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ICAR

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National Research Centre for Arid Horticulture
Bikaner (Rajasthan)

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NATIONAL RESEARCH CENTRE FOR ARID HORTICULTURE BIKANER

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CONTENTS

Introduction

The hot arid regions are spread over almost 12 per cent land surface of India in the States of Rajasthan, Gujarat, Andhra Pradesh, Punjab, Haryana, Karnataka and Maharashtra. The region has predominantly animal husbandry-based economy. Crop productivity in these areas is erratic and the output is hardly of subsistence level which is also beset with uncertainty owing to high risk factors. The quantum of production of horticultural crops seems to be related to availability of irrigation resources besides with the extent of aridity. Therefore, their production sites are sporadic and the productivity is low. Consequently, the income of arid zone farmers is low and uncertain and the people get inadequate supply of horticultural produce. It is now realised that horticultural crops can be a compatible component of the arid zone ecosystem which can also help to achieve food, nutrition and income security for the people.

The special geophysical and agroclimatological constraints for horticultural productivity in arid areas necessitated development of special production technologies but the available research set up for this purpose in the State Agricultural Universities and the Institutes of Indian Council of Agriculture Research (ICAR) was inadequate. Therefore, realising the technology crisis for horticultural production in arid regions, the Indian Planning Commission, as recommended by the Working Group on Agricultural Research and Education, approved establishment of an independent National Research Centre for Arid Horticulture (NRCAH) during the Seventh Five Year Plan.

Setting up of the Centre

The ICAR constituted a Task Force in April, 1987 to identify specific missions/ objectives, work requirements and programmes for the NRCAH. The Task Force in its report in August, 1987, recommended to locate the NRCAH in arid part either of Rajasthan or Gujarat. The Site Selection Committee constituted in April, 1989 in its report of July, 1989 recommended establishment of NRCAH at the site offerd by the Government of Rajasthan at Bikaner on NH 15. The Rajasthan Agricultural University (RAU) transferred this land to the ICAR in January, 1991 which was ratified by the Government of Rajasthan. This land however, could not be taken over because the RAU rescinded the memorandum of understanding earlier reached with the Council offering a different site for the purpose. The Council, therefore, appointed a Committee to examine the suitability of the new site. Since the Committee found the new site unsuitable, the RAU agreed to hand over to the Council the site offered earlier with slight readjustment of boundaries. The land was taken into possession in November, 1992.

Organisation

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

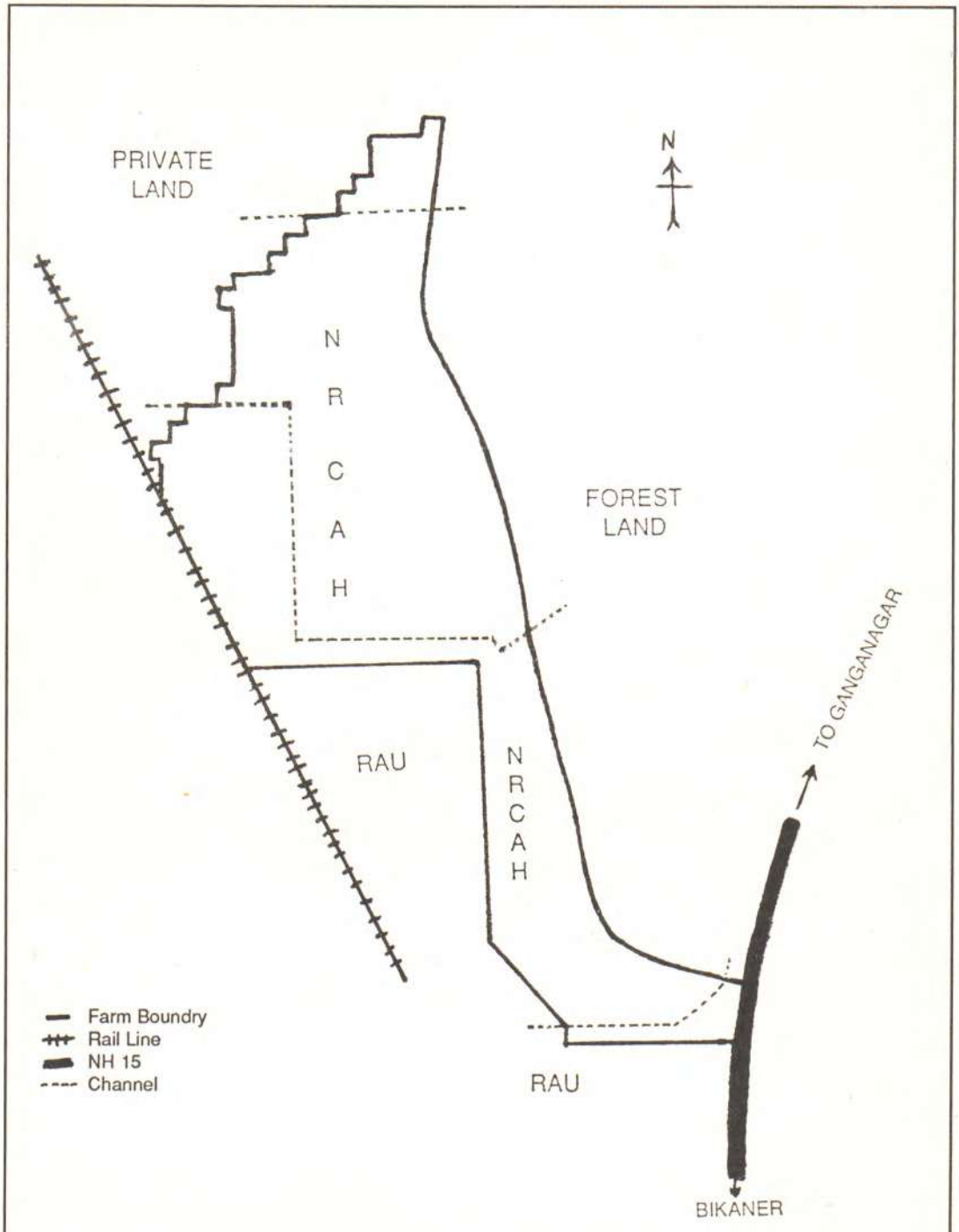

Fig. 1 NRCAH Farm

AZF are given in Appendix I. In order to provide office and laboratory accommodation to the new establishment, a rented premises was acquired in Bikaner city.

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 at an altitude of 234.84 m above mean sea level. The Centre is located at a distance of 10 km. from Bikaner city and 13 km. from Bikaner railway station. The research centre is spread over an area of 124.58 hectares (Fig.1).

Soil

The soil of the research farm belongs to the Order Aridisols and is sandy desertic, very poor in fertility and water holding capacity having pH 8.3 to 8.5, EC 0.1 to 0.15, and 0.08 to 0.09 per cent 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 (280 mm) but is also erratic resulting in frequent droughts. The potential evapotranspiration (PET) is 1772.4 mm with a moisture index value of -- 84.2. Occurrence of high wind speed, intense radiation and frost are common. The mean monthly minimum temperature is 2°C during January and the mean monthly maximum temperature during May is 46° C.

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**

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

B. **Short term missions**

1. Survey and conservation of genetic resources of fruits, vegetables and other horticultural crops having economic importance.
2. Evaluation of *ber* germplasms to identify source of resistance to powdery mildew.
3. Evaluation of germplasm of *ber*, pomegranate, *aonla*, *ker* (*Capparis decidua*),

khejri (*Prosopis cineraria*), watermelon *(Citrullus lanatus*), *tumba (Citrullus colocynthis*) and *Cucumis* species (e.g. *kachri*) under arid environment.

4. Working out *ber*- based cropping system.
5. Devising water harvesting techniques for *ber* and watermelon.
6. Devising efficient irrigation methods for *ber* and pomegranate.

Staff position

One post of project Coordinator (Arid Fruits) and 10 posts of Scientists were available in the Centre out of which 8 posts of Scientists were provided by transfer from Indian Institute of Horticultural Research, Bangalore and two posts became available by merger of Coordination Unit of AICRP on AZF. However, these 10 posts remained vacant during the period under report (Appendix II).

Infrastructure

Fencing of the farm area of the Centre was completed by providing compound wall in front on the national highway and barbed wire fencing on the remaining sides. For initiating developmental works in the farm area of the Centre, a Land Use Plan is being prepared by the Central Public Works Department.

Equipments including tractor and farm implements were acquired. Purchase of reference books and journals was initiated to establish a library at the Centre.

Finance

The total approved outlay for the VIII plan period is given in Table 1. The budget estimates and expenditure incurred during 1993-94 is given in Table 2.

Table 1 : VIII Plan outlay of NRC for Arid Horticulture, Bikaner

(Rs in lacs)

Head	Amount
1. Establishment	52.60
2. Travelling allowance	2.50
3. Other charges including equipments	34.17
4. Vehicle	5.00
5. Works	155.73
Total	250.00

Table 2 : Budget estimate and expenditure incurred during 1993-94

(Rs in lacs)

Head	Budget estimate	Expenditure
1. Establishment	9.00	0.66
2. Travelling allowance	0.40	0.15
3. Other charges including equipments	7.00	6.19
4. Works	23.60	10.48
Total	40.00	17.48

Participation in farm advisory service

The Centre actively participated in dissemination of know-how on cultivation of arid zone fruits through programmes of Krishi Vigyan Kendra, Rajasthan Agricultural University, Bikaner and helped in planning and implementation of demonstration on development of date palm orchards on farmers' fields in the vicinity of Bikaner.

Participation in Symposia, Seminars, etc.

Dr. O. P. Pareek, Project Coordinator participated in the following Symposia/ Workshops/ Meetings during the year :

(i) Golden Jubilee Symposium of Horticulture Society of India, held at IIHR, Bangalore during 24-27 May, 1993.

(ii) SAARC Counterpart Scientists Meeting held at Central Potato Research Institute, Shimla during 14-16 June, 1993.

(iii) Workshop on Techno-Economic Feasibility Study on Integrated Horticultural Dovelopment in Rajasthan, during 9-10 August, 1994 at Pant Krishi Bhavan, Jaipur.

(iv) Follow-up Meeting of ICAR Regional Committee-IV held at Pant Krishi Bhavan, Jaipur on 15 July, 1993.

(v) National Consultation Seminar held at IIHR, Bangalore on 5 October, 1993 and delivered a lecture on Dryland Fruit Crops.

(vi) Indo-German Conference on Impact of Modern Agriculture on Environment held at CCS Haryana Agricultural University, Hisar during 1-3 December, 1993 and presented a paper on "Under-exploited fruits for adverse ecological conditions."

(vii) पर्यावरण विभाग, राजस्थान सरकार द्वारा आयोजित पारिस्थितिकी विकास शिविर, दिनांक 9-12 मार्च, 1994 डूँगर महाविद्यालय, बीकानेर । ''शुष्क क्षेत्रों में उद्यानिकी विकास'' विषय पर भाषण दिया ।

(viii) National Symposium on Resource Management and Crop Productivity held at CCS Haryana Agricultural University, Hisar during 16-18 February, 1994 and presented a paper on "Fruit crops for arid and semi-arid areas".

(ix) विज्ञान एवं प्रौद्योगिकी विभाग, राजस्थान सरकार द्वारा दिनांक 28 फरवरी 1994 को आयुर्विज्ञान महाविद्यालय, बीकानेर में 'विज्ञान चेतना विकास' विषय पर आयोजित संगोष्ठी में तकनीकी सत्र की अध्यक्षता की एवं ''शुष्क क्षेत्र में उद्यानिकी विकास'' पर प्रपत्र प्रस्तुत किया ।

Publications

a. Books

Chadha, K. L. and Pareek, O. P., Editors. 1993. *Advances in Horticulture. Fruit Crops.* Malhotra Publishing House, New Delhi. Vol. I,pp. 515; Vol. 2,pp. 586; Vol.3,pp. 561; and Vol. 4,pp.467.

b. Research papers

Chadha, K.L. and Pareek, O.P. 1993. Horticulture for wasteland development. *J. Environmental Resources,* 1 (1-2) : 58-64.

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Gupta, O.P., Siddiqui, S. and Pareek, O.P. 1992. Post-harvest handling of ber

(*Zizyphus mauritiana* Lamk.) - A review. *Agri. Rev.*, 13 (4) : 199-208.

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Pareek, O.P. 1993. Fruits and vegetables from desert flora. In *Indigenous Technologies for Sustainable Agriculture*. National Council of Development Communication, BHU, Varanasi.

Pareek, O.P. 1993. Irrigation management in fruit crops. In *Important Aspects of on-farm Water Management*, eds., Singh. D.P. and Sharma, H.C., Directorate of Research,CCS Haryana Agricultural University (under Indo-Dutch Collaborative Project), Hisar, Haryana, India, pp. 161-85.

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Sharma, Suneel, Gupta, O.P. and Pareek, O.P. 1992. Retrospect and prospects of viticulture in northern India. *Agric. Rev.*, 13(3) : 129-50.

Sharma, Suneel and Pareek, O.P. 1992. Viticulture in India. *Chronica Horticulture*, 32(3) : 44-45.

c. Popular articles

Pareek, O.P. and Mohan, Inder. 1993. Indian aloe, the vegetable of Thar desert. *Indian Horticulture*.

Pareek, O.P. and Sharma , Suneel, 1993. Under-utilized fruits. *Indian Horticulture*, April-June, 47-56.

Sharma, Suneel and Pareek, O.P. 1993. Horticulture paves the way to better days for them. *Intensive Agriculture*, XXX (11-12) : 8-13.

Sharma, Suneel and Pareek, O.P. 1993. Water chestnut. *Intensive Agriculture*, XXX (11-12) : 39-42

Appendix - I

ALL INDIA COORDINATED RESEARCH PROJECT ON ARID ZONE FRUITS

Background history

Research on fruits like *ber*, date palm, pomegranate, fig, custard apple, etc., was initiated on *ad hoc* basic since 1976 under an AP Cess Fund Scheme entitled, "Research on some selected fruits in the semi-arid areas in India", at ten centres in the country, *viz.*, Abohar (Punjab Agricultural University), Jodhpur (Central Arid Zone Research Institute), Chandan Well near Jaisalmer (Govt. of Rajasthan), Hisar (Haryana Agricultural University), Khedoi (Gujarat Agricultural University) and now at Mundra, Rahuri (Mahatma Phule Agriculutal University), Yercaud (Tamil Nadu Agricultural University), Lahual (HPKVV), Bangalore (Indian Institute of Horticultural Research) and Udaipur (Rajasthan Agricultural University). During the VI Plan, this *ad hoc* Scheme was merged as such and was named as the Cell III of All India Coordinated Fruit Improvement Project (AICFIP). The Centre from Chandan Well was shifted at Bikaner under the Rajasthan Agricultural University. The Centre from Yercaud was shifted to Aruppukottai (TNAU) w.e.f. 1.4.83 and that from Udaipur was shifted to Jobner, w.e.f. 24.9.82. Two Centres, one at Anantapur (Andhra Pradesh Agricultural University) and the other at Sardarkrushinagar (GAU) were established w.e.f. 15.3.83. The Centre in Lahaul (Himachal Pradesh Krishi Vishwa Vidyalaya) was closed w.e.f. 1.3.86 and two new Centres were established w.e.f. 1.3.86 at Faizabad (Narendra Dev University of Agriculture & Technology) and at Bhojka (RAU) w.e.f. 1.4.87. Bhojka Centre was later closed w.e.f. 1.4.93. Therefore, there are now 12 centres under the Project (Fig. 2).

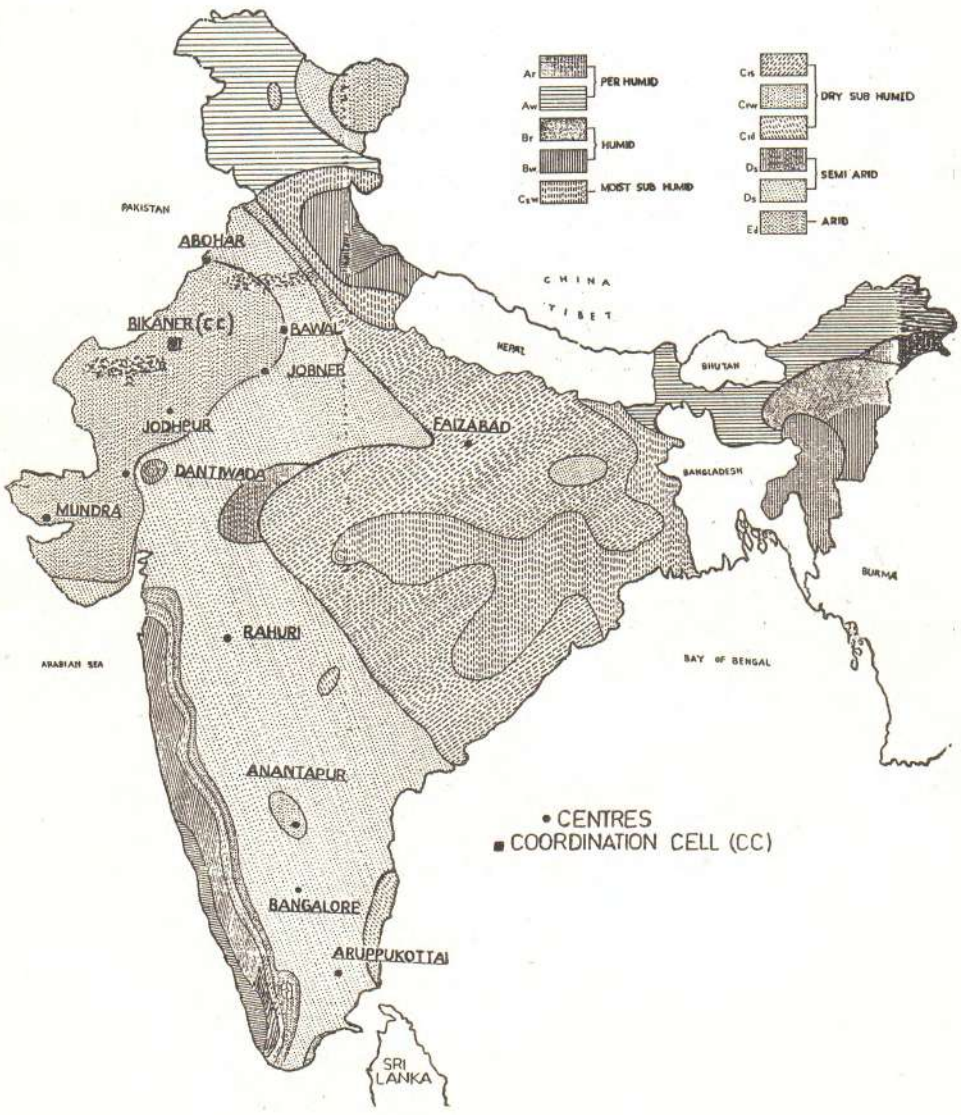
Objective

To develop fruit growing technology for the arid regions of the country with particular reference to fruits such as *ber,* date palm, pomegranate 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.

Project Centres and Major Results of the Year

Centre	Crops	Major results of the year
Abohar	Date palm	Application of Diuron (2kg/acre) at pre-emergence stage and after 20 days glyphosate (1.5 lt/acre) killed about 80% of the total weed population.
Aruppukottai	*Ber*, custard apple, *aonla*, pomegranate	*In situ* water harvesting by providing 5% slope gave the highest yield in *ber*
Anantapur	*Ber,* pomegranate, custard apple, fig	Soft-wood grafting during March proved the best method of propagation in custard apple giving 48 per cent graft take.

Fig. 2 Centres of AICRP on Arid Zone Fruits



Bangalore	Pomegranate, *ber,* fig	Four hybrids of custard apple superior in quality, yield and shelf life have been identified.
Bawal	*Ber,* pomegranate, *aonla*	Black polythene proved to be the best mulch material in *ber* orchard. 0.4% Blitox -50 was effective in controlling black leaf spot in *ber.*
Bikaner	Date palm	–
Faizabad	*Aonla, ber, bael*	Vigour of trees was minimum on *Zizyphus nummularia* rootstocks.
Jodhpur	Date palm	*Graphiola* leaf spot of date palm was effectively controlled by 0.4 percent Fytolam.
Mundra	Date palm	Technology for preparation of *pind khajoor* and beverages has been standardised.
Rahuri	Pomegranate, custard apple, *ber,* fig	Fifteen promising pomegranate hybrids have been developed by crosses between Russian cultivars and Ganesh followed by back crossing with Ganesh. Drip irrigation on 20% wetted area basis recorded maximum yield in pomegranate. Application of 0.2% wettable sulphur, once at 50% flowering followed by 4 subsequent sprays at 20 days interval starting from initiation of the disease, proved the best in the control of powdery mildew of *ber.* 0.3% mancozeb and 0.4 copper oxychloride were effective in the control of leaf and fruit spot in pomegranate. Three sprays of 0.1% fenvalerate 20 EC, 0.02% deltamethrin 28 EC, 0.2% carbaryl 50 WDP and 0.05 quinalphos 25 EC on rotational basis at 30 days interval could control fruit borer in *ber.*
Sardarkrushi-nagar	*Ber,* pome-granate, *aonla*	Maximum yield in pomegranate was recorded by irrigation based on 20% evaporation replenishment.

Appendix - II

(i) Sanctioned staff strength as on 31.3.1994

	No. of posts	Filled	Vacant
Centre			
1. Scientists	8	-	8
Coordination Unit AICRP (AZF)			
1. Project Coordinator (Arid Fruits)	1	1	-
2. Scientist (Horticulture)	1	-	1
3. Scientist (Statistics)	1	-	1
4. Stenographer	1	1	-
5. Jr. Clerk cum Typist	1	1	-
6. T-1 (Computer)	1	1	-
7. Messenger	1	-	1

(ii) Staff position as on 31.3.1994

			Date of joining
1.	**Dr. O.P. Pareek**	Project Coordinator and OSD	6.11.90
2.	**Sh. V.K. Pandey**	Senior Clerk	3. 6. 93
3.	**Sh. Rajesh Daiya**	Jr. Clerk cum Typist	2. 2. 94
4.	**Sh. Bhoj Raj Khatri**	T-1 (Computer)	29.3.94

ACKNOWLEDGEMENT

Valuable assistance and cooperation received from sister organisations at Bikaner particularly Rajasthan Agricultural University, National Research Centre on Camel, Regional Research Station of Central Arid Zone Research Institute, Jodhpur and Arid Region Campus of the Central Sheep and Wool Research Institute, Avikanagar is gratefully acknowledged. Grateful thanks are also due to Dr. K.L. Chadha, Deputy Director General (Hort.), ICAR, New Delhi, for his help and guidance in the development of the Centre.