वार्षिक प्रतिवेदन

ANNUAL REPORT

1997 - 98



गोवा में स्थित भा.कृ.अनु.प. का अनुसंधान

(भारतीय कृषि अनुसंधान परिषद)

एला, ओल्ड गोवा - 403 402

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(Indian Council of Agricultural Research

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(Indian Council of Agricultural Research)

Ela, Old Goa - 403 402, INDIA

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Annual Report
1997-98

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1. PREFACE BY DIRECTOR

I have immense pleasure in presenting the Annual Report of the Institute for the year 1997-98. Unlike many of the ICAR Institutes which are commodity based, ours is a region based one, with multidisciplinary and multi-commodity research programmes embroiled into the working system. Upgraded to an independent status in 1989, the Institute is nearing a decade of comprehensive research programmes required for the region, with which I have been continuously associated with.

The Complex endeavours to identify local agricultural problems on priority and carry out research which are mostly adaptive and applied in nature. The identified varieties and breeds and the technologies, oriented towards increasing productivity and revenue from various suitable commodities of the region, are passed on to the farming community through the development agencies. The Institute and the Krishi Vigyan Kendra attached to it, which are complementary to each other, conduct various transfer of technology programmes relevant to the region.

Though a small Institute, its research responsibilities and the expectations are very high. We are striving hard to achieve the above goals and have planned our priority thrust areas for the next 25 years prepared in the form of "Vision 2020". Identification of scented and saline tolerant rice varieties for the region, improved groundnut production technology, identification of local promising selections (Cardozo Mankurad in mango and Balli-2 in cashew), establishment of germplasm bank in cashew and mango, standardization of technology for mushroom and spawn production, technology package for rabbit rearing, fabrication of low cost feed pelleting machines for small animal and fish feeds, technologies for integrated fish farming systems etc., are some of the significant contributions in the recent past, which bear testimony to the usefulness of the Institute to the region.

Within the short span of its existence, the Institute has created some of the essential infrastructural facilities like the main laboratory-cum-administrative building which is ready for occupation, fisheries field laboratory, feed technology unit, rabbit unit, automatic weather station, ARIS Cell etc., which would help to strengthen the research programmes of the Institute.

It is hoped that this report will be of use to those who are keen to see the agricultural production and farm earnings, are increased substantially in Goa and its adjoining areas.

D. G. Dhandar
DIRECTOR

2. EXECUTIVE SUMMARY

The research efforts of ICAR Research Complex for Goa, functioning as a independent institute since 1989, are mainly focussed around applied aspect in order to increase the agricultural production and productivity in Goa. Th institute is headed by a Director and assisted by a team of 20 Scientists work ing in various disciplines of Crop sciences, Horticulture, Animal Sciences an Fisheries. A Krishi Vigyan Kendra (KVK), to look after the transfer of techno ogy aspect, has also been established at the Complex during 1983.

Based on the technical programmes identified for 1997-98, the Institut had carried out 22 research projects and Transfor of Technology programmes The salient achivements of which are highlighted below :

Research Highlights

Crop Science

Rice

The on-going project on 'Evaluation of short duration and fine graine scented rice varieties was continued during the year, both in Kharif and Rab seasons.

The variety Vikas out yielded all the other six varieties including the lo cal check Jyoti, both in Kharif (5.1 t/ha and 4.48 t/ha, respectively) and i Rabi (6.47 t/ha and 4.5 t/ha, respectively).

Among the fine grained scented rice varieties evaluated during Khar season, the variety Indrayani once again registered the highest yield of 6.4 t/ha as against the control variety Ambe Mohar (2.78 t/ha). The two oth promising varieties viz., Pawan and Pusa Basmati -1, registered a yield of 5.6 t/ha and 4.02 t/ha, respectively.

During the Rabi season, a similar trend was observed with the variet Indrayani out yielding all the other varieties with a yield level of 6.03 t/ha a against the control variety Ambe Mohar (2.68 t/ha). The other promising var ety Pawan (5.14 t/ha) and Pusa Basmati-1 (3.42 t/ha) were found to occup second and third positions, respectively.

During the year, preliminary observations on some recently acquired ric varieties from Directorate of Rice Research, Hyderabad, were also recorded a the Institute farm.

Pulses and oilseeds

Two more cowpea varieties viz., Konkan Sadabahar and Konkan Safe were procured from the Konkan Krishi Vidyapeeth, Dapoli, during the yea

and were evaluated for their adaptability under residual soil moisture conditions of Goa during the rabi season alongwith the existing variety V-118 and the local check variety Alsando.

The results indicated that the varieties were early (65-70 days) with good growth, podding habit and yield levels [Konkan Sadabahar (0.69 t/ha) and Konkan Safed (1.0 t/ha)] compared to V-118 (0.88 t/ha) and local Alsando (0.47 t/ha).

During the year, the groundnut (Dh-40) seed multiplication was also taken up.

Plant protection

Rice varieties viz., Suraksha and IET-12875 were evaluated for the gallmidge and found to be good, both in terms of yield and insect resistance.

In groundnut, pod borer assumed a major pest status in this region. Field experiments with various insecticides and oil cakes revealed that Carbofuron (3G) was the most effective treatment.

Effective mango fruitfly management was done with attractant traps using methyl eugenol, jaggery and malathion.

Horticulture

Cashew

In a survey under an Ad-hoc Project "Collection of cashew germplasm in Goa and establishment of gene bank", 18 more promising trees were located and the total collection was increased to 83 accessions. Based on the nut yield and size of apple and nut the accessions were grouped into three categories. The second category with 50 accessions was observed to be the most promising group. These accessions had medium to bold nuts (7.5 to 12.0 g) and big apple (80-90 g), besides higher nut yield (15 kg/tree).

Clonal propagation of the accessions was taken up by soft wood grafting.

The existing cashew germplasm collection of 68 (31 local accessions, 35 introduction, one related species and one coloured mutant) accessions was increased to 76 by 8 new additions namely Ullal-1, Ullal-2, Ullal-3, UN-50, Accession-9-10 (all from cashew Research Station, Ullal), Priyanka, Madakthara-2 (Both from KAU, Thrissur) and V-7. Balli-2 continued to show promising performance by recording the highest nut yield of 4.95 kg/tree in the current season with 29.8 % shelling, while the cumulative yield for eight years was 18.9 kg/tree. Four multilocational demonstration blocks in villages namely Chandor (Salcette),Kalay (Sanguem), Nirankal(Ponda) were established and Kandola (Ponda) through KVK and one in ICAR Farm.

As regards to the introduction, the accessions H-1600 recorded the maxi-

mum nut yield of 3.46 kg per tree with 28.99 per cent shelling and 13.08 kg of cumulative nut yield (for 8 years).

Mango

Mango germplasm collection of 84 accessions, comprising of 61 local accessions, 10 introduced varieties and 13 introduced hybrids, was maintained.

A new seedling of the local variety, "Bemcorado" was identified for medium to big sized attractively coloured fruits of good quality and early fruiting (March-April) with regular bearing habbits.

Local varieties namely Maxima, Toranja, Furtad and Colaco Branca recorded 18.5, 13.5, 12.87 and 9.4 kg of fruit yield per tree during 1997-98, with a range of 19-21 per cent TSS and 0.18 to 0.25 per cent total acids.

Hybrids namely Neelgoa, Amrapali, H-45, H-87 and Ratna recorded 62.0, 53.95, 21.95, 21.73 and 18.1 kg of fruit/tree, respectively. Fruit quality was better in Amrapali, Ratna and Arka Aruna (TSS 21 % and total acid contents of 0.17 to 0.23 %). Neelgoa fruits were of good size (342.66 g) with reddish shoulders but were less sweet in taste (TSS-16.6%).

Among the popular varieties, Kesar yielded 16.85 kg of fruit/tree. The fruit quality and size were observed to be better in Kesar and Alphonso.

Sensory evaluation tests revealed that Amrapali, Ratna, Alphonso, Arka Aruna and Kesar scored better in respect of general taste, fibreness and pulp quality.

Pineapple

Application of 50 ml solution containing calcium carbide (1 %) with urea (2 %) at the age of 11-12 months (35-40 leaf stage) in September and October, induced 95 per cent flowering within a period of 55 to 72 days after applying, as against 205 days in control. This resulted in early harvesting of fruits by March-April under Goa condition.

Animal Sciences

Feeding high energy diets with 3,000 k cal/kg energy level, feeding has shown marginal improvement in growth performnance of rabbits. Improvement in kit survival was observed in rabbits after feeding of jaggery to doe, one week before and after kindling. Semen quality studies in rabbits revealed better quality of semen in Soviet Chinchilla as compared to New Zealand White.

Out of 196 serum samples collected from cattle and tested for Brucellosis, 11.8% samples proved positive. An incidence of Pasteurellosis was investigated in rabbits, for intensity of infection.

Techniques for isolation of specific pathogens like *Listeria, Monocytogenes, Vibrio,* and *E. coli* were standardized for field investigation. Efforts have been

initiated to set up a disease investigation laboratory.

For comparative performance study of broilers under deep litter and cage rearing systems, trials were initiated with suitable modification in the existing infrastructure.

Fishery Science

For increasing the income from rice field, a project has been initiated with integration of Vyttila-I rice variety and freshwater prawn, *Macrobrachium rosenbergii* and Netlon cages were used to avoid heavy mortality of juveniles of prawn vile stocking.

Under the project on use of neem based pestcides in the eradication of weed fishes, it was found that Achook was effective in achieving 100% mortality in the case of *Aplocheilus, Mystus* and *Heteropneustes* at the concentration of 37.5, 50 and 200 ppm of Achook (0.0225, 0.015 and 0.060 ppm of Azadirachtin) within 12, 3½ and 6½ hours, respectively.

In the project on formulation of low cost feed for fish and prawn, 17 feed ingredients suitable for fish and prawn feed were identified and analysed in the laboratory for their proximate composition. The carp feed formulation is in progress.

Transfer of Technology

The Krishi Vigyan Kendra (KVK) conducted 79 training courses in the disciplines like crop science, horticulture, home science, animal science, plant protection and agricultural extension and imparted need based skill oriented training to 1,181 participants comprising of 830 practicing farmers, 258 rural youths and 93 grass root level extension functionaries. The participation of women was 50.86 per cent.

During the year, survey work and multiplication of Indrayani and Pusa Basmati-1 were taken up to cover 5ha area.

Front line demonstrations on Groundnut was successfully conducted over an area of 19.7 ha in Sangolda village in association with Zonal Agricultural Officer (Bardez) and the Farmer's club of Union Bank. The demonstration results showed the impact of various components demonstrated and recorded an yield increase of over 50% in case of Dh-40 and 44.21% in case of Dh-3-30 groundnut varieties, respectively.

During the year, a new project on "Technology Evaluation and Impact Assessment" in rice and groundnut was introduced with an aim to have quick impact and transfer of latest technologies to various test sites. Thirty two groundnut varieties were evaluated during summer both with and without polythene mulching technology. Highest yield of 6.8 t/ha was recorded in case of Dh-40 variety under polythene mulch and an yield of 3.76 t/ha was recorded in NRCG variety INS 9714 withput polythene mulch.

Under On-Farm Testing, cowpea varieties Konkan Safed (10 q/ha) and Konkan Sadabahar (6.8 q/ha) were tested both in KVK farm and farmers' fields.

Four multilocational trials were laid out in farmers' fields in Khandola, Nirankal, Kalay and Chandor villages and the promossing cashewnut variety Balli-2 was planted along with the ruling variety V-4 as control.

Twenty metallic portable chullas were supplied in Madcaim village under the SC/ST programme for improving cooking efficiency. Field demonstrations with sex pheromone traps in sweet potato weevil invested areas, were conducted as effective pest control method.

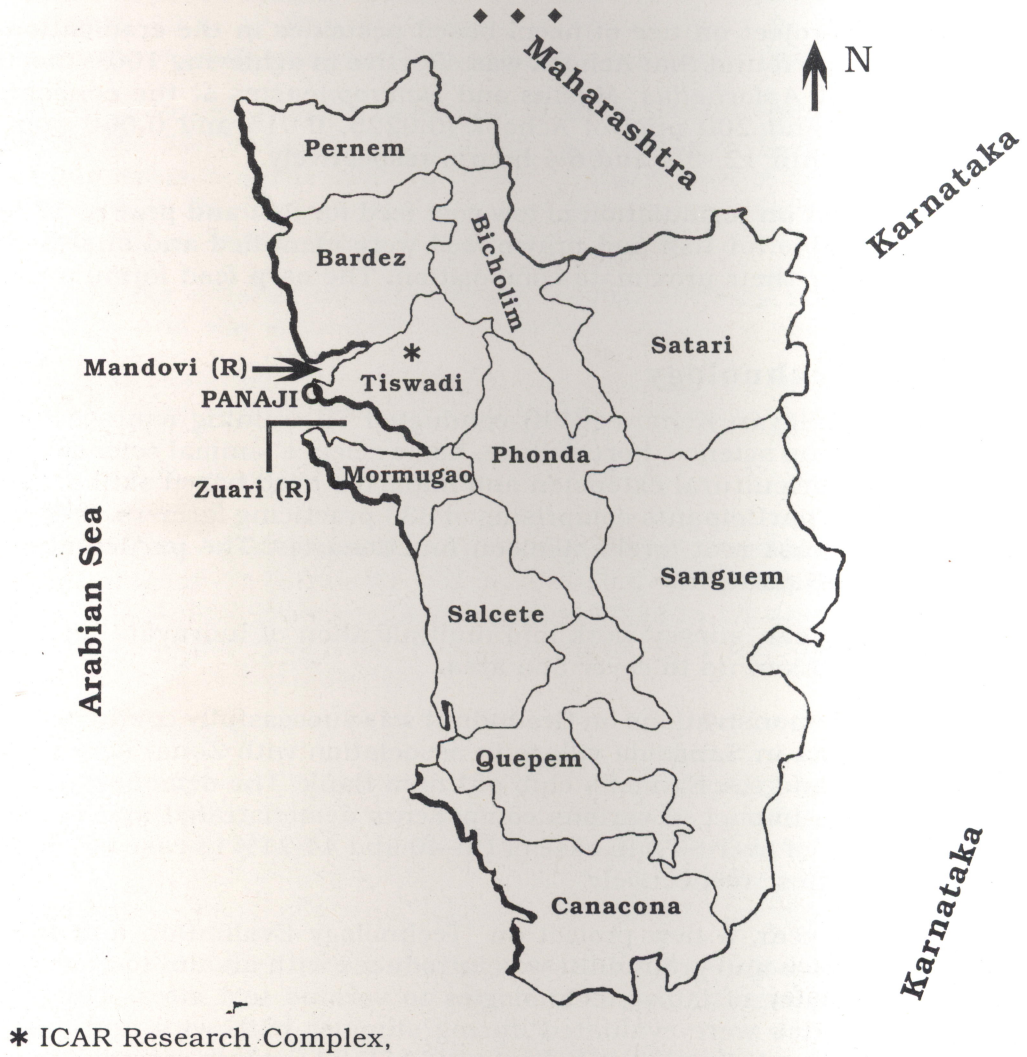


Fig. 1. Goa at a Glance.

3. INTRODUCTION

Goa is an idyllic coastal state situated on the Western Coast of Konkan tract bounded by Arabian Sea and the States of Karnataka and Maharashtra (Fig. 1). It has a warm and humid coastal climate which is ideally suited for all kinds of agricultural activities viz., cultivation of annual crops, horticultural crops, livestock enterprises and fish farming. However, Goa lacks an agricultural university or any other agency to look after the specific agricultural research needs of the state.

Hence, the Indian Council of Agricultural Research established the ICAR Research Complex for Goa in April, 1976. To begin with, the Complex was a research centre under the administrative and technical control of Central Plantation Crops Research Institute, Kasaragod. After functioning at different Government farms, it was finally shifted to its present location at Ela, Old Goa, in 1982. In order to intensify further the transfer of technology and to impart grassroot level vocational training, a Krishi Vigyan Kendra was established at the Research Complex in 1983.

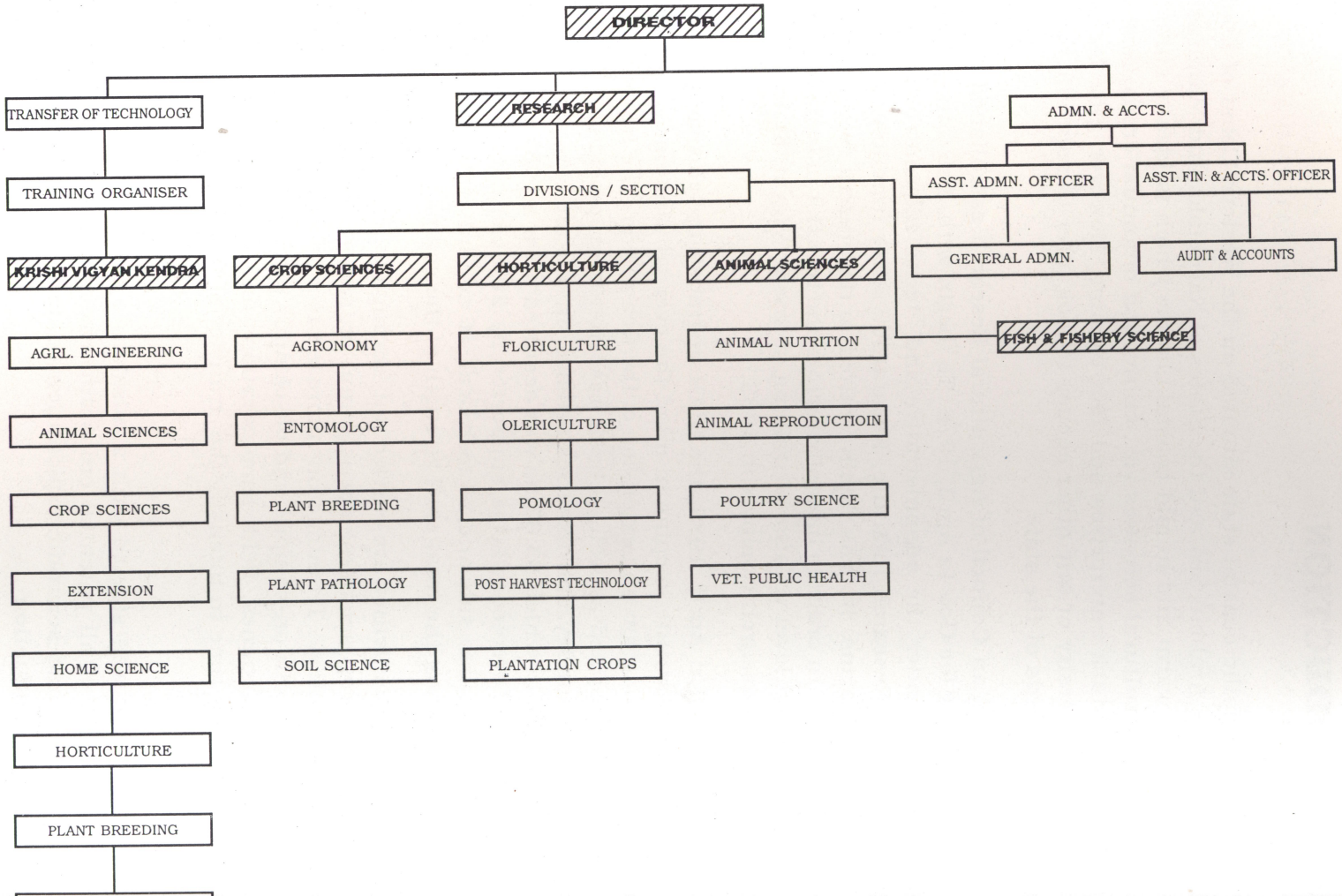
Subsequently in April, 1989, the ICAR upgraded the Research Complex to a full-fledged institute keeping in mind the ever growing needs of agricultural research, education and extension of the Goa region. The Research Complex carries out applied as well as basic research in crop sciences, horticulture, animal husbandry and fisheries science. In all, the Research Complex has 53.37 ha land of which 33.67 ha was acquired during 1987. The Institute is headed by the Director, who is supported by 20 Scientists from different disciplines on research side and 23 technical, 16 administrative, and 33 supporting staff, making the total staff strength of the complex to 93.

The research activities are carried out through 22 research projects distributed among crop sciences, horticulture, animal sciences, fisheries and Transfer of technology. Trainings on improved technologies are imparted to farmers through both on-campus and off-campus programmes. Further, special training programmes, field demonstrations and kisan melas are organized from time to time to intensify the transfer of technology process.

3.1 Mission

The institute was started with a mission to achieve, 'the introduction and improvement of all potential crops and various species/breeds of livestock production and scientific exploitation of various aquatic resources for improving fish production'.

Fig. 2 - **Organizational Setup**



3.2 Mandate

Based on the local requirements and priorities, the mandate of the institute is defined as under:

1. To conduct strategic and applied research on potential agricultural and horticultural crops, livestock and fisheries for improving productivity and post harvest management,
2. To disseminate improved technology developed,
3. To act as a centre for training in updated technologies,
4. To collaborate with national and international institutes/agencies in developing and tranferring new technologies,
5. To generate nucleus planting materials,
6. To provide consultancy services and
7. To act as a repository of information on Western Ghat agricultural systems.

3.3 Organisational Setup

The Director heads the technical and the administrative units of the institute. The research and the extension activities are carried out through a network of discipline based divisions/sections and a Krishi Vigyan Kendra (Orgasational chart detailed in Fig. 2). Different committees viz., Institute Management Committee, Research Advisory Committee, Staff Research council and Scientific Advisory Committe of KVK help the management for the smooth functioning of the institute.

3.4 Financial Statement

Table - 1 Abstract of Expenditure of the Institute for the year 1997-98.

(Rs. in Lakhs)

Head	Non Plan	Plan	KVK
Establishement charges	32.18	13.44	12.97
Travelling Allowance	0.91	0.50	0.29
Other charges	18.85	24.33	0.83
Works	0.44	113.66	13.95
Total	**52.38**	**151.93**	**28.04**

In addition, actual expenditure incurred for the year 1997-98 under other ongoing scheme of the Institute are as under :

(Rs. in lakhs)

- Adhoc project on Cashew Germplasm -- 0.74
- Front line Demonstraction -- 0.65

3.5 Staff position

Brief statement of staff position of the Institute and Krishi Vigyan Kendra are furnished in table No. 2 and 3, respectively.

Table - 2. List of staff strength of ICAR Research Complex for Goa.

Category	Sanctioned posts	Posts filled	Post vacant	No. of S.C.	No. of OBC
1. **Director** (RMP)	1	1	--	1	--
2. **Scientific**					
Principal Scientist	2	--	2	--	--
Sr. Scientist	4	3	1	1	--
Scientist	14	8	6	--	--
	20	11	9	1	--
3. **Technical**	23	21	2	2	2
4. **Administrative and Accounts**	16	10	6	2	--
5. **Supporting staff**	33	29	4	5	3
TOTAL	**93**	**72**	**21**	**11**	**5**

Table 3. List of staff strength of Krishi Vigyan Kendra, ICAR Research Complex for Goa.

Category	Sanctioned posts	Posts filled	Post vacant	No. of S.C.	No. of OBC
1. **Scientific** (Training organizer)	1	--	1	--	--
2. **Technical**					
Training Associate	6	6	--	2	--
Training Assistant	1	1	--	--	--
Farm Manager	1	--	1	--	--
Computer programmer	1	--	1	--	--
Driver	2	2	--	1	--
3. **Administrative**	2	2	1	--	--
4. **Supporting staff**	2	5	--	1	--
TOTAL	**16**	**16**	**4**	**4**	--

4. RESEARCH ACHIEVEMENTS

4.1 Crop Science

1. **Evaluation of short duration and fine grained scented rice varieties of Goa**
(H R Prabhudesai)

Evaluation trials on short duration rice varieties comprising of seven entries along with Jyoti as control and fine grained scented rice group comprising of seven entries, which were evaluated earlier over three years, were continued during the year, both in Kharif and Rabi seasons.

Each set of trials was laid out in a Randomised Block Design (RBD) with three replications. The net plot size was 10 m^2. In all there were 21 plots in each set of trial. The sowing was taken up in May and December for Kharif and Rabi trials, respectively. Standard agronomic practices were followed for all the treatments. A uniform fertilizer dose consisting of N_2 (80 kg) P_2O_5 (50 kg) and K_2O (50 kg) and N_2 (100 kg) P_2O_5 (50 kg) and K_2O (50 kg) were applied for the short duration and scented fine grained rice varietal trials, respectively.

Observations in respect of growth and the yield contributing characters viz., plant height (cm), earhead length (cm), number of productive tillers, number of panicles per m^2, number of filled grains/pannicle, 1000 grains weight (g), etc., and the final yield (t/ha) were recorded for all the fourteen varieties.

The results have indicated that among the seven short duration varieties evaluated during Kharif, 1997, variety Vikas had significantly higher yield (5.14 t/ha) than the control variety Jyoti (4.48 t/ha) which was higher by 14.73 per cent. The other two varieties Annada (4.22 t/ha) and Abhay (4.28 t/ha) were found to be at par with each other (Table 4).

During the Rabi season too, a similar trend was observed in the said trial with the variety Vikas yielding 6.47 t/ha, which was significantly higher than the control variety Jyoti (4.5 t/ha), with an increase of 43 per cent (Table 5).

In both these trials, there was a positive correlation between the various yield contributing characters and the final yields.

The performance of fine grain scented rice varieties were evaluated in Kharif. The results showed that the variety Indrayani was once again superior (Table 6) to the rest of the scented varieties yielding 6.42 t/ha as against the control Ambe Mohar (2.78 t/ha) Pawan (5.64 t/ha) and Pusa Basmati-1 (4.02 t/ha).

Table 4. Performance of short duration rice varieties during Kharif, 1997-98.

Sl. No.	Variety	Plant height (cm)	No. of tillers per hill	No. of productive tillers	Length of earhead (cm)	No. of filled grains/ pannicle	No. of pannicles/ m^2	1000 grain weight (g)	Yield (t/ha)
1	Abhay	106.9	21.8	20.8	22.4	106.5	614	36.8	4.28
2	Aditya	96.1	19.4	15.3	21.2	102.4	596	34.6	3.93
3	Tulsi	105.8	21.0	19.8	21.0	121.2	608	35.9	4.09
4	Annada	89.7	20.7	19.0	21.0	128.6	683	39.4	4.22
5	Jyoti	96.0	20.1	18.8	21.7	143.6	742	38.6	4.48
6	Vikas	108.5	22.6	21.3	23.5	162.5	784	37.4	5.14
7	Suraksha	101.7	19.4	17.6	20.4	104.8	516	38.3	3.21

Table 5. Performance of short duration rice varieties during Rabi, 1997-98.

Sl. No.	Variety	Plant height (cm)	No. of tillers per hill	No. of productive tillers	Length of earhead (cm)	No. of filled grains/ pannicle	No. of pannicles/ m^2	1000 grain weight (g)	Yield (t/ha)
1	Abhay	89.0	19.8	18.6	21.4	126.5	623	36.8	5.22
2	Aditya	82.4	17.9	16.8	20.1	102.6	546	33.5	4.60
3	Tulsi	90.3	16.8	14.9	18.8	106.8	583	38.2	4.20
4	Annada	89.7	21.0	19.8	21.0	124.7	641	36.4	4.00
5	Jyoti	96.0	20.8	20.4	20.4	135.3	662	34.7	4.50
6	Vikas	100.4	21.4	22.4	23.6	159.0	743	36.3	6.47
7	Suraksha	101.7	19.4	17.6	20.4	104.8	516	28.3	3.64

4	Annada	89.7	21.6	19.8	21.6	124.7	641	36.4	4.66
5	Jyoti	96.0	20.8	20.4	20.4	135.3	662	34.7	4.50
6	Vikas	100.4	21.4	22.4	23.6	159.0	743	36.3	6.47
7	Suraksha	101.7	19.4	17.6	20.4	104.8	516	28.3	3.64

Table 6. Performance of fine grained scented rice varieties during Kharif, 1997-98.

Sl. No.	Variety	Plant height (cm)	No. of tillers per hill	No. of productive tillers	Length of earhead (cm)	No. of filled grains/ pannicle	No. of pannicles/ m^2	1000 grain weight (g)	Yield (t/ha)
1	Basmati-370	120.0	20.4	16.4	24.8	151.3	883.3	23.4	3.86
2	Basmati-385	113.9	18.5	14.8	24.3	123.6	780.6	24.3	3.69
3	Taro Basmati	120.9	17.9	13.6	25.8	146.4	698.6	23.8	3.29
4	Pusa Basmati-1	106.4	23.8	20.4	25.6	164.8	902.2	23.8	4.00
5	Indrayani	110.2	26.3	24.5	24.7	198.6	988.5	22.8	6.42
6	Pawan	104.2	25.6	22.3	23.9	174.8	936.2	23.3	5.64
7	Ambe Mohar	138.4	15.9	13.6	19.3	123.4	657.4	26.8	2.78

Table. 7 Performance of fine grained scented rice varieties during Rabi, 1997-98.

Sl. No.	Variety	Plant height (cm)	No. of tillers per hill	No. of productive tillers	Length of earhead (cm)	No. of filled grains/ pannicle	No. of pannicles/ m^2	1000 grain weight (g)	Yield (t/ha)
1	Basmati-370	98.6	18.8	16.8	21.4	132.6	769.5	21.6	3.06
2	Basmati-385	100.4	19.4	18.2	20.2	142.5	814.3	23.8	3.28
3	Taroari Basmati	110.2	20.2	19.6	21.8	151.3	648.8	24.2	3.15
4	Pusa Basmati-1	98.8	23.4	20.0	23.4	184.8	874.5	23.8	3.42
5	Indrayani	104.3	26.2	24.6	24.2	239.4	948.6	24.7	6.08
6	Pawan	98.2	22.8	21.4	22.8	182.3	886.3	25.4	5.14
7	Ambe Mohar	136.4	20.6	15.8	20.6	125.4	654.3	23.2	2.68

Table 8. Performance of new introductions of rice varieties during Kharif, 1997-98.

Sl. No.	Plant Variety	Plant height (cm)	No. of tillers per hill	No. of productive tillers	Length of earhead (cm)	No. of grains/ pannicle	No. of pannicles/ m^2	1000 grain weight (g)	Yield (t/ha)
1	IET-13548	98.8	17.8	15.2	25.6	148.4	714	26.8	4.48
2	IET-12875	86.8	24.6	20.2	24.6	154.2	693	28.3	4.63
3	IET-9994	89.6	25.4	21.6	24.2	186.3	890	27.5	5.16
4	Pusa Basmati-1	106.0	22.5	19.8	26.8	173.6	765	24.3	4.82
5	Prakash	101.2	23.4	18.4	24.2	139.6	684	29.8	3.44

Table 9. Performance of new introductions of rice varieties during Rabi, 1997-98.

Sl. No.	Plant Variety	Plant height (cm)	No. of tillers per hill	No. of productive tillers	Length of earhead (cm)	No. of grains/ pannicle	No. of pannicles/ m^2	1000 grain weight (g)	Yield (t/ha)
1	IET-13548	87.8	19.7	16.2	23.4	130.2	689	28.6	4.23
2	IET-12875	97.7	23.8	19.4	21.6	146.8	586	26.9	4.08
3	IET-9994	98.2	24.4	21.3	20.6	163.4	876	28.7	4.73
4	Pusa Basmati-1	100.2	24.6	22.6	23.3	183.2	818	24.1	3.88
5	Prakash	97.8	22.8	19.8	19.2	129.8	630	28.4	3.46

5	Prakash	97.8	22.8	19.8	19.2	129.8	630	28.4	3.46
	Basmati-1	100.2	24.6	22.6	23.3	183.2	818	24.1	3.88

A similar trend of yield of these varieties were observed during the Rabi also. Indrayani had a consistent yield (6.08 t/ha), followed by Pawan (5.14 t/ha), Pusa Basmati-1 (3.42 t/ha) and Ambe Mohar (2.68 t/ha)(Table 7).

Considering the consistent performance of the variety Indrayani and Pusa Basmati -1 for last seven seasons, it could be recommended for cultivation in the state of Goa as a high yielding scented rice variety which can be a good replacement for medium duration coarse seeded variety, Jaya or short duration medium bold variety, Jyoti.

During the year, some new entries were obtained from the Directorate of Rice Research, Hyderabad and maintained for studying their performance both in the Kharif as well as Rabi. Among these varieties, IET-9994 performed better than other varieties both in the Kharif and Rabi, yielding 5.16 t/ha and 4.73 t/ha, respectively (Table 8 and 9).

Pulses

During the year, performance of four pulse varieties viz., Konkan Sadabahar, Konkan Safed, V-118 and Alsando (local) was evaluated and preliminary observations on various yield characters like number of pods per plant, grain per pod, pod length (cm), pod width (cm), 100 grain weight (g) and yield were recorded. The results have indicated that Konkan Safed outyielding other varieties (1.0 t/ha) having medium growth with 60-65 days duration and proved to be a promising variety for rice fallows.

2. Evaluation and management of salt tolerant rice varieties in Goa

(H M Wasnik)

To evaluate the rice varieties for the salt tolerance, field experiment was conducted during Kharif season of 1997-1998 in a randomised block design with three replications on saline soils at the farmers field. The experimental soils were silty clay to silty clay loam with sodium chloride as dominant soluble salt and acidic in reaction with high salt content. The available nitrogen and available potassium were in the high range while available phosphorus was at the medium range. The available micronutrient status i.e., available zinc, copper, iron and manganese were in adequate levels. The trial consisted of eight salt tolerant rice varieties i.e., CSR-10, CSR-22, CSR-23, CSR-26, CSR-27, CSR-28, Korgut and Azgo. The results revealed that the rice variety CSR-27 performed well compared to other varieties with an yield of 4.2 t/ha, which was found to be significantly higher than the local varieties Korgut (2.0 t/ha) and Azgo (1.90 t/ha). The more number of productive tillers, higher number of panicles per meter square area and more test grain weight contributed for higher yield of these varieties as compared to the local one. The other varieties CSR-10 (4.10 t/ha), CSR-23 (3.90 t/ha), CSR-22 (3.5 t/ha), CSR-26 (3.20

t/ha) were on par with each other but yielded superior to the CSR-28 (2.5 ha) and the local varieties Korgut and Azgo (Fig. 3 and Table 10).

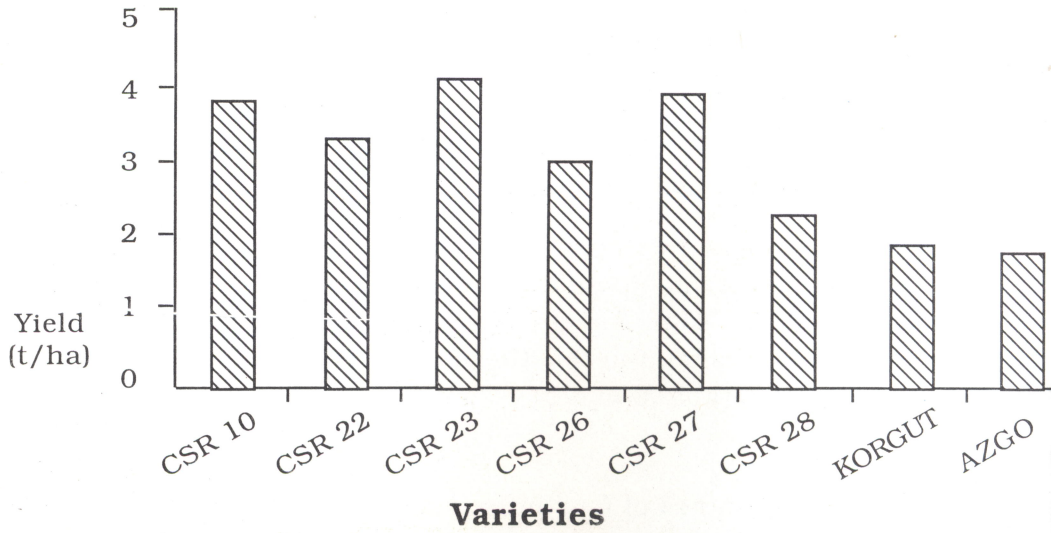


Fig. 3. Performance of Salt tolerant rice varieties during Khrif, 1997-98.

Table 10. Performance of salt tolerant rice varieties during Kharif, 1997.

Sl. No.	Variety	Height (cm)	No. of tillers	Panicles/ m^2	1000 grain weight (g)	Yield (t/ha)
1.	CSR-10	85.5	6.6	292	25.25	4.10
2.	CSR-22	82.7	6.2	285	24.80	3.50
3.	CSR-23	81.5	6.3	274	26.10	3.90
4.	CSR-26	86.6	6.6	282	26.80	3.20
5.	CSR-27	88.2	7.0	96	27.12	4.20
6.	CSR-28	75.6	5.5	210	23.80	2.50
7.	Korgut	120.5	4.1	250	24.58	2.00
8.	Azgo	115.5	3.5	245	25.12	1.90
C.D. (P=0.05)		7.25	1.33	22	1.40	0.59

SR-28 (2.5 t/
).



rif,

arif, 1997.

n	Yield (t/ha)
	4.10
	3.50
	3.90
	3.20
	4.20
	2.50
	2.00
	1.90
	0.59

PLATE-1 CROP SCIENCE



←
Indrayani - a high yielding scented rice variety



→
CSR-27 - a promising salt tolerant rice variety



↑
Polythene mulch technique introduced for high ground nut yield.

- Inset-
  Luxurient growth of groundnut



↳
Konkan Safed - a high yielding short duration cowpea variety for rice fallow

3. Evaluation of high yielding varieties of sugarcane

(H M Wasnik)

To evaluate the high yielding varieties of sugarcane, the following studies were undertaken:

In second ratoon , the best eight sugarcane varieties viz., Co-740, Co-7527, Co-85061, Co-8014, CoC-671, Co-89018, Co-90006, and Co-90009 with high sugar content, were planted during February, 1995 and the second ratoon harvested in February, 1998. The results indicated that the sugarcane variety Co-90009 performed well than all other varieties by recording the highest yield of 95 t/ha with 19.39 percent Brix and 8.7 per cent sugar recovery, followed by Co-90006 (yield - 91 t/ha; 18.59 % Brix and 8.29 % sugar recovery) and Co-7527 (yield-90.0 t/ha; 18.39 % Brix and 8.08 % sugar recovery), as detailed in table 11.

Table 11. Performance of sugarcane varieties as second ratoon during 1997-98.

Sl. No.	Variety	Height of cane (m)	Weight of cane (kg)	Girth (cm)	Brix (%)	Yield (t/ha)	Recovery (%)
1.	Co-740	2.44	1.69	1.72	17.69	81.50	7.63
2.	Co-7527	2.52	1.71	1.93	18.39	90.00	8.08
3.	Co-85061	2.45	1.63	1.64	17.99	84.00	7.85
4.	Co-8014	2.47	1.61	1.66	18.67	82.50	7.89
5.	CoC-671	2.40	1.52	1.69	19.20	55.50	8.24
6.	Co-89018	2.42	1.64	1.88	17.99	68.50	7.76
7.	Co-90006	2.45	1.72	1.95	18.59	91.00	8.29
8.	Co-90009	2.47	1.74	2.00	19.39	95.00	8.70
C.D. (P= 0.05)						12.90	

In another trial, the best five sugarcane varieties with high sugar content namely, Co-90014, Co-90009, Co-90006, Co-7527 and Co-85061 were planted as cane during February, 1996 and harvested in February, 1998 for its first ratoon performance.

The results indicated that the variety Co-90009 outyielded all other varieties by recording an yield of 96.20 t/ha with 19.47 per cent Brix and 8.11 per cent sugar recovery, followed by Co-90006 (yield - 93.5 t/ha with 18.53 % Brix and 8.04 % sugar recovery) and Co-7527 (yield - 92.5 t/ha with 18.39 % Brix and 8.08 % sugar recovery) (Table 12).

Table 12. Performance of sugarcane varieties as first ratoon during 1997-98.

Sl. No.	Variety	Height of cane (m)	Weight of cane (kg)	Girth (cm)	Brix (%)	Yield (t/ha)	Recover (%)
1.	Co-90006	2.57	1.53	1.99	18.53	93.50	8.04
2.	Co-90009	2.60	1.62	2.04	19.47	96.20	8.11
3.	Co-90014	2.42	1.43	1.46	16.59	88.20	7.53
4.	Co-7527	2.52	1.51	1.98	18.39	92.50	8.08
5.	Co-85061	2.43	1.45	1.51	17.89	91.40	7.86

To find out the consistency amongst the sugarcane varieties tested their performance, the mean yield data of one plant crop and two ratoons these eight sugarcane varieties were compared for the three year period fr 1995-96 to 1997-98. The result indicated that the variety Co-90009, Co-90 and Co-7527 with mean yield levels of 112.67 t/ha, 107.6 t/ha and 106.3 ha, respectively, showed consistency in yield and sugar recovery (9.05, 8 and 8.70 per cent, respectively) as compared to the other varieties in the t (Table 13).

Table 13. Mean performance of sugarcane (one plant and two ratoons during 1995 to 1998.

Sl. No.	Variety	Plant (1995-96)		Ratoon I (1996-97)		Ratoon II (1997-98)		Mean	
		Yield (t/ha)	Recovery (%)	Yield (t/ha)	Recovery (%)	Yield (t/ha)	Recovery (%)	Yield (t/ha)	Recov (%)
1.	Co-740	112.0	9.21	89.10	9.2	81.50	7.63	94.2	8.68
2.	Co-7527	138.0	9.03	91.00	9.0	90.00	8.08	106.3	8.70
3.	Co-85061	125.0	7.70	90.50	8.6	84.00	7.85	99.9	8.05
4.	Co-8014	115.9	9.03	81.20	8.4	82.50	7.89	92.4	8.67
5.	CoC-671	60.0	7.99	52.50	9.2	55.50	8.24	56.0	8.48
6.	Co-89018	120.0	9.06	69.20	7.8	68.50	7.76	85.9	8.20
7.	Co-90006	140.0	8.86	92.00	9.0	91.00	8.29	107.6	8.72
8.	Co-90009	146.0	9.26	7.00	9.2	95.00	8.70	112.7	9.05
C.D.(P = 0.05)		13.65		13.10		12.90.		13.80	

4. Studies on pest management problems in rice based cropping systems for Goa

(Mani Chellappan and H R C Prabhu)

a) Bioefficacy of insecticides for the management of groundnut pod borer, *Anisolobes stallii*

Replicated field trials were conducted in the institute's farm to evaluate the efficacy of the bio pesticides on the groundnut pod borer, *Anisolobes* stallii, which has become a major pest in this region. The trials were laid out on RBD with three replications. Groundnut variety, Dh-3-30 was used for the trial. Treatments (Table 14) were given when the crop started pegging. The per cent infestation was recorded at the time of harvest.

Table 14. Bioefficacy of insecticides for the management of groundnut pod borer, *Anisolobes stallii.*

S. No.	Treatment	Per cent infestation
1.	Control	81.3h
2.	Endosulfan	61.3 ef
3.	Malathion	49.5 cde
4.	Lindane	44.5 bc
5.	Sevin	53.5 de
6.	Neem cake	71.9 g
7.	Karanj oil cake	63.1 f
8.	Carbofuran	29.1 a
9.	Thimmet	39.5 b

DMRT (p=0.05) ; Alphabets following same data are not significantly different.

In the untreated control, the infestation was as high as 81 per cent. Among the insecticide treatment, Carbofuron treatment gave a fairly good control (29.1 %) followed by Thimmet (39.5 %). The Karanj oil cake had some insecticidal effect recording 63.1 per cent infestation as against the neem cake (71.9 %).

b) Introduction of rice gallmidge, *Orseolia oryza,* resitant rice varieties

Two Directorate of Rice Research varieties viz., Suraksha and IET-12875, were evaluated for gallmidge resistance in Goa.

Both varieties have performed well and the incidence of gallmidge was negligible. The growth and yield parameters were excellent.

c) Effect of attractant traps for the management of mango frui *Bactrocera sp.*

Attractant traps with methyl eugenol + jaggery + malathion, were out in the mango orchard to trap the mango fruitfly. Traps with the top wi opening have attracted more number of adults than the traps with holes.

5. Studies on biologically derived materials for the management insect pests

(Mani Chellappan and H R C Prabhu)

a) Antifeedant and repellent effects of different plant extracts on VI star *Spodoptera litura*

Sixth instar *Spodoptera litura* larvae were allowed to feed on castor discs (soaked in plant extracts and air dried). The per cent feeding was corded for the antifeedant and repellant actions of the extracts.

Among the extracts, *Annona squamosa* seed extracts (both water ether extracts) had the least feeding (Table 15) followed by *Adhatoda vass* Leaf discs soaked with the *Eupatorium odoratum* extacts were fed upon by the insects.

Table 15 Antifeedant and repellent effects of different plant extracts on VI instar *Spodoptera litura.*

S. No.	Treatment	Mean feeding (cm^2)	Per cent feeding
1.	*Adhatoda vassica* (EE)	1.90	12.6
2.	*Adhatoda vassica* (WE)	2.20	14.0
3.	*Annona squamosa* (EE)	1.56	9.9
4.	*Annona squamosa* (WE)	1.80	11.9
5.	*Hyptis sauveolens* (EE)	2.23	14.2
6.	*Hyptis sauveolens* (WE)	3.00	19.0
7.	*Eupatorium odoratum* (EE)	2.01	18.1
8.	*Eupatorium odoratum* (WE)	2.10	18.9
9.	Control (EE)	3.25	20.6
10.	Control (WE)	3.40	21.6

WE - Water extract

EE - Ether extract

mango fruitfly.

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12.6
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9.9
11.9
14.2
19.0
18.1
18.9
20.6
21.6

PLATE-2 PLANT PROTECTION



←

Field experiment for the management of groundnut pad borer, *Anisolobes stalli*

- Top inset - Earwing damage in groundnut.
- Bottom inset - adult male and female earwing.



→

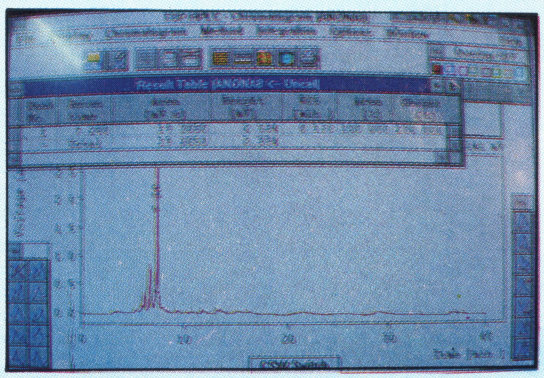
Multiple pest resistant high yielding rice variety for Goa.



←

Mango fruitfly damage

- Inset - Locally fabricated attractant trap for fruitfly



→

Annona seed extract fractions separated out by HPLC (isoractic) for insecticide properties.

b) Effect of topically applied plant extracts on *Spodoptera litura* food consumption and utilisation

Spodoptera litura larvae were treated topically with 2µ of the plant extract using Hamilton microsyringe to know the effect on the consumption of food and its utilisation.

The increase in the body weight was progressive for 120 hours in different degrees in various treatments (Table 16). At the end of 120 hours the larve treated with water extracts of *H.sauveolens* and *A. vassica* had the least mean body weight (0.279 and 0.287g, respectively) compared to other treatments. This effect was further seen in the mean pupal weight. Lighter pupae were formed from the treatments of *H.sauveolens*, *A. vassica* and *A. squamosa*.

Table 16. Effect of topically applied plant extracts on *Spodoptera litura* food consumption and utilisation.

Sl. No.	Treatment	Mean body weigfht (g)					Mean pupa weight (g)
		24h	48h	72h	96h	120h	
1	*Adhatoda vassica* (EE)	0.112	0.120	0.226	0.382	0.346	0.202
2	*Adhatoda vassica* (WE)	0.095	0.112	0.259	0.412	0.287	0.257
3	*Annona squamosa* (EE)	0.072	0.097	0.154	0.376	0.310	0.249
4	*Annona squamosa* (WE)	0.081	0.103	0.180	0.400	0.350	0.270
5	*Hyptis sauveolens* (EE)	0.099	0.108	0.211	0.421	0.333	0.231
6	*Hyptis sauveolens* (WE)	0.105	0.113	0.304	0.465	0.279	0.239
7	*Eupatorium odoratum* (EE)	0.096	0.143	0.260	0.467	0.350	0.290
8	*Eupatorium odoratum* (WE)	0.105	0.155	0.292	0.476	0.396	0.305
9	Control (EE)	0.125	0.150	0.300	0.480	0.410	0.320
10	Control (WE)	0.135	0.155	0.306	0.470	0.425	0.350

WE - Water extract

EE - Ether extract

c) Effect of *Annona squamosa* ether extract on *Spodoptera litura* consumption and utilisation

Based on the above study, *A. squamosa* seed extract was selected further investigations.

Different concentrations of *A. squamosa* seed ether extract was topic applied on the newly moulted sixth instar *S. litura* larvae. As the concen tion increased, the mean body weight gain and the cumulative faecal p weight decresed. At the highest concentration (2µl), there was as much a per cent malformation/mortality (Table 17).

Table 17. Effect of *Annona squamosa* ether extract on *Spodoptera litura* food consumption and utilisation.

S. No.	Treatment volume (µl)	Mean body weight (g)	Cumulative faecal matter weight(g)	Malformation/ mortality (%)
1.	0.0 (Control)	1.49	1.37	-
2.	0.5	1.47	1.25	5.0
3.	1.0	1.39	1.15	15.0
4.	1.5	1.20	0.87	25.0
5.	2.0	1.12	0.71	40.0

d) Growth regulatory effects of *Annona squamosa* ether extract *Spodoptera litura.*

With further increase in the concentration of the extract, there was m mortality of the larrvae (Table 18). Malformation (both larva-pupa and pu adult intermediaries) was recorded upto 2.5µl and 100 per cent mortality w observed at the highest concentration.

Table 18. Growth regulatory effects of *Annona squamosa* ether extra on *Spodoptera litura.*

S. No.	Treatment (µ l)	Mean body weight (g)	Per cent malformation			Per cen mortalit
			Larva	Larva-pupa	Pupa-adult	
1	0.0 (Control)	1.40	--	--	--	--
2	1.0	1.45	--	--	--	--
3	1.5	1.30	--	20.0	--	10.0
4	2.5	1.21	--	10.0	30.0	20.0
5	5.0	0.75	--	--	--	60.0
6	10.0	0.52	--	--	--	100.0

f) Effect of topically applied *Annona squamosa* ether extract on *Dysdercus cingulatus*

Topically applied *A.squamosa* ether extract on *Dysdercus cingulatus* using Hamilton microsyringe, had the maximum effect on its growth and development. The per cent mortality was directly proportional to the concentration tested (Table 19) and it was dose dependent.

Table 19. Effect of topically applied *Annona squamosa* ether extract on *Dysdercus cingulatus*.

S. No	Treatment	Per cent malformation	Mortality (%)
1.	Control	0.0	0.0
2.	100.0 (%)	0.0	100.0
3.	75.0 (%)	8.0	83.0
4.	50.0 (%)	10.0	78.0
5.	25.0 (%)	0.0	68.0
6.	12.5 (%)	0.0	42.0

4.2. HORTICULTURE

1. Collection of cashew germplasm in Goa and establishment of germplasm bank (Ad-hoc project)

(A R Desai and Leebu Babu)

Besides 65 accessions identified during first year (1996-1997), 18 new accessions (plus trees) were located during the period under report (1997-1998), thus making the total collection up to 83 accessions. The zone wise distribution of the identified accessions and details of new collections are presented in tables 20 and 21, respectively.

The clonal propagation of the identified accessions was taken up by soft wood method of grafting. So far, all the 65 accessions were clonally propagated, besides clonal propagation of some newly identified plus trees. In each accession about 15 - 20 grafts were prepared. The grafts were maintained in the nursery.

Observations on such characters as number of flowering laterals/m^2 canopy, number of nuts/panicle, nut size and weight, apple weight etc., were recorded in those accessions wherever possible, as the general performance of cashew trees was adversely affected by the unfavourable season.

Table 20. Germplasm collection from different zones.

Sl. No.	Zone	No. of Accessions
1.	Valpoi	7
2.	Salcette	13
3.	Sanguem	4
4.	Bardez	12
5.	Ponda	4
6.	Bicholim	5
7.	Canacona	22
8.	Quepem	7
9.	Pernem	4
10.	Tiswadi	5
	TOTAL	83

The data with respect to the above mentioned parameters in some acc sion are furnished in Table 22.

Based on total nut yield and weight of nut and apple, the accessi were classified into following three broad categories:

CATEGORY 1: High yielders (10 to 15 kg/tree) with small to medi nuts (5 to 7.5 g) and medium to big apple size (50 to 90 g) were grouped category-1, which included 26 of the total accessions.

CATEGORY 2: High yielders (more than 15 kg/tree) with medium to b nut (7.5 to 12 g) and Big apple (80 to 90 g) were grouped category -2, which consisted of 50 accessions.

CATEGORY 3: Low yielders (Less than 10 kg/tree) with big apple (90 110 g) and ultra boldnut size (12 to 14 g) were grouped in category-3, wh consisted of seven accessions.

Table 21. Nut and apple characteristics of some new cashew trees identified during 1997-1998.

Sl. No.	Zone	Code	Avg. nut wt. (g)	Agv. apple wt. (g)	Apple colour	Nut yield (kg/tree)	Age years	Remarks
1.	Valpoi	Valpoi-5	9.3	77.66	Red	35-40	>20	Very early
		Valpoi-6	10.0		Yellow	>15	>15	
		Valpoi-7	10.53	69.75	Yellow	>15	>12	
2.	Sanguem	Sanguem-2	75-80	>60	Yellow	15-20	>12	Early
3.	Bardez	B-18/98	7.76	71.0	Yellow	88-12	8-12	Grown on laterite rocks
		Pirna-3	7.75	60-70	Red	12-15	8-10	Bunch Bearing
4.	Cancona	Agonda-6	6.16	50.60	Red	15-20	>20	
		Agonda-7	6.00	50-60	Red	15-20	>20	
		Agonda-8	6.31	60-70	Red	20-22	>20	
		Tudal-4	>8.0	80-90	Red	10-15	8-10	
		Khola-3	9.6	107.6	Red	35-40	>20	
5.	Quepem	Keni-1/98	9.0	80-90	Red	6-8	10-12	
		Keni-2/98	13.52	60-70	Red	10-12	10-12	
		Kholakher-3	11.98	--	--	20-25	>20	
6.	Tiswadi	Tiswadi-2	>7.0	--	Yellow	10-15	>20	Succeptible to TMB
		Tiswadi-3	14.42	170	Yellow	8-10	10-12	Shy bearer
		Pilar-1	>9.0	70-80	Yellow	10-12	12-15	Ultra bold nut, Shy bearer
		Pilar-2			Red	8-10	15-20	

Table 23. Performance of local cashew accessions during 1997-98.

Varieties	Nut yield (g)	Average nut weight (g)	Average apple weight (g)	Cumulative yield (kg/tree) (8 Years)	Per cent shelling
IA -Farmagudi	802.5	7.79	50.84	4.21	28.98
Balli - 2	4352	7.38	68.00	18.90	29.80
Balli - 3	< 50	7.66	65.00	1.72	-
Balli - 5	543	7.25	52.68	4.20	20.76
Buipal - 1	105	10.75	-	1.29	-
C - 3	284	6.05	42.00	1.44	-
CHWL - 1	605	8.76	40.00	1.22	--
Betul - 1	50	6.8	75.00	1.02	26.47
Gurko (Shirlim-1)	415	8.68	50.76	1.46	23.27
Mardol - 5	113.5	10.23	50.53	1.56	20.70
Nanora - 2	825	3.54	<20	5.56	28.37
P - 2	--	--	--	3.70	--
Uguem - 5	285.5	6.27	30.00	2.32	25.30
Vethal - 1	309	8.34	45.21	0.79	--
Malorem	204	7.11	58.65	1.06	30.30
Loutoulim	440	8.6	60.29	0.96	--

Table 24 reveals the performance of introduced accessions in the current season. H-1600 recorded the maximum nut yield of 3.46 kg per tree with 28.99 per cent shelling and 13.08 kg of cumulative nut yield (for 8 years), although nut size was observed to be only 5.6 g. VTH-59/2, VTH-539 and H-1598 (Kanaka) were other accessions which recorded 1.18, 1.28 and 1.71 kg of raw nuts per tree during the current year with 9.45, 8.84 and 7.12 kg of cumulative nut yield (for 8 years), respectively. In these accessions, the shelling percentage varied from 27.52 to 30.41 per cent and the average nut weight from 4.6g (Kanaka) to 5.86g (VTH-59/2). In general, apple size was observed to be very small in all the accessions (i.e., 15 to 46 g).

Table 24. Performance of introduced cashew accessions during 1997-98.

Varieties	Nut yield (kg/tree)	Average nut weight (g)	Average apple weight (g)	Cumulative yield (kg/tree)	Per ce shelli
BLA - 39/4	0.61	3.00	46.4	3.35	21.93
VTH - 59/2	1.18	5.86	34.48	9.45	27.52
VTH - 30/4	1.41	3.26	37.00	2.99	30.33
VTH - 125	0.33	3.73	19.67	1.68	27.68
VTH - 539	1.28	5.70	21.27	8.84	27.71
VTH - 154	0.70	7.81	43.61	2.24	29.96
M-10/4(VRC-1)	1.03	6.08	36.90	4.96	23.84
M-26/2(VRC-2)	0.70	6.73	22.84	7.66	26.34
VTH-107/31	0.11	6.16	40.23	0.71	28.05
BPP- 1	1.09	4.59	28.13	5.39	31.22
BPP - 2	1.41	3.62	29.25	7.58	27.35
BPP - 4	0.03	4.28	21.42	0.03	33.33
BPP - 5	0.08	4.11	17.00	1.40	26.88
HB -1598 (Kanaka)	1.71	4.60	30.00	7.12	30.41
HB -1600	3.46	5.63	22.00	13.08	28.99
HB - 1608 (Dhana)	1.19	4.50	15.84	9.82	25.06
HB - 1610	0.08	8.00	40.85	0.14	25.00

Mango

Mango germplasm collection of 84 accessions, comprising of 61 loca cessions, 10 introduced varieties and 13 introduced hybrids, was maintai

A new seedling of the local variety " Bemcorado" was identified for dium to big sized attractive fruits with agreeable flavour and fruit quality to 19° B). The tree was observed to bear early and regularly. Further obse tions are under progress.

uring

Per cent shelling
21.93
27.52
30.33
27.68
27.71
29.96
23.84
26.34
28.05
31.22
27.35
33.33
26.88
30.41
28.99
25.06
25.00

of 61 local ac-
s maintained.

tified for me-
uit quality (18
ther observa-

PLATE-3 HORTICULTURE

Balli-2 bunch



Cashew (Balli-1 & 2 characterstics)



→ Bemcorado - a local promising mango selection





← Kesar - a potential mango variety



→ Mango in mine reject soil

Local varieties namely Maxima, Toranja, Furtad and Colaco Branca recorded 18.5, 13.5, 12.87 and 9.4 kg of fruit yield during 1997-98 (Table 25). Colaco Branca had average fruit weight of 263.88 g with 76.6 per cent pulp, 19 per cent total soluble solids and 0.36 per cent total acids, besides excellent flavour, whereas fruit weight in Mankurad was 249 g and fruits had 76.3 per cent pulp with 19.8 per cent T.SS and 0.18 per cent total acids (Table 26). Other varieties namely Maxima and Toranja recorded higher T.S.S of 21.36 and 20.65 percent, respectively, although medium sized fruits (206.66 g and 208 g) had 69.29 and 74.08 per cent fruit pulp with acidic blend of 0.2 to 0.25 per cent. Among the late varieties, fruit quality was good (22.3° B T.S.S.) in Hilario unlike that of Fernandin (T.S.S. - 14.5° B).

Table 25. Performance of local mango varieties during 1997-98.

Variety	Year of planting	Fruit yield per tree		Remarks
		No. of fruits	Weight (kg)	
Maxima	1989	95.50	18.50	
Hilario	1989	21.50	4.06	Late variety
Mankurad	1989	4.00	1.00	
Fernandin	1989	27.00	4.64	Late variety
Colaco Branca	1989	40.00	9.40	
Furtado	1989	68.00	12.87	Susceptible to fruit fly attack
Monteiro	1992	7.50	0.85	Small fruits
Toranja	1991	48.00	13.50	
Miranda	1991	12.00	2.00	
Koita	1991	13.50	2.50	Poor fruit quality
Jesuit	1991	6.00	2.00	

Yield performance and fruit quality of introduced hybrids and varieties are presented in tables 27 and 28, respectively. Hybrids viz., Neelgoa and Amrapali yielded 62.0 and 53.95 kg of fruits/tree, respectively, followed by H-151 (24.0 kg/tree), HB-45(21.95 kg/tree), H-87 (21.73 kg/tree) and Ratna (18.1 kg/tree).

Among the popular varieties, Neelum and Kesar yielded 17.0 and 16.85 kg of fruits/tree in the current season followed by Alphonso (16.18 kg/tree).

Table 26. Fruit size and quality of local mango varieties durin 1997 - 98.

Variety	Fruit weight (g)	Pulp (%)	TSS (%)	Total acids (%)
Maxima	206.66	69.29	21.36	0.200
Hilario	181.00	66.96	23.30	0.170
Mankurad	249.00	76.33	19.80	0.180
Fernandin	209.62	65.84	14.50	0.450
Colaco Branca	263.88	76.63	19.04	0.360
Furtado	191.89	66.79	16.11	0.210
Monteiro	120.00	65.19	18.05	0.209
Toranja	208.00	74.08	20.60	0.250
Miranda	140.00	55.68	22.20	0.310
Jesuit	248.30	56.35	17.00	0.260
F test	***	***	***	***
C.D (5%)	38.2	8.54	3.12	0.12

Table 27. Performance of introduced mango varieties / hybrids during 1997 - 98.

Variety	Year of planting	Fruit yield/tree	
		Number	Weight (kg)
HYBRIDS			
HB - 45	1984	59.00	21.95
H -151	1984	349.00	24.00
Amrapali	1984	446.00	53.95
Neelgoa	1984	221.00	62.00
Ratna	1984	67.00	18.10
HB - 87	1984	107.00	21.73
HB - 56	1984	51.50	11.90
Arka Aruna	1989	10.00	3.50
Arka Anmol	1991	32.75	7.00
K x B	1994	52.00	7.67
VARIETIES			
Alphonso	1982	53.80	16.18
Kesar	1984	58.50	16.85
Neelum	1989	170.00	17.00
Himayuddin	1990	15.00	7.00
Kalapady	1992	19.00	2.75

Table 28. Fruit size and quality of introduced mango hybrids/ varieties during 1997 - 98.

Variety	Fruit weight (g)	Pulp (%)	TSS (%)	Total acids
HYBRIDS				
HB - 45	418.66	75.33	15.00	0.40
Amrapali	186.11	72.29	21.82	0.23
Neelgoa	342.66	73.28	16.16	0.11
Ratna	258.05	67.30	21.00	0.28
HB - 87	240.50	72.67	20.60	0.53
HB - 56	295.00	69.60	19.20	0.21
Arka Aruna	400.30	80.29	21.33	0.17
Arka Anmol	231.80	67.97	15.16	0.38
K x B	160.00	73.75	19.00	0.36
F test	**	**	**	**
C. D. (5%)	114.34	9.42	2.21	0.09
VARIETIES				
Alphonso	335.47	71.18	18.47	0.42
Kesar	279.17	71.47	19.42	0.19
Neelgoa	188.60	63.56	19.20	0.16
Himayuddin	323.33	76.63	20.90	0.13
Kalapady	131.67	68.97	22.50	0.23
F Test	**	**	N.S.	**
C.D. (1%)	63.41	5.31	--	0.12

Fruit quality was observed to be better in hybrids viz., Amrapali, Ratna and Arka Aruna with T.SS of 21 per cent (Table 28) and total acid contents of 0.17 to 0.23 per cent. Pulp quantity also varied from 67.3 per cent (Ratna) to 80 per cent (Arka Aruna). However, fruit size in Amrapali was 186.11 g, while fruits were bigger in Arka Aruna (400.3 g) and medium in Ratna (258.5 g). HB-87 was observed to have 72.67 per cent pulp content in medium sized fruits (240.5 g) with sugar (TSS 20.6 %) and (0.53 %) blend, but skin colour, upon ripening, remained light green or greenish yellow. Although Neelgoa fruits were of good size (342.66 g) with attractive reddish blush on shoulder, recorded only 16.16 per cent TSS. Similarly, HB-45 yielded bigger sized fruits

(418.66) with 75.33 per cent pulp content but quality of pulp was observ be acidic (TSS 15 % & 0.4 % acids). On the other hand, in HB-56, fruit (295 g) and quality (TSS 19.2 %) were better and pulp consistency was served to be watery. Among popular varieties introduced, Kesar, Alph and Himayuddin were observed to be better in fruit size (335.47 and 279. respectively) and quality (18.47 % to 20.9 % TSS, respectively). In these eties, pulp content varied from 71.18 per cent (Alphonso) to 76.63 per (Himayuddin). However, a dominant sugar acid blend was recorded in Alph (i.e. 18.47 % TSS and 0.42 % total acids). In Kesar, besides good quali pulp, fruits developed attractive reddish blush colour on shoulder.

Results of sensory evaluation test of some local mango varieties as as introductions are presented in table 29. In general, the introduced va ies/hybrids, except Neelgoa, scored better with respect to general taste (r than 6 points). Furtad scored the highest points (7.25) for general taste, lowed by Amrapali (7.07), Ratna (6.92), Alphonso (6.47), Arka Aruna (6 and Mankurad (6.46).

Table 29. Organoleptic test on some mango varieties, 1997-98.

Variety	General taste	Flavour & aroma	Pulp appearance	Pulp texture	* Fibre
LOCAL					
Furtado	7.25	5.50	7.12	7.75	-
Mankurad	6.46	5.76	6.4	6.0	5.8
Colaco Branca	5.04	5.45	5.28	5.33	5.9
Sakri	5.42	5.21	6.5	5.30	4.7
Toranja	5.38	6.07	7.16	5.92	6.0
Introductions					
Alphonso	6.47	6.00	7.50	6.38	6.1
Kesar	6.14	5.80	6.69	6.07	6.3
Amrapali	7.07	7.00	7.83	7.15	6.0
Neelgoa	5.69	5.30	5.71	5.76	6.0
Arka Aruna	6.46	6.38	4.86	6.38	7.0
Ratna	6.92	6.85	7.57	6.92	6.6

Score scale : 1 - 10 points

* Lesser fibre = Higher score (Better quality)

Flavour and aroma of Amrapali was most liked (7.0 points), followed by Ratna (6.85 points), Arka Aruna (6.38) and Toranja (6.07 points). Similarly, Amrapali scored better in terms of appearance of pulp (7.83), its texture (7.15) and its less fibreness (6.00), whereas the corresponding scores were 6.69, 6.07 and 6.33, for Kesar, 7.57,/6.92 and 6.69, for Ratna and 7.16, 5.92 and 6.07, for Toranja, respectively.

Although Arka Aruna was the least fibrous variety (7.08) with better pulp texture (6.38 points), its yellow coloured pulp scored the least points (4.86). Neelgoa scored moderately for taste (5.69), appearance of pulp (5.71), texture of pulp (5.76) and fibreness (6.07), except flavour and aroma of pulp (5.30). The local popular variety Mankurad, despite its better scores in respect of general taste (6.46), texture and appearance of pulp (6.0 and 6.4 points, respectively), was considered as moderately fibrous variety (5.84 points). Sakri was the most fibrous (i.e.. juicy) variety with attractive yellowish orange pulp colour.

3. Evaluation of oil palm hybrid combination (D x P) under Goa condition

(A R Desai and D G Dhandar)

In an evaluation trial of five oilpalm hybrids of Dura x Pisifera combinations viz., 82D x 266P, 124D x 266P, 18D x 32P, 35D x 291P and 65D x 111P, it was observed that the hybrids did not differ significantly either in yield of fresh fruit bunches (FFBs) or in palm growth during 1997-98 season (Table 30). The FFB yield varied from 21.97 to 34.14 kg/palm (124D x 266P, 35D x 291P, respectively), while the mean FFB weight was the highest in 82D x 266P (4.69 kg), followed by 18D x 32P (4.61 kg) and 65D x 111P (4.04 kg).

Table 30. Growth and FFB yield of oilpalm hybrids during 1997 - 98.

Hybrid combination	Height (m)	Girth (m)	FFB Yield (1997-98)		
			No.	Total weight (kg)	Avgerage weight (kg)
82D x 266P	5.60	2.13	6.23	29.27	4.69
124D x 266P	5.79	2.26	6.15	21.97	3.53
18D x 32P	6.05	2.35	6.69	32.88	4.61
35D x 291P	5.91	2.20	9.08	34.14	3.82
65D x 111P	5.65	1.95	8.08	32.98	4.04
F Test	N.S	N.S	N.S	N.S	N.S

Flavour and aroma of Amrapali was most liked (7.0 points), followed by Ratna (6.85 points), Arka Aruna (6.38) and Toranja (6.07 points). Similarly, Amrapali scored better in terms of appearance of pulp (7.83), its texture (7.15) and its less fibreness (6.00), whereas the corresponding scores were 6.69, 6.07 and 6.33, for Kesar, 7.57,/6.92 and 6.69, for Ratna and 7.16, 5.92 and 6.07, for Toranja, respectively.

Although Arka Aruna was the least fibrous variety (7.08) with better pulp texture (6.38 points), its yellow coloured pulp scored the least points (4.86). Neelgoa scored moderately for taste (5.69), appearance of pulp (5.71), texture of pulp (5.76) and fibreness (6.07), except flavour and aroma of pulp (5.30). The local popular variety Mankurad, despite its better scores in respect of general taste (6.46), texture and appearance of pulp (6.0 and 6.4 points, respectively), was considered as moderately fibrous variety (5.84 points). Sakri was the most fibrous (i.e.. juicy) variety with attractive yellowish orange pulp colour.

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124D x 266P	5.79	2.26	6.15	21.97	3.53
18D x 32P	6.05	2.35	6.69	32.88	4.61
35D x 291P	5.91	2.20	9.08	34.14	3.82
65D x 111P	5.65	1.95	8.08	32.98	4.04
F Test	N.S	N.S	N.S	N.S	N.S

Trends in cumulative performance of the hybrids (Table 31) revealed seedlings of 82D x 266P recorded the highest cumulative yield of 65.11 k FFB/palm followed by 65D x 111P (59.89 kg FFB/palm) and 18D x 32P (5 kg/palm) for a period of six years. The mean bunch weight was the highe 18D x 32P (4.3 kg) and the least was 2.8kg in 124D x 266P. The ave bunch weight was the highest in 18D x 266P (4.39 kg). With regard to y wise performance, 82D x 32P recorded maximum yield of 7.98 kg FFBs/p with average bunch weight of 1.57 kg in 1995-96 and the trend was contin in 1996-97 with corresponding values of 27.56 kg and 6.23 kg. Further highest FFB yield of 32.98 kg/palm with average bunch weight of 4.04 kg recorded in 65D x 111P in 1997-98 season.

Table 31. Trends in cumulative FFB yield of tenera hybrids under Goa conditions (1995-96 to 1997-98).

	Hybrid	1995-96			1996-97			1997-98		
		Total No. of FFB	Total weight (kg/ palm)	Average weight (kg)	Total No. of FFB	Total weight (kg/ Palm)	Average weight (kg)	Total No. of FFB	Total Weight (kg /Palm)	Av We
1	82D X 266P	4.77	7.98	1.57	10.52	35.84	3.41	16.62	64.44	
2	124D X 266P	5.00	5.17	1.16	11.23	25.94	2.31	17.31	49.17	
3	18D X 32P	2.38	3.73	1.66	7.13	26.31	3.69	13.85	63.48	
4	35D X 291P	5.07	5.77	1.40	9.30	21.03	2.26	18.15	55.63	
5	65D X 111P	4.15	4.32	1.20	9.47	26.91	2.84	17.62	64.80	

Besides, it was observed in general that some individual palms sh highly promising performance in terms of FFB yield, number of FFBs an mean weight of FFBs. The hybrid seedlings, No. 8/4 and No. 5/7 of 6 111P combination recorded the highest cumulative yield (six years) of 16 and 124.1 kg of FFBs with average bunch weight of 5.25 and 6.62 kg, re tively (Table 32). The differential increase in cumulative FFB yield was 17 % in No.8/4 and 91.51 per cent in No. 5/7 over group mean, indic their maximum contribution to the mean performance of 65D x 111P co nation. Similarly, the superior palms in each of the other four D x P com tions were also identified for further observations.

Table 32. Comparison of some superior tenera hybrid palm with their mean performance.

Combination	Pl. No.	1995-96			1996-97			1997-98			Cumulative FFB yield for 3 years		
		Total No. (FFB)	Total Wt. (kg/ palm)	Avg. Wt. (kg)	Total No. (FFB)	Total Wt. (kg/ palm)	Avg. Wt. (kg)	Total No. (FFB)	Total Wt. (kg/ palm)	Avg. Wt. (kg)	Total No. of FFB	Total Wt. (kg/ Palm)	Avg. wt. (kg)
82D X 266P	3/4	14.00	28.30	2.02	8.00	30.05	3.80	6.00	24.90	4.15	28.00	82.95	2.96
	3/5	12.00	31.15	2.59	4.00	20.00	5.00	7.00	35.00	5.00	23.00	86.15	3.75
	4/3	5.00	6.20	1.24	7.00	42.80	6.11	6.00	30.00	5.00	18.00	79.00	4.39
	Group mean	4.77	7.98	1.57	5.62	27.56	4.90	6.23	29.27	4.69	16.62	64.44	3.93
124D X 266P	3/3	9.00	8.30	9.92	8.00	34.95	4.40	5.00	15.20	3.40	22.00	68.90	3.13
	6/5	11.00	8.50	0.77	12.00	36.10	3.00	12.00	41.35	3.50	35.00	85.95	2.46
	7/3	11.00	8.50	0.77	7.00	45.00	6.43	3.00	19.50	6.50	13.00	67.25	5.17
	Group mean	5.00	5.17	1.16	6.10	20.60	3.38	6.15	21.97	4.69	17.31	49.17	2.89
18D X 32P	5/5	7.00	11.00	1.57	10.00	49.70	4.97	10.00	47.70	4.77	27.00	108.40	4.01
	5/4	2.00	2.60	1.30	3.00	16.00	5.33	12.00	64.00	5.50	17.00	130.10	7.65
	Group mean	2.38	3.73	1.66	4.47	21.39	4.78	6.69	32.88	4.61	13.85	63.48	4.69
35D X 291P	5/11	7.00	6.90	0.99	3.00	27.00	9.00	7.00	63.70	9.10	17.00	97.60	5.74
	7/4	6.00	5.65	0.94	4.00	18.80	4.70	14.00	71.80	5.12	24.00	95.75	3.99
	Group mean	5.07	5.77	1.40	4.60	15.68	3.41	9.08	34.14	3.82	18.15	55.63	3.10
65D X 111P	8/4	3.00	3.55	1.18	10.00	58.10	5.81	18.00	82.00	4.56	31.00	166.65	5.25
	5/7	3.00	3.10	1.03	7.00	56.00	8.00	8.00	60.00	7.50	18.00	124.10	6.62
	7/6	9.00	7.85	0.87	12.00	74.75	6.22	5.00	30.00	6.00	26.00	113.40	4.36
	Group mean	4.15	4.32	1.24	5.00	22.84	4.56	8.08	32.98	4.04	17.62	64.80	3.37

4. Standardization of agrotechniques for pineapple in Goa

(D G Dhandar and A R Desai)

A field trial on chemical regulations of flowering for staggered harv was laid out using Giant kew pineapple. These studies revealed that abo per cent flowering was induced within a period of 55.75 days after ap 50 ml of solution containing calcium carbide (1%) and urea (2 %) (T1) age of 12 months (stage-1) as against 193 days in control plants (Tabl But the same solution (T1) when applied 13 months after planting (st was observed to induce about 95 per cent flowering only after 72 da against 205 days in control plants.

T1 (CaC_2 1 % + urea 2 %) induced flowering in just 32.5 days after cation and there after, about 95 per cent of plants flowered within 23 d stage-1, whereas in stage-2, flowering started 38 days after T1 appli and thereafter within 34 days more, than 95 per cent flowering was obs

Application of 50 ml T4 (Ethrel 25 ppm + urea 2 % + sodium carb 0.04 %) although could induce flowering after 38 days in stage -1 and 33.75 days in stage-2, only a maximum of 75 per cent flowering was obs after 110 days in stage-1 and after 131.35 days in stage-2 after applica

On the other hand, T2 (calcium carbide 1% + urea 2 % + sodium ca ate 0.04) was observed to induce flowering only after 100 days after ap tion in Stage-1 and 75 days in stage-2 . The duration taken for inducing than 95 per cent flowering was observed only after about 40 days in s and 75 days in stage-2.

Further, the early flowering induction by T1 was observed to redu average fruit weight from 1.73 kg (control) to 1.59 kg in stage-1 and fro kg (control) to 1.73 kg in stage-2 (Table 34). The reduction in fruit weig more prominent in T2. Reduced fruit girth from 42.2 cm (control) to 40. (T1) in stage-1 and from 46.0 cm (control) to 42.66 cm (T1) and 41.56 c in stage-2 had resulted in decreased fruit weight.

Table 33. Time taken for flowering (No. of days) after imposing treatments in pineapple.

Treatment		Per cent flowering			
		25 days	50 days	75 days	>95 days
S_1	T1	32.5	48.00	52.00	55.75
	T2	100.5	126.75	127.00	140.25
	T3	130.5	151.75	154.25	161.75
	T4	38.00	58.00	110.00	--
	T5	114.00	141.25	151.00	193.00
Mean		83.1	105.15	118.85	137.68
S_2	T1	38.00	60.00	72.00	72.00
	T2	75.00	93.75	101.25	150.00
	T3	82.50	126.00	130.25	190.00
	T4	33.75	48.75	131.35	--
	T5	98.25	109.50	142.00	205.00
Mean		65.5	87.6	115.37	154.25
C.D. (at5%) for:					
Stage of application		10.55	8.11	7.83	N.S.
Treatment		16.68	12.82	12.38	13.33
Interaction		23.59	18.13	17.50	N.S.

T1 = CaC_2 1% + Urea 2%

T2 = CaC_2 1% + Urea 2% + Na_2CO_3 0.04%

T3 = NAA 100 ppm + CaC_2 1% + Urea 2%

T4 = Ethrel 25 ppm + Urea 2% + Na_2CO_3 0.04%

T5 = Control

S1 =When plants were of 11 months age

S2 = When plants were of 12 months age

Table 34. Fruit size as influenced by the chemical induction flowering in pineapple.

Treatments		Fruit wt. (kg.)	Fruit length (cm)	Fruit girth (cm)	Crown wt. (g)
S_1	T1	1.59	16.34	40.89	395.90
	T2	1.58	16.67	41.83	334.70
	T3	1.81	16.50	43.50	308.50
	T4	1.30	14.80	42.13	284.00
	T5	1.73	16.71	42.20	438.60
Mean		1.60	16.30	42.10	357.90
S_2	T1	1.73	16.72	42.66	357.90
	T2	1.38	16.88	41.00	343.50
	T3	1.79	17.75	40.75	436.00
	T4	1.49	14.86	41.56	452.00
	T5	2.20	18.80	46.00	422.00
Mean		1.72	17.00	42.39	402.28
C.D. (at5%) for :					
Stage of application		N.S.	N.S.	N.S.	38.26
Treatment		0.31	N.S.	2.35	N.S.
Interaction		0.44	N.S.	3.31	85.56

T1 = CaC_2 1% + Urea 2%

T2 = CaC_2 1% + Urea 2% + Na_2CO_3 0.04%

T3 = NAA 100 ppm + CaC_2 1% + Urea 2%

T4 = Ethrel 25 ppm + Urea 2% + Na_2CO_3 0.04%

T5 = Control

S1 =When plants were of 11 months age

S2 = When plants were of 12 months age

induction of

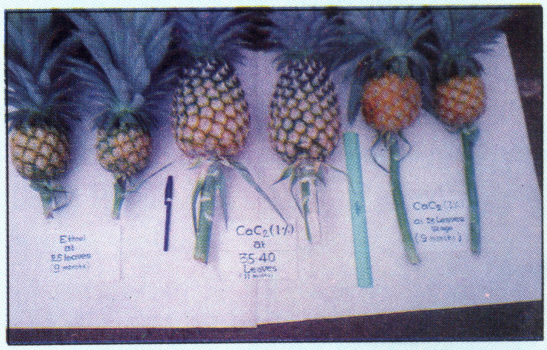
own wt. (g)
95.90
84.70
08.50
84.00
88.60
57.90
57.90
43.50
36.00
52.00
22.00
92.28
8.26
N.S.
5.56

PLATE-4 HORTICULTURE



←

Uniform fruit set induced by CaC_2 in Giant Kew pineapple



→

Flowering induction at 35-40 leaf stage for desirable fruits size in pineapple



←

Stylosanthus, a promising fodder as intercrop in coconut



→

PBN - 16, high yield fodder grass as intercrop in coconut

5. Intercropping studies of forage grasses and legumes in coconut

(B L Manjunath and R N S Sundaram)

A field experiment initiated during 1996-97 to identify profitable forage grasses/legume species and their varieties for intercropping in coconut was continued during the year. The trial included seven forage grasses viz. Guinea grass (variety Punjab Guinea - 123), Setaria grass (Nandi) and five hybrid Napier grasses (PBN-16, NB-21, DHN-1, DHN-2 and DHN-3) and four forage legumes viz. *Stylosanlthus scabra, Stylosanlthus hamata, Centrocema* and fodder cowpea in a randomized block design with three replications in a ten year old coconut garden (variety Benaulim). The plots received on an average 35 to 56 percent of total photosynthically active radiation.

The growth and yield parameters recorded in different grasses is presented in table 35. The hybrid Napier DHN-2 recorded the highest plant height (248.6 cm) and was followed by DHN-1 (222.9 cm) and NB-21 (203.6 cm). The tillers/clump which is an important attribute for higher yields was highest in Guinea grass (32.5/clump) and among the hybrid Napier PBN-16 recorded higher (19.2/clump) tillers. The hybrid Napier NB-21 recorded higher leaves/tiller (12.1) with higher leaf length (80 cm). While another hybrid Napier DHN-1 had better leaf length (80.5 cm) and leaf width (3.21 cm). The hybrid Napier PBN-16 with more tillers and less internodal length (10.5 cm) found to be more fleshy and vigorous.

The yield of different forage grases during different periods of the year is presented in table 36. In general, yields of forage grasses is more during rainy period and post rainy period while the yield potential is relatively less during summer months owing to scarcity of moisture even with irrigation. The hybrid napier DHN-1 although recorded highest forage yield (133.2 t/ha/year) was found to be more coarse with hard stem which is also reflected in leaf to stem ratio (1:3.92). On the other hand hybrid Napier PBN-16 and NB-21 recorded moderately good yields (103.5 and 124.1 t/ha/year respectively) with lower leaf to stem ratio. (1:1.63 and 1:1.82 respectively). The hybrid Napier DHN-3 although was more leafy (1:1.09 leaf to stem ratio) was found to be a moderate yielder (98.1 t/ha/year).

Table 35. Growth parameters of different forage grasses as intercrops in coconut (Mean of four cuttings).

Forage grasses/variety	Plant height(cm)	Tillers/ clump	Nodes/ tiller	Leaves/ tiller	Leaf length(cm)	Leaf Width(cm)	Internodal length(cm)
Guinea (Punjab Guinea-123)	141.4	32.5	4.7	7.3	55.3	1.68	13.9
Setaria	132.6	29.5	4.8	7.3	39.3	1.12	10.6
Hybrid Napier							
PBN-16	156.5	19.2	5.2	8.9	56.3	2.56	10.5
NB-21	203.6	14.6	7.8	12.1	80.0	2.80	14.1
DHN-1	222.9	14.5	8.0	11.4	80.5	3.21	15.5
DHN-2	248.6	10.2	8.4	11.6	61.6	2.78	15.8
DHN-3	183.2	16.3	6.5	9.0	67.7	2.58	14.1

Table 36. Yield of forage grasses as intercrops in coconut (t/ha of coconut plantation).

Forage grasses/varieties	I cut (April-June)	II cut (July-Sept.)	III cut (Oct.-Dec.)	IV cut (Jan.-Mar.)	Mean Total yield (t/ha/yr.)	Leaf:stem ratio
Guinea grass	18.53	23.73	26.93	22.93	92.12	1:2.11
Setaria grass	17.80	14.33	19.67	20.93	72.73	1:1.79
Hybrid Napier						
NB-21	30.40	29.93	36.53	27.20	124.06	1:1.82
PBN-16	19.85	25.53	34.20	23.93	103.51	1:1.63
DHN-1	33.00	48.20	27.00	25.00	133.20	1:3.92
DHN-2	13.20	16.00	24.27	16.20	69.67	1:1.09
DHN-3	25.40	38.47				

Among the different forage legumes tried as intercrops in coconut *Stylosanthus scabra* was better both in plant height (87.5 cm) and number of trifoliate leaves (297.2) with moderately good number of branches, while another forage legume *Stylosanthus hamata* had more branching. The vine length was maximum (166.4 cm) in *Centrocema* which was found to root at each of the nodes and cover the whole plot (Table 37).

The yield of different forage legumes during different periods of the year along with mean total yield and leaf to stem ratio is presented in table 38. In general, the growth of forage legumes was optimum during rainy season owing to favourable conditions. *Centrocema* with good soil coverage recorded higher forage yield (13.43 t/ha/year) and was followed by *Stylosanthus scabra* (12.69 t/ha/year). The fodder cowpea was found to be not much suitable for the shaded situations under coconut as reflected in its yield (7.69 t/ha/year). *Stylosanthus hamata* and *Centrocema* were found to be more leafy and succulant as reflected with lower leaf to stem ratio (1:0.91 and 1:0.92 respectively).

Table 37. Growth parameters of different forage legumes as intercrops in coconut (mean of three cuttings).

Forage legume	Plant height (cm)	No. of trifoliate leaves	No. of primary branches	No. of secondary branches	Vine length (cm)
Stylosanthus scabra	87.5	297.2	5.3	20.1	87.5
Stylosanthus hamata	56.4	247.8	4.0	21.5	56.4
Centrocema	17.3	141.5	7.2	15.4	166.4
Fodder Cowpea	37.7	14.4	1.9	1.4	64.8

Table 38. Yield of forage legumes as intercrops in coconut.

Forage legume	I cut (Feb-April)	II cut (May-Aug.)	III cut (Sept.-Jan.)	Mean total yield (t/ha/year)	Leaf: stem ratio
Stylosanthus scabra	3.35	7.34	2.00	12.69	1:1.07
Stylosanthus hamata	3.23	6.65	1.60	11.47	1:0.91
Centrocema	1.3	9.10	3.03	13.43	1:0.92
Fodder Cowpea	1.03	3.86	2.80	7.69	1:1.57

6. Utilisation of mine reject soils for fruit production

(H M Wasnik)

In Goa, the mine rejects at the site and their transportation by road h proved detrimental to agriculture and silted lakes and river beds in low ly areas. The soils in the form of clay, flow alongwith monsoon water and spr on surrounding agriculture fields, affecting the low lying paddy fields, sides silting the lakes and river beds. Annually, 30 to 35 million tones of m rejects are generated which occupy nearly 500 ha of cultivated land. Wi view to utilize barren mine reject soils for planting with suitable econo perennial crop species, the project was initiated with the following objecti

* Development of technologies for efficient use and management of m reject soils

* Development of cashew and mango based cropping models on mine ject soils

* Development of integrated nutrient management for mine reject soil

To develop the models for cashew and mango based cropping syste Sirigaon mines of M/S Chowgule and Co. was selected for implementing cashew and mango based cropping models on mine reject soils of Goa. S are slightly acidic in reaction and normal in respect of salt content. The av able nitrogen, phosphorus and potassium were in lower ranges. The availa zinc and copper are adequate whereas, the available iron and available m ganese are in higher ranges.

Four hundred pits were dug in the spacing of 5x5 meter in one ha a and each pit filled with 10 kg of farm yard manure. About 200 cashew gr (V- 4) and 200 mango grafts (50 each of varieties, Amrapali, Hilario, Ball Mussarat) were planted at the onset of monsoon during 1996. There was per cent survival of cashew and mango grafts during 1996-97. The surviva mango grafts were only 40 per cent during 1997-98. The plants were 60- cm in height with 3-35 branches and 85-640 number of leaves in case of cas grafts. Flowering and fruiting were also observed in cashew grafts. Where mango grafts were 30-60 cm in height with 6-9 branches and 21-106 lea after one year of planting.

4.3 ANIMAL SCIENCES

1. Evaluation of varying energy protein level in rabbit and pig diet for better performance

(R N S Sundaram and E B Chakurkar)

Two experimental diets with isoprotein value and two calorie levels were prepared for young rabbits and the proximate values were estimated. The digestible energy value of feed was 2650 kcal, for control diet and 3000 kcal for experimental diets. Crude protein value of the diet was 18.5 per cent for both control and experimental feeds. Chemical composition of the feed and the comparative growth performance during the three months trial period are presented in Table 39. The average daily weight gain of control and experimental group were 7.41 and 7.84g, respectively.

Table 39. Effect of high energy diet on the growth performance in rabbits.

Parameters	Control	Treatment
CP (%)	18.50	18.50
DE (kcal)	2650	3000
DWG(g)/animal		
1	8.24	4.39
2	8.79	7.08
3	7.14	9.34
4	7.14	8.79
5	8.79	9.24
6	4.39	8.24
ADG (g)	7.41	7.84

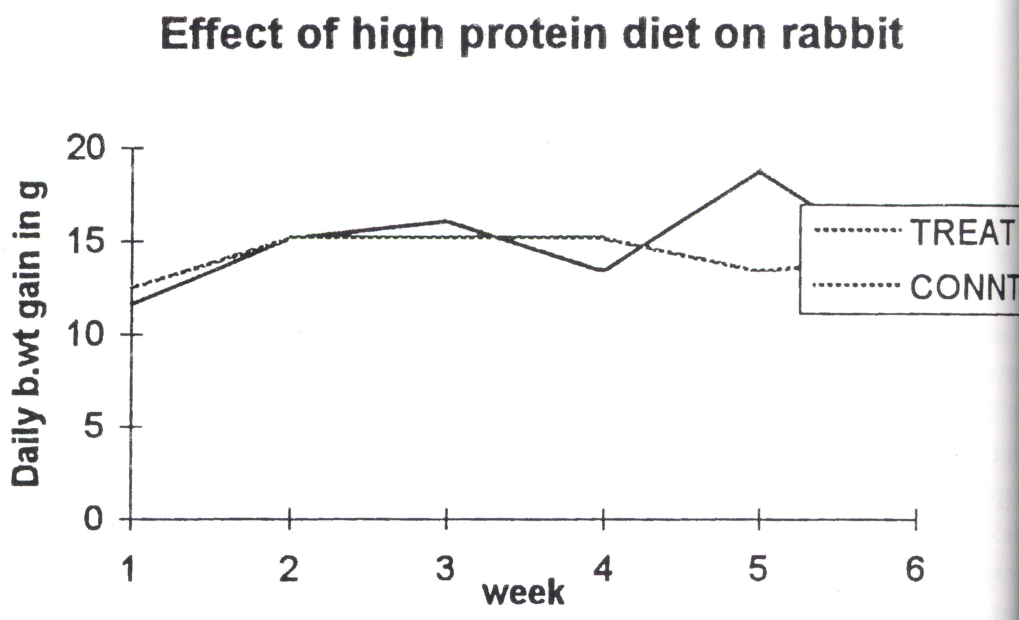
Two feeding trials were conducted for feeds with 16.5 per cent and 18.5 per cent crude protein levels. Trial-I was conducted for two months with 12 rabbits. Trial II was conducted with 12 weaners for 8 weeks. Each trial was initiated with a digestibility study. In both trials there was an increase in daily weight gain with enhanced protein content in the diet as it can be seen from Table 40. Effect of mineral supplementation on the performance of weaner rabbit was studied for 8 weeks. Ostocalcium @ 5ml/litre water was provided to experimental animals. The results of the trial are presented in Fig. 4. and table 41. The study indicated that an increase in daily weight was observed in the experimental group. Experimental feeds were formulated using biodegraded by-products for high energy diets and analysed for proximate principles.

Table 40. Daily weight gain in rabbits with two levels of crude pro

Parameters	Control*	Treatment *
CP (%)	16.50	18.50
DE.(kcal)	2650.00	2650.00
DWG (g)/animal		
1	12.50	11.60
2	15.17	15.17
3	15.17	16.07
4	14.28	13.39
5	13.39	18.75
6	14.28	13.39
ADG(g)14.28	14.72	

* Mean value of six replications

Fig. 4. Effect of high protein diet on rabbit



Two feeding trials were conducted on pigs for a period of 90 days each. Feed intake and fortnightly weight gain were recorded. The average daily weight gains of the control and experimental groups were 72.26 and 107.27g, respectively.

Table 41. Effect of mineral supplimentation on the growth performance of weaner rabbbits.

I. Ostocalcium Group

Animal No. / Week	Body wt (kg)						
	E1	E2	E3	E4	E5	E6	Average
1	1.85	1.75	1.90	2.00	2.00	2.20	1.95
2	1.85	1.85	2.05	2.00	2.00	2.20	1.99
3	1.90	1.90	2.15	2.10	2.05	2.20	2.05
4	1.90	2.00	2.40	2.20	2.15	2.30	2.16
5	1.95	2.00	2.35	2.20	2.15	2.35	2.16
6	2.00	2.05	2.45	2.20	2.20	2.35	2.21
7	2.00	2.20	2.45	2.25	2.20	2.35	2.24
8	2.10	2.20	2.40	2.25	2.30	2.35	2.27

II. Control group

Animal No. / Week	Body wt (kg)						
	C1	C2	C3	C4	C5	C6	Average
1	1.90	1.55	1.65	1.75	1.85	1.75	1.74
2	1.90	1.65	1.70	1.75	1.85	1.85	1.78
3	2.00	1.75	1.75	1.80	1.90	1.90	1.85
4	2.15	1.75	1.75	1.80	1.90	2.00	1.89
5	2.15	1.80	1.80	1.80	1.95	2.00	1.92
6	2.25	1.85	1.85	1.85	2.00	2.05	1.98
7	2.25	1.95	1.95	1.90	2.00	2.20	2.04
8	2.30	2.00	1.95	1.95	2.00	2.20	2.07

2. Adoption of improved techniques to increase the fertility and fec dity in pigs and rabbit

(E B Chakurkar, R N S Sundaram and S B Barbuddhe)

The main objective of this project is to optimize the reproductive e ciency of the meat animals so as to get more number of young ones per a mal per unit time. In this regard, attempts were made to improve fertilit the animals and to improve survival of young ones from birth to weanin adopting different techniques.

Rabbit

Rematting interval was reduced in does and they were bred within 2 48 hours after kindling and 10 days after kindling. It was observed t fertility was improved and there was no ill effect on kit survival in subsequ kindling.

An attempt was made to improve kit survival by feeding jaggery to lactating does from the day of kindling for a period of ten days. Jaggery i rich source of energy as well as important minerals like calcium and ph phorous which are essential for lactation. Results of this trial are promisi Total of 46 kindlings were studied consisting of control and treatment grou Control group consisting of six animals showed average litter size of 4.33 birth and 2.00 at weaning i.e., survival of 46 per cent, whereas group fed w jaggery (35 kindlings) showed 4.88 average litter size at birth and 4.02 weaning, indicating 82.4 per cent survival.

For using superior male in mating with maximum females, attempts being made to standardize AI technique. As a part of this study, 24 sem samples were collected from Newzealand White (NW) and Soviet Chinch (SC) bucks. Semen was collected using AV developed at this Institute. collected samples were analyzed for important characters like volume, ini motility, motility after dilution, live and dead sperm count, abnormal spe count and total sperm count. Average volume in Soviet Chinchilla was 0.5 ml and in Newzealand White 0.350 ml per ejaculate. Initial motility was 86 and 76.25 per cent in SC and NW, respectively. Motility was not affected a dilution. Live sperm count was more in SC, i.e., 83.15 per cent as compa to NW, i.e.74.74 per cent. Abnormal sperm count was 3.5 per cent and 3 percent in SC and NW, respectively. The abnormalities observed were tail normalities. Total sperm count was considerably high in Soviet Chinch i.e., 81.6×10^7 as compared to New Zealand White where sperm count was 30. 10^7.

Pig

Oestrous was induced in sows using prostaglandin and PMSG, 30 d after farrowing and no ill effect was observed on litter size. Sows were s plied with mineral mixers for 15 days after farrowing to reduce agalactia a improve piglet survival.

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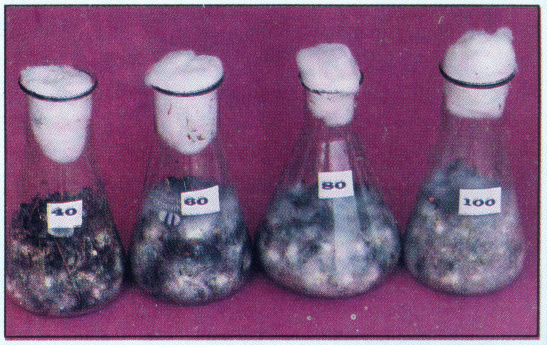
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PMSG, 30 days
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PLATE-5 ANIMAL SCIENCES



←
Effect of *Trichoderma* sp. for enrichment of cashew apple waste as animal feed.



→
Biodegradation of 'Karad hay' for enrichment as animal feed



←
Increasing litter size through induced ovulation technique in rabbit



→
ICAR Director General, Dr. R. S. Paroda visits the rabbit unit of ICAR Research Complex for Goa.

3. Studies on existing diseases including zoonoses in Goa region and establishment of disease investigation laboratory

(S B Barbuddhe, E B Chakurkar and B K Swain)

The project was initiated with an aim to survey livestock diseases including zoonoses in Goa region and to suggest suitable preventive measures to combat these diseases.

Goa has a sizeable livestock population and outbreaks of noticeable diseases continue to occur. There are no systematic studies of livestock diseases due to lack of well-equipped disease investigation laboratory. Efforts have been initiated to set up the animal disease investigation laboratory with all infrastructures required for disease investigation.

As a preliminary study, a total of 186 serum samples were collected from slaughtered animal. Out of these samples, 11.8 per cent were positive for brucellosis. A total of 74 rabbit serum samples were tested for brucellosis and none was found to be positive.

An outbreak of pasteurellosis was investigated. Young rabbits (2-3 months old) were affected with the manifesting symptoms of dyspnoea and acute mortality. Post mortum of dead animals revealed pleuritis, retention of urine, swollen kidney and congestion of liver. Bacteriological investigation showed gram negative non-motile rods. Biochemical characterisa-tion revealed it to be *Pasteurella* spp.

4. Microbiological studies of meat and meat products

(S B Barbuddhe and B K Swain)

The project was initiated with an aim to asses the microbiological quality of meat and meat products.

Quality parameters like total plate count (TPC), yeast and mould count(YMC) and isolation of *Salmonella* spp. were estimated .

A total of 92 beef samples were collected. Out of these, 33 samples were processed for TPC and YMC and 83 samples for *Salmonella* isolation. TPC were estimated for mesophiles as well as psychrophiles. Highest mesophilic count was estimated to be 4. $13X10^7$ cfu/g (colony forming units) whereas the lowest count was 10^3 cfu/g. Psychrophiles ranged between $4x10^4$ cfu/g. YMC was found to be as high as $14.4x10^6$ cfu/g and the lowest count was about 10^3.

The common species of mesophilic bacteria noticed were *Staphy Streptococci, Serratia, Pseudomonas, Bacillus, E. coli, Kleibsiella, Alka Bacillus* spp. etc.

Out of 83 samples tested for Salmonella isolation, 11 revealed p typically for *Salmonella* spp. The isolates are being sent for confirma National Salmonella Center (Veterinary), IVRI, Izatnagar.

5. Performance of crossbred broilers under different feedin rearing systems under Goa conditions

(B K Swain, R N S Sundaram, E B Chakurkar and S B Barbuddhe

The project was initiated with an objective to assess the performa commercial broiler strains under cage and deep litter system of hous achieve this, target was fixed in different phases.

Modification of Housing System

* Partitions made in the existing poultry house for deep litter sys rearing of broilers.

* Fabrication of new broiler cages & metabolic cages for cage rea broilers and metabolic trial to be conducted in broilers.

Establishment of research unit

* Existing egg incubator put into function.

* Rearing of RIR layers for production of hatching eggs.

* Litter materials such as rice husk,coir dust and saw dust procur deep litter rearing of broilers.

* Feeders, waterers and faecal trays procured for deep litter and cag tem of rearing of broilers.

* Studies on "Effect of different litter materials on the performance of ers" is in progress.

A study was also conducted on the "Influence of calcium supplem tion on the egg production of RIR layers".

An experiment was conducted containing two treatments (contro calcium supplement groups) each having five numbers of RIR layers weeks age. Calcium supplement containing 16mg calcium per ml was vided. Calcium was provided through water with addition of 5ml of su ment per litre. The egg production of both the treatment groups was rec for a period of 4 weeks. Calcium supplement was found to improve th production by 20 per cent.The average egg production for control grou 40 per cent whereas the same was 60 per cent for the calcium supplem group.

4.4. FISHERY SCIENCE

Under the Fisheries mega project,' Introduction and evaluation of technology package for culture and propagation of appropriate fish and shellfish species under Goa conditions, there are three ongoing projects covering aspects of rice-freshwater prawn integration, neem insecticides in the eradication of freshwater weed fish and formulation of economic fish feeds with locally available ingredients.

1. Rice-freshwater prawn culture suitable for Goa

(S Subramanian, BL Manjunath and KN Mohanta)

Freshwater prawn has gained importance in recent years as a candidate for both economic culture and easy market. When integrated in low lying rice fields, it could not only sustain the dwindling rice cultivation but also increase the economic yields. However, this integration poses the challenge of raising suitable rice variety under water logged conditions and overcoming the danger of heavy predation of freshwater prawn juveniles at stocking stage due to its vulnerably small size.

The trial plot of 0.1 ha was prepared and nylon net installed all along the bund to prevent entry of predacious fishes into the pond. Rice variety, Indrayani, was directly broadcasted in the field during May. Though germination was there, establishment was poor due to sudden raise of water level during onset of monsoon which submerged the crop. A fresh batch of Vyttila-1 rice variety was procured for seed multiplication as the earlier line has become contaminated.

Juveniles of *Macrobrachium rosenbergii* were airlifted from CIFE, Mumbai and stocked in a bottomless netlon enclosure fixed in the field itself for growing upto 3cm size as the field had other carnivorous fishes. However, due to crab burrows the enclosure was not effective. Therefore, another netlong enclosure with bottom was prepared which will be tried during the oncoming season. The project is continuing.

2. Use of neem based pesticides in the eradication of weed predatory fishes

(S Subramanian, Mani Chellappan, K N Mohanta)

Under this project, neembased pesticide was tried to know their e tiveness in eradicating the unwanted carnivorous and weed fishes in the ture ponds. One more carnivorous fish was recorded in the freshwater system thereby a total of 11 numbers of local unwanted fishes were iden so far.

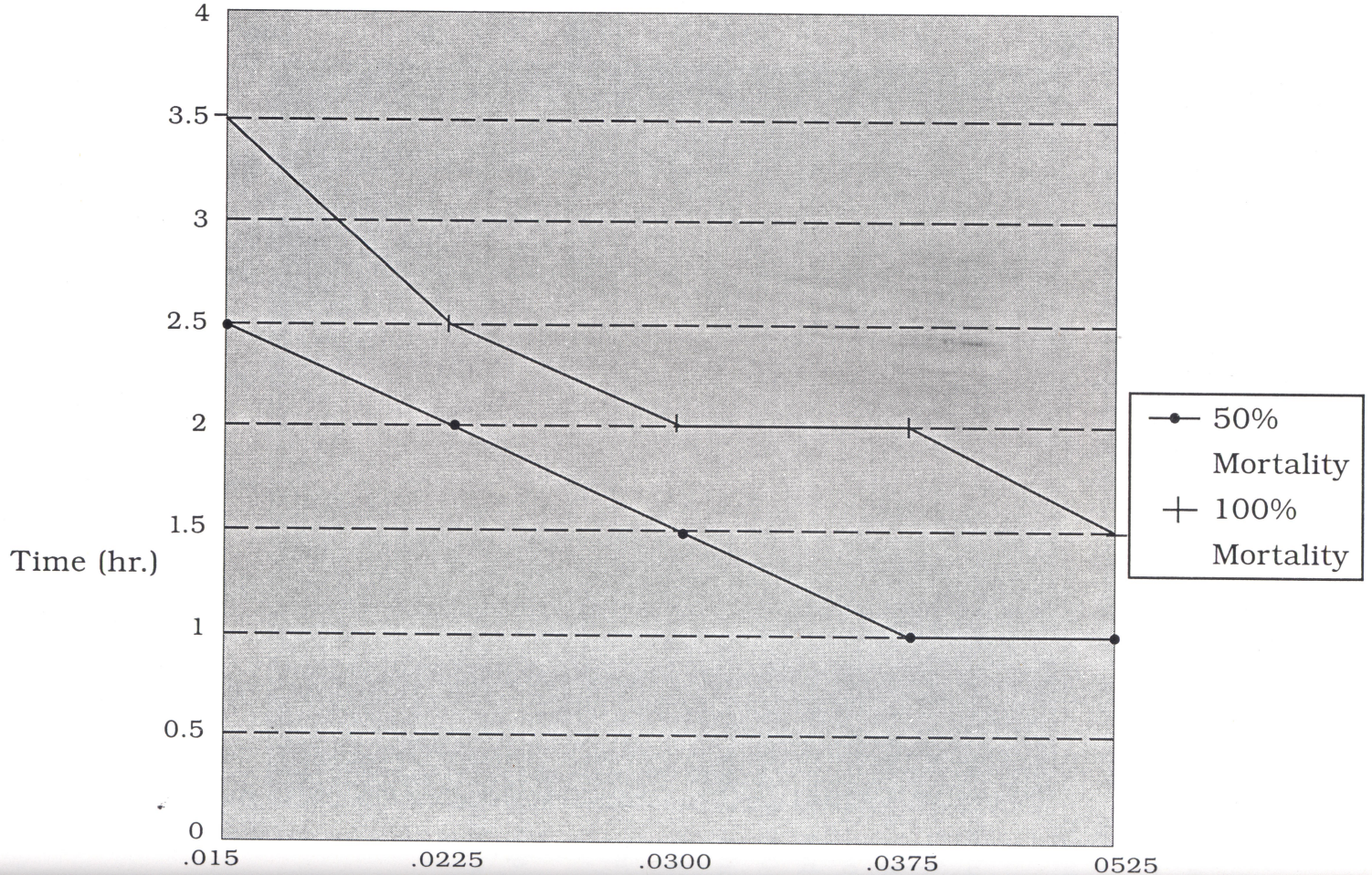
Neem cake and Achook were tried for the eradication of *Aplocheilu* the laboratory. It was found that neemcake is effective in killing the fish a higher concentration of 1000 ppm within 5 hours whereas Achook is e tive at the concentration of 0.011 ppm Azadirachtin (37.5 ppm Achook). Ac is again tried for eradication of *Mystus* and *Heteropneustes* species and observed that it is effective in 0.015 ppm (50 ppm Achook) and 0.060 (200 ppm Achook) of Azadirachtin concentration within 3½ and 6½ h respectively.

Azadirachtin is the active ingredient present in Achook at 0.02 per concentration which is responsible for killing the fishes.

The 50 and 100 percent mortality of *Aplocheilus* spp., *Mystus* spp. *Heteropneustes* spp. on the different levels of Azadirachtin in Achook, a lustrated in Fig. 5, 6, & 7, respectively.

Fig. 5. Effect of Achook on eradication of *Aplocheilus sp.*

Fig. 6. Effect of Achook on eradication of *Mystus* sp.



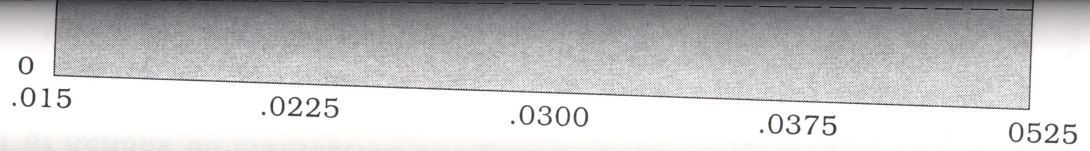
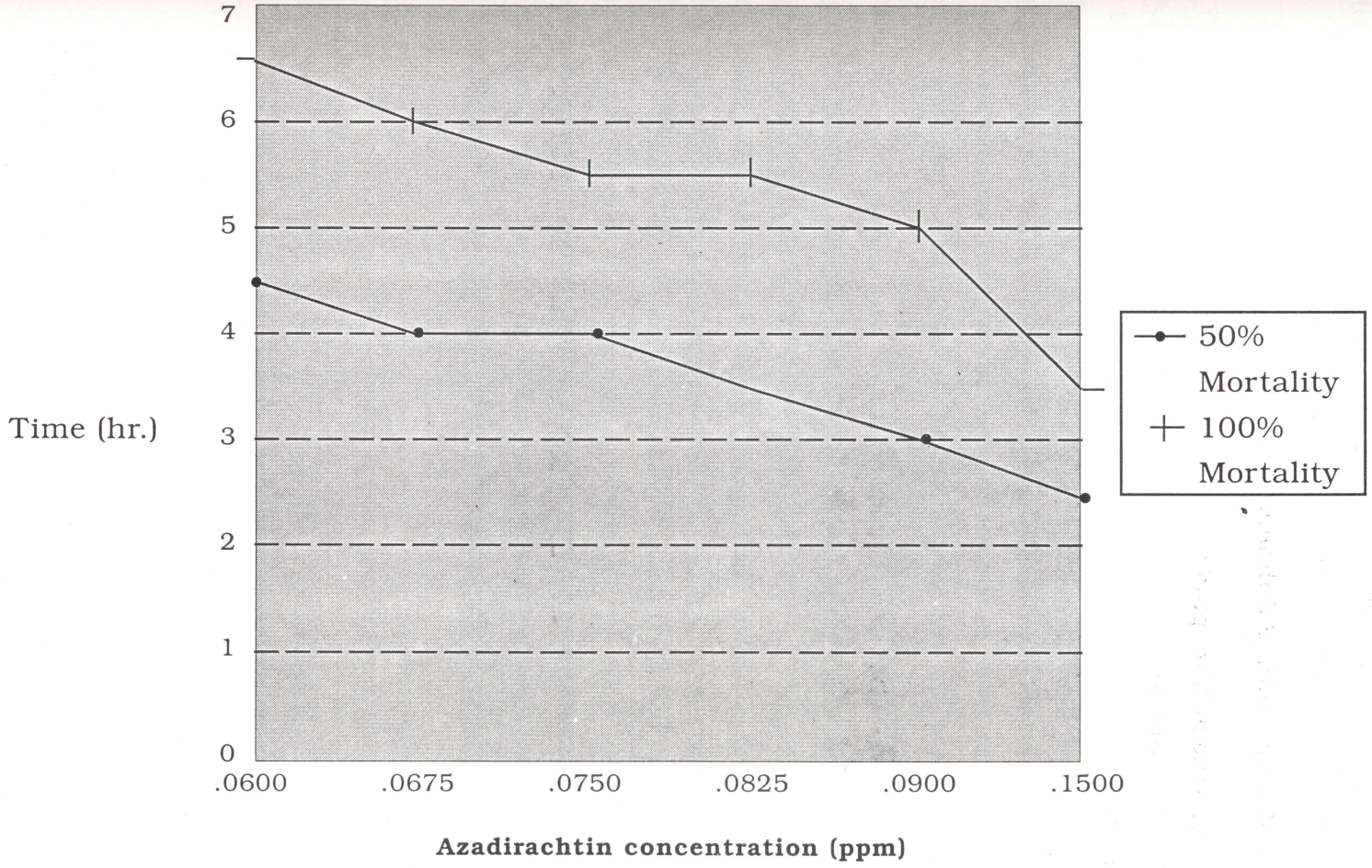


Fig. 7. Effect of Achook on *Heteropneustes* sp.



3. Formulation of low cost feed for fish and prawn, using locally able feed ingredients

(K N Mohanta, S Subramanian and R N S Sundaram)

In aquaculture production system, feed constitute about 60-70 pe of the operational cost. There is a wide gap between the demand and sup the fish feed. Till recently, we are depending upon the imported feed wh very costly (around Rs.40-50/kg). The cost of the feed mainly depended certain materials like fishmeal which is the main source of protein in the Therefore, in order to reduce the cost of the feed, an attempt was ma replace the costly and scarcely available ingredients partially or fully locally available agro-waste products.

A survey was made to know the availability and cost of the ingred which include ricebran, wheatbran, groundnut oilcake, coconut oil cake ton seed cake, prawn shell waste, fishmeal, pressmud, maize, sugar jaggery, spent yeast, Azolla, tur chunni, gram chunni, blood meal, bone silkworm pupae and brewery grain waste as shown in table 42. Proxi analysis was made for the above mentioned feed ingredients, the resu which have been presented in table 43. The fish feed pelleting machine d oped was installed for making pelleted feed. Different feed ingredients req for fish and prawn feed were procured and the feed formulation is u progress.

Table 42. Availability and cost of different feed ingredients (as on January, 1998).

Sl. No.	Feed ingredient	Approximate cost (Rs./kg)	Address of the supplier
1.	Fish meal	8.00	Sagar Fish Meal, Balli
2.	Groundnut oil cake	8.50	Goa Bagayatdar Society, Ponda Valfran Agencies, Margao Tapu Topan, Margao
3.	Wheat bran	6.00	-do-
4.	Cottonseed cake	6.50	-do-
5.	Tur Chunni	6.00	-do-
6.	Gram Chunni	5.70	-do-
7.	Rice bran	1.50	Rice Mill, Carambolim
8.	Fish oil	280.00	Sumac Agencies, Curchorem, Goa.
9.	Silkworm pupae	9.50	-do-
10.	Meat cum bone meal	6.50	-do-
11.	Sterilized liver meal	6.00	-do-
12.	Brewery grain waste	3.00	UB, Bethora, Ponda Arlem Breweries, Madgaon
13.	Spent yeast		
	(a) Dried form	30.00	UB, Bethora, Ponda
	(b) Liquid form	4.00	Arlem Breweries, Ponda, Real Distillaries, Nuvem Impala Distillaries, Salcette
14.	Press mud	——	Sanjeevani Sugar Factory, Usgaon, Tisca, Goa.
15.	Sugarcane jaggery	—	-do-
16.	Maize	5.70	Goa Bagayatdar Society, Ponda
17.	Coconut Oil cake	4.00	Coconut Oil Mill, Patto, Panaji.

Table 43. Proximate composition of some of the locally available feed ingredients of Goa.

Sl. No.	Ingredient	Crude protein (%)	Crude fibre (%)	Crude fat (%)	Dry matter (%)	Mois-ture (%)	Total ash (%)	Acid insol-uble ash (%)	NDF (%)	ADF (%)
1.	Fish meal	42.0	3.0	6.0	93.8	6.2	31.5	7.0	8.0	4.0
2.	Prawnshell waste	32.0	22.5	1.5	93.7	6.3	40.6	8.5	18.0	8.0
3.	Groundnut oil cake	42.0	8.5	9.0	95.4	4.6	6.9	2.8	4.0	4.0
4.	Wheat bran	13.9	10.5	4.0	89.9	10.1	6.9	0.2	38.0	6.0
5.	Cottonseed cake	26.0	21.0	8.0	91.9	9.1	14.0	1.2	42.0	24.0
6.	Maize	9.0	2.2	4.0	91.1	9.1	1.9	0.6	6.0	2.0
7.	Spent yeast	43.0	Neg.	0.5	94.1	5.9	7.6	—	Neg.	Neg.
8.	Brewery grain waste	26.0	15.5	15.5	91.4	8.6	3.0	0.6	52.0	14.0
9.	Azolla	13.0	9.0	1.2	89.8	10.2	17.6	2.4	46.0	28.0
10.	Pressmud	9.0	3.0	1.5	79.7	20.3	12.0	6.5	18.0	22.0
11.	Tur Chunni	12.5	31.0	2.2	91.3	8.7	14.0	9.2	32.0	38.0
12.	Gram Chunni	11.0	20.0	1.8	91.8	8.2	11.3	7.9	48.0	48.0
13.	Rice bran	12.8	13.8	13.8	92.3	7.7	10.5	2.5	8.0	3.0

11.	Tur Chunni	12.5	31.0	2.2	91.3	8.7	14.0	9.2	32.0	22.0	38.0	
12.	Gram Chunni	11.0	20.0	1.8	91.8	8.2	11.3	7.9	48.0		48.0	
13.	Rice bran	12.8	13.8	13.8	92.3	7.7	10.5	2.5	8.0		3.0	

4.5 TRANSFER OF TECHNOLOGY

Krishi Vigyan Kendra (KVK) is a project of the ICAR for testing and transfer of agricultural technologies to bridge the gap between the production and productivity and to increase self-employment opportunities among the farming communities. In order to achieve this objective, the Krishi Vigyan Kendra carried out activities during 1997-98 in order to fulfill mandate.

* Organizing vocational training programmes in agriculture and allied enterprises.

* On-farm testing(on farmer's fields) in crop production, horticulture, livestock production, fisheries, etc.

* Front line demonstrations on major cereal crops, oilseeds and pulses and other enterprises related to agriculture.

* In-service training of field level extension officials.

1. Training and other activities

(R N S Sundaram, V Y Gaonkar, Sunetra M Talaulikar, H R Prabhudesai, E B Chakurkar, H R Chidananda Prabhu, V S Sakharkar, K K Metar and Scientists)

During the year 1997-98, the Krishi Vigyan Kendra conducted 71 skill oriented, need based vocational training programmes both on the campus as well as off campus in various disciplines like crop sciences, horticulture, animal sciences, home science and plant protection and trained 1088 participants in two categories viz., practicing farmers and farm women and rural youths comprising of 377 males and 711 female participants. The details of the vocational training's conducted for practicing farmers and farm women and rural youth in different disciplines are provided in table 44.

Table 44. Vocational training programmes conducted during 1997-98 in agriculture and allied enterprises.

Sl. No.	Title of the Course	Duration (days)	No. of courses conducted			No. of participants		
			On	Off	Total	Male	Female	Total
1	2	3	4	5	6	7	8	9
	CROP SCIENCES							
	A. Practicing farmers and farm Women							
1.	Basmati rice production	2	2	2	4	50	8	58
1.	Pulses and oilseeds cultivation practices	2	2	1	3	40	14	54
2.	Resource recycling and composting techniques.	2	1	1	2	21	6	27
4.	Integrated nutrient management.	1	1	—	1	12	—	12
	Sub Total of A	19	6	4	10	123	28	151
	B. RURAL YOUTH							
1.	Vermicomposting	2	—	1	1	6	5	11
2.	NADEP composting	2	1	—	1	6	—	6
	Sub Total of B	4	1	1	2	12	5	17
	Grand total (A+B)	23	7	5	12	135	33	168
	HORTICULTURE							
	A. Practicing farmers and farm Women							
1.	Coconut based cropping system	1	2	—	2	34	5	39
2.	Kitchen gardening	1	1	1	2	6	17	23
3.	Mushroom cultivation	1	—	4	4	—	30	30
4.	Vegetable cultivation	1	1	1	2	15	21	36
5.	Cultivation of fruit crops	1	1	2	3	39	41	80
6.	Rose cultivation	1	1	1	2	30	14	44
	Sub Total of A	15	6	9	15	124	128	252

continued

during 1997-98

No. of participants		
Male	Female	Total
7	8	9
50	8	58
40	14	54
21	6	27
12	—	12
23	28	151
6	5	11
6	—	6
12	5	17
55	33	168
34	5	39
6	17	23
—	30	30
15	21	36
9	41	80
0	14	44
4	128	252

continued...

1	2	3	4	5	6	7	8	9
	B. RURAL YOUTH							
1.	Mushroom cultivation	1	3	1	4	19	46	65
2.	Grafting techniques in Important horticultural crops	3	1	—	1	7	1	8
3.	Vegetative propagation in important horticultural crops	1	2	—	2	14	21	35
	Sub total of B	9	6	1	7	40	68	108
	Grand total (A +B)	24	12	10	22	164	196	360
	PLANT PROTECTION							
	A. Practicing farmers & farm women							
1.	Pest management in rice	1	-	1	1	1	16	17
2.	Safe use of pesticides	1	-	1	1	10	40	50
3.	Pest management in vegetable crops	1	-	1	1	5	16	21
5.	Apiculture	1	1	-	1	-	10	10
6.	Sweet potato weevil management through sex pheromone	1	-	2	2	16	2	8
7.	Pest management in groundnut	1	-	1	1	25	10	35
8.	Pest management in plantation Crops.	1	-	1	1	-	10	10
	Sub total of A	9	1	8	9	59	117	176
	B. RURAL YOUTH							
1.	Spawn production	1	2	—	2	12	7	19
	Sub total of B	2	2	—	2	12	7	19
	Grand total (A + B)	11	3	8	11	71	124	195

continued...

1	2	3	4	5	6	7	8	9
	ANIAML SCIENCES							
	RURAL YOUTH							
1.	Broiler rearing	1	—	1	1	—	11	1
2.	Rabbit rearing	1	—	1	1	7	—	7
	Grand total	2	—	2	2	7	11	18
	HOME SCIENCE							
	A. Practicing farmers and farm women.							
1.	Low cost nutritious recipes	1	2	6	8	—	133	133
2.	Recipes from mushroom	1	1	5	6	—	90	90
3.	Child care and preparation of weaning mixture.	1	—	2	2	—	20	20
4.	Diet counselling	1	1	—	1	—	8	8
	Sub total of A	17	4	13	17	—	251	251
	B. RURAL YOUTH							
1.	Home scale food preservation	2	4	—	4	—	60	60
2.	Bakery	2	1	—	1	—	12	12
3.	Crafts	5	1	—	1	—	17	17
4.	Income generating activities	5	1	—	1	—	7	7
	Sub total of B	20	7	—	7	—	96	96
	Grand total of (A + B)	37	11	13	24	—	347	347
	Great Grand Total (1+2+3+4+5)	97	33	38	71	377	711	1088

In-service training of field level extension officials

During the year under report, the Krishi Vigyan Kendra conducted eight inservice training programmes for field level extension officials both on the campus as well as off campus in various disciplines like crop sciences, horticulture, agricultural extension and plant protection and trained 93 participants comprising of 76 males and 17 females participants. The details of the in-service training programmes conducted for field level extension officials are furnished in table 45.

8	9
11	11
—	7
11	18
133	133
90	90
20	20
8	8
251	251
60	60
12	12
17	17
7	7
96	96
347	347
711	1088

conducted eight
als both on the
sciences, horti-
ined 93 partici-
he details of the
ension officials

Table 45. In-service training programmes conducted during 1997-98 for field level Extension officials.

Sl. No.	Title of the Course	Duration (days)	No. of courses conducted			No. of participants		
			On	Off	Total	Male	Female	Total
1. Crop Sciences								
1)	Biofertilizer use in crop production.	1	1	—	1	7	—	7
2)	Basmati rice technology	1	1	--	1	8	--	8
3)	Polythene mulching technology in groundnut.	2	2	—	2	17	—	17
2. Horticulture								
1.	Refresher course in horticulture	1	—	1	1	29	—	29
2.	Kitchen gardening	1	1	—	1	—	17	17
3. Agricultural Extension								
1.	Use of Audio visual aids for Technology transfer.	2	1	—	1	1	—	2
4. Plant Protection								
1.	Microbial pesticides	1	1	—	1	13	—	13
Total		9	7	1	8	76	17	93

Extension activities

During the year under report, six popular articles and two Research Articles are published in the Newspapers/Journals. Six Radio talk and two television talk were broadcasted/telecasted by All India Radio/Doordarshan, Panaji.

During the year under report, Krishi Vigyan Kendra participated in various Seminars, Melas and special training programmes conducted by various agencies like State Departments, NABARD, CADA, Zuari, KRIBHCO, IFFCO, Nationalized banks, farm clubs, mahila mandals etc. and gave technical guidance on various topics of interest to participants.

During the year 1997-98, 710 progressive farmers visited to the ICAR Research Complex, Ela, Old Goa. The Government of India, Ministry of Agri-

culture, Department of Agriculture and Co-operation, New Delhi had decide to commemorate 50th Anniversary of Independence Day. ICAR and Depar ment of Agriculture, Government of Goa jointly organized nine Kisan Mela's Exhibitions in each taluka during the year. The main theme of the exhibition Kisan Mela was" Progress made in Agriculture" during the last 50 years. ICA and Department of Agriculture, Govt. of Goa had jointly organized a Exhib tion from 22-12-1997 to 2-1-1998 at Rosary School ground, Navelim, Marga The KVK celebrated the World food day on October 16th,1997 at Pillar an Women in Agriculture day on December 6th, 1997 at Mapusa.

Table 46. Farm advisory services and extension programmes.

Sl. No.	Particulars	No. of programmes	No. of farmers covered	Male	Female
1.	Scientific visits to farmers field	15	136	79	57
2.	No. of farmers visited	17	710	497	213
3.	Exhibition	10	2180	1635	545
4.	Kisan Mela	9	2000	1500	500
5.	World Food Day	1	85	65	20
6.	Women's day	1	70	—	70

Table 47. Other extension activities.

Sl.	Activities	No.
1.	Radio broadcast	6
2.	T.V. telecast	2
3.	Research Articles published	2
4.	Popular articles published	6
5.	News paper coverages	1
6.	New slides prepared	146

Bench mark servey

Bench mark survey was conducted in Bori village of Ponda taluka, situated in North Goa district. Fifty respondents were interviewed with the help of interview schedule from ten wada's of Bori village. Ninety eight and two per cent of the respondents belonged to Hindu and Christian religion, respectively. Majority of the houses were electrified and average number of rooms of dwelling house was four.

Farmers were depend on monsoon. only six per cent of the respondents were having their own source of irrigation. Main crop of Bori village is rice (variety-Jaya & Jyoti). Fifty eight and eight per cent of the farm families pos-

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7 at Pillar and

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Male	Female
79	57
497	213
1635	545
1500	500
65	20
—	70

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PLATE-6 TRANSFER OF TECHNOLOGY



←
Dr. D. G. Dhandar, Director, ICAR Research Complex for Goa being welcomed at the Field day function of FLD on groundnut at Sangolda



→
Grafting technique being perfected by one of the trainees under horticulture



←
Live demonstration on oyster mushroom cultivation in the exhibition organised at Margao



→
Nutritional recipes being demonstrated to Anganwadi workers

sessed television and radio sets, respectively, whereas, only fourteen per cent of respondents were having their own conveyance.

Sixty six and thirty four per cent of surveyed families had nuclear and joint family system, respectively. Average number of members in one family is seven. Educational status of youth upto 30 age was critically analyzed and the data revealed that only seven per cent of youth had completed graduation. Source of livelihood of twenty two per cent of the respondents was dairy. Twenty and two per cent of the respondents depend on poultry and pig rearing, respectively.

During Kharif season, majority of the farmers kept rice seed in gunny bag in the ponds for 24 hours and next day they removed the rice seed from the pond and watering was given to the gunny bag for 48 hours and on the fourth day they broadcasted the pre-germinated rice seedlings in the main field. Rice cultivators are not following the salt and seed treatment, as majority of the rice cultivators opined that they are not aware of the salt treatment and seed treatment methods. Majority of the farmers were not applying the recommended quantity of inorganic fertilizers to the rice crop. Plant protection measures were not followed by majority of the rice cultivators.

In Rabi season, majority of the farmers in Bori village are doing ploughing manually. Many farmers revealed that tractor was not available in the village and not supplied by the concerned department. Farmers soaked the rice seed for 24 hours and incubated for 48 hours in gunny bags and on the fourth day they broadcasted the pre-germinated rice seeds in the wet nursery. Transplanting of rice in the main field is done after 21 days. Farmers have not adopted the recommended doses of inorganic fertilizers. Plant protection measures were not followed by majority of rice cultivators as they were not aware of the plant protection measures to be followed. Farmers were requested in which area they are willing to attend training course.

Majority of the farmers stated that they are willing to attend a training course on pest management of rice.

2. Field Demonstrations

(R N S Sundaram, V Y Gaonkar, Sunetra M Talaulikar, H R Prabhudesai, H R Chidananda Prabhu, V S Sakharkar, K K Metar and Scientists)

a) Front line demonstration on cereals.

During the year, the mandate of KVK was revised to include the above mention programme. Accordingly, a detailed action plan for implementing the FLD on cereals (Basmati rice) was prepared with various components and the intervening points. A target of 5 hectares was proposed and survey conducted during the year. On receipt of the approval, necessary action to multiply sufficient foundation seed of both Indrayani as well as Pusa Basmati-1 varieties

on the Institute farm. Similarly, selection of village and beneficiary farm were also completed during the year.

b) Front line demonstrations on horticultural crops

The inputs like vegetable seeds and pesticides are purchased. The inputs will be distributed to twelve farmers from Pillar village.

c) Front line demonstration on oilseeds [Groundnut].

A target of 20 ha. was alloted by the Zonal co-ordinating unit for implementing the Frontline demonstrations on oilseeds. Accordingly, the action pl was prepared as per the revised guidelines of the scheme. The work of iden fication of the village, survey of the participating farmers plots was taken during the year. Similarly, a series of meetings and training programmes we also conducted to expose the beneficiary farmer's to the new programme well as the technologies of groundnut cultivation under residual soil moi ture conditions. All the critical inputs as per the components in the demo stration were supplied to the participating farmers. The plots were laid out folowing 5 components :

Component 1: Improved seed with low seed rate @ 150 kg pods/ha.

Component 2 : Improved seed with higher seed rate {200 kg pods/ha} and se treatment.

Component 3 : Improved seed with higher seed rate + Fertilizer 20:50: 25 NPK/ha.

Component 4 : Improved seed with higher seed rate + Gypsum @ 500 kg/ha

Component 5 : Improved seed with higher seed rate + Plant protection wi Monocrotophos and Bavistin.

In addition, a method demonstration on Chinese technology of ploythe mulching in groundnut was also held in the village for the benefit of the FL farmers.

Under this programme, 5 training, for beneficiary farmers of FLD as we as 2 training, for the departmental officials on Polythene Mulching techno ogy were conducted. In addition, regular visits to the demonstration site, i spection of the crop, taking up curative measures on the incidence of le eating pests like thrips, supply of pesticides, recording of regular observa tions and collection of componentwise yield data were made and a field da function in the farmer's field were also arranged.

The crop was harvested in the first and second week of April and the da on the yield and other observations were recorded and presented in table 4

Table 48. Average yield and cost particulars of the demonstration and locl check plots under FLD on groundnut.

1. District : North Goa					3. Taluka : Bardez	
2. Season : Rabi 1997-98					4. Village : Sangolda	
Name of the crop	Vareity	No. of Farmers	Avg. Yield Q/ha		Increase in yield (%)	Cost of cash Inputs
			Demo.	Check		Demo (Rs.)	Local check (Rs.)
Groundnut							
Component 1		8	14.05	13.2	9.09	2,700	1,900
Component 2		6	14.76	13.2	11.36	3,750	1,900
Component 3		5	16.21	13.2	21.96	4,800	2,300
Component 4		4	17.57	13.2	32.57	5,300	2,300
Component 5		2	19.20	13.2	50.00	6,000	2,500
	Mean		16.36	13.2	25.00		
Component 1		3	15.20	14.7	3.40	2,700	1,800
Component 2		2	16.25	14.7	10.88	3,750	2,000
Component 3		2	17.40	14.7	18.36	4,900	2,500
Component 4		2	19.56	14.7	33.33	5,400	2,500
Component 5		1	21.22	14.7	44.21	6,100	2,750
	Mean		17.92	14.7	22.04		
Component 1		1	12.80	12.1	5.78	2,850	1,800
Component 2		1	13.56	12.1	11.57	3,950	1,900
Component 3		1	13.91	12.1	14.87	4,900	2,300
Component 4		1	14.42	12.1	19.00	5,350	2,300
Component 5		1	16.12	12.1	33.88	6,100	2,500
	Mean		14.16	12.1	17.02		

The componentwise results obtained in these demonstration revealed (Table 48) that the component number 5 comprising of full package of practice for groundnut, gave the highest yield in all the three varieties. It was 19.20 q/ha in case of Dh-40 (50% increase over control), 21.22 q/ha in case of Dh-3-30 (44.21% increase over control) and 16.12 q/ha in case of JL-24) (33.88% increase over control). The demonstration results gave a mean yield increase of 25% in case of the variety Dh-40, 22.04% in case of the variety Dh-3-30 and 17.02% in case of the variety JL-24.

The results obtained also suggested that single component had limited effect on the overall yield of each of these varieties.

3. On Farm Testing

(R N S Sundaram, V Y Gaonkar, Sunetra M Talaulikar, H R Prabhudesai, H R Chidananda Prabhu, V S Sakharkar, K K Metar and Scientists).

Twenty smokeless chulla's were distributed in Madkai village. The improved chullas are scientific modifications of the traditional chullas. They ensure proper combustion and reduce losses due to convection and radiation thus utilizing the heat value of the fuel efficiently.

Among the diseases of groundnut in Goa, tikka disease is the main contributor for the loss. For the management of this disease, 45 farmers of Sangolda village were supplied with carbendazim. The spraying of this fungicide resulted in considerable increase of yield.

a) Technology evaluation and impact assessment in rice and groundnut

During the year, a new project has been added exclusively for field crops with the following objectives:

- To involve Agronomist (KVK) with the testing of final stage trials on varietal evaluation and other production aspects.
- To provide additional test sites for more comprehensive assessment of the technologies.
- To enhance interaction among the Research and the KVK scientist.
- To get feedback on the response of farmers to the final stage test technologies.

As per the target during 1997-98, two crops namely rice and groundnut have been allotted for this state. During the year, a set of 12 rice varieties was received from the Directorate of Rice Research Hyderabad in January, 1998 which could not be sown due to it's late receipt. This will be however, sown during the ensuing Kharif season. However, 16 varieties of medium duration were rice sown.

Similarly, a set of 16 latest varieties of groundnut was received from the Project Co-ordinator (Groundnut), NRC, Junagadh. A trial with 16 groundnut varieties with 4 replications was laid out at the Institute as summer crop.

5. TECHNOLOGY ASSESSED AND TRANSFERRED

The Krishi Vigyan Kendra attached to the Institute functions as extension unit for the assessment of relevant technologies both within the campus and in farmers field and their transfer through the Development Departments of the state. The Scientists and the Training personnels are complementary to each other.

So far the Institute has identified, standarderdised and field tested 33 appropriate technologies in various crops, species and farming systems, which are ready for transfer to the farmers. Out of these, 18 technologies have already found a place in the farmer's fields either through the Krishi Vigyan Kendra or various development agencies. During the year under report, following technologies were given emphasis for transfer:

1. Technology for Basmati and fine grained scented rice.
2. Salt tolerant high yielding rice varieties for Khazan lands.
3. Technology for rice based cropping systems.
4. Technology for groundnut production under residual moisture conditions.
5. Polythene mulching technology to boost grounut production.
6. Management technology for sweet potato weevil.
7. Technology for rejuvenating unthrifty cashew trees through top working.
8. Grafting techniques for cashew, mango and other horticultural crops.
9. Production technologies for cashew, mango, coconut, arecanut, oil palm, vegetables, spices, pineapple, minor fruits, flowers and ornamentals.
10. Technology for year round cultivation and spawn production of *Pleurotus florida* and *Pleurotus sojorcaju* mushrooms.
11. Technology package for meat rabbit production.
12. Technology for Pig breed improvement and pork production.
13. Technology for enhancement of broiler and layer production.
14. Technology for composite fish culture in freshwater ponds.
15. Package for the culture of freshwater prawn, *Macrobrachium rosenbergii.*

6. EDUCATION AND TRAINING

In the absence of any agricultural university in Goa, the Institute has to shoulder the responsibility of education and training in agriculture. The Institute and the Krishi Vigyan Kendra impart trainings and academic assistance to a limited extend.

During the year under report, the Institute helped the Goa University in formulating and conducting a one year Post Graduate Diploma Course in "Applied Plant Sciences".

Under Graduate students of the Goa University were guided for their project work under the following topics. (Guide - Mani Chellapan)

1) Investigation of soil fauna in cashew and coconut rhizosphere (Guide - Mani Chellappan).

2) Studies on the pest complex of paddy (Guide - Mani Chellappan).

3) Botanical insecticides in the management of insect pests (Guide - Mani Chellappan).

4) Studies on the natural enemy complex of rice ecosystem (Guide - Mani Chellappan).

Scientists and the KVK faculty have been giving regular lectures to various specific groups on relevant topics as indicated below :

1) Lecture on "Recent developments in horticulture" for Kisan Mela farmers at Kerim on 25-10-97..V Y Gaonkar

2) Lecture on " Spices cultivation in Goa " for Kisan Mela farmers at Pernem on 28-11-97 ..V Y Gaonkar

3) Lecture on "Coconut cultivation in Goa" for farmers of Kisan Mela at Pillar on 9-12-97..V Y Gaonkar

4) Lecture on "Mushroom cultivation at Mapusa on 19-12-97, for ladies training camp organized by Goa Rajya Sahakari Sangh..V Y Gaonkar

5) Lecture on "Cultivation of Spices" for farmers of Kisan mela at Bicholim on 7-1-98..V Y Gaonkar

6) Lecture on "Recent developments in horticultural crops" for the farmers of Kisan Mela at Canacona on 9-1-97..V Y Gaonkar

7) Lecture on "Improved Technologies for ratoon Sugarcane production" at Training programme organized by Sanjivani Sugar Factory Dharbandora on April 24The,1997.. H R Prabhudesai

8) Lecture on "Technologies for Basmati Rice Production and Groundnut Production' organized by Zonal Agril. Officer Ponda at Nirankal on April 30The,1997.. H R Prabhudesai.

9) Lecture on "Technologies for Basmati Rice Production and Groundnut Production'at Municipal Hall Mapusa organized by Zonal Agril. Officer Mapusa on May 10th,1997.. H R Prabhudesai

10) Lecture on "Technologies for Basmati Rice Production and Groundnut Production'at the Kisan Mela organised by ZAO , Bicholim on May 15th,. 1997.. H R Prabhudesai

11) Lecture on Groundnut Production Technology organized by ZAO, Canacona at the Kisan Mela held at Canacona on May 16th, 1997.. H R Prabhudesai

12) Lecture on "Activities of the Krishi Vigyan Kendra" for the Farmer's Club Meeting organized by Union Bank of India Sangolda on November 6th, 1997.. H R Prabhudesai

13) Lecture on " Scientific Rice Cultivation and Rice Based Cropping Systems" at the Kisan Mela organized by ZAO, Tiswadi at Pilar village on 9-12-1997.. H R Prabhudesai

14) Lecture on " Cultivation of Scented Rice" at the Kisan Mela organized by Department of Agriculture at Advai, Valpoi on 14-12-1997.. H R Prabhudesai

15) Lecture on "Technologies for Scented Rice and Groundnut cultivation" at the Kisan Mela organized by ZAO, Sanguem on 8-1-1998..H R Prabhudesai

16) Lecture on "Cultivation of Basmati Rice and Production Technologies for Groundnut" at Kisan Mela organized by ZAO, MAPUSA ON 28-1-1998.. H R Prabhudesai

17) Lecture on" Recent Technologies in the field crops and horticulture" at the Farmer's Club Meeting organized by NABARD and Bank Of India Shiroda held at Shiroda on 14-3-1998. H R Prabhudesai

18) Lecture on " Soil Nutrient Management" to the students of Goa University on 21st.and 28th March 1998.. H R Prabhudesai

19) Lecture on 'Biological Control' for the Extension Officers of Department of Agriculture on 17.11 97 at FTC..Mani Chellappan

20) Lecture on 'Integrated Pest Management' for the PG-Diploma Students of Goa University on 09.02.98 at Goa University..Mani Chellappan

21) Lecture on 'Cultural Methods in Pest Management' for the PG-Diploma Students of Goa University on 09.02.98 at Goa University..Mani Chellappan

22) Lecture on 'Physical Methods in Pest Management' for the PG-Diploma Students of Goa University on 26.02.98 at Goa University..Mani Chellappan

23) Lecture on 'Chemical Methods in Pest Management' for the PG-Diploma Students of Goa University on 04.03.98 and 10.03.98 at Goa University .Mani Chellappan

24) Lecture on 'Pesticide poisoning and First Aid' for the PG-Diploma Students of Goa University on 26.03.98 at ICAR, RC, Goa..Mani Chellappan

25) Lecture on 'Storage Entomology'for the PG-Diploma Students of Goa University on 05.04.98 at ICARRC, Goa..Mani Chellappan

26) Lecture on " Influence of nutritional status on the egg and meat quality" organized by Department of Animal Husbandry and Veterinary Services, Govt.On 9-3-1998 of Goa at Curti-Ponda, Goa. .B K Swain

27) Farmers training on "Broiler rearing" at Taleigao organized by KVK, ICAR, Old Goa on 26-3-1998 at Taleigao, Goa. .B K Swain

The Krishi Vigyan Kendra have been conducting need based training to the farmers, rural youth and grass root level extenstion workers on the following topics:

Training programmes

Discipline	Title of the training course
Crop Science	Basmati Rice Production Resource Re-Cycling & Composting Integrated Nutrient Management Pulses & Oilseed Cultivation Rice based cropping systems Vermicomposting NADEP Composting Biofertilizers in Crop Production Polythene Mulch technology in groundnut
Horticulture	Coconut based cropping systems Kitchen Gardening Mushroom Cultivation Cashew Production Technology Improved cultivation practices for Vegetables Improved cultivation practices for fruit crops Rose Cultivation Propogation techniques in important hort. crops Vegetable Production
Home Science	Low cost Nurtitional Recipes Recipes from Mushrooms Child care and preparation of weaning mixture Diet Counselling Home Scale Food Preservation Bakery and Crafts Methods of food preservation
Plant Protection	Integrated Pest management in rice, fruit, vegetable and plantation crops Storage pests and their management Apiculture Mushroom Spawn production Plant protection equipments Bioagents in Plant protection
Animal Science	Backyard and poultry keeping Piggery as an Enterprise Rabbit rearing Broiler Rearing
Fishery Science	Integrated fish farming system comprising rice-fish, Duck-fish, Poultry-fish combinations Composite fish culture Brakishwater fish farming

The duration of the above training programmes vary from 2 to 5 days

7. AWARDS AND RECOGNITIONS

The Institute has been recognized as a Post Graduate Research Centre b the University of Agricultural Sciences, Dharward and the following Scien tists have been recognized as Post Graduate Teachers/Guides for the disci plines indicated :

1.	D G Dhandar	-	Horticulture
2.	S Subramanian	-	Fishery Science
3.	H M Wasnik	-	Soil Science
4.	R N S Sundaram	-	Animal Nutrition
5.	A R Desai	-	Horticulture
6.	E B Chakurkar	-	Animal Reproduction
7.	Mani Chellappan	-	Entomology

8. LINKAGE AND COLLABORATION

Close collaboration is maintained with the State Departments of Agricul ture, Animal Husbandry & Veterinary Services, Fisheries, Rural Developmen Agency and Horticultural Development Corporation, in identifying the areas of research priority and active involvement in their development programmes through mutual participation in the joint meetings and various training and extension programmes. In the process of finalization of research priorities o the Institute, the expertise and experience of specialists of other relevant ICAR Institues, neighbouring Agricultural Universities and Goa State Departments are obtained in major meetings and committees arranged for the purpose. The Institute has jointly identified areas of inter institutional collaborative research with the University of Agricultural Sciences, Dharwad, in which infrastructural and man power facility available under both the organizations would be utilised for common research programmes. The Institute is also try ing to establish similar arrangement for collaborative research with Goa Uni versity and Konkan Krishi Vidhyapeeth, Dapoli.

In various state level committees constituted by the Government of Goa, the Institute has been nominated as participant member. There exists a close and reciprocal involvement in various programmes conducted by agencies like NABARD, CADA, Sanjivani Sugar Factory, Central Integrated Pest Manage ment Centre, Margao, banks, cooperatives, Mahila Mandals, private nurser ies, panchayats, etc. The Institute is participating in the agricultural programmes of All India Radio and Doordarshan Panaji Centres. The Institute also has combined research and technology transfer programmes with Baba Atomic Research Centre, Mumbai, Coconut Development Board, Government of India, Kochi and Government Polytecnic, Panaji.

9. OTHER PROJECTS/PROGRAMMES

1. An Adhoc project on "Collection of cashew germplasm in Goa and establishment of germplasm bank" has been under away from 1996 - 97 for four year period. Salient achivements and the research details of the project has been furnished elsewhere in the report.

2) The Institute has been identified as a cordinating centre for the AICRP on mushroom. However, the work under the project will be initiated when scientific man power is made available.

3) As per the guidelines, a project on Frontline demonstrations in oilseeds is being carried out at the Institute, the details of the project is furnished elsewhere in the report.

4) Acessfund project on Technology evalvation and impact assessment in rice and groundnut is being taken up under KVK the details of which are given elsewhere in the report.

10) LIST OF PUBLICATIONS

A Research paper

Barbuddhe S B, Prahlad Kumar & Singh D K 1997. Serological evidence of brucellosis in sheep and goats. Indian J.Anim. Sci. 67(3):180-182

Barbuddhe S B, Malik S V S and Gupta L K 1997. Effect of in vitro monocyte activation by listerial antigens on phagocytosis and production of reactive oxygen and nitrogen radicles in bovines. Vet. Immunol. Immunopathol. (accepted).

Barbuddhe S B and Yadava V K 1997. Efficacy of indirect haemolysis test in the of human brucellosis. J.Commu.Dis. 29 (3) : 241-243

Barbuddhe S B, Chakurkar E B, & Sundaram R N S 1997. Comparative efficacy of different treatments in improving sexual receptivity and conception in low reproductive rabbit does. Indian J. Vety. Res. 6(2) 28-31.

Chakurkar E B, Sundaram R N S and Barbuddhe S B 1997. Comparative efi cacy of different treatments in improving sexual receptivity and concep tion in low reproductive rabbit does". Indian. J. Vety. Res. 6 : 28-31

Desai A R, Ram Chandra, Govind S and Gupta P N 1997. Metrophyph analysi in turmeric (Curcuma longa L.) Germplasm in India. Scientia Horticu ture:70 211-222

Swain, B.K.; Johri, T.S.; Srivastava, A.K. and Majumdar, S.1996. Performanc of broilers fed on high or low fibre diets supplemented with digestiv enzymes.J.Appl.Anim.Res.10(1) :95-102.

B Paper presented at the Seminars/Workshops/Symposia

Barbuddhe S.B. Chakurkar E.B. and Sundaram R. N.S.(1998) Seroprevalenc of brucellosis in animals in Goa region - A sample survey. Abstract o paper presented at National symposium on " Recent advances for en hancement of reproductive efficiency in farm animals", held at Bidar November, 14-16, 1997

Chakurkar E B, Barbuddhe S B and Sundaram R N S 1997. Jaggery feeding improves kit survival in rabbits. Abstract of paper presented at National symposium on " Recent advances for enhancement of reproductive effi ciency in farm animals", held at Bidar, November, 14-16, 1997.

Chakurkar E.B., Barbuddhe S.B. and Sundaram R. N.S. (1998) Blood biochem istry of rabbits. Abstract of paper presented at National symposium on " Recent advances for enhancement of reproductive efficiency in farm ani mals", held at Bidar, November, 14-16, 1997

Dhandar D G and Subramanian S, 1998. Management of khazan lands in Goa. Paper presented in the seminar on Coastal zone management in Goa, or ganized at Goa International Centre, Dona Paula on 28-3-1998 (mimeo): 18 p.

Gaonkar V Y, 1997. Strategies for increasing mango production in Goa State. Paper presented in Seminar on "Mango production" organized by Devika Beverages Limited, at Hotel Mandovi on June 13, 1997.

Gaonkar V Y, 1997. Fruit crops in Goa. Paper presented in at Marathi Science Conference, at Vidyaniketan Margao on October 19, 1997.

Mani C. 1997, Biopesticides and sex pheromone in the management of sweet potato weevil Cylas formicarius. In 3rd IFOAM - ASIA Conference, UAS, Bangalore, 1-4 Dec. 1997. pp 152

Manjunath B L, Satish Modak, H R Prabhudesai 1997. Comparative performance of Pulses and Groundnut in rice based cropping systems. Abstract presented in 3rd IFOAM- ASIA Conference 1997 organized by IFOAM- ASIA in association with University of Agricultural Sciences Bangalore. 31st. Nov to 4The December, 1997

Sundaram R N S and Bhat D J 1998. Effect of carbohydrate enrichment on the biodegradation of lignocellulosic wastes with Pleurotus florida as animal feed. Paper presented at the International symposium on Ecology of fungi 20- 22 Jan, 1998, held at Goa University

Sundaram R N S and Bhat D J 1998. Effect of biodegradation on the chemical composition and nutritive value of karad hay. Paper presented at the International symposium on Ecology of fungi 20- 22 Jan. 1998, held at Goa University.

C) Popular articles

Mohanta, K.N. and Subramanian S., 1997. Problems and prospects of freshwater prawn farming in India. Fishing Chimes, 17(9): 19-20.

Prabhudesai H R, 1997. "Basmati Milling" article in English published in the Navhind Times dated 28-9-97.

Prabhudesai H R, 1997. Multiple Cropping— A remunerative option for rice farmer. Article in English published in Herald daily dated 15-10-1997.

Prabhudesai H R, 1997. Indrayani holds promise for Goa. Article in English published in Herald daily dated 27-8-97.

Prabhudesai H R, 1998. Goa excells in peanut production article in English published in Herald daily dated 3-12-98

D) Review Article

Mohanta, K.N., 1997. Formulation of feeds for Giant Freshwater prawn larvae as alternatives or additions to Artemia salina: A review. Fishing Chimes October, 1997, pp. 10-11.

E) Reports/Bulletins/Technical folders/Misc.publications

Gaonkar V Y, 1997. Softwood grafting technique in cashew, Eds: DG Dhanda and S Subramanian, ICAR Research Complex for Goa, Extension Folde No.13, p 6.

ICAR Research Complex for Goa, 1997, Vision-2020 Perspective Plan, ICA RC-Goa. Eds : D G Dhandar and Mani Chellappan, p. 54.

ICAR Research Complex for Goa, 1997. Annual Report (1996-97) Eds: Mar Chellappan, S. Subramanian, BL Manjunath, p 97.

ICAR Research Complex for Goa, 1997. Status paper for the sixteenth meetin of the ICAR Regional Committee No.VII, held at Goa International Centre Dona Paula, 21-22 November, 1997 (Mimeo) Ed. S Subramanian, p 18.

ICAR Research Complex for Goa, 1997. Krishi Vigyan Kendra. Sttus Repor (1984-1997). Eds. H R Prabhudesai, RNS Sundaram and D G Dhandar For the ICAR Regional Committee No. VII meeting held at Goa Interna tional Centre, Dona Paula, 21-22 November, 1997.

Sundaram R N S and Chakurkar E B 1998. Introduction and evaluation o meat type rabbits in Goa. Report submitted to ICAR for the award o Fukhrudin Ali Ahmed Award. p 40

Sundaram RNS and Chakurkar EB.,1997. Preservation and enrichment of green fodder. Ed: S. Subramanian, ICAR Research Complex for Goa, Technica Folder No.12, p 6.

Sunetra T., 1998. Mushroom recipes. Eds. S Subramanian and R N S Sundaram ICAR Research Complex for Goa, Extension Folder No.14, p 6.

F. Radio talks

'Prunning techniques in Rose', on 11-8-97..V Y Gaonkar

'Integrating fish farming systems for Goa'. on 15-10-1997, S Subramanian

'Nursery techniques in vegetables', on 4-11-97..V Y Gaonkar

'Summer vegetables are profitable', on 16-1-98..V Y Gaonkar

11. LIST OF APPROVED ONGOING PROJECTS

I. Crop Sciences

1. Evaluation of short duration and fine grained rice varieties.
2. Screening and management of salt tolerant rice varieties in Goa.
3. Evaluation of high yielding varieties of sugarcane.
4. Studies on rice based croping systems.
5. Studies on pest management problems in rice based croping systems for Goa.
6. Studies on biologically derived materials for the management of insect pests.

II. Horticulture

7. Survey, collection and evaluation of mango, cashew, jackfruit and local vegetables.
8. Evaluation of oilpalm combinations (DxP) under Goa conditions.
9. Regulation of flowering in pineapple.
10. Intercropping studies on grasses and forage legumes in coconut.
11. Utilization of mine reject soils for fruit production.

III. Animal Sciences

12. Evaluation of varying energy level in rabbit and pig diets for better performance.
13. Adoption of improved techniques to increase the fertility and fecundity in pigs and rabbits.
14. Studies on existing dieseses including zoonoses in Goa region and establishment of disease investigation laboratory.
15. Microbiai studies on meat and meat products.
16. Studies on performance of crossbred broiler chicken under suitable systems of rearing and feeding in Goa conditions.

IV. Fishery Science

17. Rice - freshwater prawn integration.
18. Use of neem based pesticides in eradication of weed fishes.
19. Formulation of low cost feed for fish and prawn, using locally available feed ingedients.

V. Transfer of Technology

20. Training and other activities.
21. Farm advisory services (LLP, ND and FLD) and study of technology adoption under FLD.
22. On arm research/Operational Research including technology evaluation and impact assessment on farmer's fields.

4. Dr. S. Ray - Member
Director of Animal Husbandry and Veterinary
Services (Retd.), Deluxe Apartments
Tonca, Caranzalem - Goa.

6. Dr. T. J. Varghese - Member
Director of Instruction (Retd.)
College of Fisheries (UAS, Bangalore)
Mangalore - 575 002, (Karnataka)

6. Shri. Tomy Thomas - Member
113, Samachar Apartments,
Mayur Vihar, Phase I,
New Delhi - 110 096.

7. Shri. Ramalinga Reddy - Member
8-2-603/L/15,
Near Noor Nagar,
Road No. 10,
Banjara Hills, Hyderabad. (A.P.)

8. Dr. D. G. Dhandar - Member
Director,
ICAR Research Complex for Goa.
Ela, Old Goa - 403 402.

9. Dr. R. N. Pal - Member
Asst. Director General (PC),
ICAR, Krishi Bhavan,
New Delhi - 110 001

10. Dr. S. Subramanian - Member Secretary
ICAR Research Complex,
Ela, Old Goa - 403 402.

b) Staff Research Council

The suggestions made by the Research Advisory Committee were taken as guidelines for scrutinizing the ongoing individual research projects and finalization of technical programmes of the projects by the Staff Research Council of the Institute. The eighth Annual Research Council meeting was held during 5-6 June, 1997 and attended by the representatives of the Development Departments of Government of Goa and experts from various ICAR Institutes besides the subject matter specialists of the Staff Research Council. The Research Council finalized the technical programmes of the 22 research projects for the year 1997-98 before reviewing the progress made under the research projects for the year 1996-97. The members of the committee constituted for a period of three years from 14.7.1995, are as under :

1. Dr. D. G. Dhandar - Chairman
   Director,
   ICAR, Research Complex for Goa,
   Ela, Old Goa - 403 402.
2. Dr. J. V. Goud - Member
   Ex Vice-Chancellor, (UAS, Dharwd),
   Sanjay Building, Narayanpur,
   Dharwad - 580 005.
3. Dr. N. C. Hulamani - Member
   Director of Instruction (Hort.),
   UAS, Dharwd - 580 005.
4. Dr. I. G. Chavan - Member
   Ex-Head of the Division of Animal Sciences
   MPKV, Rahuri
   5, Vijaya Housing Society,
   University Road, Pune (Maharashtra)
5. All Projects Leaders - Member
6. Shri. B. L. Manjunath,
   Scientist,
   ICAR Research Complex for Goa,
   Ela, Old Goa - 403 402.

c) Institute Management Committee

The Institute Management Committee constituted for financial and administrative guidance of the Institute, met twice in the year, on 2 June, 1997 and 17 March, 1998, and reviewed the progress of infrastructure development and approved the important financial and administrative proposals of the Institute for the year. The composition of the committee is as follows :

1. Dr. D. G. Dhandar - Chairman
   Director,
   ICAR, Research Complex for Goa,
   Ela, Old Goa - 403 402.
2. Dr. R. N. Pal - Member
   Asst. Director General (PC),
   ICAR, Krishi Bhavan,
   New Delhi - 110 001
3. Dy. Director of Agriculture - Member
   Govt. of Goa, Vidyut Bhavan,
   Panjim.

4. Director (Horticulture), - Member
Directorate of Horticulture,
Government of Maharshtra,
Old Secretariat, Pune

5. Dr. N. C. Hulamani - Member
Director of Instruction (Hort.),
UAS, Dharwd - 580 005.

6. Shri. Tomy Thomas - Member
113, Samachar Apartments,
Mayur Vihar, Phase I,
New Delhi - 110 096.

7. Shri. Ramalinga Reddy - Member
8-2-603/L/15,
Near Noor Nagar,
Road No. 10,
Banjara Hills, Hyderabad. (A.P.)

8. Finance and Accounts Officer, - Member
Central Institure of Fisheries Education,
Versova, Mumbai - 400 061

9. Dr. R.N.S. Sundaram - Member
Senior Scientists,
ICAR Research Complex for Goa.
Ela, Old Goa - 403 401.

10. Dr. E. B. Chakurkar - Member
Scientists,
ICAR Research Complex for Goa.
Ela, Old Goa - 403 401.

11. Shri. B. L. Manjunath - Member
Scientists,
ICAR Research Complex for Goa.
Ela, Old Goa - 403 402.

12. Shri. S. Sadashiva - Member Secretary
Asst. Administrative Officer,
ICAR Research Complex for Goa,
Ela, Old Goa - 403 402.

d) KVK Scientific Advisory Committee

The Scientific Advisory Committee of the Krishi Vigyan Kendra, constituted with the representation from both government and non-government organizations and farmers, met on 7 June, 1997, reviewed the progress of transfer of technology programmes of the Krishi Vigyan Kendra as per the modified norms of the council and approved the technical programmes for 1997-98. Following are the members of the committee:

1.	Dr. D. G. Dhandar Director, ICAR Research Complex for Goa	- Chairman
2.	Director of Agriculture, Govt. of Goa.	- Member
3.	Director of A.H. & V.S., Govt. of Goa	- Member
4.	District Animal Husbandry Officer, Directorate of AH & VS, Govt. of Goa	- Member
5.	Assistant Director (Training), FTC, Ela, Old Goa	- Member
6.	Shri. Vithal Benaulikar	- Member representative of small famers
7.	Shri. Tatysaheb Shinde	- Member representative of big farmers
8.	Ms. Muriel D'Soua	- Member representative of farm women
9.	Fr. Luis	- Member Social worker (male)
10.	Mrs. Mangala Wagle	- Member Social worker (female)
11.	Mr. Sebi Fernandes	- Member representative of young farmers
12.	District Project Officer (Agriculture)	- Member
13.	Mr. J. Dorado Project Officer Nabard, Panjim	- Member
14.	Officer Incharge, Govt. Estuarine Fish Farm Dhauji, Old Goa	- Member
15.	Dr. N. S. Dhume Nutrition Board, Dir. of Health Services Govt. of Goa.	- Member
16.	The Director Social Welfare Dept., Govt. of Goa.	- Member
17.	Dr. R.N.S. Sundaram Training Organizer (KVK), ICAR Research Complex, Old Goa.	- Member Secretary

14. PARTICIPATION OF SCIENTISTS IN CONFERENCE, MEETINGS, WORKSHOPS, SYMPOSIA, ETC.

Second Inter-Institutional Research Collaboration meeting organized by University of Agricultural Sciences, Dharwad on 2-4-1997 at Dharwad.
S Subramanian and B L Manjunath

State Level Sugarcane Productivity awards meeting held at Directorate of Agriculture Govt. of Goa Panaji on April 14th1997.
H R Prabhudesai

Seminar on optimization of production and productivity of mango organized by PDKV, Akola on 21-5-1997.
D G Dhandar

Staff Research Council, June, 4-6, 1997.
All Scientists and KVK Staff.

Meetings for framing the syllabus for P.G. Diploma Course in applied Plant Sciences, on 11-7-97, 17-7-97 and 30-7-97.
S Subramanian, B L Manunath, V Y Gaonkar, A R Desai.

Seventeenth CADA Meeting organized by the Irrigation Department Govt.of Goa at Colvale on 12-6-1997.
H R Prabhudesai

Eighteenth CADA Board Meeting organized by the Irrigation Department Govt. of Goa at the Irrigation Complex Quepem on June 24th,1997.
H R Prabhudesai

Meetings of "Farm advisory Committee at All India Radio Panaji on 19-8-97 and 18-3-98.
D G Dhandar, S Subramanian, R N S Sundaram, A R Desai, V Y Gaonkar

Meeting of Hindi Implementation Committee held at ICAR headquarters, New Delhi, September, 16, 1997.
S B Barbuddhe.

Workshop on "Zoonotic diseases and artificial insemination in cattle" organized by All Goa Association of Zoologists, 1997, Curti, Ponda, Goa. October 15 1997.
R N S Sundaram, E B Chakurkar, S B Barbuddhe and B K Swain

World food day seminar organized by the Pilar Seminary, panchayat and ICAR Research Complex for Goa at Pilar on 16-10.1997.
All KVK staff and Scientists

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World food day seminar organized by the Pilar Seminary, panchayat and ICAR Research Complex for Goa at Pilar on 16-10.1997.
All KVK staff and Scientists

Meeting of the Technical Terminology Committee ((Horticultural session) at Old Goa on 24-27 October,1997.
D G Dhandar, M S Balbatti, All Scientists and KVK staff.

Orientation Workshop on "Technology Evaluation and Impact Assessment" organized by Division of Agril. Extension and Crop Division of ICAR at Krishi Anusandhan Bhavan, Pusa New Delhi between October 25 and 26,1997.
H R Prabhudesai

Review meetings for Regional Committee meeting at Directorate of Agriculture, Panaji Goa, on 28-10-97, 4-11-97, 10-11-97 and 18-11-97.
V Y Gaonkar, H R Prabhudesai, H R C Prabhu and others

National symposium on "Basic and biotechnological approaches in animal health", Ludhiana, November, 6-8, 1997.
S B Barbuddhe

XIIIth Biennal workshop of AICRP on cashew held at KKV, Dapoli on 6-11-1997.
D G Dhandar and A R Desai

Review meeting for flower show at Horticulture development corporation on 11-11-97.
V Y Gaonkar

National symposium on "recent advances for enhancement of reproductive efficiency in farm animals" held at Bidar during 14-16 Nov. 1997.
E B Chakurkar

Sixteenth Meeting of the Regional Committee No.VII organized by Cotton Technological Research Institute, Nagpur, ICAR Research Complex for Goa, Old Goa and Department of Agriculture, Government of Goa, at Goa International Centre, Dona Paula on 21-22 November,1997.
All Scientists and KVK staff.

Xth Biennal group meeting of AICRP on tropical fruits held at UAS, Dharwad on 27-11-97.
D G Dhandar and A R Desai

Farmer's Club Meeting Organized by Union Bank Sangolda on 6th, 24th, November and 14th 23rd December 1997.
H R Prabhudesai

International Seminar on sustainable agriculture, organised by IFOAM (1 to 04. 12 .97) UAS, Bangalore
Mani Chellappan

Seminar on " Polythene Mulching Technology in Groundnut" organized jointly by ICAR Research Complex for Goa and Directorate of Agriculture Govt. Of Goa at FTC , Old Goa on 22nd December, 1997.
D G Dhandar, R N S Sundaram & H R Prabhudesai

Seminar on "Organic Horticulture" organized by Goa Bagyatdar Society held at Ponda on December 23, 1997.
V Y Gaonkar

Inaugural function for the starting of a technical course on Plant Science Technologies, organized by Goa University, Dona Paula on 8-1-1998.
S Subramanian and V Y Gaonkar

International symposium on 'Ecology of fungi', organized by the mycological society of India and held at Goa University, Jan. 20- 22, 1998.
R N S Sundaram

Inaugural function of Entrepreneurship Deveopment Programme on Food Processing Industries organized by SISI at Margao on 5-2-1998.
D G Dhandar (Chief Guest), R N S Sundaram and Sunetra Talaulikar

Fifth annual conference of Indian association for Advancement of Veterinary Research and National symposium on "challenges for the advancement of veterinary sciences in 21st century' held at Indore during 18-19 Feb.1998.
E B Chakurkar and S. B. Barbuddhe

Hindi meeting for west zone held at N.I.O. on 6-3-98
E. B. Chakurkar

Special lecture on "importance of meat Hygiene" and "Poultry nutrition" arranged by Goa State Animal Husbandry dept. at stockman's training centre Curti Ponda on 9-3-98
E. B. Chakurkar

Seminar on Conservation and Plantation of trees for Environmental Protection jointly organized by Goa University, WWF (India) Goa Division and BAIF Development Research Foundation (Pune) held at Goa University on 20th March 1998.
H R Prabhudesai

Seminar on Coastal Zone Management in Goa organized at Goa International Centre, Dona Paula, on 28-3-1998
D G Dhandar and S. Subramanian

State Level Sugarcane Productivity Awards Committee Meeting held at Directorate of Agriculture Govt.of Goa on March 30th,1998.
H R Prabhudesai

15. WORKSHOPS, SEMINARS, SUMMER INSTITUTES, FARMERS DAY, ETC. ORGANIZED AT THE INSTITUTE

- XVI meeting of the ICAR Regional Committee number VII, was organized by ICAR Research Complex for Goa in collaboration with Department of Agriculture, Government of Goa at the International Centre, Dona Paula, Goa on 21st-22nd November 1997. For Inaugural session on 21-11-1997, Shri. D. G. Narvekar, Minister for Agriculture, Irrigation and Rural Development, Government of Goa was the Chief Guest and Shri. Prem Sai Singh, Minister of Dairy and Fisheries, Government of Madhya Pradesh, graced the occasion. Dr. R. S. Paroda, D. G,, ICAR, New Delhi had Chaired all the sessions and guided the proceedings, which were attended by officials from ICAR, Development Departments, Universities and Governments of three States of the region namely Goa, Maharashtra and Madhya Pradesh.

- Meeting of Scientific and Technical Terminology Committee (Horticultural Section) sponsored by Ministry of Human Resources Development, Government of India was organized by ICAR Research Comples for Goa at Old Goa. during 24-27 October, 1997. The meeting was attended by 25 professors from Agricultural Universities, besides Dr. Kirti Singh, Member, ASRB, ICAR, New Delhi.

- ICAR Research Complex for Goa and the Dept. of Agriculture, Government of Goa, jointly participated in the Goa Golden Jubilee Exhibition, organised by Government of Goa, at Navelim, Margao, from 22-12-1997 to 2-1-1998, in which the ongoing research and TOT programmes of the Intitute were illustrated. The Agricultural stall was adjusted best among the 90 stalls arranged at the exhibition.

- ICAR Research Complex for Goa and the Department of Agriculture, jointly organised ten Kisan Melas cum Exhibitions in different talukas of Goa during October, 1997 to March, 1998. The main theme of the Kisa Mela/ Exhibition was, "Progress made in agriculture during 50 years of India's independence."

- Krishi Vigyan Kendra, ICAR Research Complex for Goa, celebrated the 'World Food Day' on 16th October, 1997, by arranging Farmer's Day meet at the Pilar village, in which local farmers participated.

- Women in Agriculture Day was celebrated by KVK, ICAR Research Complex on 6th December, 1997 at Mapusa, in which Anganwadi workers participated. Special focus of the Day was the "Nutritional management for children and pregnant women".

16. DISTINGUISHED VISITORS

DR. R. S. PARODA,
Director General, ICAR, New Delhi

DR. G. C. SRIVASTAVA,
Chief Secretary, Government of Goa.

DR. MANGALA RAI,
DDG (Crop science), ICAR, New Delhi.

DR. S. P. GHOSH,
DDG (Horticulture), ICAR, New Delhi.

DR. P. K. DAS,
DDG (Extension), ICAR, New Delhi.

DR. G. B. SINGH,
DDG (AF & SS), ICAR, New Delhi.

DR. DEHADRAI
DDG (Fisheries), ICAR New Delhi.

DR, GAJENDRA SINGH,
DDG (Engineering), ICAR, New Delhi.

DR. R. C. MAHESHWARI,
ADG (CSC), ICAR, New Delhi.

DR. R. N. PAL
ADG (PC), ICAR, New Delhi.

CAPTAIN MARVA,
Director (Personnel), ICAR, New Delhi.

SHRI. R. S. BALHARA and SMT. SARLA, SANGWAN
Members, Board of Management, CCS, HAU, Hissar.

DR. PETER P. MAKAROV,
Councillor (Agriculture and food),
Embassy of Russian Federation, New Delhi.

PROF. KIRTI SINGH,
Chairman of Horticulture Committee
and Member of ASRB, ICAR, New Delhi.

DR. K.V.A. BAVAPPA,
FAO Expert, and Ex-Director, CPCRI, Kasargod.

DR. J V. GOUD
Ex-Vice-Chancellor, UAS, Dharwad.

DR. N. C. HULAMANI,
Director of Instruction (Horticulture), UAS, Dharwad.

DR. R. T. GUNJATE,
Ex-Director of Research, Vengurla Fruit Research Station.

QRT team for AICRP Palms :
DR. S. B. KHADREKAR, DR. GOPAL SWAROOP,
DR. THAMBURAJ, MR. P. K. THAMPAN,
DR. K. V. NAMPOOTHIRI and DR. V. RAJGOPAL,

DR. BASU,
Project co-ordinator (Groundnut), Junagad.

DR. P. S. SAKLANI,
Geologist and Chairman of commission
for Scientific and technical terminology.

DR. HARISHKUMAR,
Secretary and Principal scientific officer, CSTT.

DR. M. M. RAO,
Prof. of Horticulture, UAS, Dharwad.

DR. N. R. GODARA,
Prof. Horticulture,
Harayana Agricultural University, Hissar.

DR. S. K. BHATIYA,
Scientist, Harayana Agriculture University, Hissar.

DR. M. S. KAIRON,
Director, NRC for Citrus, Nagpur

DR. THOMAS,
Director AH & VS, Government of Goa.

SHRI. K. G. SHARMA,
Director of Agriculture, Government of Goa.

DR. N. S. DHUME,
Nutrition Board, Directorate of Health Service,
Government of Goa.

SHRI. S. V. DESAI,
Deputy Director of Horticulture, Government of Goa.

SHRI. J. DORADO,
Project officer, NABARD, Panjim.

Shri. Gunde,
Progressive Farmer of Groundnut, Kolhapur

PLATE-7 DISTINGUISHED VISITORS



←

Dr. R. S. Paroda, D. G., ICAR inaugurates the Feed Technology Unit and Dr. G. S. Srivastava, Chief Secretary, Govt. of Goa, looks on.



→

Dr. D. G. Dhandar along with Dr. R. N. S. Sundaram and Dr. S. Subramanian, explains the details of the small scale pelleting machine to Director General of ICAR Dr. R. S. Paroda.



←

Dr. G. B. Singh, DDG (AF & SS) visits the Institute farm along with the Director and Scientsts.



→

Dr. Peter Makarov, Agricultural Councillor of Russia is being welcomed by the Director, during his visit to the Institute

17. PERSONNEL

Name	Designation	Specialisation	Remarks
Managerial			
D G Dhandar Ph.D.	Director	Horticulture	
Scientific			
S Subramanian, Ph.D	Senior Scientist & Head, Fishery Science	Fish & Fishery Science	
M M Wasnik Ph.D	Senior Scientist & Head, Crop Science	Soil Science	
N S Sundram M.V.Sc.	Senior Scientist, I/C KVK & Head, Animal Science	Animal Nutrition	
B L Manjunath M.Sc. (Ag.)	Scientst	Agronomy	(on study leave)
S B Chakurkar M.V.Sc.	Scientist	Animal Reproduction	
Mani Chellapan Ph.D.	Scientist	Agril. Entomology	
A R Desai M.Sc. (Ag.)	Scientist	Horticulture	
S B Barbuddhe Ph.D.	Scientist	Vet. Public Helath	
Kedarnath Mohanta M.F.Sc.	Scientist	Fish & Fishery Science	
B K Swain Ph.D.	Scientist	Polutry Science	
Sureshchand Rana Ph.D.	Scientist	Horticulture	
Technical			
M S Balbatti, M.Sc. (Ag.)	Farm Supdt. (T-7)	Agronomy	

KVK

V Y Gaonkar, M.Sc. (Ag)	Training Associate (T-6)	Horticulture	
H R Prabhudesai B.Sc. (Ag.), PG Dip. (PP)	Training Associate (T-6)	Agronomy	
Sunetra M. Talaulikar, B.Sc. (Home Sci), PG. Dip. (D & Ap. N)	Training Associate (T-6)	Home Science	
Avinash V Nirmale, B.V.Sc.	Training Associate (T-6)	Animal Science	(on study leave)
H R Chidananda Prabhu, M.Sc. (Ag.)	Training Associate (T-6)	Plant Protection	
V S Sakharkar Ph.D	Training Associate (T-6)	Ag. Extension	
K K Metar,	Training Asst. (T-4)	Agri. Extension	

Administrative

S Sadashiva	Asst. Admn. Officer
A P Shenoy	Asst. Fin. & Accts. Officer

18. ANY OTHER RELEVANT INFORMATION

A) Deputation abroad

- Dr. D. G. Dhandar, Director, ICAR Research Complex for Goa, was deputed as an Horticultural expert to Iran for a period from 12-7-1997 to 12-8-1997, under the TCDC project, launched by FAO. The main objective of the project was to study and recommend steps to reduce post-harvest losses by adopting appropriate post-harvest technologies and processing of tropical fruits, to the Department of Tropical and Sub tropical fruits, Government of Iran, Teheran.

B) Scientists deputed for higher studies

- Shri B. L. Manjunath, Scientist (Agonomy) went on study leave to persue his Ph.D. degree at University of Agricultural Sciences, Dharwad, in the discipline of Agronomy.

- Dr. A. V. Nirmale, Training Associate (KVK) went on study leave for his M.V. Sc. degree in Animal Nutrition at University of Agricultural Sciences, Dharwad.

C) Training attended

- Shri V Y Gaonkar, Training Associate (Hort.) attended a training on "Recent advances in commercial production of cut flowers" at IIHR Bangalore during 14-26 September,1997.

- Shri K N Mohanta, Scientist (Fish & Fishery Science), attended a training on ornamental fish culture at Vizhinjam Research Centre of CMFRI, Trivandrum during 16-21 March,1998.

D) Appointments

Name	Designation	Date of joining
Suresh Chand Rana	Scientist (Hort.)	15-12-1997
Sidhart K Marathe	Techl.Asst. T-II-3 (Tech. Cell)	27-10-1997
Yoganand R Gawde	Techl.Asst. T-II-3 (Electrical)	15-11-1997
Ramchandra Bhaskar Kale	Techl.Asst. T-II-3 (Farm)	17-11-1997
Madina Altar Babasahe	Techl.Asst. T-II-3 (Civil Engg.)	20-11-1997

E) Infrastructural development

- A Feed Technology Unit was constructed which contained complete instrumentation facilities for grinding the feed ingredients, mixing and pelletizing, besides storage. The two pelleting machines fabricated with the capacity of 60 to 80 kg/hour, for the production of low cost feeds for small animals and fish, were installed in the Unit. The Unit was inaugurated by Dr. R S Paroda, Director General, ICAR, New Delhi on 7-10-1997 in the presence of Dr. G C Srivastava, Chief Secretary, Government of Goa.

F) Weather data

S. No.	Month	Rain fall (mm)	Temperature (C)			Average wind speed (km/h)	Total sunshine hours	Relative humidity % at	
			Mean Max.	Mean Min.	Mean			8.30 hrs.	17.30 hrs.
	1997								
1.	January	7.6	31.5	19.9	25.1	8.3	307.6	81	57
2.	February	0.0	31.3	18.9	25.1	9.0	292.7	77	57
3.	March	0.1	32.4	23.7	28.1	8.0	256.8	84	69
4.	April	0.0	33.0	24.3	28.6	10.0	291.2	72	63
5.	May	0.0	34.0	26.4	30.2	10.0	299.5	71	65
6.	June	1057.3	31.2	25.0	28.1	12.0	170.0	86	75
7.	July	1210.3	29.3	24.8	27.1	15.0	96.2	90	86
8.	August	854.3	28.9	24.2	26.5	14.0	86.2	92	87
9.	September	57.6	31.3	24.5	27.9	8.0	219.4	88	74
10.	October	58.1	33.7	24.7	29.2	8.0	267.4	83	73
11.	November	51.3	33.0	24.4	28.7	8.0	233.3	83	71
12.	December	70.1	31.8	22.7	27.3	8.0	268.6	85	65
	1998								
1.	January	0.0	32.2	21.4	26.8	9.0	289.4	83	60
2.	February	0.0	32.5	20.7	26.6	9.0	285.2	81	57
3.	March	0.0	31.8	22.9	27.3	8.0	284.5	85	61

PLATE-8 GENERAL



←

Dr. R. S. Paroda, D. G., ICAR, releases the Institute's Perspective Plan. Dr. Srivastava, Chief Secretary, Govt. of Goa, Dr. Mangala Rai, DDG (CS) and Dr. D.G. Dhandar, Director, are also present



→

Dr. Kirti Sing, Member, ASRB, New Delhi, being received by the Director, during his visit to the Institute.



←

Dr. Basu, Project Co-ordinator (Groundnut), Junaghad visits the ICAR Research Complex exhibition stall with the Director, Training organisor and Scientists.



→

Victorious volleyball team of the Institute poses with their ICAR-Interzonal meet trophies.

19. प्रगति सारांश

भारतीय कृषि अनुसंधान परिषद ने अप्रैल 1976 में गोवा में कृषि अनुसंधान परिषद का संकुल स्थापित किया । विभिन्न सरकारी फार्मो में कार्यकरने के पश्चात अंतमें इसे एला, ओल्ड गोवा में स्थानांतरित कर दिया गया, जहाँ यह अभी भी स्थित है। यह अनुसंधान संकुल पहले केन्द्रीय रोपण सस्य अनुसंधान संस्थान कासरगोड के प्रशासनिक नियंत्रण के अधीन था और अप्रैल 1989 में इस पूर्ण विकसित संस्थान बना दिया गया। यह संस्थान प्रशिक्षण, अनुसंधान तथा कृषि क्षेत्रों की गतिविधियों के प्रसार और पशु विज्ञान तथा मत्स्य उद्योग जैसी महत्व पूर्ण इकाइयों को कार्यान्वित करने में अपनी एक महत्वपूर्ण भूमिका निभा रहा है। सन् 1983 के दौरान इस संस्थान में फार्म प्रौद्योगिकी के कार्यों को गहन बनाने एवं मूलस्तर पर आधार भूत व्यावसायिक प्रशिक्षण प्रदान करने के उद्देश्य से एक कृषि विज्ञान केन्द्र की स्थापना की गयी।

अधिवेश

1. गोवा की सस्य जलवायु की परिस्थितियों के अनुरुप संभावी कृषि फसलों की उत्पादकता तथा फसलोत्तर व्यवस्था में सुधार लाने के दृष्टिकोण से उनका संरचनात्मक एवं व्यवहारिक अनुसंधान करना।
2. विकसित प्रौद्योगिकी में लाये गये सुधार का प्रसार करना।
3. उद्यान प्रौद्योगिकी में प्रशिक्षण केन्द्र के रुप में कार्य करना।
4. नई प्रौद्योगिकियों को विकसित एवं हस्तांतरित करने के निमित्त राष्ट्रीय एवं अन्तराष्ट्रीय संस्थानों एवं अभिकरणों का सहयोग करना।
5. न्यूक्लीयस पौध साम्रगी का उत्पादन करना ।
6. परामर्शदात्री सेवा उपलब्ध करना।
7. पश्चिमी घाट की परिस्थितिकी प्रणाली के सूचना संग्रहालय के रुप में कार्य करना।

अनुसंघान पर प्रकाश

फसल विज्ञान

धान वर्तमान समय मे चल रहे परियोजना में कम समय वाली पतले दाने की सुगन्धित जातियों के मूल्यांकन का परीक्षण वर्ष के रबी और खरीफ मौसम में जारी रहा।

धान की जाति विकाश की पैदावार सबसे अधिक अन्य 6 जातियों से रही जिसमें स्थानीय जाति ज्योति भी शामिल थी तथा जिसकी उपज खरीफ (5.1 टन हे. तथा 4.4 टन हे. क्रमशः) और रवी में (6.67 टन हे. और 4.5 टन हे. क्रमशः) प्राप्त की गयी।

अन्य पतले दाने वाली सुगंन्धित प्रजातियों में जिसका मूल्यांकन खरीफ मौसम में किया गया उसमें इन्द्रायनी एक बार फिर सबसे अधिक उपज दी (6.42 टन/हे.) जबकि स्थानीय प्रजाति अम्बे मोहर की उपज 2.78 टन/हे. ही रही। दो अन्य जातियाँ पवन और पूसा बासमती - 1 से 5.64 टन हे. तथा 4.02 टन है. उपज क्रमशः प्राप्त की गयी।

रबी मौसम के समय भी समान स्तर प्राप्त किया गया जिसमें भी इन्द्रायनी जाति में अधिक 6.03 टन/हे. उपज प्राप्त किया जोकि स्थानीय प्रजाति अम्बेमोहर (2.68टन।हे.) की अपेक्षा अधिक था। अन्य उन्नतशील जातियों में पवन (5.14 टन।हे.) और पूसा बासमती -1 (3.42 टन। हे.) कमशः दूसरे तथा तीसरे स्थान पर रहे।

वर्तमान समय में कुछ प्रजातियाँ जो कि धान अनुसंधान निदेशालय हैदराबाद से लायी गयी थी उनका भी परीक्षण प्राथमिक स्तर संस्थान के प्रक्षेत्र पर किया गया।

दलहन और टिलहन

दो अन्य लोबिया की प्रजातियाँ, कोंकण सदावहार और कोकण सफेद कोकण कृषि विद्यापीट दपोली से लायी गयी और उनका परीक्षण रवी मौस में कम नमी की भूमि की में गोवा में अन्य प्रचलित जातियों वी. 118 तथा स्थानीय प्रजाति अल्सानो को साथ किया गया। जिसका परिणाम यह रहा कि शीघ्र जाति (65-70 दिन) के रुप में अच्छी वृद्धि के साथ अच्छी फसल और पैदावार के रुप में (कोंकण सदाबहार 0.69 टन। हे. और कोंकण सफेद (1.0 टन। हे. स्थानीय प्रजाति वी.118 (0.88टन/हे. और अल्सानो 0.47 टन/हे.) की तुलना में प्राप्त किया गया।

इसी वर्ष मूँगफली में जाति डी. एस. 40 के वीज का प्रवर्धन का कार्य भी किया गया।

पौध संरक्षण

धान की जाति 'सुरक्षा' और आई. ई. टी. 12875 का मूल्यांकन गालामिर्च कीट के प्रति प्रतिरोधी क्षमता तथा अच्छे उत्पादन के रुप में किया गया।

मूँगफलीमें फलवेघक कीड़े का प्रकोप एक मुख्य कीड़े के रुप में इस क्षेत्र में पायागया। प्रक्षेत्र में विभिन्न कीटनाशकों के प्रयोग एवं खली के प्रयोग से यह ज्ञात हुआ कि कार्वोफ्यूरान (3 जी.) का प्रयोग काफी प्रभावी पाया गया।

आम की फलमक्खी का प्रकोप रोकने के लिए विशेष टैप का प्रयोग मिथाइल यूजीनाल द्वारा, शीरे एवं मैलाथियान कीटनाशी द्वारा किया गया।

उद्यान विज्ञान

काजू

काजू की अस्थाई परियोजना के अत्तरगत सर्वेक्षण का कार्य जर्मप्लाजम को इकट्ठा करने के लिए किया गया। इसमें 18 और अधिक नये पौधो द्वारा कुल संग्रह संख्या 83 हो गयी। नट के उत्पादन एवं सेव के आकार के आधार पर इसको तीन वर्गो में विभाजित किया गया। दूसरे वर्ग में 50 एक्सेसन का समूह सबसे उन्नतशील पाया गया। इन एक्सेसन में मध्यम से बडे नट (7.5से 12.0 ग्राम) और बडे सेव (80-90 ग्राम) उपज के अतिरिक्त (15 कि.। वृक्ष) प्राप्त किए गये।

क्लोनल प्रर्वधन की तकनीक इन एक्सेसन में साफ्ट उड कलम तकनीक द्वारा किया गया।

वर्तमान काजू जनन संग्रह में 68 (31 स्थानीय संग्रह 35 लाई हुई एक सम्वन्धित प्रजाति और एक रंगीन म्यूटेंट) से एक्सेसन की संस्था 76 हो गयी जिसमें 8 अन्य जैसे उलाल-1, उलाल-2, उलाल-3, एन.50 सभी काजू अनुसंधान केन्द्र उलाल), प्रियंका, मादकथारा-2 (दोनो के. ए. यू. त्रिसूर), तथा वी.-7, वाली-2 4.5 कि. नट पैदावार/वृक्ष के साथ उन्नतशील गुण दिखा रहे है। जिसमें सेलिंग प्रतिशत 29.8% है जब कि इकट्ठा 8 वर्ष की पैदावार 18.9 कि. ग्रा/वृक्ष प्राप्त की नयी। चार विभिन्न क्षेत्रो के प्रर्दशन क्षेत्र, विभिन्न क्षेत्रो तथा गावों जैसे चन्देर (सालीसेट), कलय (संगुएम), निरीकल (पोण्डा) और कण्डोला (पोण्डा) में कृषिविज्ञान केन्द्र तथा एक भारतीय कृषि अनुसंधान परिषद के प्रक्षेत्र में स्थापित किया जा चुका है।

एच-1600 के इन्ट्रोडक्सन के बाद अधिकतंम पैदावर 3.46 कि. नट/वृक्ष प्राप्त की गयी जिसमें सेलिंग प्रतिशत 28.99% और इकट्ठी पैदावार 13.08 कि. 8 वर्ष में प्राप्त की गयी।

आम

आम के जनन संग्रह में 84 एक्सेसन है। जिसमें 61 स्थानीय, 10 लायी हुई जातियाँ तथा 13 लाई हुई संकर जातियाँ शामिल है।

एक नई पौध स्थानीय जाति "वेमकोराडो" को मध्यम से बड़े आकार तथा आकर्षित फल का रंग, अच्छे फल के गुण एवं शीघ्र फलन (मार्च-अप्रैल) तथा हर साल फल देने वाली जाति के रुप में पहचान की गयी।

स्थानीय प्रजाति जैसे मैक्सिमा, टोरान्जा, फुरटाड, और कौलेको ब्राँका से 18.5, 13.5, 12.87, और 9.4 कि/पौध पैदावार 1997-98 में दर्ज किया गया, जिसमें सम्पूर्ण चीनी की मात्रा का प्रतिशत 19-21% तथा पूरे अम्लका प्रतिशत 0.18 से 0.25% प्राया गया।

संकर जातियाँ जैसे नीलगोवा, आम्रपाली, एच-45, एच-87 और रत्ना से प्रतिवृक्ष 62.00, 53.95, 21.95, 21.73 और 18.1 कि. फल क्रमशः प्राप्त किया गया। फल के गुण आम्रपाली, रत्ना, और अरका अरूना (सम्पूर्ण घुलनशील ठोस पदार्थ की मात्रा का प्रतिशत 21% और कुल अम्ल का प्रतिशत 0.17 से 0.23%) प्राप्त किया गया। नीलगोवा फल का आकार काफी बड़ा (342.66 ग्राम) तथा कन्धे पर लाल रंग पाया गया लेकिन यह कम मीठा स्वाद (16.6% कुल घुलनशील पदार्थ की मात्रा) प्राप्त किया गया।

अन्य प्रचलित जातियों में केसर से 16.85 कि. ग्रा./वृक्ष पैदावार प्राप्त की गयी। फल का गुण एवं आकार केसर एवं अलफान्सो में अच्छा पाया गया।

स्वाद परीक्षण में आम्रपाली, रत्ना, अल्फान्सो, अरका अरुना और केसर सामान्य स्वाद में अच्छे अंक, रेशे एवं गूदे के गुणों में प्राप्त किए।

अनन्नास

कैल्सिम कार्बाइड (10%) 50 मि.ली. घोल तथा 2% यूरिया के साथ प्रयोग करने से 11-12 माह की पौध (35-40 पत्ती अवस्था) में सितम्बर और अक्टूबर में 95% फूल आ गये जो 55 से 72 दिन के भीतर छिडकाव करने के बाद आ गये जो सामान्यत 205 दिन की अपेक्षा प्राप्त किया गये। इसके परिणाम स्वरुप गोवा में शीघ्र फसल मार्च अप्रैल में प्राप्त की जा सकती है।

पशुविज्ञान

अत्याधिक उर्जायुक्त भोज्य पदार्थ 3000 कीलो कैलरी/कि. ग्रा. उर्जा स्तर पर खिलाने से सामान्य वृद्धि और विकाश खरगोस में प्राप्त किया गया। बच्चों के जीवन क्षमता में विकाश किडलिग के बाद जगरी द्वारा प्राप्त किया गया। वीर्य गुणों में सोवियतचिंचिला जाति का वीर्यगुण-न्यूजीलैंण्ड सफेद की अपेक्षा अच्छा पाया गया।

जानवरो के 196 संग्रह किए हुए सीरम सैम्पल का परीक्षण ब्रूसेलोसिस के लिए किया गया, जिसमें 11.8% सैम्पल धनात्मक पाया गया। पास्टीयूरोलोसिस की खोज खरगोस में प्रदूषित क्षमता के रुप में की गयी।

एक विशेष पैथोजन को अलग करने की तकनीक जैसे लिस्टोरिया मोनोकाटोजिनस, विब्रियो, ई. कोली को क्षेत्र परीक्षण के समय स्थापित किया गया। रोम निदान के लिए प्रयोगशाला बनाने की योजना पर प्रयास किया गया।

ब्रायलर के तुलनात्मक अध्ययन के लिए डीपलीटर और केज पद्धति का परीक्षण कुछ परिर्वतन के साथ मौजूद सुविधाओं के अन्तरगत किया गया।

मत्स्य पालन

धान के खेत से आय बढ़ाने के लिए परियोजना शुरू की गयी जिसमें धान की वेटिला-1 जाति और मीठा जल झीगे (मैक्रो ब्रीचियस रोजेन वेरजी) का उपयोग किया गया।

इस परियोजना के अतरगत नीम पर आधारित कीटनाशक का प्रयोग अवांक्षित मछलियाँ को समाप्त करने के लिए अचूक का प्रभाव 100% मृत्युदर एप्लोचिलस, मिस्टस और हेड्रोफेने यूस्टस के 37.5, 50 और 100 पी. पी. एम. सान्द्रण और अचूक 10.0225, 0.015, और 0.060 पी. पी. एम. एजाडिराच्टिन का प्रभाव 12, 31/2 और 61/2 घंटो के भीतर क्रमशः प्राप्त किया गया।

कम मूल्य के खाद्य परियोजना के अंतरगत मछली और झीगे के 17 विभिन्न खाद्य तत्वों की उपयोगिता का परीक्षण किया गया तथा इस की पहचान और एनालिसिस प्रयोग शाला में की गयी इसके विभिन्न स्तर का निर्धारण लगभग किया गया। कार्प मछली के खाद्य बनाने का कार्य उन्नति पर है।

तकनीक का हस्तांतरण

कृषि विज्ञान केन्द्र ने 79 प्रशिक्षण कार्यक्रम विभिन्न इकाईयों में जैसे फसल विज्ञान, उद्यान विज्ञान, गृह विज्ञान, पशुविज्ञान, पादप संरक्षण, कृषि प्रसार में किये और आवश्यकता नुसार तकनीकी प्रशिक्षण 1181 प्रशिक्षुओं में जिसमें 430 किसान और किसान महिला, 258 ग्रामीण युवा और 93 निचलेस्तर के प्रसार कर्मचारी भाग लिए। इसमें महिलाओं के भाग लेने का प्रतिशत 50.86% रही।

इसवर्ष तकनीकी कार्यक्रम के अन्तर्गत फसल विज्ञान में सर्वेक्षण का कार्य और इन्द्रायनी तथा पूसा बासमती के बीज प्रर्वधन का कार्य 5 हे. क्षेत्र को पूरा करने के लिए किया गया।

फ्रन्टलाईन प्रर्दशन में मूगफली को 19.7 हे. क्षेत्र में संगोल्डा गाँव में जोनल कृषि अधिकारी (वारडेज) और किसान क्लब यूनियन बैंक के सहयोग से किया गया। इस प्रर्दशन से विभिन्न प्रभावों को प्रदर्शित किया गया 50% तक पैदावार में वृध्दि डी. एच.- 40 मूँगफली की जाति तथा 44.21% वृद्धि डी.एच. 3-30 मूँगफली की जाति द्वारा प्रदर्शित किया गया।

इसीवर्ष एक नई परियोजना तकनीकी मूल्यांकन और प्रभाव अध्ययन धान तथा मूँगफली मे शुरू

किया गया। जिसमें इसका उद्देश्य तुरन्त प्रभाव तथा अति आधुनिक तकनीक के अन्तरगत 32 मूगफली की जातियों का परीक्षण किया गया। अधिकतम पैदावार 6.8 टन/हे. डी. एच.- 40 द्वारा प्राप्त किया जो कि पालीथीन मल्चिंग के अन्दर ाा। इसके अति रिक्त 3.7 टन/हे. उपज एन. आर.सी. जी. जाति आई.एन एस. 9714 द्वारा विना पालीथीन मल्चिंग के प्राप्त किया गया।

आन फार्म परीक्षण के अतरगत लोविया की प्रजाति कोकण सफेद (10 कु./हे.) तथा कोकण सदा बहार (6.8कु./हे.) का परीक्षण कृषि विज्ञान केन्द्र एवं किसान के खेत में किया गया।

उद्यान विज्ञान के अन्तरगत चार बहु स्थानीय परीक्षण का प्रयोग किसान के क्षेत्र में खण्डोला, निराकल, कलय और चन्दोर गावों में उन्नतशील काजू की जाति बाली-2 को लगाया गया जिसमें जाति वी. 4 कन्ट्रोल के रुप में प्रयोग की गयी।

गृह विज्ञान के अतरगत 20 धातु के हल्के चूल्हे मादकाम ग्राम में निचली जाति (एस.सी.।एस.टी.) में वितरित किए गये। इसीप्रकार से पौध संरक्षण कार्यक्रम के अतरगत सेक्स फेरामोन ट्रैप को शकरकन्द के वीविल को रोकने के लिए किया गया । इसके द्वारा सक्षम ढंग से कीणों की रोकथाम की गयी।