. *National Symposium on Agriculture in Relation to Environment,* January 16-18, 1995. Indian Agricultural Research Institute, New Delhi, Indian Society of Agricultural Science, Abstr. p.3.
2. Pareek, O.P. 1994. *Phalon ka Vaigyanik Parirakshan. Phal Phool,* 17(1) : 21-23
3. Pareek, O.P. and Chandra, Atul 1994. *Shusk Kshetron ke liye Phalotpadan Praudyogikiyan. Unnat Krishi,* 33(1) : 7-13.
4. Pareek, O.P. and Chandra, Atual 1995. Potential and prospects for export of arid zone horticultural crops. *National Symposium on Advances in Research and Development in Horticulture for Export,* 28-30 January, 1995. CCS Haryana Agricultural University, Hisar.
5. Pareek, O.P. and Sharma, Suneel. 1995. Role of under-exploited fruit crops in sustainable agricutlure and environment. *International Conference on Sustainable Agriculture and Environment,* CCS Haryana Agricultural University, Hisar, 11-13 January, 1995.

B. Meetings

The follwing meetings were attended by Dr. O.P. Pareek :

1. Meeting of the sub-committee for fruits to finalise standards and norms for release and notification of fruit varieties on November 10, 1994 at CIHNP, Lucknow.
2. Annual ICAR Director's meeting, 6-9 November, 1994 at IARI, New Delhi.
3. Meeting of the regional committee VI, January 30-31, 1995 at GAU, Anand.
4. Meeting of 'Tissue Culture of Horticultural Crops'. Directorate of Horticulture, Pant Krishi Bhawan, Jaipur, August 16, 1994.
5. Meeting to finalise package of practices of horticultural crops. Directorate of Horticulture, Pant Krishi Bhavan, Jaipur, February 8-9, 1995.
6. Meeting of the Farmers of Ganganagar district, September 10, 1994.
7. Meeting on commercial forestry held in CAD, Bikaner, December 2, 1994.

C. Lectures delivered

1. Dr. O.P. Pareek Advances in Research of Arid Fruits in NARP training programme at CIHNP, Lucknow.
2. Dr. O.P. Pareek Advances in Nursery Management in farmers training Programme in KVK, RAU, Bikaner.
3. Dr. O.P. Pareek participated in training programme frontline demonstration on 'Date palm cultivation' organised by KVK, RAU, Bikaner.
4. Sh. D.K. Samadia, Improved vegetable cultivation in watershed areas in farmers training programme in KVK, RAU, Bikaner.
5. Dr. Vishal Nath Use of plant harmone in nursery management in farmers training programme in KVK, RAU, Bikaner.

D. Radio talks

1. Sh. D.K. Samaia (1995). Nimboo ke bagichon mein en dino kiye jane wale krishi karye, AIR, Bikaner.
2. Dr. Vishal Nath (1995). Phalon ke bagh bagichon ko pale se bachayen, AIR, Bikaner.

Finance

The total approved outlay for the VIII Plan period and budget estimates and expenditure incurred during 1994-95 are given in Table 4 & 5.

Table 4 : VIII Plan outlay for NRCAH, Bikaner

Head	Rs. (In lakhs)
Establishment	52.60
Travelling allowance	2.50
Other charges including equipments	34.17
Vehicle	5.00
Works	155.73
Total	**250.00**

Table 5 : Budget estimate, revised estimates and expenditure incurred during 1994-95 (Rs. In lakhs)

Head	BE	RE	Expenditure
Establishment charges	19.50	3.60*	0.84
Travelling allowances	0.40	0.40	0.15
Other charges including equipments	29.00	8.00	8.00
Works	85.00	33.00	35.75
TOTAL	**134.00**	**45.00**	**44.74**

* Rupees 2.75 Lakhs reappropriated under 'works'

APPENDIX – I

All India Coordinated Research Project on Arid Zone Fruits has 12 Centres. The project objective is to develop fruit growing technology for the arid regions of the country with particular reference to fruits such as *ber*, date palm, pome granate, fig, custard apple, *aonla* and *bael* with a view to building up a viable commercial cultivation of fruit crops in the arid regions and thus improve the economic condition of the people, their nutrition and health standard.

Centre	Crops	Major results
Aruppukottai	*Ber*, custard apple, *aonla*, and pomegranate	In *ber* Kaithali and AS-1 variety of custard apple were recommended for rained areas.
Anantapur	*Ber*, custard apple, fig, *phalsa*, pomegranate, tamarind and *aonla*	Softwood grafting during march proved the best method of propagation in custard apple. Crop residues like paddy husk and groundnut husk were found to be the best mulch for pomegranate.
Bikaner	Date palm	Mulching with black polythene helped in weed control
Faizabad	*Aonla*, *ber* and *bael*	In *aonla*, more than one cultivar/genotype should be planted for normal fruit production
Rahuri	Pomegranate, *ber* and custard apple	Application of 0.2% wettable sulphur, one at 50% flowering followed by seven subsequent sprays at 10 days interval proved the best to control powdery mildew in *ber*.
Sardarkrushinagar	*Ber*, pomegranate, and *aonla*	Use of black polythene or castor shells proved good mulch materials for conserving soil moisture after the cessation of monsoon. Application of 0.2% wettable sulphur or 0.1% dinocap can control powdery mildew of *ber*.

APPENDIX – II

Sanctioned staff strength as on 31.3.1995

Cadre	Strength	Filled	Vacant
Scientific	11	3	8
Administra - tive	6	4	2
Technical	5	2	3
Auxiliary	3	2	1
Supporting	1	1	—
TOTAL	26	12	14

ACKNOWLEDGEMENT

Thanks to all the staff of the Centre particularly to Sh.P.P. Pareek for providing help in compilation and to Sh. Rajesh Daiya in type setting the manuscript.