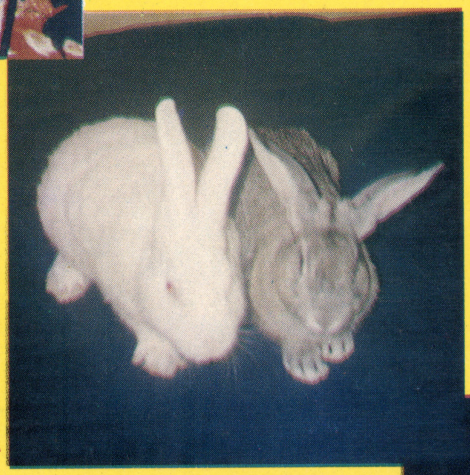
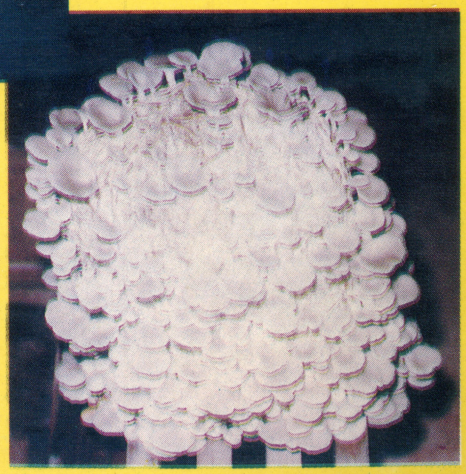
ANNUAL REPORT
1994-95







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ICAR

ICAR RESEARCH COMPLEX FOR GOA
ELA, OLD GOA - 403 402, GOA, INDIA

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Published by:
D. G. Dhandar
Director
ICAR Research Complex for Goa, Ela,
OLD GOA 403 402 GOA

Gram : RESEARCH VELHA GOA: Telex: 194-293-ICAR-IN
Fax : 0832-286 249
Phone: Off:286 181, 286 249
Res:217523: STD:0832 (Panjim)

Compiled and edited by
B. L. Manjunath, Mani Chellappan, A.R. Bhattacharyya

Front cover:
Top: Agassaim local brinjal - a suitable intercrop in coconut

Middle: **Exotic meat type of rabbits - New Zealand White and Soviet Chinchilla.**

Bottom:**Oyster mushrooms - ready for harvest.**

Cover design:
Mani Chellappan

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1. Director's Introduction.

The ICAR Research Complex for Goa was established during 1975 by Indian Council of Agricultural Research, to meet the agricultural research needs of the region. The Research Complex, after being a research centre under the administrative control of ICAR Research Complex for North Eastern Hill Region, Shillong and Central Plantation Crops Research Institute Kasargod, became an independent Institute during April, 1989. To meet the transfer of technology of the farming community, a Krishi Vigyan Kendra was also established at the Research Complex during 1983.

Mandate

The Institute mandate covers "Introduction and improvement of all potential crops and various species/breeds of livestock, their production, and scientific exploitation including various aquatic resources for improving fish production.

The present mandate of the Institute is as follows:

1. To conduct strategic and applied research on all potential agricultural and horticultural crops, livestock and fisheries, relevant to climate in Goa for improving productivity and postharvest management
2. To help disseminate improved technology developed
3. To act as a repository of information on Western Ghats agricultural systems
4. To collaborate with national and international agencies in achieving the above mandate
5. To act as a centre for training in updated technologies
6. To provide consultancy services
7. To generate nucleus planting material

Staff and budget

The total staff strength of the Institute and KVK was 66 and the annual expenditure including plan (55.40 lakhs) non plan (39 lakhs) and KVK (10 lakhs) for the year 1994-95 was Rs.104.4 lakhs.

Research activities

Durng the year under report, there were 23 ongoing research projects, comprising, six in Crop sciences, seven in Horticulture, seven in Animal Science and Fisheries and three in Transfer of Technology. All the research projects were targetted for increase in the agricultural productivity of the region.

Research Council

The Sixth Staff Research Council meeting of the Institute was held on 20-21 July, 1995 to review the progress of research programmes and to chalk out the technical programmes for 1995-96. The achievements of the research projects are presented in the research highlights of this report.

Institute Management Committee

The Institute Management Committee has met twice (18-06-1994 and 6-3-1995) during the period under report to approve the important financial and adminstrative proposals of the Institute.

Quinquennial Review Team

The ICAR constituted the QRT to review the work done by the Institute for the period 1989-94. The Committee reviewed the different activities of the Institute and submitted its report with detailed recommendations on 15-11-1994.

Research Advisory Committee

To suggest research programmes based on the thrust areas and to review the research

achievements of the Institute, ICAR constituted the RAC with effect from 9th March, 1995. The Committee met on 16-6-1995 and gave necessary directives for strengthening the ongoing research programmes.

Staff Research Council

The ICAR Head Quarters, New Delhi constituted SRC Committee for the Institute with effect from 14-7-1994, for consideration of new project proposals, and to review the progress of ongoing research projects.

Local Management Committee

To monitor the activities of Krishi Vigyan Kendra periodically, the Local Management Committee consisting of representatives of both government and non-government organisations, met on 11-5-1994 and reviewed the progress and approved the technical programme for 1994-95.

Institute Joint Staff Council

In order to promote harmony and relationship amongst staff, and to increase the co-operation between the employer and the employees, the Joint staff Council met twice during the period under report.

Collaboration with Development Agencies/Organisations

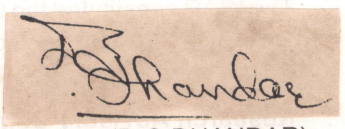
A close collaboration is maintained with State Department of Agriculture, Animal Husbandry, Fisheries and Forests through joint meetings with the officers to decide the work priorities. There is an active involvement of officers and experts from neighbouring Agricultural Universities, other ICAR Institutes dealing with crops and livestock of local importance in important Institute meetings. The Institute is also represented by the Director/Officers in different State level Committees constituted by Government of Goa. Regular trainings are given to practicing farmers, rural youth and departmental staff on various farm technologies. A close liaison is also maintained with other Institutions like NABARD, RDA, CADA, Sanjivani Sugar Factory, IPM Centre, Margao, etc. Besides giving periodical radio talks on various topics of local importance, the Institute provides guidance on the formulation of agricultural programmes of All India Radio and Doordarshan, Panaji.
The Scientists of the Institute are also participating in the academic activities of Goa University. The Senior Scientists of the Institute are also functioning as external evaluators for post-graduate thesis of students of neighbouring Agricultural Universities.

Library

The Institute is subscribing 18 foreign and 27 Indian Journals and has 804 books, 514 bound back volumes. The KVK has 256 books covering various aspects of agricultural production.

About this Report

The Annual Report for 1994-95, of this Institute, briefly highlights the research achievements, followed by report on the ongoing projects during the year. In addition, general information on important Committees of the Institute, staff position, budget, visitors, participation in seminar/ symposia, publications, appointments, transfers, and weather data of Goa is provided for reference.



(D.G.DHANDAR)
DIRECTOR

2. Research Highlights

I. Crop Science

Rice

Among the medium duration varieties tried during rabi season of 1993-94, Sarjoo-52 gave significantly higher yield (8.23 t/ha) as compared to State's ruling variety Jaya (6.56 t/ha). The variety MO-7 was next best in the order (7.0 t/ha). However, these varieties (Sarjoo-52 & MO-7) were found not much suitable for the kharif season (4.25 t/ha) as compared to Jaya (5.25 t/ha).

In a new varietal lot of 26 latest midearly IET series for irrigated conditions, IET-13380 (5.42 t/ha) IET-13691 (5.25 t/ha), IET-13687 (5.17 t/ha) and IET-13245 (5.17 t/ha) were found promising. In another new varietal lot of 22 latest IET series, IET-13497 (3.33 t/ha) and IET-13336 (3.08 t/ha) gave the maximum yields.

Screening of rice varieties for khazan lands (salt affected soils) indicated that the variety, CSR-10 with an yield potential of 32.9 q/ha and CSR-4 with an yield potential of 31.4 q/ha performs better.

Sugarcane

The performance of sugarcane variety CO-85061 even as a second ratoon was consistently well with an yield level of 98.5 t/ha followed closely by CO-7527 an yield level of 95.1 t/ha.

In a trial on latest released varieties (90000 series), variety CO-90006 showed an excellent performance by yielding 136 t/ha followed closely by CO-90009 (134 t/ha) and 900010 (127.7 t/ha) as first ratoon. These varieties also showed good brix and recovery per centage.

In a new trial on eight mid early short duration varieties, CO-90009 out yielded all the rest of the varieties with an highest yield of 143.2 t/ha followed closely by another variety CO-85061 with yield level of 137.20 t/ha. These varieties also showed good brix and recovery per cent.

The trial on water management in sugarcane indicated that the yield of sugarcane was relatively more in furrow irrigation (177.08 t/ha) compared to drip irrigation (175.03 t/ha) However, the highest yield (189.5 t/ha) was recorded with drip irrigation at an IW/CPE ratio of 0.75. All the quality parameters in sugarcane viz., POL percentage, brix percentage, purity and recovery were more with furrow irrigation as compared to drip irrigation. Similarly, irrigation at an IW/CPE ratio of 0.75 recorded higher quality parameters.

Others

Among the crops and varieties tested for rice fallows, groundnut varieties, DH-3-30 and DH-40 were found to yield highest followed by Cowpea varieties Alsano and V-118. Among the pigeonpea varieties tested, ICPL-27 and Sel-31 recorded the highest yield. However, greengram varieties were very poor in yield in comparison to other three crops.

The studies on pest management problems in sweet potato indicated that a combination of nimbecidine treatment along with pheromone proved better for the control of weevil and resulted in the highest yield of marketable tubers.

II. Horticulture

Cashew

The germplasm collection of cashew at the Institute increased to 63 accessions. A scion bank with 15 released varieties is maintained in 0.4 ha. One trial with selections of NRC Cashew, Puttur and another with eleven local accessions (with more additions later) are in progress to select high yielding bold nut types with good apple and nut yields. Out of

the 15 local accessions evaluated for six bearing years (1990-1995), the accession Balli-2 is found promising with an average yield of 1.675 kg and cumulative yield of 10.05 kg/tree. Similar studies on four hybrids indicated that HB-1600 is the best with an average yield of 1.2 kg/tree and among 12 high yielding accessions (outside Goa), M 26/2 is the promising type (0.98 kg/tree). However, none of the above accessions surpassed V-4 in terms of rawnut yield per/tree (1.776 kg). Nevertheless, Balli-2 is having the advantage of good apple size (70 g) and apple yield over V-4 besides yield potential, and good shelling (28.5%) and hence is suitable for Goa. For supply of nucleus planting material, grafts of V-4 were prepared.

Mango

Intensive survey and collection of mango germplasm has facilitated to collect 73 distinct varieties of local mango and one improved seedling selection of Mankurad (the leading variety) with superior attributes. Good clones in Udgo, Fernandin, Hilario and Mankurad also were collected. One accession of seedling origin with small sweet fruits was also collected. The work on mango bulletin has been completed.

In Mankurad, out of four clones planted in 1989, quality was excellet in two clones. Both of them had deep orange and yellowish-orange flesh, better flavour and sweetness (T.S.S. 24 Brix).

Thirteen hybrids evaluated so far have indicated that HB-87, Amrapali, Ratna and Arka Puneet are very promising with regular yields and excellent fruit quality. However, all of them are late maturing (May-June). One budsprout in Amrapali has been noticed having fruits of excellent colour and quality and is being isolated and studied. Out of eight commercial Indian varieties collected, Kesar and Himayuddin are observed to give quality fruits but are late maturing (May-June).

Applications of cultar (Paclobutrazol) in last week of July @ 15 and 20 ml per tree have been found to induce regular flowering in Mankurad variety of mango and increased the yields by 170 per cent as compared to the control in 12 years old trees. In order to supply nucleus planting materials of selected varieties 750 grafts were prepared.

Vegetables

Evaluation of local germplasm was continued during the year. Two varieties of brinjal 'Agassim' (Long fruits) and 'Taleigao' (Round fruits) were evaluated for two years. The yields were recorded upto 60 t/ha. The former is soft, puffy fruited whereas the latter has solid flesh. Both are susceptible to bacterial wilt and little leaf diseases.

In waal, three types were evaluated, i) long fleshy poded, ii) black seeded and iii) red seeded. The highest yield of 4.9 t/ha was recorded in the long fleshy poded type.

Evaluation studies of five oil palm hybrids planted in 1991 has shown that there are no significant differences among them for the vegetative characters studies except in 82D x 266 P which is comparatively taller, No significant differences were noticed among the hybrids as regards the number of male and female inflorescence production.

Pineapple

A second trial of potassium doses at 0,6,8,10 and 12 g/plant did not indicate any significant differences among treatments with regard to flowering or rate of leaf production.

The Mauritius pineapple has been introduced and the plant crop matured in 18.7 months after planting and yielded 43.6 t/ha with an average fruit weight of 1.0 kg. Fruit maturity is three months earlier than Kew and the fruit quality is excellent.

Mushrooms: Five edible wild mushroom

species (Termaitomyces and Boletus) were collected, studied and got identified and the cultures are maintained for further studies.

Cultivation of two wild mushrooms Coprinus comatis and Podaxis sp has been attempted. More studies are undertaken to improve (Biological Efficiency) and shelf life.

Cultivation of Calocybe indica (milky mushroom) has been successful with a B.E. of 42 per cent in Goa. High temperatures of February - May favoured high productivity. The shelf life has been observed to be about one week at ambient temperature conditions and 30 days under cold storage (6-7°c).

Partial success in the cultivation of jelly mushroom (Auricularia polytricha) has been obtained with a sawdust medium.

A modified method of oyster mushroom cultivation with a polytube of 2 m length and perforated PVC (6.2 cm dia) pipe in the centre was tested and the system gave 10 per cent more yield and saved 25 per cent of the working space as compared to the common method.

The important diseases of coconut, mango, cashew, and oil palm were monitored and studied. Budrot out break in coconut was noticed during the year.

In oil palm, PEQ inspection of 40,000 seeds imported by Godrej Soaps Ltd., Bombay was completed.

Dieback and anthracnose was commonly noticed in mango nursery whereas pink disease, sooty mould and powdery mildew were observed on adult trees.

For the control of fruit drop in breadfruit a spray schedule has been developed for reducing the incidence of the drop.

III. Animal Sciences

Pigs

Cross breeding of local pigs with exotic breed is beneficial. However, for consistent good performance, introduction of new strain for breeding after some years is necessary to avert inbreeding stress. This has been observed both in Yorkshire and landrace crosses.

Systematic studies on effect of castration indicated that in male pigs, castration and slaughter at younger age up to seventh month has little effect in body fat deposition. This finding is important for lean pork production.

Rabbit

The litter size and growth performance of exotic meat rabbits were higher when the doe is provided with a feed containing 22 per cent crude protein as compared to feed with 16 per cent crude protein under local conditions.

Comparative study on New Zealand White and Soviet Chinchilla rabbits has indicated that feed consumption and growth of young rabbits are same under identical managemental conditions.

Digestibility of coir dust increases with fermentation of Pleurotus spawn by seven per cent.

It was found that in rabbit does fertity was reduced when does were bred immediately after kindling. Fecundity was improved from two to seven by changing breeding male. Artificial insemination technique has been standardised for breeding of does at any desired period.

Digestibility of cashew apple waste was more when fermented with Pleurotus sp.

The study clearly indicated efficiency of Pleurotus sp in enriching the feed compromising unconventional feed material such as agro waste products.

Poultry

Introduction of new strains in the form of

parental hatching eggs of male and female lines indicated poor hatchability and high mortality of chicks.

Fishery

The poultry (chicken) - fish integrated culture indicated a peak average egg production of over 60 per cent at 9th month of age and a fish production of over 3500 kg/ha/15 months for 3 to 4 species of carps at the stocking density of 3000/ha.

Vyttila-1 proved to be suitable deep water variety for both in Kharif (2.0t/ha) and Rabi (6.7 t/ha) seasons under rice fish integration.

Stocking of pre-reared advanced carp fingerlings of 100 to 150g size could yield a fish production rate of 1,250 kg/ha/6-8 months.

The carp combination of Catla, Rohu, Mrigal and common carp is also suitable for rice-fish combination.

Conversion of 1/10 of field into pond is sufficient as fish refuge during field operations.

The combination is also economical as the fish could utilise the naturally produced plankton food in rice (paddy) fields.

Transfer of Technology

During the year, the Krishi Vigyan Kendra of the Research Complex conducted 70 training courses in four disciplines viz., Crop Science (16), Horticulture (20), Animal Science (9) and Home Science (16) for practicing farmers and farm women. Similarly for Rural youth four courses in Crop Science, two courses in Horticulture, three courses in Animal Science and five courses in Home Science were conducted.

In addition, for field level extension functionaries three courses under crop science, one course under Horticulture and one course under Home Science were conducted. In all, 1289 trainees comprising of 714 males and 575 females were imparted skill oriented training in the above categories and disciplines.

The KVK also implemented other schemes like Front line demonstration on groundnut over an area of 15 hectares comprising of 65 beneficiaries during Rabi 1994-95. The demonstration yield registered an increase of 43 per cent (23 qt/ha) over control (16 Qts/ha.) The variety Dh-3-30 along with other critical inputs and technology was demonstrated.

Similarly, under the lab-to-land programme 52 families were selected and technologies under Crop Science (groundnut) and Horticulture (vegetable cultivation) were demonstrated. The total demonstration area was two hectares. The per cent increase in yield in the demonstration was to the order of 100 per cent in case of groundnut and 57 per cent in case of vegetables. The cost benefit ratios for these two enterprises worked out to Rs. 1:8 and 1:3, respectively.

The Crop Science discipline of KVK also conducted National Demonstration scheme in Nerul village of Bardez taluka in which 12 demonstrations (4 each in monocrop, double crop and multiple crops) were taken. There was 46 per cent yield increase in case of groundnut cultivation. The gross family return registered a sharp increase of Rs. 28,600/- with three crop sequence.

During the year, initial survey work was initiated for implementation of programmes like client oriented and problem oriented research under On - Farm Research.

The KVK staff also actively participated in many extension oriented programmes like Farmers Convention, World Food Day, Cashew Field Day, Kisan Mela, Crop Seminar, Workshop on Agril. Journalism, etc.

The staff also gave five radio talks, one T.V. programme and wrote six popular articles during the year.

3. Report on Ongoing Projects

3.1 Crop Science

1. Screening of rice varieties suitable for Goa

(KD Patil HR Prabhudesai)

Rice, which occupies one third of the total cropped area accounts for about 86 per cent of the food grain production in the Goa state. The work of evaluating performance of rice varieties was continued during the year with an objective to screen suitable alternatives for ruling variety 'Jaya' in medium duration group and 'Jyoti' in short duration group. Besides, the performance of recently introduced fine grain/scented varieties was also taken up for the first time at the Institute.

During the rabi season of 1994-95 an experimental trial with eleven medium duration rice varieties was laid out in randomised block design at the Institute farm. The recommended agronomic practices were carried out. The observations in respect of all the growth and yield contributing characters such as (1) height of plant (2) number of tillers (3) number of productive tillers (4) length of panicle (5) number of grains/panicle (6) number of chaffy grains/panicle (7) number of panicles/m2 (8) weight of panicle (9) thousand grain weight and (10) yield/ha were recorded.

The results indicated that among the medium duration group the variety Jaya gave the highest yield of 6.86 t/ha. This was relatively higher than all the rest of the varieties including 'Sarjoo-52 (6.66 t/ha) and MO-7 (5.96 t/ha). (Table 1)

During the Kharif season of 1994, the trial was divided into three aspects.

In the first part, a lot of eleven medium duration rice varieties which were evaluated during earlier seasons were tried. The data revealed that the ruling variety Jaya out yielded all the rest of the varieties by recording 5.25 t/ha which was significantly higher than rest of the varieties. The variety Vibhava recorded the second highest yield (4.3 t/ha). All the other varieties like Sarjoo-52, Co-44, and MO-7 were at par with each other.

In another trial, 26 newly released and latest IET series which were designated as mid-early were planted in RBD. The results showed that the variety IET 13380 recorded the highest yield of 5.42 t/ha whereas varieties IET 13691, IET 13687 and IET 13245 yielded 5.25 t/ha, 5.17 t/ha and 5.17 t/ha respectively.

During the year for the first time four fine/scented varieties were tried in RB design with five replications during rabi season.

The results showed encouraging trend

Table 1: Performance of medium duration paddy varieties during Rabi 1994-95

Sl. No.	Paddy Varieties	Plant Height	No. of tillers per hill	Productive trillers	Earhead length	Filled grains	Panicle per sqmt.	1000 grains wt. (gm)	Yield (t/ha)
1.	Co-44	85.2	11.3	49.3	23.5	99.6	533	28.0	5.33
2.	Sarjoo-52	89.9	11.1	51.0	21.9	96.3	579	24.0	6.66
3.	Pusa-205	89.9	11.1	49.0	23.6	97.1	524	24.2	5.03
4.	MO-7	82.8	11.1	53.7	23.0	112.6	391	27.6	5.96
5.	Jaya	90.2	13.1	55.3	21.7	100.8	634	30.4	6.86

as regard to growth and yield contributing characters (Table 2)

From the results obtained, it was seen that the variety M-127 (Pusa Basmati-1) yielded 4.25 t/ha followed closely by another two varieties viz., M-109 and M-108 each yielding 4 t/ha. There was a good relationship between various yield contributing characters such as number of productive tillers, length of earhead, number of filled grains / panicle, number of panicles/m^2, 1000 grain weight and final yield.

Table 2: Performance of scented/fine rice varieties during Rabi 1994-95

Sl. No.	Paddy Varieties	Dura-tion (Days)	Plant Height (cm)	No. of tillers per hill	Produc-tive tillers	Earhead length (cm)	Filled grains	Panicles per sqmt.	1000 grains wt. (gm)	Yield (t/ha)
1.	M-102	135	100.6	15.1	14.0	12.0	103.1	793.3	18.0	2.25
2.	M-109	125	112.5	17.4	15.7	26.3	122.9	728.7	20.0	4.00
3.	M-127	130	97.0	24.7	23.2	27.0	142.0	693.3	21.0	4.25
4.	M-108	125	97.5	25.0	23.2	26.5	130.8	838.7	20.0	4.00

2. Screening of salt tolerant rice varieties.

(H.M. Wasnik)

An experiment with seven salt tolerant rice varieties i.e. CSR-10, CSR-4, Palghar-1, Panvel-1, Panvel-2, CO-43 and Korgut was conducted on famer's field at Britona during the Kharif season of 1994-95. The experimental soil was a typical saline soil locally kown as khazan lands having E.C. of 14 d S/m. The rice seedlings of 30 days age were transplanted at 15x15 cm in a plot size of 5x5 m^2. The experimental design was randomised block with three replications. The observations on height of plant, number of panicles per hill, length of panicle perm^2 and 1000 grain weight as well as yield were recorded. The results indicated that variety CSR-10 out yielded all the varieties (32.90 q/ha), followed by CSR-4 (31.40 q/ha) and Palghar-1 (29.0 q/ha). There was significantly higher number of effective tillers, number of panicles per metre square and the boldness of grain as reflected by higher 1000 grain weight in these varieties than the local variety Korgut.

3. Evaluation of high yielding varieties of sugarcane.

(K D Patil, H M Wasnik, B L Manjunath and H R Prabhudesai)

During the year under report, there were three trials in the project.

First trial (Plant cane)

Planting of the cane for this trial was done in January, 1994 and the harvesting was undertaken in January 1995. In all there were eight varieties in this trial (mid-early group). The results indicated that the variety Co-90009 out yielded all the rest of the varieties by recording the highest yield of 143 t/ha followed closely by another variety Co-85061 with an yield level of 137.23 t/ha. However, these yield

Table 3: Performance of salt tolerant rice varieties during kharif 1994

SL. No.	Variety	Height (cm)	Tillers No.	Panicles per m^2	1000 gr. wt.	Yield (t/ha)
1.	CSR-10	83.5	7	312	24.3	3.29
2.	CSR-4	89.3	7	308	23.8	3.14
3.	Palghar-1	85.2	7	304	22.8	2.90
4.	Panvel-1	84.4	6	285	20.6	2.70
5.	Panvel-2	79.3	6	292	23.5	2.54
6.	Co-43	74.2	6	288	21.7	2.30
7.	Korgut	148.0	4	235	19.9	1.90
	C.D. 5%	6.9	1.2	22	1.5	0.56

levels were statistically on par with each other. The third variety namely Co-90006 also showed a good performance with an yield level of 130.5 t/ha. When we consider the quality aspect of these varieties, we find that the same varieties i.e. Co-90009, Co-85061 and Co-90006 also recorded good brix per cent as well as recovery which was in the order of 9.01, 8.56 and 10.51 per cent respectively. The highest recovery in this trial was recorded by a variety Co-86141 (11.03%) with an yield level of 118.75 t/ha. In general, there was good relationship between yield contributing characters like height of the cane, weight of the cane, girth of the cane and the cane yield.

Second Trial (First Ratoon):

This particular trial was planted in January 1993 and harvested as first ratoon in January 1995 with 13 latest released varieties especially suited for peninsular coastal region of Western India (Konkan). Data revealed that the variety Co-90006 showed an excellent performance by recording 136.3 t/ha, followed closely by two more varieties, namely Co-90009 (133 t/ha) and Co-90001, (127.5 t/ha). So for as quality aspect of these varieties was concerned, thay recorded a good brix per cent of 19.7, 18.3 and 18.6 per cent respectively with good recovery per centage of 10.51, 9.01 and 8.46 respectively. Here again, the yield levels of these top three varieties were statistically on per with each other. In general, there was a good relationship between yield contributing characters such as height of the cane, weight of the cane and girth of the cane and the cane yield.

Third Trial (Second Ratoon)

This experimental trial was intially started with fourteen varieties suited for tropical coastal climate in January 1992. The results indicated that the variety Co-85061 consistently performed well by recording the maximum yield of 98.2 t/ha followed closely by another good variety Co.7527 with an yield level of 95.3 t/ha. The yield of these two varieties were however statistically on par with each other. The third variety which also showed a good performance was Kolhapur, a local selection from that region which yielded 88 t/ha. When quality aspect of these varieties is considered they also exhibited reasonably good brix per centage levels (19.5, 19.2 and 18.4 respectively) with recovery per cent of 8.56, 9.43 and 8.10 respectively. Here again there was a good relationship between some of these yield attributes like height of the cane, weight of the cane and girth of the cane.

Table 4: Performance of short duration varieties as a plant cane during 1994-95

Sl. No.	Variety	Height (m)	No. of nodes	Weight of cane (kgs)	Girth (cm)	Brix (%)	Yield (t/ha)	Recovery (%)
1.	Co-90006	3.40	26.1	3.17	2.49	20.3	130.8	10.51
2.	Co-90009	2.87	25.3	2.94	2.53	17.7	143.2	9.01
3.	Co-85134	2.75	24.3	2.37	2.73	19.5	117.0	8.95
4.	Co-85016	3.15	24.9	1.99	2.74	19.2	111.8	9.12
5.	Co-86141	2.85	25.2	2.09	2.56	19.8	118.7	11.03
6.	Kolhapur	2.67	25.2	1.94	2.55	18.0	101.5	8.77
7.	Co-85061	3.15	25.3	2.11	2.26	19.2	137.2	8.56
8.	84 WL 22	2.75	22.7	1.77	2.19	18.8	98.5	10.16
'F' test							**	
C.D. at 5%							22.52	

Table 5: Performance of sugarcane varieties as first ratoon during 1994-95

Sl. No.	Variety	Height (m)	No. of nodes	Weight of cane (kgs)	Girth (cm)	Brix (%)	Yield (t/ha)	Recovery (%)
1.	Co-90002	2.61	23.6	2.33	2.57	20.3	97.3	10.06
2.	Co-90004	2.63	21.6	2.43	2.78	19.8	105.8	--
3.	Co-90005	3.04	23.4	2.54	2.52	20.3	95.9	9.57
4.	Co-90006	3.39	26.1	2.14	2.48	19.7	136.0	10.51
5.	Co-90007	2.90	19.8	2.29	2.75	19.2	103.1	11.24
6.	Co-90008	3.39	24.4	2.64	2.43	19.8	100.6	9.72
7.	Co-90009	2.81	22.0	2.18	2.54	18.3	134.0	9.01
8.	Co-90010	3.19	23.5	2.34	2.48	18.6	127.7	8.46
9.	Co-8371	2.71	25.7	2.26	2.26	19.8	99.8	8.10
10.	Co-85134	2.81	22.2	2.12	2.66	19.6	119.4	8.95
11.	Co-89018	2.95	23.8	2.15	2.59	19.7	117.3	8.44
12.	Co-86141	3.02	24.3	2.17	2.11	20.2	105.5	11.03
13.	Co-85135	2.69	24.9	2.27	2.17	19.3	123.8	11.09
'F' test							**	
C.D. at 5%							28.92	

Table 6: Performance of sugarcane varieties as second ratoon during 1994-95

S1. No.	Variety	Height (m)	No. of nodes	Weight of cane (kgs)	Girth (cm)	Brix (%)	Yield (t/ha)	Recovery (%)
1.	Co-740	2.40	21.6	1.22	2.16	19.8	67.9	8.10
2.	84WL22	2.79	23.4	1.57	2.24	18.2	65.1	10.16
3.	Co-85018	2.60	21.6	1.61	2.27	25.3	61.3	--
4.	Co-85061	3.00	24.7	2.23	2.34	19.5	98.5	8.56
5.	Coc-671	3.14	25.6	1.75	2.39	20.1	62.9	10.35
6.	Co-7914	2.65	24.1	1.61	2.34	25.0	66.8	10.97
7.	Co-8231	2.78	24.0	1.63	2.49	19.9	65.5	9.56
8.	Co-85016	2.99	25.1	1.83	2.83	19.2	66.8	9.12
9.	Co-8011	3.14	27.5	1.85	2.30	19.2	66.3	10.32
10.	Co-8014	2.96	25.4	1.59	2.43	19.7	62.7	10.88
11.	Co-7219	3.13	27.0	1.84	2.41	20.1	66.0	9.10
12.	Co-7527	3.31	25.9	2.11	3.05	19.2	95.1	9.43
13.	Co-7704	3.15	25.4	1.78	2.54	19.0	66.3	7.87
14.	Kolhapur	2.32	26.3	2.02	2.90	18.4	88.0	8.10
'F' test							**	
C.D. at 5%							9.21	

Table 7: Performance of selected Sugarcane varieties in terms of Sugar yield.

Plant Cane:

I	Variety	Sugar yield (Q/ha)
	Co- 90006	18.69
	Co- 86141	17.76
	Co-90009	17.57
	Co-85061	16.00

II First Ratoon

	Co-90006	19.44
	Co-85135	18.63
	Co-90009	16.40
	Co-86141	15.77
	Co-90007	15.73

III Second Ratoon

Co-7527	12.16
Co-85061	11.47
Co-7914	9.98
Co-8011	9.28
Kolhapur	9.72
Co-740	7.45

4. Studies on water management in Sugarcane

(B.L.Manjunath and Satish Modak)

In order to economise the irrigation water for sugarcane production an experiment was conducted for evaluating the feasibility of drip irrigation in sugarcane. Secondly to schedule irrigation for economic cane production an approach based on ratios of irrigation water depth to cummulative pan evaporation (IW/CPE) was included in the experiment.

Irrigation were scheduled for each treatment based on pan evaporation to meet the IW/CPE ratios of 0.5, 0.75 and 1.00. The pan evaporation data revealed that the lowest average daily pan evaporation (2.71 mm/day) was recorded during 52nd standard meteorological week (last week of December) and on increasing trend (up to 5.76 mm/day) was observed till last week of March during the period under report.

The cane height was relatively more (2.6m) in furrow irrigation than in drip irrigation (2.2m) and the highest height of cane (2.7 & 2.3 m) was recorded when the irrigation were scheduled at an IW/CPE ratio of 1.00 both in drip and furrow irrigation. Similarly, more number of internodes per cane were observed in furrow irrigation especially at an IW/CPE ratio of 1.00 as compared to drip irrigation.

The furrow irrigated plots recorded relatively more number of millable canes (1,51,607/ha) as compared to drip irrigated plots (1,46,333/ha). However, individual cane weight does not varied much between the irrigation methods although the maximum cane height (2.15 kg/cane) was recorded at an IW/CPE ratio of 1.00 in furrow irrigation.

The average yield of sugarcane was relatively more in furrow irrigation (177.08 t/ha) as compared to drip irrigation (175.03 t/ha), although the highest yield of sugarcane (189.5 t/ha) was recorded when the plots were irrigated through drip system at an IW/CPE ration of 0.75. The cane yield was lowest (157.64 t/ha) when the irrigation were scheduled at an IW/CPE ratio of 0.5 in drip irrigation.

The study on the root characteristics revealed that the drip irrigation favoured horizontal spread of root (upto 65 cm) but restricted their vertical growth (41 cm) as compared to furrow irrigation (61 cm and 48 cm respectively). Similarly, drip irrigation favoured for higher mass of root growth (587 gms/clump) in contrast to furrow irrigation (492 g/clump)

It is interesting to note that the vertical root growth was higher (51 cm) coupled with higher mass (900 gms) when the irrigations were scheduled sparsely (IW/CPE-0.5) particularly in drip irrigation as compared to same level in furrow irrigation (42 cm and 475 gm respectively).

All the quality parameters of sugarcane viz. POL per centage, purity, brix and recovery were more with furrow irrigation as compared to drip irrigation. Similarly irrigation at IW/CPE ratio of 0.75 recorded higher quality parameters both in drip and furrow irrigation.

Table 8: Growth and yield characteristics in sugarcane as affected by different irrigation treatments.

		Tiller (000/ha)	Av. height of cane (m)	No. of internodes/ cane	No. of mill able canes/ ha	Av. cane weight (kgs)	Yield t/ha
Drip Irrigation	I_1	130.92	2.00	19.0	1,01,481	1.65	157.64
	I_2	138.15	2.20	21.0	1,27,407	1.83	189.50
	I_3	136.48	2.30	21.0	1,31,111	2.00	177.96
	Mean	135.18	2.17	20.3	1,19,999	1.83	175.03
Furrow Irrigation	I_1	118.33	2.65	24.0	1,02,222	1.98	175.91
	I_2	124.07	2.40	23.0	1,34,815	2.15	176.65
	I_3	120.00	2.70	25.0	1.28,148	1.30	178.68
	Mean	120.80	2.58	24.0	1,21,728	1.81	177.08

Table 9: Quality parameters of sugarcane as affected by irrigation treatments.

		Pol (%)	Brix (%)	Purity	Recovery (%)
Drip	I_1	12.39	16.33	75.87	6.04
	I_2	15.65	17.63	88.75	8.42
	I_3	12.80	15.03	85.16	6.34
	Mean	13.61	16.33	83.26	6.93
Furrow	I_1	17.03	18.30	93.06	9.43
	I_2	17.89	19.23	93.03	10.06
	I_3	17.20	18.83	91.34	9.56
	Mean	17.37	18.78	92.48	9.68

$I_1 = \frac{IW}{CPE} = 0.5$

$I_2 = \frac{IW}{CPE} = 0.75$

$I_3 = \frac{IW}{CPE} = 1.00$

Table 10: Root growth characterstics of sugarcane as influenced by irrigation treatments.

Irrigation method/level		Horizontal spread (cm)	Vertical growth (cm)	Root dry dry wt(gms)
Drip	I_1	63.0	51.0	900.0
	I_2	68.0	35.0	360.0
	I_3	65.0	38.0	475.0
	Mean	65.3	41.3	578.3
Furrow	I_1	63.0	42.0	475.0
	I_2	73.0	55.0	850.0
	I_3	48.0	46.0	150.0
	Mean	61.3	47.7	491.7

$I_1 = \frac{IW}{CPE} = 0.5$

$I_2 = \frac{IW}{CPE} = 0.75$

$I_3 = \frac{IW}{CPE} = 1.00$

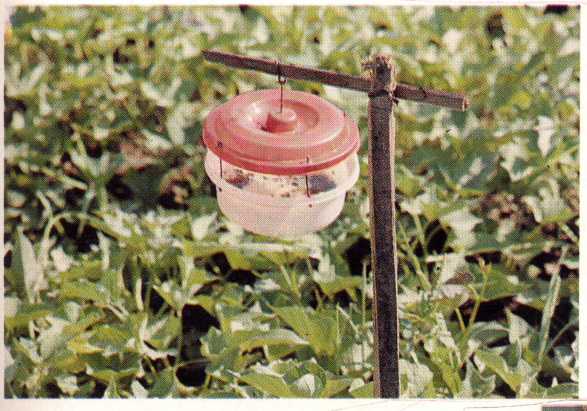
PLATE 1



Sarjoo-52 - a high yielding promising rice variety for Goa



A view of the experimental plot on water management in Sugarcane



Pheromone trap for sweet potato weevil management



Damage due to sweet potato weevil - *Cylas formicarius*

5. Introduction and evaluation of cowpea, tur, mung and groundnut varieties under rice fallows

(Sathish Modak and B L Manjunath)

Varieties of cowpea, greengram (mung), Pigeonpea (tur) and groundnut were collected from ICRISAT, Hyderabad, UAS Dharwad, and the Directorate of pulses and oilseeds, Gulbarga. Field trials for their screening were laid out during rabi season of 1994-95.

Biometric observations on growth and yield characteristics recorded are summarized below:

Table 11: Performance of cowpea, greengram and groundnut varieties under rice fallows

Crop variety	LAI_{max}	NAR_{max}	CGR_{max}	Pod yield (q/ha)	Grain yield (q/ha)
Cowpea					
Alsano	2.692	2.934	5.069	15.75	9.39
V 118	0.810	11.320	6.726	15.05	11.33
C 152	0.966	8.315	8.000	13.00	9.30
Greengram					
Pusa Baisaki	0.098	1.191	0.327	6.67	5.00
PS 16	0.275	6.167	1.814	6.55	4.93
China Mung	0.217	2.486	0.507	1.20	0.92
Groundnut					
DH 3-30	1.067	7.951	6.440	17.80	9.67
DH 40	1.237	9.939	8.423	16.70	8.13
TMV 2	0.610	3.300	1.785	15.60	6.86

Table 12: Performance of pigeonpea varieties

variety	LAI_{max}	NAR_{max}	CGR_{max}	Pod yield (q/ha)	Grain yield (q/ha)
Sel 31	0.65	10.202	4.865	13.44	6.05
85010	0.70	8.088	4.194	12.52	6.63
84031	0.82	7.734	4.287	11.56	6.01
ICPL 87	0.52	11.617	4.597	11.03	5.52
ICPH 8	1.10	12.334	8.377	10.82	5.62
DT 7	0.25	9.652	2.182	10.17	5.60
ICPL 27	0.62	10.704	4.177	7.82	3.75
87039	0.76	13.567	7.041	5.77	3.11

LAI : Leaf Area Index = Leaf area per pl. / spacing

NAR : Net Assimilation Rate $= \frac{(\ln L2 - \ln L1) \times (W2 - W1)}{(L2 - L1) \times (T2 - T1)}$

CGR : Crop Growth Rate $= \frac{(W2 - W1)}{(\text{Spacing}) \times (T2 \times T1)}$

where,

Ln : natural log; W1 & W2 : dry matter/ plant at time T1 & T2, respectively.

L1 and L2 : Leaf area / plant at time T1 and T2, respectively.

6. Studies on pest management problems in rice based cropping systems of Goa

(Mani Chellappan)

Use of neem based insecticides and sex pheromone in the management of sweet potato weevil

Environment friendly neem based insecticides (Nimbecidine and Limnool) and male sex attractants were employed for the management of sweet potato weevil, Cylas formicarius. Field trial was laid out in randomized block design with three replications (Table 13) during rabi, 1994-95. Local white sweet potato variety was selected for the experiment. The vines were dipped in the neem insecticide (0.5 %) and monocrotophos (0.05%) (as an insecticide check for the neem insecticides) solution for 1h prior to planting. The insecticide treatment was repeated as a spray on 45 days after planting.

Pheromone septa were mounted in locally fabricated traps (plate) and placed 100 sq. m. apart and 45 cm above the crop canopy, immediately after planting. The traps were kept in above insecticide treated plots and also in control plots.

Trapped weevil count was taken daily till the harvest. At harvest, the damage grade index (DGI) due to the weevil attack for tubers was taken seperately as per the scoring method recommended by CTCRI, Thiruvananthapuram, India.

The mean yield data (Table 13) has shown that more marketable tubers (72.04%) were obtained in nimbecidine + pheromone combination followed by monocrotophos + phereomone (70.27%). In individual treatment, nimbecidine was the most effective (70.09%). Altogether, there was a significant increase in the marketable tubers when compared to the control (43.05%).

In general, the neem based pesticides has performed as good as monocrotophos treatment and the pheromone traps might play as an effective tool in the integrated management of the sweet potato weevil.

Table 13: Effect of neem pesticides and sex pheromone on the sweet potato weevil infestion

Treatment No.	Particulars	Mean tuber yield (%) *	
		Infested	Marketable
1.	Nimbecidine + pheromone	9.0 (17.46)	91.0 (72.54)^{a}
2.	Limnool + pheromone	22.7 (22.45)	77.3 (61.55)^{c}
3.	Monocrotophos + pheromone	11.4 (19.73	88.6 (70.27)^{b}
4.	Pheromone	27.2 (31.44)	72.8 (58.56)^{d}
5.	Nimbecidine	11.6 (19.95)	88.4 (70.09)^{b}
6.	Limnool	27.8 (31.82)	72.2 (58.18)^{d}
7.	Monocrotophos	22.0 (27.97)	78.0 (62.03)^{c}
8.	Control	55.4 (48.10)	46.6 43.05)^{e}

* Data transformed into arc sine transformation - DMRT (P=.005)
Original data are in the paranthesis.

3.2 Horticulture

1. Survey, collection, conservation and evaluation of horticultural and plantation crops.

(P A Mathew, D G Dhandar, V Y Gaonkar)

A. Cashew

During the year, a total of 71 accessions were maintained for observations which include 15 released varieties (V-1, V-3, V-4, V-5, V-6, M 44/3, M 10/4, M 26/2, BLA-139-1, BLA-39-4, VTH-107/3I, BPP-1, BPP-2, BPP-4, and BPP-5) and six high yielding accessions (VTH-30/4, VTH-539, VTH-125, VTH-174 and VTH-154), eight hybrids (HB-1600, HB-1608, HB-1610, HB-1598, H-255, H-320, H-303 and H-307); two ornamental types, two bold nut types (Kankady and Vetore-56), 29 local elite accessions, eight NRCC selections and Anacardium microcarpum. Out of 29 local accessions, promising have been planted in a trial in RBD.

The yield data pertaining to 15 local elite accessions, four hybrids and 13 high yielding accessions (from outside Goa) along with V-4 (Standard variety) planted at 2m x 2m in a germplasm block for the past six years is presented in Table 14 along with nut and apple characters. It is seen that only the local accession Balli-2 is promising compared to all the other accessions with an yield of 3.35 Kg/tree (1995) with an average of 1.675 Kg/tree for the past six years. However, none of the accessions surpassed V-4 in terms of rawnut yield. Nevertheless Balli-2 is more suited to Goa owing to the fruit characteristics in view of the feni making industry in Goa.

Further survey work on cashew is envisaged in an intensive way through an adhoc scheme. Two trials, one involving accessions from NRCC, Puttur and another with local accessions (11) are in progress to select types with bold nut and good apple yields.

Table 14: Average yield, nut and apple characters of cashew accessions (1990-1995)

Sl. No.	Accession	Cumlative yield/tree (Kg)	Average yield/tree (Kg)	Average nut weight (g)	Average apple weight (g)
A. Local					
1.	1.A.Farm	2.614	0.436	10.63	98.24
2.	Balli-2	10.051	1.675	7.31	69.84
3.	Balli-3	1.172	0.195	7.00	93.03
4.	Balli-5	2.617	0.436	7.25	73.39
5.	Buipal-1	0.973	0.243	10.60	57.20
6.	C-3	0.978	0.163	6.90	67.40
7.	Chwl-1	0.219	0.044	13.00	92.50
8.	Betul-1	0.476	0.079	6.86	82.71
9.	Gurko	0.741	0.124	8.00	81.50
10.	Mardol-5	0.926	0.154	11.89	117.76
11.	Nanora-2	2.906	0.404	4.67	39.37
12.	Painguim-2	3.224	0.537	9.12	102.30
13.	Uguem-5	1.729	0.288	4.29	34.62
14.	Belha-1	0.130	0.022	8.00	70.00
15.	Malorem	0.243	0.122	11.00	78.00
B. Hybrids					
1.	HB-1600	7.27	1.212	6.36	50.80
2.	HB-1608	2.411	0.402	8.42	84.42
3.	HB-1610	0.000	0.000	0.00	0.00
4.	HB-1598	4.829	0.813	6.12	59.23
C. High yielding accessions					
1.	BLA-39-4	1.862	0.310	3.46	15.00
2.	VTH-59/2	4.201	0.700	5.24	24.70
3.	VTH-30/4	1.146	0.191	4.62	32.50
4.	VTH-125	1.160	0.193	4.80	44.44
5.	M 10/4	2.600	0.435	6.66	54.71
6.	M 26/2	5.881	0.988	6.49	34.09
7.	BPP-1	2.186	0.364	4.00	20.43
8.	BPP-2	3.995	0.659	3.55	40.00
9.	BPP-5	1.207	0.201	5.93	52.14
10.	VTH-174	0.607	0.101	9.26	99.41
11.	VTH-539	4.284	0.714	6.87	47.96
12.	VTH-107/3I	0.469	0.235	7.00	55.00
13.	V-4 (control)	10.685	1.776	7.04	38.13

Table 15: Yield of cashew accessions at Institute farm for the period 1990-1995 (Kg/tree)

Sl. No.	Acc. No.	1990	1991	1992	1993	1994	1995	Average apple weight (g)
1.	1.A.Farm	0.130	0.104	0.648	0.685	0.764	0.283	98.24
2.	Balli-2	0.172	0.522	1.075	2.097	2.835	3.350	69.84
3.	Balli-3	0.000	0.000	0.103	0.167	0.379	0.523	93.03
4.	Balli-5	0.040	0.044	0.226	0.585	0.912	0.810	73.39
5.	Buipal-1	0.000	0.000	0.032	0.026	0.490	0.425	57.20
6.	C-3	0.000	0.159	0.048	0.031	0.295	0.445	67.40
7.	Chwl-1	0.000	0.016	0.018	0.013	0.022	0.150	92.50
8.	Betul-1	0.000	0.000	0.144	0.172	0.097	0.063	82.71
9.	Gurko	0.000	0.040	0.241	0.000	0.070	0.390	81.50
10.	Mardol-5	0.000	0.083	0.123	0.277	0.443	0.185	117.76
11.	Nanora-2	0.061	0.147	0.233	0.950	0.790	0.725	39.37
12.	Paing-2	0.029	0.230	0.257	0.465	1.403	0.840	102.30
13.	Ugue-5	0.000	0.217	0.526	0.234	0.232	0.520	34.62
14.	Vethal01	0.000	0.000	0.000	0.000	0.000	0.130	70.00
* 15	Malorem	0.000	0.000	0.000	0.000	0.183	0.060	78.00
B. Hybrids								
1.	HB-1600	0.000	0.151	0.790	1.726	2.433	2.170	
2.	HB-1608	0.000	0.000	0.101	0.417	0.613	1.280	
3.	HB-1610	0.000	0.000	0.000	0.000	0.000	0.000	50.80
4.	HB-1598	0.000	0.000	0.765	1.123	1.879	1.120	84.42
								0.00
C. High yielding accessions								59.23
* 1.	BLA-39-4	0.000	0.070	0.051	0.483	0.621	0.637	
2.	VTH-59/2	0.000	0.145	0.848	1.099	1.006	1.103	15.00
3.	VTH-30/4	0.000	0.062	0.066	0.197	0.776	0.045	24.70
4.	VTH-125	0.000	0.000	0.000	0.320	0.625	0.215	32.50
5.	VTH-539	0.086	0.136	1.041	0.893	2.038	0.090	44.44
6.	VTH-174	0.031	0.048	0.110	0.025	0.184	0.205	54.71
7.	M 10/4	0.050	0.260	0.354	0.503	0.960	0.475	34.09
8.	M 26/2	0.000	0.231	1.443	1.285	1.807	1.115	20.43
* 9.	VTH 10/3I	-	-	- -		0.014	0.455	40.00
10.	BPP-1	0.000	0.000	0.000	0.553	1.105	0.548	52.14
11.	BPP-2	0.025	0.343	0.240	1.009	1.904	0.434	99.41
12.	BPP-4	0.000	0.000	0.000	0.000	0.000	0.049	47.96
13.	BPP-5	0.000	0.000	0.032	0.350	0.425	0.400	55.00
14.	V-4(control)	0.090	1.105	0.750	1.300	3.200	4.300	38.13

Spaced 2m x 2m

* Planted in 1989. All other in 1987.

B. Mango

Collection of local mango germplasm was continued during the year. 'Papel', 'Gadgo', 'Kapri', 'Barreto' and 'Nicolau' Afonso were collected and added to the existing germplasm making the total entries to 74. These consist of 73 varieties and one seedling selection in Mankurad. Besides, the other collections include 12 clones of Mankurad, five clones of Hilario, one clone each in Udgo, Fernandin and Salcete Mussarat. Two collections were made from outside Goa with good quality fruits one from Gokarna and the other from Kerala. One mango with fruits of bigger size resembling 'Banganapalli' reported to be imported from Mozambique has also been located in Cuncolim of Salcete Taluka. It has fibreless flesh with good keeping quality and is reported to give fruits from January onwards. One collection of sucking type from seedling origin was also made.

Evaluation of local varieties and their clones are in progress. The parent tree of seedling origin from Mankurad which has been selected was monired for regular yields. It has yielded this year also and the fruits recorded 25° Brix. Out of eight clones of Mankurad planted earlier, four yielded fruits this year. Assessment of fruit quality revealed that the flesh colour is deep orange or yellowish orange. The type with yellowish orange had better flavour and tasted more sweeter (24° Brix). It was observed in one of the clones (the grafts separated for flesh colour)that the parental tree had fruits with yellowish orange flesh, but one of the grafted trees was with orange flesh fruits. This indicates the possibility of chimeral variation in Mankurad accounting for the variability of this variety. Hence, careful monitoring of shoots is necessary to get true to type trees in the variety.

Among the thirteen hybrids evaluated for fruit quality HB-87, Amrapali, Ratna and Arka Puneet continued to perform better over the years. However, all these varieties are late in fruit maturity, although they are regular in bearing. Fruit set in Arka Puneet is observed to be poor inspite of profuse flowering. In Amrapali, a budsprout with very good colour of fruit has been noticed which is being isolated and tested.

The yield data of the hybrids for the year 1994 is given in Table 16. Arka Puneet has given only two fruits during 1995 season for the first time.

Table 16: Yield of Mango hybrids for the year 1994

Sl. No.	Hybrid	Year planted	Average number of fruit /plant	Average yield of fruits/ tree (Kg)	Commulative yield/ tree (Kg)	Average fruit weight (Kg)
1.	Amrapali	1984	47.0	19.20	112.96	0.41
2.	Ratna	1984	0.0	0.00	24.51	0.00
3.	Neelgoa	1984	71.0	27.25	161.28	0.38
4.	HB-56	1984	56.5	23.50	139.89	0.42
5.	HB-87	1984	30.3	9.75	66.77	0.32
6.	HB-45	1984	14.3	7.23	56.08	0.49
7.	HB-151	1984	114.0	9.92	43.15	0.09
8.	Arka Aruna	1989	2.0	0.80	0.80	0.40
9.	Arka Anmol	1989	8.5	1.92	1.92	0.23
10.	KxB	1990	6.0	1.10	1.10	0.18
11.	Arka Puneet	1989	2.0	0.37	0.37	0.19

It was observed that the average individual fruit weight was improved in Amrapali when fruit set was poor. Ratna and Arka Aruna were found highly susceptible to pink disease of the bark.

Table 17 furnishes the yield of south Indian commercial varieties, all of them being late maturing types. Ratnagiri Alfonso was erratic in bearing and hence the yields are poor and the fruits suffered from spongy tissue. Kesar is a good variety but its late maturing trait may make it less competitive with the local varieties in terms of quality. Kalappady is a dwarf, profuse bearing clone having small fruits of satisfactory quality.

An empirical observation which needs to be further tested is that the seedlings of Kalappady that closely resemble the parent found to induce precocity in bearing and improved the fruit quality as a scion material. Further, kalappady seedlings show a lot of variation and some seedlings are very dwarf. Table 18 gives the data on vegetative characters of 21 seedlings grown for one year in the nursery. Some seedlings are very dwarf and resemble the parent. Hence, there is a possibility of selecting dwarf rootstocks of mango from kalappady seedlings. This variety may also be useful for breeding dwarf varieties.

Cultar (Paclobutrazol) was applied to twelve year old Mankurad grafts @ 10ml, 15ml and 20ml per tree for two years consecutively. The yield of fruits obtained from treated trees are given in Table 19. In general, cultar induced flowering and increased the yields as compared to the untreated trees at 15ml and 20ml/tree. However, some trees were found to yield erratic and detailed studies are required.

Table 17: Yield of south Indian Mango varieties (1994)

Sl. No.	Variety	Year planted	Average number of fruit s/tree	Average yield of fruits/ tree (Kg)	Commula-yield/tree (Kg)	Average fruit weight (Kg)
1.	Kesar	1984	27.5	8.50	41.08	0.31
2.	Neelum	1984	38.0	5.80	8.20	0.15
3.	Ratnagiri Alfonso	1982	7.0	2.49	24.19	0.36
4.	Kalappady	1984	112.5	20.80	62.45	0.19

Growth observations on kalappady seedlings

Sl. No.	Height (cm)	Girth at collar (cm)	Number of leaves	Length of leaf (cm)	Breadth of leaf (cm)	Number of branches	Remarks
1.	11.5	0.4	5	9.0	1.5	1	Resemble parent
2.	13.0	0.5	12	10.0	1.6	2	"
3.	17.0	0.5	9	8.0	1.5	2	"
4.	18.0	0.8	25	16.5	2.4	2	"
5.	26.0	0.4	20	15.1	2.8	0	—
6.	27.2	1.2	12	17.5	3.7	0	—
7.	27.5	1.2	16	17.2	2.0	1	—
8.	34.6	0.9	49	24.0	4.8	2	—
9.	36.7	0.8	26	17.0	2.4	2	"
10.	46.0	0.9	28	20.0	4.2	2	—
11.	48.8	1.2	73	18.5	3.0	1	"
12.	52.5	1.2	45	24.0	4.4	1	—
13.	61.1	1.8	77	20.7	4.5	2	"
14.	63.1	1.1	51	19.1	3.3	2	—
15.	77.0	1.6	78	19.2	3.2	2	—
16.	79.8	1.5	69	24.0	4.3	1	—
17.	83.8	1.4	55	24.5	4.7	1	—
18.	93.5	1.5	57	23.0	4.1	2	—
19.	95.3	1.4	56	29.0	4.9	1	—
20.	102.0	1.6	69	23.0	4.1	3	—
21.	111.2	1.6	45	21.0	4.3	1	—

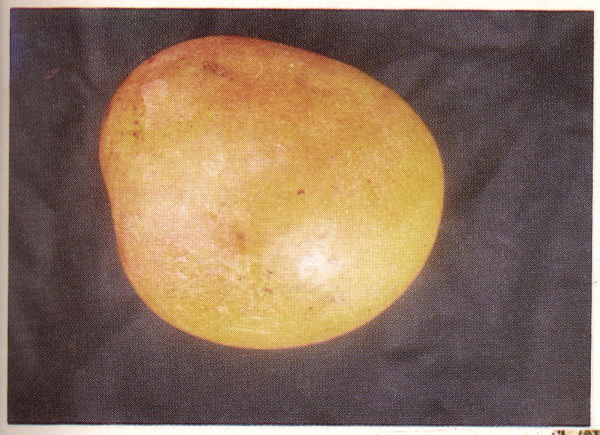
Table 19: Effect of cultar on Mankuard Mango

Dosage tried (ml)	Number of trees treated	Average number of fruits obtained/tree	Percentage yield increase over control
10	12	23.1	46.2
15	12	42.8	170.89
20	12	41.4	162.03
Control	12	15.8	

Remarks

semble parent

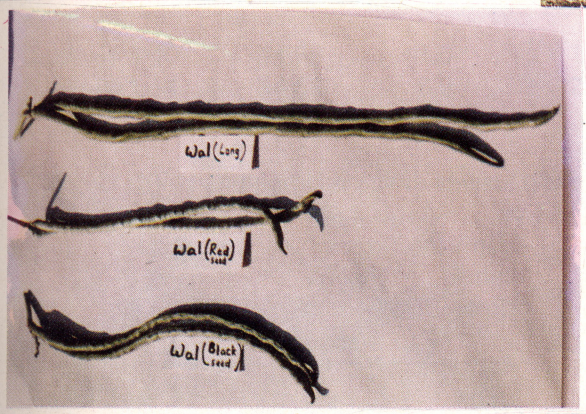
PLATE 2



Bemcorado - a local promising mango cultivar for export



Fernandin - a promising local mango cultivar



Variation in local vegetable cowpea (Wal)



Taleigao - a local promising brinjal cultivar

C. Vegetables

Germplasm collection and evaluation of local vegetables were continued. During the year, two varieties of brinjal i.e., Agassim (Long) and Taleigao (round) and three types of waal (vegetable cowpea) were evaluated, viz. (a) long fleshy poded (b) red seeded and (c) black seeded. The data collected on these two vegetables crops are furnished in Tables 20 and 21.

It is seen that the yield potential of the local brinjal types is high. The Agassaim type has elongated fruit whereas the Taleigao type is round fruited. Fruit colour in both types is violet purple. The flesh of Agassim is soft and puffy while it is hard in Taleigao and hence the latter keeps better in storage. Seed content in both the varieties is low. Both the varieties are highly susceptible to bacterial wilt and little leaf diseases.

Among these three types, the most promising line is long fleshy poded with red seed which is also the highest yielder. Variation for pod colour was observed in the other two types and there is scope for selection of purelines for uniform colour and yield. The black types is useful for selecting lines where the fleshy grains (peas) are preferred for specific uses.

Table 20: Growth and yield of local brinjal varieties (average of two years)

Variety	Average plant height (m)	Average number of leaves produced/ month/plant	Average number of fruits	Average yield/ plant (kg)	Average fruit weight (kg)	Average fruit length (cm)	Average fruit breadth/ (cm)
Agassim	1.10	11.65	7.0	1.97	0.287	17.5	6.85
Taleigao	1.14	14.58	6.9	2.34	0.350	10.9	9.40

Table 21: Yield and pod characters in waal types

Type	Yield/plant Numer of pods	Weight of pods	Pod length (cm)	Number of grains/ pod	yield T/ha	Remarks
Long pod	26	0.49	59.6	14	4.9	Fleshy, fibre-less pods
Black seeded	46	0.38	29.0	12	3.8	
Red seeded	21	0.18	32.0	13	1.8	

2. Evaluation of oil palm combination (D x P) under Goa condition (P A Mathew, D G Dhandar)

The evaluation of five oil palm hybrids planted in 1991 was continued during the year. Data on vegetative and yield characters are given in Tables 22 and 23.

The growth of the plants is satisfactory. There were no significant differences between the hybrids as regards various vegetative growth parameters studied. However, 82D x 266P was found to be significantly taller than others.

It is clear from Table 23 that the hybrids do not show any significant differences with regard to both male and female inflorescence production. Nevertheless, the maximum male and female inflorescence were produced by the hybrids 35D x 291P. With regard to the fresh fruit bunches/palm obtained the hybrid 18D x 32P, indicated lower number of bunches. The pollinating weevil has been introduced for effective pollination and improvement in bunch size.

PEQ inspection of 40,000 pre-germinated seeds imported by M/s Godrej Soap Ltd., Bombay was also completed.

Table 22: Vegetative growth of oil palm hybrids (1994-95)

Tenera	Number of leaves/palm/ month	Height increment (m)	Girth increment (m)
82D x 266P	2.3	1.75	0.353
124D x 266P	2.2	1.44	0.382
18D x 32P	2.2	1.42	0.395
35D x 291P	2.2	1.60	0.402
65D x 111P	2.0	1.32	0.335
F	NS	*	NS
SEM ±	-	0.109	-
CD 5%	-	0.3083	-

Table 23: Flowering and yield in oil palm hybrids (1991-1994)

Tenera	Cumulative number of female inflorescence /palm	Cumulative number of male inflorescence /palm	Cumulative number of bunches/ palm (FRP)	Cumulative weight of bunches/ palm (Kg)
82D x 266P	17.2	13.9	+3.3(2.3)	3.26(2.26)
124D x 266P	16.8	13.4	5.0(4.0)	4.24(3.24)
18D x 32P	9.9	20.2	2.4(1.4)	2.78(1.78)
35D x 291P	21.2	18.2	4.6(3.6)	4.48(3.48)
65D x 111P	17.8	11.4	3.9(2.9)	3.50(2.50)
F	NS	NS	*	NS
SEM I	-	-	0.69	-
CD 5%	-	-	1.95	-

+ Transformed values

3. Studies on Coconut based Cropping systems.

(BL Manjunath, Sathish Modak)

With a view to increase the monetary returns of coconut growers through an increased intensity of cropping, an intercropping trial was conducted in a coconut garden with inclusion of locally preferred annual/seasonal crops.

Among the annual inter crops, Ginger gave an average fresh rhizome yield of 6.42 Q/ha while turmeric gave an yield of 7.70 Q/ha. Pineapple yielded 59.61 Q/ha with a net additional return of Rs.8688/ha.

Among the Kharif season vegetables, Bhendi yielded 4.83 q/ha with a net additional return of Rs.1156/ha. Clusterbeans yielded 5.82 Q/ha with a net additional return of Rs.802/ha.

Chilles grown under coconut found to grow

Table 24: Yield of intercrops in coconut with economics

Season/crop	Yield (Q/ha) (Rs/ha)	Gross Returns (Rs/ha)	Cost of Cultivation (Rs/ha)	Net Returns (Rs/ha)
ANNUALS				
GINGER	6.42	14,124	31,094	-16,970
TURMERIC	7.70	13,106	30,563	-17,456
PINE APPLE	59.61	23,844	15,156	8,688
SEASONALS				
BHENDI	4.83	3,864	2,708	1,156
KHARIF				
CLUSTER BEANS	5.82	4,656	3,854	802
CHILLIES	0.79	1,264	4,844	-3,580
BRINJAL	48.53	19,412	5,000	14,412
RABI				
V.COWPEA	0.39	780	2,135	-1,335
CLUSTER BEANS	1.33	1,330	4,167	-2,837
SUMMER				
TOMATO	-	-	-	-
BHENDI	4.86	4,860	3,541	1,319
COCONUT	5685 (3607)+	22,740	5,400	28,596
MANGO	9.38 (1.49)+	11,256		

+previous year yield

more vegetatively and inturn producing less fruits (79 Q/ha). However, Brinjal can yield substantially high upto 48.53 Q/ha with a net additional return of Rs.14,412/ha. In contrast, Vegetable cowpea and clusterbeans were found to be unsuitable as intercrops during rabi season.

Bhendi found to be a suitable intercrop in coconut for summer season with yield level upto 4.86 Q/ha and with the higher vegetable prices prevailing in the market during the season, it can fetch good additional returns (Rs.1319/ha). However, tomato found to be affected with bronze wilt virus during the season.

The suitability of these crops for shade tolerance was studied by raising all these crops under open light conditions. The light interception passing through coconut canopy was monitored using Line Quantum Sensor. It was observed that the percentage of light transmitted through the canopy varied with the season and a maximum of 70 per cent light is intercepted.

It was observed that the intercrops showed differential response to coconut shade. Among the annual crops, viz. Ginger, Turmeric and Pineapple, Ginger found to yield 84 per cent of the yield obtained under open light conditions thus showing greater tolerance to shade. Pineapple and turmeric were next in order.

Among the seasonal crops, it was observed that Brinjal was not offered much by shade of coconut-mango canopy by yielding 89 per cent of the yield obtained under open light conditions. This was followed by chillies. Bhendi found to be affected by shade during Kharif season. Vegetable cowpea showed maximum susceptibility to shade by yielding only 9.4 per cent of the normal yield.(open light conditions)

Thus it can be concluded that pineapple is a suitable annual intercrop in coconut for the agro-climatic conditions of Goa. However, for intermittent farm returns and to offset the scarcity of vegetables in the State, Brinjal can be grown profitably in coconut gardens during rabi season. Bhendi is a suitable short duration intercrop in coconut both for Kharif and Summer seasons in Goa.

Table 25: Seasonal PAR* (M md S^{-1} m^{-2}) under coconut and open light conditions.

	1994			1995			
	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.
Coconut canopy	19.9	21.3	22.8	13.0	16.3	19.9	20.5
Full Radiation	30.8	32.8	34.8	26.2	28.2	30.1	29.3
Per cent transmission of light	64.3	64.9	65.5	49.5	58.2	66.1	70.0

*PAR—> Photosynthetically Active Radiation as measured by Licor Quantum Sensor.

Table 26: Productivity of intercrops in coconut as compared to sole crops underr open light ccnditions.

Crop	Yield as Intercrop (Q/ha)	Yield as sole crop (Q/ha)	Percentage
Ginger	6.42	7.64	84.0
Turmeric	7.70	9.38	82.1
Pine apple	59.61	72.17	82.6
Bhendi	4.83	14.46	33.4
Cluster beans	5.82	9.94	58.6
Chillies	O.79	1.01	78.2
Brrinjal	48.53	54.71	88.7
V.Cowpea	O.39	4.15	9.4
Cluster beans	1.33	1.89	70.4
Bhendi	4.86	6.29	77.3

4. Standardisation of Agro-Techniques for pineapple in Goa

(D G Dhandar, P A Mathew, Satish Modak)

In a field trial, potassium doses of 0,6,10 and 12g/ plant were imposed on established plants of Kew Pineapple with N @ 16 g/plant and P_2O_5 @ 4g/ plant as common doses for all the treated plants. The population was 43,500 per hectare. Observation on vegetative growth and flowering were recorded during the year. The data collected are furnished in Table 27.

The table clearly indicates that there is no significant effect of the various levels of potassium dose on any of the characters studied. Yield data is being collected for further evaluation.

Table 27: Effect of potassium level on vegetative growth and flowering in Kew pineapple.

Treatments K/plant	Flower initiation (Days)	50% flowering (Days)	leaf production rate/month/plant
Ko	282	326	2.48
k6	313	325	2.40
k8	278	349	2.34
k10	258	325	2.30
k12	294	323	2.58
F	NS	NS	NS

5. Utilization of mine reject soils for fruit production.

(H M Wasnik)

The experiment was laid out in the mine reject soils of Goa in a split plot design with two high yielding varieties of cashew grafts i.e. Vengurla-4 and Vengurla-6 as main plot treatments and control, 500g N per plant and 1000g N per plant as sub plot treatments with five replications (six plants per plot) during the Kharif season of 1994 at M/s SESA GOA MINE Co., Sankhali, Goa. The initial soil samples from 0.25 cm depth were collected, dried, ground and analysis of different available nutrients are under progress. The observations on different growth parameters of cashew grafts are also under progress.

6. Studies on Oyster and other tropical mushrooms

(S Chander Rao and V Y Gaonkar)

(i) Collection of wild mushrooms.

Four species of Termitomyces and one species of Boletus wild edible mushrooms collected in previous years were re-collected this year also, so as to prepare fresh isolations and cultures. In all, five species were collected, morphological characters were studied, spore prints collected and specimens preserved in FAA solution. These species were (Table 29) identified as Termitomyces clypeatus, T. mummiformis, T. microcarpus, T. heimii and boletus edudis. Mycelia cultures of these cultures maintained on MEA slants for further studies.

(ii) Studies on domestication of wild mushrooms

Two species of edible mushrooms namely Coprinus comatis and Podaxis Spp. which were isolated and produced spawns last year were tried for cultivation during this year.

Podaxis mushroom cultivation trial: In all the three attempts made but mycelial colonisation on the substrate was not satisfactory.

Coprinus comatis (Inky cap) mushroom cultivation trial:

By adopting cultivation technology described by Geetha & Nair (1991), the inky cap mushrooms were cultivated during the summer months when temperature is 25 - 33° C). However, the yields were just 8 per cent to the weight of dry substrate. The shelf life of fruiting bodies were only few hours and delayed harvest lead to turning of the mushrooms to soggy, thick coloured paste. Since these mushrooms are known for its delicacy and flavour and are more in demand, more studies on cultivation and post harvest aspects needs to be undertaken.

(iii) Cultivation trials of Calocybe indica (Milky mushrooms).

In continuation to the preliminary trials conducted during the last years, three trials were undertaken this year with a modified technology as described by Anil Doshi, Meera Pandey et al (1993). The observations recorded on spawn run, yield, size, etc indicates that this mushroom can be successfully cultivated in Goa and production will be more at high temperatures of Feb to May followed by June-September months (Table 28) although the highest Biological efficiency obtained was only 42 per cent as against to its potential of 80-100 per cent B.E. There is enough scope to increase its yields by conducting more trails on improvement and supplementation studies. The mushroom harvested in Aug-Jan months had a long stalk measuring from 15-22 cm and

Table 28: Yield and Growth performance of Calocybe indica

Cultivated season	No of days taken for				Av.No of fruiting bodies/bag	Av. wt. of fruiting bodies	Av. yeild B.E. (%)
	Mycelial colonisation-	Casing	Primordial initiation	1st harvest			
June-Sept	28	12	5	52	5	45	25
Oct-Jan.	33	15	6	64	4	25	14
Feb-May	23	10	5	50	8	55	42

small pileus (cap) with 5-6 cm diameter, whereas the mushrooms produced in Feb-May had short stalk (10-12 cm) and broad pileus (8-12 cm dia) which is a desirable character. The shelf life of mushrooms under normal conditions were more than a week and under refrigeration (6-7° C) it can be extended up to 30 days or ever more.

(iv) Introduction and cultivation trials of Auricularia polytricha

Mushroom cultures were obtained from Mushroom Research Laboratory of IIHR Bangalore and were multiplied and maintained on grain spawn. Initial trials conducted on substrate evaluation showed that mycelial colonnisation was faster (14-16 days) in case of saw dust substrate inoculated beds compared to paddy straw substrate which look 4-6 days longer (20 days). No fruiting bodies could be harvested from both the beds due to contamination at later stages.

(v) Production of spawn

About 300 bottles of mushroom spawn was produced and 145 bottles were supplied to the growers.

(vi) Cultivation of Oyster mushrooms

Keeping in view in the large scale commercial cultivation and for effective utilisation of space and labour, a new cultivation technology developed by Tewari et al (i.e. 2 mtrs polytube with perforated 6 cm dia. PVC pipe in the centre of the substrate) was tried. It is observed that by adopting this modified technique, mushroom yields were increased by about 10 per cent B.E. and about 25 per cent of the space in the cropping rooms can be saved which can be further utilised for increasing the production capacity of the units.

Table 29: Collection of wild mushrooms.

Name of the species	Habit/Habitat	Season	Morphological character		
			Stripe (L) cm	Cap (D) cm	Spores (U)
Termitomyces clypeatus	Solitary, Gregarious Termite mounds	July - Sept.	15-20	8	12-16
T. mummiformis	Cluster, soil/plant debris	July - Oct.	10-15	7-8	8-10
T. microcarpus Termite mounds/Soil	Cluster/group	July - Oct.	10-12	4-6	4-6
T. heimii	Individual - Soil/ Termitomyces	July - Aug.	20-25	3-4	4-6
Boletus edudis	Solitary, groups soil plant debris (under Mango trees)	Aug - Jan	10-20	20-25	5-8

7. Studies on disease management in coconuts, oilpalm, mango and bread fruit

(S Chander Rao)

(i) Studies on diseases of coconut, oilpalm, cashew and mango.

The important diseases noticed in the above crops are listed below:

Coconut:

Outbreak of budrot disease in coconut was rampent during the year in most of the plantations in Valpoi-Sattari, Bicholim and Sanguem talukas. Due to severe cyclonic winds occurred in May 1994, splitting of the crowns at base was commonly observed and as a result most of the palms got infected with budrot organism. Since the infection was from down to upwards, the mortality rate was very high ranging from 5 to 20 per cent.

The timely diagnosis, prophylactic and curative measures suggested, reduced the disease spread.

Immature advanced stage nut falling is noticed in some places of Goa, on which preliminary observation for cause of the disease is under investigation.

Oilpalm:

Regular monthly PEQ inspections of oil palm nursery of 'Godrej Farms' were carried. No quarantine important diseases were reported. The commonly observed leafspots caused by Botryodiplodia, Helminthosporium, Curvularia, Corticum and Pestalotiopsis fungus were identified. Most of the commonly occuring nursery diseases and physiological disorders of oil palm were photographed.

Mango:

In mango nursery, die-back and anthracnose

Table 30: Variations in the causal organisms of the fruit drop disease of Breadfruit

Name of the organism	Colletotrichum sp.	Phytophthora sp.
Isolated from the part of plant	inflorescence, fruit stalk	Fruit stalk end, Fruit tissues
Nature of infection	Primary	Secondary
Virulance of pathogen	Strong	Weak
Survival of pathogen	Soil, plant debris	Basal portion of plant dried twigs
Cross inoculation	Nil	Coconut, Arecanut tissues
Media and growth	PDA Plain, less spores	PV PH Carrot Agar Fluffy, abundant spores
Spores	Macro conidia, Micro-conidia 40 x 8 microns 10 - 20 microns	Oospores, + and - types Physiological. race - A2 type.

was commonly noticed. Grafts kept under shade and high humid areas were found more susceptible. Pink disease, sooty moulds and powdery mildew was observed in adult trees.

(ii) Chemical control of fruit drop disease in breadfruit:

Colletotrichum gleosporides and Phytophthora pathogens were isolated from the infected leaves, fruit stalks and tissues of fruits respectively. Cultural variations and morphological characters of the organisms were studied. Correlation between survival of organism in the soil, pre disposition and development of the diseases was investigated.

The preliminary observation recorded from the trial on chemical control indicated that the spray scheduled reduced the disease incidence by 30 per cent in the first crop (Kharif) and about 42 per cent in the second crop (Rabi) season. (Table 30).

Table 31: Spray schedule for control of fruit drop disease in Bread fruit.

Stage of the crop	Season (I/II crop)	Chemical with dosage
Flowering stage	July - Aug. Jan. - Feb.	Carbendazim 0.2 %. (Bengurd / Bavistin)
Bud / fruit initiation stage	Sept.- Oct. Feb. - Mar.	Copper oxychloride (0.3%)
Early fruiting stage	Oct. - Dec. Mar. - May	Ridomyl 0.1% + Monocrotophos (0.05%)

* Each spray with 15 days interval.

3.3 ANIMAL SCIENCES :

1. Performance of cross bred pigs in Goa.

(A R Bhattacharya, RNS Sundaram)

During the year altogether, 17 farrowings which produced 102 piglets in the categories of Yorkshire (6), Yorkshire F_1 cross (2), Yorkshire half cross (2) and Local x Landrace cross (7) were studied. The average litter size were Y-6.6, Y F_1 cross-7, Y half cross-4, L x L half cross-6. The highest total production was observed in Pure Y(40) and L x L (40). The average gestation period and age at maturity were 114.3 and 335 days for Y, 114 days and 306 days for Y F_1 cross, 115 days and 301 days for Y half cross, 117 days and 306 days for L x L half cross (Table 32).

The age at maturity and gestation period were almost of the same range except a little longer gestation period in case of L x L cross. The effect of introducing new strain of pure Yorkshire male last year could still be found useful as was observed in the very less number of still births in case of Yorkshire crosses.

The performance of piglets produced out of these farrowings was studied by recording body weights at bi-weekly intervals (Table 33). The average body weight at birth, at 8th, 12th and 20th weeks were 0.85 kg., 6.52 kg., 9.96 kg., and 16.97 kg., respectively in pure Y. In Y F_1 cross it was 0.83, 7.45, 11.13 and 19.4 kg respectively. In Y half cross, it was 1.0, 6.5, 11.0, and 19.0 kg. respectively and in the case of L x L cross, the weights were 0.66 , 5.37, 9.30, & 15.17 kg. respectively. The growth rate indicated that there was little decline in the performance of L x L cross than its earlier performance which may be attributed to the effect of introduction of the new strain of Yorkshire male last year.

On the disease aspects, no infectious disease was observed except one case of

Table 32: Reproduction Performance of Pigs during 1993-94 and 1994-95.

Breed	Age at Maturity (Days)	Gestation Period (Days)	Farrowings	Litter size	Still Birth
Yorkshire	1)114.5	318.5	5	7.2	4
	2)114.3	335.0	6	6.6	8
Y F1 Cross	1)115.5	461.0	2	8.0	1
	2)114.0	306.0	2	7.0	0
Y Half Cross	1)115.0	372.0	1	5.0	0
	2)115.5	301.0	2	4.0	2
L x L Cross (Local Landrace)	1)116.0	352.3	7	6.3	3
	2)117.0	306.0	7	6.0	10

1)1993-94
2)1994-95

hereditary form of disease (Male Cryptorchidism); this was operated and rectified but not used for breeding.

Carcase studies were conducted elaborately to see the effect of castration particularly on the growth and body fat deposition. Altogether eight batches of males were studied at different age groups, at different days of castration as well as at different times of slaughter. The range of study of the effect of castration was from the second week to 10th week and at a gap of four months to 12 months after castration. The general observation indicated that there was definite increase in the growth after castration (Table 33). The general observation indicated that there was definite increase in the growth after castration (Table 34). The studies of body fat, both the side fat and the back fat thickness, indicated that castration at a younger age and slaughter at a younger age upto seventh month, had very little difference in the fat content of both castrated and non castrated group (Table 34

Table 33: Production performance of difference breeds during 1993-94 and 1994-95.

Breed	Year	Average Body weight (kg.)				Average Daily weight gain (g)		
		At Birth	8Wk.	12Wk.	20Wk.	8Wk.	12Wk.	20Wk.
Y	1993-94	0.8	8.5	12.9	19.8	137	157	123
	1994-95	0.8	6.5	9.9	16.9	101	122	250
YF_1	1993-94	0.7	7.75	12.0	21.3	126	152	166
	1994-95	0.8	7.40	11.13	19.4	118	139	295
YF_2	1993-94	1.0	8.92	12.8	21.4	142	139	154
	1994-95	1.0	6.50	11.0	19.0	98	160	285
LxL	1993-94	0.6	8.2	12.9	21.6	135	168	155
F_2	1994-95	0.7	5.37	9.3	15.9	84	139	210

Table 34: Effect of castration on body weight at different stages of slaughter in cross bred Pigs.

Age at Slaughter	Months							
	5th	6th	7th	8th	9th	10th	11th	12th
Body Weight (Kgs)								
a) Non Castrated	15.5	19.0	31.0	32.0	27.0	27.0	57.0	69.0
b) Castrated	21.0	28.0	40.0	40.0	30.0	26.0	63.5	71.0
Difference (Kgs.)	6.5	9.0	8.5	8.0	3.0	-1.0	6.5	3.0

b). However, when the slaughter was done beyond that period there was higher fat deposition in the castrated group (Table 35). These findings were important for lean pork production.

Table 34 b: Effect of Castration in crossbred pigs - on fat deposition at different stages.

	Age of castration			
	6th week		More than 6 Weeks	
	Back fat(cm)	Loin fat(cm)	Back fat(cm)	Loin fat(cm)
Castrated	0.9	0.7	3.0	3.0
Control	0.5	0.4	1.4	1.9

Table 35: Effect of age of slaughter on for deposition in cross breed Pigs.

	Age of Slaughter			
	5-7 months Fat thickness (cm)		More than 7 months Fat thickness (cm)	
	Back	Loin	Back	Loin
Castrated	0.7	0.8	3.0	2.3
Control	0.3	0.1	1.7	1.9

2. Introduction and performance studies of meat type Rabbits in Goa.

(R N S Sundaram, E B Chakurkar and A R Bhattacharyya)

Performance of the rabbit unit is being affected by climate as well as management practices. With a view to identify the suitable management practices for the local climate condition where the humidity and temperature are higher than the required optimum level, two different diets were formulated viz. control feed with 16 pe rcent crude protein and experimental feed with 22 per cent crude protein and fed to eight does for a period of 90 days. The results are presented in Table 36.

The average litter size of control and experimental group was 4.5 and 5.1 respectively. The average daily weight gain for control and experimental group was 11.7 g and 14.5 g respectively indicating that by increasing the crude protein level of concentrate feed to 21 per cent, incidence of agalactia can be reduced.

Optimum feeding of rabbit is necessary to maintain production and profit. Information pertaining to this aspect for tropical coastal climatic condition is limited. In view of this a comparative feeding trial was conducted on two exotic meat breeds under identical management condition to find out their daily feed requirement. NB 21 grass and concentrate feed with 18.25 per cent C.P and 8.15 per cent C.F were fed adlibitum to individual animals. Dry matter intake and digestibility were calculated based on the data collected during the feeding trial. Comparative performance of the breeds is presented in Table 37.

Table 36: Studies on Agalactia and effect of nutrient level on the production performance in rabbit.

Feed Ingredients	DE K.Cal Kg.feed	C.P (%)	No. of animal on trial	No. of Agalactia cases	Av. litter size	Daily weight gain (g) recorded
Groundnut Cake 20% Wheat 25% Wheat bran 55%	2800	16.20	6	1	4.5	11.7
Ground Cake 35% Wheat 25% Wheat bran 55%	2885	21.80	6	nil	5.1	14.7

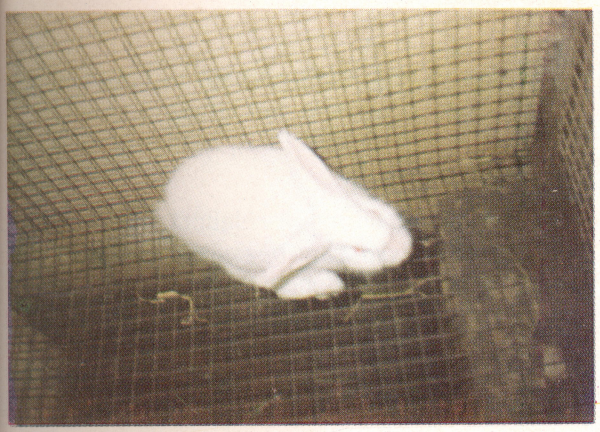
Table 37: Comparative performance of exotic meat rabbit.

	Soviet Chinchilla	New Zealand White
Total DM Intake g/day	88.12	81.99
DM digested (g)	51.88	49.65
DM digestibility (%)	58.87	60.55
Av. Body Wt. (g)	950	887
DM l/Kg. b.wt.	9.27	9.24
ADF digested (%)	40.02	40.03
C.P. digested (%)	62.06	65.66
Av. daily wt. gain (g)	24.60	24.38

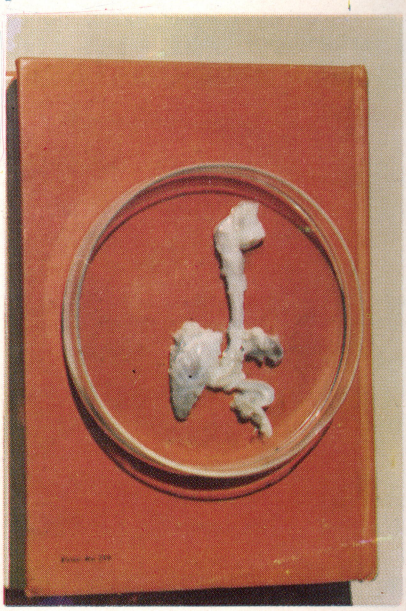
The daily weight gain and feed intake per day were almost at par for both the breeds. Drymatter digestibility was 58.87 percent and 60.55 percent for Soviet Chinchilla and New Zealand White rabbits respectively. The digestibility of ADF and CP were 40.02 and 65.66 for New Zealand White rabbits.

The study indicated that the daily drymatter requirement of weaners is around 9 percent of their body weight irrespective of the breed.

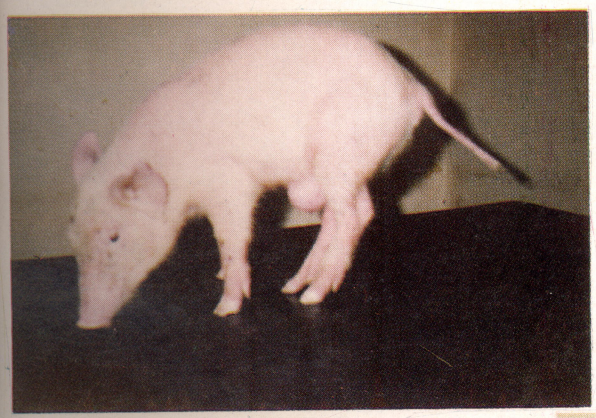
PLATE 3



Newzealand white - a promising meat type rabbit



Genetic deformity in rabbit testicle



Urnea deformity in male pig



Poultry cum fish - an integration for recycling biological waste

3. Effect of feeding microbial protein on tissue growth and muscle protein turn over in rabbit. (RNS Sundaram)

Agro Industrial by-products available locally were processed and analysed for chemical composition. Attempts were made to improve the nutritive value of these by-products through microbial fermentation. Pleurotus florida spawn (5%) was inoculated on auto claved by-products and subjected to solid state fermentation at 60 per cent moisture level. Effect of fermentation on the structural carbohydrates of the substrate studied through chemical analysis is presented in Table 38.

Bio degradation reduced the lignin content from 17.5 per cent to 14.80 per cent in rice bran and from 10.75 per cent to 4.65 per cent in wheat bran. In coir dust the lignin content of untreated and treated substrate was 39.72 per cent and 31.60 per cent respectively. Effect of fermentation on the nutritive value of coir dust was studied, through feeding trial in rabbits. An experimental feed was formulated with 25 per cent fermented coir dust. Feeding trial was conducted on eight adult rabbits for 45 days, and the data collected during the trial were analysed and presented in Table 39.

Table 38: Chemical composition of by-products fermented with Pleurotus florida spawn.

Substrate	Lignin (%)		ADF (%)	
	Untreated	Treated	Untreated	Treated
Coir dust	39.72	31.60	67.02	60.25
Cashew applewaste	7.12	5.12	21.70	17.40
Karad hay	12.60	9.35	31.10	24.40
Rice bran	17.50	14.80	30.12	25.41

The trial indicated that the digestibility of feed increased from 71.10 per cent to 75.70 per cent by incorporating fermented coir dust in the diet at 25 per cent level. The dry matter intake per kg body weight was 5.14 per cent and 5.58 per cent for control and experimented feed. The feeding trial conducted with fermented cashew apple waste at 25 per cent level in rabbit feed indicated that the digestibility of experimental feed was higher (81.34 per cent) than control feed indicating that the nutritive value of the by products can be improved through bio degradation with Pleurotus florida.

Table 39: Drymatter intake and digestibility of fermented agro by-products incorporated feed.

	Cashew applewaste incorporated feed		Concentrated feed with fermented coir dust.	
	Untreated	Treated	Untreated	Treated
Dry matter intake (g/day)	118.92	97.64	122.79	94.62
DM digested (g)	81.34	79.42	87.30	71.62
DM digestibility (%)	68.40	81.34	71.10	75.70
Body Wt. (g)	2300.00	1770.00	2400.00	1760.0
DM intake/kg.Body Wt.	5.14	5.58	5.14	5.37

4. Studies on reproduction aspects of meat animals to improve the fertility and fecundity.

(E B Chakurkar, A R Bhattacharyya)

To make livestock industry more profitable, particularly in meat producing livestock, it is necessary to monitor reproductive management. In this particular project attempts are being made to adopt modern techniques for augmenting fertility and fecundity and to get maximum number of young ones per animal per year.

Livestock used for the project work during this year was selected from breeding stock of last year's experimental stock.

Sows and gilts of different breeds viz. Yorkshire and Yorkshire crosses were bred at different post partum period ranging from 29 days to 229 days. No difference was observed in litter size in two consecutive farrowings.

In rabbits, similar technical programme was carried out. It was observed in rabbit does that fecundity was reduced when does were bred immediately after kindling. In rabbits it was also observed that fecundity was increased from two to seven by changing the breeding male.

Breeding of rabbits artificially by collecting semen through artificial vagina yielded successful results and the technique has been standardised. In biochemical studies blood serum was collected from sows and rabbit does. Before breeding serum protein was 4.23 g per cent and 5.62 g per cent in sows and rabbits, respectively.

Studies on oestrus induction was done using chlomephencitrate, prostaglandin F2 in rabbits and sows. Copper sulphate solution 0.1 per cent at the rate of 1 mg/kg body weight was injected intravenously in rabbits. Favourable results were observed. Artificial vagina for rabbits was improved for collection, evaluation and insemination in rabbits.

3.4 Fishery Science

Under this section there are two sub projects, in which research on integrated farming systems involving livestock fish and rice-fish combinations were conducted.

1. Fish-Poultry farming systems under Goa Conditions.

(S Subramanian, N S Nair, A V Nirmale)

Fish-poultry integration is aimed at recycling the poultry dropping through fish involving fast growing species of carps to utilise the available freshwater bodies of Goa.

Under the year under report, the chicken-fish integrated culture trial was conducted with 23 Austro-white hybrid birds and 4 species of carp viz. catla, rohu, mrigal and common carp, stocked at 4000/ha stocking density. The chicken were reared in the poultry shelter with wiremesh bottom constructed over the pond, for a period of eight months.

The birds started laying at the age of five months and the average egg production for the last five months of rearing (i.e 5,6,7,8, and 9th month age) were 33.6, 30.5, 41.4, 43.1 and 62.7 per cent, respectively. The final average individual weight of birds was 1.373 kg.

The fish harvest data indicated individual maximum growth ranging from 1.74 kg to 2.8 kg over 15 months and a fish production rate of 4,100 kg /ha/16 months. For the third consecutive year the fish production rate was over 3500 kg/ha.

2. Rice-cum-fish culture suitable for Goa.

(S Subramanian, B L Manjunath)

For developing a package for integrated culture system involving rice and fish under freshwater field conditions, suitable rice variety and performance of the two components were tested in a lowlying field designed and prepared for the purpose.

The performance of the already screened rice variety vyttila-1 during Rabi 1994-95 was studied under water-lodged conditions. The transplanted rice established well under stagnated condition and yielded 7.42 t/ha for the 120 days growth period. Other parameters observed for the rice variety vyttila-1 were as follows:

1. Plant height - 80.6 cm
2. Average number of panicles/plant - 11.4
3. Grains/panicle - 174.5
4. Grain weight (g)/ panicle - 4.25
5. Grains/hill - 1284
6. 1,000 grain weight - 22.6

Advanced fish fingerlings were raised separately and stocked at 2000/ha density, with an indicated production rate of 1250 kg/ha/8 months.

3.5 TRANSFER OF TECHNOLOGY

Transfer of technology programmes are categorised as per the new ICAR norms under the revised function based activities viz.,

A. Training

B. Farm Advisory Services

1. Lab to land programme
2. National Demonstrations

C. On Farm Research

i) Problem Oriented Research
ii) Client Oriented Research
iii) Watershed management

D. Front line demonstrations

However, the transfer of technology programmes of the Institute have been carried out under three sub-projects viz.,

Main Project: Transfer of technology in Crop Sciences, Horticulture, Animal Science, Fishereies and Home Science.

Sub project: I. Training and other activities

II. Farm Advisory Services including Lab to Land programme, national Demonstration and Front Line Demonstration

III. On-Farm Research

1. Training and other activities

(NS Nair / HM Wasnik, VY Gaonkar, HR Prabhudesai, AV Nirmale, Sunetra Talaulikar, KK Metar, K Manikandan, P Lade and All Scientists)

Training:

Altogether 80 skill oriented training courses in four major desciplines of Crop Science, Horticulture, Animal Science and Home Science were conducted both in the campus as well as off campus to impart training to 1289 beneficiaries comprising of 714 males and 575 females in three catogories viz., practicing farmers and farm women, rural youth and grassroot level extension functionaries. The details of these trainings are furnished in tables

Participation in other activities

During the year under report, one ex trainees convetion was held on 1st March 1995, to evaluate the impact of training programme in which 150 ex-trainees participated.

World Food Day was celebrated on 16.10.94 in collaboration with Department o Agriculture.

Two field days were conducted on cashew, one at Mayem and another at Ela Old Goa in collaboration with Department o Agriculture in which 214 farmers participated The KVK personnel also participated in the National Seminar on cahwew at Dona Paula from 15th - 16th April, 1994, and in the IPM conference at FTC, Ela, Old Goa on 25.5.199

In addition, the training personnel also participated in Crop Seminars, Kisan melas KVK Zonal Workshops, Workshop on Agricul ture Journalism and in Doordarshan Programmes.

During the year six popular articles on topics of topical interest were published.

Table 40: Details of training programmes conducted during 1994-95 for practicing farmers and farm women

CROP SCIENCE

sl. no.	Title of the training course	Duration (Days)	No. of courses conducted	No. of partipants		Total
				Male	Female	
1.	Organic farming	2	2	16	5	21
2.	Integrated nutrient management	1	2	17	14	31
3.	Rice Based cropping systems	2	1	26	14	40
4.	Sugarcane ratoon management	2	2	25	-	25
5.	Technologies for groundnut production	2	4	43	15	58
6.	Post harvest groundnut technology	1	2	18	6	24
7.	Vermiculture biotechnology	1	3	20	8	28
	Sub Total		16	165	62	227
	HORTICULTURE					
1.	Grafting techniques in cashew & mango	3	5	151	37	188
2.	Coconut based cropping systems	2	2	8	3	11
3.	Cashew production technology	3	3	80	1	81
4.	Improved cultivation prctices for vegetables	1	1	9	8	17
5.	Production and Propagation techniques for roses	1	2	8	15	23
6.	Cultivation of fruit crops	1	1	12	3	15
7.	Kitchen gardening	1	2	3	17	20
8.	Mushroom cultivation	1	3	31	12	43
9.	Mushroom spawn production	1	1	8	6	14
	Sub Total		20	310	102	412
	ANIMAL SCIENCES					
1.	Broiler Rearing	2	3	48	6	54
2.	Layer Rearing	2	1	2	-	2
3.	Rabbit Keeping	2	1	8	4	12
4.	Dairy production	2	3	22	9	31
5.	Fodder production	1	16	16	7	23
	Sub Total		9	96	26	122

Sl. no.	Title of the training course	Duration (Days)	No. of courses conducted	No. of partipants		Total
				Male	Female	
HOME SCIENCE						
1.	Low cost nutrition receipes	1	7	--	121	121
2.	Receipes from mushroom	1	5	--	77	77
3.	Child care and preparation of weaning mixture	1	4	--	65	65
		Sub Total	16	--	263	263
		Grand total (A)	61	571	453	1024
B)	**Details of trainings conducted for rural youth during 1994 - 95**					
	CROP SCIENCE					
1.	Preparation of vermi compost	1	3	18	12	30
2.	Cultivation of groundnut for seed purpose	1	1	6	3	9
		Sub total	4	24	15	39
	HORTICULTURE					
1.	Grafting techniques in cashew and mango	3	2	24	6	30
	ANIMAL SCIENCES					
1.	Poultry keeping	2	1	4	1	5
2.	Dairy Production	1	1	22	5	27
3.	Poultry-Fish Integrated farming	2	1	13	2	15
		Sub Total	3	39	8	47
	HOME SCIENCE					
1.	Home scale food production	2	3	--	63	63
2.	Crafts	4	2	--	17	17
		Sub total	5	--	80	80
		Grand total (B)	14	87	109	196

C) Details of trainings conducted for grass root level extension functionaries during 1994-95

Sl. no.	Title of the training course	Duration (Days)	No. of courses conducted	No. of partipants		Total
				Male	Female	
	CROP SCIENCE					
1.	Preparation of vermicompost	1	1	14	--	14
2.	Organic farming	2	1	11	--	11
3.	Post harvest groundnut technologies	1	1	12	--	12
		Sub total	3	37	--	37
	HORTICULTURE					
1.	Cultivation of fruit crops	1	1	17	--	17
	HOME SCIENCE					
1.	Importance of child development food and nutrition	2	1	--	15	15
		Grand total (C)	5	54	15	69
		Grand Total (A+B+C)	80	712	577	1289

2. Lab to Land Programme

(NS Nair/HM Wasnik, HR Prabhudesai, V Y Gaonkar, A V Nirmale, Sunetra Talaulikar, KK Metar, K Manikandan and P Lade)

During the year 1994-95, two villages viz., Taleigao and Kumbharjua in Tiswadi Taluka were surveyed and 52 farm families comprising 28 marginal farmers with holdings of two ha area were adopted to demonstrate the technologies for groundnut and improved vegetable cultivation.

A CROP SCIENCE:

The farmers at Kumbharjua were cultivating some traditional seasonal vegetables, like little gourd, chillies amaranthus. The survey indicated that these families were getting megre income from these lands. The beneficiaries were then imparted off-campus training in technologies for groundnut cultivation. Groundnut variety Dh-3-30 alongwith other critical inputs like Rhizobium culture, gysum, captan and pesticides were supplied to these families and field demonstrations were laid over an area of two ha in the village.

The performance of Dh-3-30 on residual moisture condition was very good and yield level of 20 q/ha was achieved in the demonstration. The farmers of the area have evinced keen interesrt because of the profitability as well as non-perishable nature of this new crop and are keen to take up groundnut cultivation in future.

The families on an average could ge income of Rs. 26,000/ha with an investme about Rs. 3,600 within a period of 105 d The profitability of this crop is then dem strated to the farmers. However due to the of improved implements the labour com nent could not be minimised. The profitab could be increased if low cost implements seed cum fertiliser drill, groundnut hoe, de ticator etc. are introduced.

B. HORTICULTURE

Total 10 demonstrations were conduc under lab to land programme, using impro vegetable vatieties of Bhendi, cluster bea Taleigaon village. The results of the dem stration is given in Table 43.

C. ANIMAL SCIENCES

Under Animal Sciences, 25 families h been selected at the village Taleigao by dc bench mark Survey and the inputs lik Poultry Birds ii) Pigs iii) Rabbits iv) Pou feed are being supplied to them and for purpose 500, six week old poultry birds h been purchased and are being brought u the Institute Poultry Unit.

D. HOME SCIENCE

Under Home Sciences, 15 metallic p table low-cost chullas were distributed to farm families selected in Taleigao village.

PLATE 4



Farmer's convention on modern irrigation systems



Training cum demonstration on coconut production



An exhibition on the eve of Ex- trainees convention



Vermicompost demonstration unit.

Table 41: Results of groundnut demonstrations under lab-to-land programme (Rabi '95)

Sl.	Observation	Yield Q/ha		
		Dh-3-30	(Control) JL-24	Per cent increae in yield
1.	No. of plants /m^2	35	35	--
2.	No. of Pods/plant	26	17	38
3.	No. of pods/m^2	910	595	--
4.	100 kernel wt. (g)	70.5	92.5	--
5.	Yield/ha	20	10	100
6.	Cost Benefit Ratio	--	--	1.7

Table 42: Results of LLP demonstrations during 1994-95 (Crop Science)

Sl.	Annual Income Based on Survey	Critical Inputs supplied	Avg. Yield (Q/ha)		Per cent Increase	Additional Income
			Demonstration	control		
1.	From Rice Rs. 1250 From Seasonal vegetables Rs. 3475 Total Rs. 4725	Groundnut seed (Dh-40) Rhizobium pesticide	20.6	10.4	99	22,100

Village : Kumbharjua
No. of famillies - 12
Area : 2 ha

Table 43: Results of improved varieties demonstration in vegetables

Type of vegetables	Method	Variety	Yield (Q/ha)
1. Bhendi	Traditional	local	68
	Improved	Parbhani Kranti	106
2. Cluster bean	Traditional	local	61
	Improved	Pusa Nav bahar	88
3. Radish	Traditional	local	152
	Improved	Pusa chetki	214

3. Research cum Demonstration

(i). National Demonstration

(NS Nair / HM Wasnik, VY Gaonkar, HR Prabhudesai, AV Nirmale, Sunetra Talaulikar, K. Manikandan, P lade and scientists)

The scheme of national demonstration which was earlier with state Department of Agriculture was included under KVK's mandate from 1994-95. During the year, a target of conducting national demonstration over an area of 12 acres four acres each under sole crop (Rice), Double crop (Kharif rice followed by Rabi groundnut) and multiple crop (Kharif Rice, Rabi groundnut and summer pulse) respectively was set.

Nerul village located about 23 kms from KVK was selected. The soil type was sandy loam. The prevalent varieties grown were Jyoti/Jaya (Rice) and JL-24 (groundnut) with average productivity of 32 Q/ha (Rice) and 15 Q/ha (groundnut).

During Kharif season, twelve acres of area covering five families were selected and 'Annada' rice variety alongwith some critical inputs was demonstrated with Jyoti variety as a check.

Similarly during Rabi under two crop squence eight acres out of 12 acres was demonstrated with groundnut variety Dh-3-30 alongwith other critical inputs like Rhizobium, Thiram, Gysum and pesticides. The control variety was JL-24 (Phule Pragati)

During summer, however, due to non availability of improved pulse seed (VCM-8) third crop sequence of cowpea variety 'Alsando' was included.

The beneficiaries were imparted skill oriented training in rice and groundnut production including post harvest techniques.

The demonstrations were monitored by visits and observations on various characters were recorded. The National Demonstration sites were visited by other farmers from the area and the results obtained were better than the average yields which can be seen from Table 44 and 45:

Table 44: Results of the national demonstration during 1994-95

Sl. No	Village	Crop sequence	Area in ha	No. of farmers	Average yield (Q/ha)	
					Demonstration	control
1.	Nerul	1. Monocrop				
		Rice (K)	1.6	4	42	34
		2. Double crop				
		Rice (K)	1.6	4	40	32
		Groundnut (R)	1.6		23	14
		3. Multiple crop				
		Rice (K)	1.6		41	30
		Groundnut (R)	1.6	4	21	16
		Cowpea (S)	1.6 *		7.2	5.8

K - Kharif, R - Rabi, S - Summer
* - Local cowpea.

Table 45: Results of National Demonstrations (1994-95)

Sl.	Crop Sequence	Sea -son	No. of farmers	Area (ha)	Avg. Yield q/ha Demo	Check	% Increase	Returns Gross	Net	C.B. Ratio
I	Monocrop (Rice)	K	6	1.6	43.8	28.4	54.2	17520	8850	1:19
II	Double Crop (Rice-G. nut)	K	4	1.6	*40.2	*26.3	52.8	16080	7430	1:26
		R			**20.6	**12.4	66.1	26780	22130	1:8
III	Multiple crop (Rice-G. nut-pulse)	K	6	1.6	*40.6	*28.2	40.4	16240	8250	1:18
		R			**19.8	**14.3	31.4	25740	21380	1:6
		S			***7.2	***5.8	24.1	10080	7250	1:3

* Rice
** Groundnut
*** Pulse

Village : NERUL

B. On farm Research

1) Problem oriented Research :

Two families have been selected for this purpose at St. Estevam and other at Old Goa. For overcoming problem of agalactia in does and to reduce the mortality of kits, balanced pelleted rabbit feed has been provided to the rabbits of the selected families.

2) Client oreinted research : for S/C, S/T

The villages in Ponda Taluka are being surveyed for the purpose.

C. Frontline demonstration on Groudnut

During the rabi season of 1994-95, a large scale demonstration for making an impact of technology transfer in oilseed (groundnut) was laid out in Porvorim village of Bardez Taluka (18 km) under the Front line demonstration (FLD) programme with an objective to demonstrate the use and the techniques for increasing the per unit productivity of groundnut under the residual moisture conditions in rice fallows.

The demonstration were conducted in a contiguous area in order to have a better impact of the technologies demonstrated among the neighbouring area. Altogether 65 beneficia-

Table 46: Percent Increase of per unit productivity of groundnut under front line demonstration (FLD).

Village/ taluka	Variety	Area (ha)	Average Yield q/ha *Demonsstrated yield	local check	Percent increase over local	No of Beneficiaries
Porvorim	1) Dh-3-30	12	23.2	14.2	63.3	65
	2) Dh-40	3	19.6	14.2	37.2	
	3) JL-24 (control)	1	-	14.2	-	

* Highest demonstrated yield obtained was 28.6 q/ha in case of polts given irrigation at flowering and pod formation stage where as the lowest yield obtained was 18.1 q/ha.

ries having roughly 0.5 ha each to have a contiguous area were selected after survey of the area. The beneficiaries were given critical imputs like improved seeds of Dh-3-30 and Dh-40 varieties of groundnut, Rhizobium culture packets, seed dresser like captan/thiram, gypsum and need based pesticides. They were imparted skill oriented trainings (both on the campus and off campus) on various aspects of skill improvement and technological aspects of Groundnut cultivation. Altogether an area of 12 ha was sown with the variety Dh-3-30 and three ha with Dh-40 while adjoining area of one ha was kept as control plot with JL-24 (Phule Pragati). The demonstration plots were visited regularly and extension activities like discussion, slide show meetings, pest diagnosis were carried out to aquaint the beneficiaries about the technology. Field demonstration of post-harvest technology with DOR method and storage with $Cacl_2$ were also arranged and observations recorded.

The results of the FLD during the year i cated that the productivity of improved var ies was 23.2 q/ha in case of Dh-3-30 and 1 q/ha in case of Dh-40 as against 14.2 q/h case of JL-24 (Control), which meant an crease of 63.3 per cent and 27.2 per c respectively as indicated in Table 46.

The Front line demonstration thus once prov that inclusion of some of the critical inputs improved varities (Dh-3-30 and Dh-40), G sum, Rhizobium, Thiram, non-cash inputs timely sowing under residual moisture con tions, optimum plant population, earthing etc have helped in increasing the per u productivity of this remurative crop in r fallows.

In order to establish the superiority of the cr over other conventional crops the econom and Benifit cost ratios have been worked and presented in Table 47.

Table 47: Economics vis-a-vis benefit cost ratio of groundnut cultivation under FLD :

Sl No.	Variety	Yield (Dry Pods) Q/ha	Gross Income @ Rs/ha	Cost of cultivation Rs/ha	Net Income Rs/ha	B: C Ratio
1.	**Dh-3-30	23.2	30,160	3,750	26,410	1:7
2.	**Dh -40	19.6	25,480	3,750	21,730	1:5.7
3.	*JL-24 (control)	14.2	18,460	2,900	16,660	1:5.7

@ The prevalling cost of dry groundnut pods was Rs.13/kg.

* The variety JL-24 was cultivated a local check under traditional farmers practice.

** The varities Dh-3-30 and Dh-40 were cultivated with additional inputs and improved technolog

4. General Information

4.1 Institute Management Committee

For the approval of important financial and administrative functions of the Institute, the Council constituted the Second Institute Management Committee for a period of three years with effect from 30.8.94. The committee met twice (18.6.94 & 6.3.95) during the period under report and discussed important points pertaining to the functioning of the Institute and gave guidance for the management of the Institute. The Institute Management Committee also accorded approval for purchase of equipments and execution of civil works. The composition of committee is as follows:

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

2. Dr. P. Rethinam - Member
Assistant Director General (PC),
ICAR, Krishi Bhavan,
New Delhi 110 001.

3. Shri S. V. Desai - Member
Dy. Director of Agriculture,
Govt. of Goa,
Vidyut Bhavan, Panaji.

4. Director (Horticulture) - Member
Govt. of Maharashtra,
Directorate of Horticulture,
Old Secretariat, Pune.

5. Dr. N. C. Hulamani, - Member
Director of Instruction (Hort.),
University of Agril. Sciences,
Dharwad 580 005, Karnataka.

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

7. Shri Ram Linga Reddy, - Member
6-3-1238/B/13, Raj Bhavan Road,
Somajiguda, Hyderabad.

8. Finance and Accounts Officer, - Member
C.I.F.E., Bombay 400 061.

9. Dr. N. S. Nair, - Member
Scientist (Selection Grade),
ICAR Research Complex for Goa
Ela, Old Goa 403 402.

10. Dr. R. N. S. Sundaram, - Member
Scientist (Selection Grade),
ICAR Research Complex for Goa
Ela, Old Goa 403 402.

11. Shri P. A. Mathew, - Member
Scientist, (Selection Grade),
ICAR Research Complex for Goa
Ela, Old Goa 403 402.

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

13. T.K.N.Nambiar/Dr.S.Subramanian, - Member Secretary
Asst. Administrative Officer,
ICAR Research Complex for Goa
Ela, Old Goa 403 402.

4.2 Quinquennial Review Team

The Indian Council of Agricultural Research, New Delhi, constituted a Quinquennial Review Team to review the work done by the ICAR Research Complex, Goa, during the preceeding five years ending April, 1994. This is the first review by a QRT after the Complex was ungraded into an independent Institute. The composition of the team is as given below:

1. Dr. K. V. Ahamed Bavappa - Chairman
FAO Consultant,
Karooth Villa, Eravakkad,
Kumaranellur 679 552,
(Kerala).

2. Dr. G. D. Radder - Member
Director of Research,
University of Agricultural Sciences,
Krishinagar, Dharwad 580 005,
(Karnataka).

PLATE 5



Dr. D. G. Dhandar, Director, welcoming members of QRT to the Institute



Dr. K. L. Chadha presiding over the fifth Staff Research Council meeting of the Institute



A. D. G. (P.C.), Dr. P. Rethinam, visiting the exhibition arranged by the Institute



The victorious Football team of the Institute at the Inter zonal sports meet held at Jhansi

3. Dr. U. V. Sulladmath, - Member
"Sharada", 12, Narayanappa Block,
Ravindranath Tagore Nagar,
Bangalore 560 032.

4. Dr. I. G. Chavan, - Member
5, Vijaya Housing Society,
University Road,
Pune 411 016.

5. Dr. T. J. Varghese - Member Secretary
Director of Instruction (Fisheries),
Mangalore 575 002,
(Karnataka)

6. Dr. S. Subramanian - Co-ordinator
Senior Scientist (Fishery Science),
ICAR Research Complex for Goa
Ela, Old Goa 403 402.

The Committee reviewed the different activities of the Institute in its two sittings (15.10.94 to 22.10.94 and 10.11.94) With reference to the mandate, organisational set up, budget, management of the Institute, current strategies and programmes, major achievements, both in research and transfer of technology. The committee highlighted the constraints found by the Institute, future projections and programmes to be taken up, policy issues to be tackled at the Head Quarter's level and submitted its report with detailed recommendations on 15.11.1994.

4.3 Research Advisory Committee

To suggest Research programmes based on National and global context of research in the thrust areas and to review the research achievements of the Institute and to see that these are consistent with the mandate of the Institute, Indian Council of Agricultural Research, New Delhi has constituted the Research Advisory Committee for the Institute for a period of three years with effect from 9th March, 1995. The committee consisted of the following members.

1. Dr. K. V. A. Bavappa, - Chairman
FAO Expert, Karoothvilla,
Eravakkad,
Kumaranellur 679 552,

2. Dr. G. D. Radder - Member
Director of Research,
University of Agricultural Sciences,
Dharwad 580 005.

3. Dr. R. T. Gunjate, - Member
6 Nutan Co-op. Housing Society,
Shirodkar Bldg., Sabniswada,
Sawantwad 416 510 (Sindhudurg).

4. Dr. R. S. Ray, - Member
Director of Veterinary (Retd.),
Goa.

5. Dr. I. J. Varghese, - Member
Director of Instruction,
College of Fisheries, UAS,
Mangalore 575 002, (Karnataka).

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

7. Shri Ram Linga Reddy, - Member
6-3-1238/B/13, Raj Bhavan Road,
Somajiguda, Hyderabad.

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

9. Dr. P. Rethinam, - Member
Asst. Director General (PC),
ICAR, Krishi Bhavan,
New Delhi 110 001.

10. Dr. K. D. Patil, - Member Secretary
Principal Scientist,
ICAR, Research Complex,
Ela, Old Goa 403 402.

4.4 Staff Research Council

The ICAR, New Delhi, with the approval of competent authority constituted the Staff Research Council proposals, ongoing research projects, to make specific recommendations of the achievements and shortcoming of projects, to advise on the fostering of linkages between Institute's divisions etc., and to monitor the followup action of the recommendation of QRT with respect to technical programmes of the Institute. The constituted committee came into effect from 14.7.94 for a period of three years, consisting of the following:

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, Dharwad.

3. Dr. H. C. Hulmani, - Member
Director of Instruction (Hort.),
UAS, Dharwad 580 005.

4. Dr. I. G. Chavan, - Member
Ex-Head, Animal Sciences,
MPKV, Rahuri,
5, Vijaya Housing Society,
University Road,
PUNE (Maharashtra).

5. All the Project leaders. - Members

6. Shri B. L. Manjunath - Member Secretary
Scientist,
ICAR Research Complex for Goa
Ela, Old Goa 403 402.

4.5 Institute Joint Staff Council

With an objective to promote harmony and relationship amongst staff, increase the efficiency of working and to increase the co-operation between the employer and the employees, a thirteen member Joint Staff Council is functioning which met on 12-7-94 and 12-1-95. During the year under report, the term of the first committee expired and a new committee was constituted with effect from 23.8.94, for a period of three years. The committee consists of the following members.

Dr. D.G.Dhandar, Director	- Chairman
Official Side	
1. Dr. K.D. Patil, Principal Scientist	- Member
2. Dr. H.M. Wasnik, Training Organiser	- Member
3. Dr. N.S. Nair, Scentist.(Sel.Grade)	- Member
4. Shri M.S. Balbatti, Farm Supdt.	- Member
5. Shri T.K.N. Nambiar, Asst.Admn.Off.	- Member
6. Dr S Subramanian, Senior Sccientist	- Member Secretary
Staff Side	
1. Shri K. K. Metar, Trg. Asst. KVK	- Member
2. Shri Krishnath R.Naik, Asstt.	- Member
3. Shri K. Yesodharan, Sr.Clerk	- Member & CJSC Member
4. Shri Gangadhar Dhargalkar, SS Gr.II (Peon)	- Member
5. Shri Giri T. Madkaikar, Suppt.Staff, Gr.I (Maz)	- Member
6. Shri Mahesh B. Parsekar, J.T.A	- Member Secretary

4.6 Local Management Committee

The Krishi Vigyan Kendra which functions as an extension wing of the Institute, is periodically monitored by the Local Management Committee which comprises of both government officials and non-governmental representatives of different categories such as farmers, women, who are directly or indirectly associated with the agricultural development of the state.

The head of the host Institute will be the chairman and the Training Organiser of the KVK will be the member secretary of the Local Management Committee. During the period under report the committee met on 11-5-1994 and reviewed the progress and approved the technical programmes for the year. As the term of the first committee is over, a new committee was constituted to function for three years from 1993-94.

The following were the members of the new committee.

1. Dr. D.G.Dhandar Officer on Special Duty ICAR Complex for Goa.	- Chairman
2. Director of Agriculture Govt. of Goa.	- Member
3. Director of A.H & V.S., Govt. of Goa.	- Member
4. Dr.Shastri Directorate of AH & VS Govt. of Goa.	- Member
5. Shri Hawaldar District Training Officer, Ela, Old Goa.	- Member
6. Shri Vithal	- Member Representative of small farmer.
7. Shri Tatyasaheb Shinde	- Member Representative of big farmer.
8. Ms.Muriel D'Souza	- 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 farmer.

12. Shri P.K. Desai - Member
Directorate of Agriculture
Govt. of Goa.

13. Mr. J. Dorado - Member
Project Officer
NABARD, Panjim.

14. Mr. Kurian - Member
Incharge, Govt. Estuarine Fish Farm
Dhauji, Old Goa.

15. Dr.Dhume N.S. - Member
Nutrition Board,
Dir. of Health Services
Govt. of Goa.

16. The Director, - Member
Social Welfare Dept.
Govt. of Goa.

17. Dr. H.M.Wasnik - Member Secretary
Training Organiser (KVK)
ICAR Complex, Old Goa

4.7 Staff of the Institute

Name	Designation	Specialisation
Managerial		
D. G. Dhandar, Ph.D	Director	Horticulture
Scientific		
K. D. Patil, Ph.D	Head, Section of Crop Sciences	Plant Psysiology
A. R. Bhattacharyya M.V.Sc FRVCs	Head, Section of Animal Sciences	Animal Reproduction
S.Subramanian, Ph.D	Senior Scientist	Fish & Fishery Science
H. M. Wasnik, Ph.D	Senior Scientist	Soil Science
N. S. Nair, M.V. Sc.NDPH	Scientist (Sel. Grade)	Poultry Science
R.N.Shanmugasundaram M.V.Sc.	Scientist (Sel. Grade)	Animal Nutrition
P.A.Mathew, M.Sc.(Ag).	Scientist(Sel.Gr.)	Horticulture
S.Chandar Rao, M.Sc.(Ag).	Scientist (Senior Scale)	Plant Pathology
B.L.Manjunath, M.Sc. (Ag).	Scientist	Agronomy
E.B.Chakurkar, M.V.Sc.	Scientist	Animal Reproduction
Satish Modak, Ph.D	Scientist	Agronomy
Mani Chellappan, Ph.D	Scientist	Agril. Entomology

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
K. Manikandan, Dip(Ag)	Training Assistant (T-4)	Agronomy
K.K.Metar, Dip (Ag)	Training Assistant (T-4)	Agrl. Extension
Premlatha Lade M.Sc.(Home Sci.)	Training Assistant (T-4)	Home Science

Administrative

T.K.N.Nambiar, M.A	Asst. Admn. Officer	
Lakshmi Kutty	Superintendent	
Sukumaran	Superintendent	
S.Sadashiva	Superintendent	

4.8 Transfers

Name and Designation	From	To	Date (w.e.f)
Dr.Mani Chellappan Scientist	I.A.RI New Delhi	ICAR Research Complex, Goa.	10.11.1993
Mr.T.K.N.Nambar	ICAR Research Complex, Goa.	CPCRI Kasaragod	17.03.1994
Mr.S.Sadashiva Superintendent	CPCRI, Regional Station, Vittal.	ICAR Research Complex,Goa.	14.03.1995

4.9 Appointments

Name	Post	Date of joining
Mr. Edgar Viegas	Village Attendant	31.5.1994
Mr. Erappa Chalawadi	Driver cum mechanic	29.6.1994

4.10 Voluntary Retirement

Name	Designation	Date of retirement
Sukumaran	Superintendent	31.01.1995

4.11 Promotions

Name	Promoted From	To	Date of promotion
Admnistrative			
Smt. Maria Teresa Nigli	Senior Clerk	Assistant	7.12.1994
Shri.Krishnanath R.Naik	Senior Clerk	Assistant	7.12.1994
Smt. Lizette C.Noronha	Jr.Stenographer	Stenographer	7.12.1994
Shri.Yeshodharan	Junior Clerk	Senior Clerk	7.12.1994
Shri Augustinho Fernandes	Junior Clerk	Senior Clerk	7.12.1994

Statement showing the total staff strength of ICAR Research Complex and KVK as on 31-3-95 and number of SC/ST amongst them.

Category	Post sanctioned			No. of employees in position			No. of Vacant posts			No. of SC employment	No. of ST employment
	MI	KVK	T	MI	KVK	T	MI	KVK	T		
1	2	3	4	5	6	7	8	9	10	11	12
Scientific	14	1	15	12	-	12	2	1	3	2	—
Technical	9	13	22	9	8	17	-	5	5	3	—
Administrative	4	3	7	4	3	7	-	-	-	2	1
Auxiliary	1	1	2	1	1	2	-	-	-	-	—
Supporting	25	3	28	25	3	28	-	-	-	3	—
Total	53	21	74	51	15	66	2	6	8	10	1

MI - Main Institute
KVK - Krishi Vigyan Kendra
T - Total

An additional 44 posts were sanctioned during VIII Plan period comprising seven scientific, 13 technical, 13 administrative, one Auxiliary and 10 supporting staff, for which recruitment process is initiated and the vacancies are being filled up.

4.12 Budget of the Institute for the year 1994-95

	Sanctioned RE (in rupees)	Actual Expenditure (in rupees)
Plan	55,50,000	55,38,000
Non-Plan	39,31,000	39,00,000
KVK	10,00,000	9,99,000
Total	1,04,81,000	1,04,37,926

4.13 Important Visitors

Dr. V.L. Chopra, Director General, ICAR, Krishi Bhavan, New Delhi.

Dr. K.L. Chadha, Deputy Director General (Hort.), ICAR, Krishi Bhavan, New Delhi.

Dr. P.Rethinam, Assistant Director General (P.C.), ICAR, Krishi Bhavan, New Delhi.

Dr. K.V.A Bavappa, Ex-Director, CPCRI, Kasaragod.

Dr. G.D. Radder, Director of Research U.A.S. Dharwad.

Dr. R.T. Gunjate, Professor & Head of Horticulture, K.K.V. Dapoli, MH.

Dr. V.T. Verghese, Ex-Director of Instruction & College of Fisheries (UAS), Mangalore.

Dr. I.G. Chavan, Ex-Head of Division of Animal, Sciences, MPKV Rahuri.

Dr. J.V. Goud, Ex-Vice Chancellor, U.A.S. Dharwad.

Dr. N.C. Hulamani, Director of Instruction, College of Horticulture UAS Dharwad.

Dr. S. Ray, Ex-Director of Animal Husbandry and Veterinary Services, Govt. of Goa.

Shri Ramalinga Reddy, IMC Member, Somajiguda, Hyderabad.

Shri D.G.Narvekar, Honourable Minister for Agriculture, Govt. of Goa.

Shri Krishna Kuttikar, Local M.L.A.,

Shri P.K. Desai, Director Agriculture, Govt. of Goa.

Shri S.V. Desai, Dy. Director (Agril), Govt. of Goa.

Shri V.V. Kulkarni, Dy. Director (Agril), Govt. of Goa.

4.14 Membership in Important Committees and Bodies

Dr. D G Dhandar
Member:
Local Advisory Committee of All India Radio, Panaji, Goa; Steering Committee of State Level Bankers, Goa: Management Committee of Sanjivani Sugar Factory, Usgao, Goa; State Level Co-ordination/Advisory Committee for sugarcane, Horticulture, Spices and Watershed Projects, Goa; Board of studies on Botany, University of Goa; Indian Society for plantation crops, Kasaragod and Horticulture Society of India, New Delhi; Indian Science Congress, Calcutta.

Dr K D Patil
Life member of the Indian Society for Plant Physiology.
Member of the Indian Society of Agricultural Science.
Member of the Association of Maharashtra Agricultural Research.
Member of the Indian Society for Coastal Agricultural Research.

Dr. A R Bhattacharyya
Founder member of ISSAR (Indian Society for the Study of Animal Reproduction)

Dr S Subramanian
Full member of Asian Fisheries Society, Manila, Philipines.

Dr. H M Wasnik
Life member of the Journal of the Maharashtra Agricultural Universities, College of Agriculture, Pune, Maharashtra.

Shri P A. Mathew
Life member of Indian Society for Plantation crops
CPCRI, Kasaragod, Kerala.
Life Member of the Horticultural Society of Indi, New Delhi.
Life member of the Indian Society for Root crops, CTCRI, Trivandrum, Kerala.
Member Agricultural sub-committee of the Goa Chamber of Commerce and Industry, Panaji, Goa.

Shri B L Manjunath
Life member for Indian Socierty of Weed Science.

Dr Mani Chellappan
a) Member of Pesticide Society of India, IARI, New Delhi.
b) Member of Entomological Society of India, IARI, New Delhi.

Shri Y V Gaonkar
a) Member of Botanical Society of Goa.
b) Member of Mushroom Society of India.

Shri H R Prabhudesai
a) Executive member of botanical Society of Goa.
b) Member of Indian Science congress.
c) Member of Deccan Sugar Technologist Association, (DSTA).

Smt. Sunetra MTalaulikar
Member of Nutrition Society of India, NIN, Hyderabad.

4.15 Participation in Seminar/Symposium/Workshop/Conference:

International Symposium on Plantation Crops, 30th November, to 3rd December, 1994 at CPCRI, Kasaragod.
D G Dhandar and P.A.Matthew

National Symposium on Agriculture in relation to Environment from 16-18 January, 1995 at IARI, New Delhi.
H M Wasnik and S Chander Rao

State level training cum workshop on National watershed development project for Rainfed areas (16-17, February, 1995) Goa.
B L Manjunath and D G Dhandar

All India Workshop on Agricultural Journalism and Editing from 19-23 September at FTC, organised by Directorate of Agriculture, Goa.
H R Prabhudesai and A V Nirmale

National Seminar on Cashew from 15-16 April, 1994 at NIO, Dona Paula.
D G Dhandar, V Y Gaonkar and P.A.Mathew

State Level convention on promotion of appropriate agro technologies for Goa of Bharat Jana Gyan Vigyan Jatha (BJGVJ) on 27th May, 1994 at Directorate of Archives, Goa.
H.R.Prabhudesai and V.Y.Gaonkar

Seminar on organic farming techniques in horticultural crops on 16th September 1994, organised by Lions Club of Quepem at Quepem.
V Y Gaonkar

Workshop on non-farm section enterprises on 25th January 1995, at Molkornem.
V Y Gaonkar

4.16 Lectures delivered

Lecture on recent developments in horticultural Crops (4-7-94) organised by KRIBHCO, Cuncolim.
V Y Gaonkar

Lecture on cashew production technology (29-3-95) organised by Lions Club of Bicholim at Hirabai Memorial Hall, Bicholim.
V Y Gaonkar

Lecture on Scientific Cultivation of Pulse and Oilseeds (10-2-95) at Sanquelim.
H R Prabhudesai

Special lecture on sugarcane ratoon management and fertilizer use (20-2-95) Sanquelim.
H R Prabhudesai

Special lecture and training programme for extension officials on.
Post harvest groundnut technologies (27-10-94)
Sugarcane ratoon management (12-10-94)
Organic farming (2-2-95)
Vermiculture biotechnology (26-2-95).
H R Prabhudesai

XIIth convention of Indian Society for Study of Animal Reproduction and National Symposium on Modern trends in Reproductive Health care for enhancing Livestock fertility and productivity, from 13-15th January, 1995 at PKV, Akola.
E B Chakurkar

State level conference on IPM at FTC, Old Goa, May, 1994.
Satish Modak and V Y Gaonkar

Lecture on Advanced technology for rice production under irrigated conditions (26-1-94 and 1-2-95) organised by ETC, Directorate of Agriculture, Goa.
B L Manjunath

Lecture on 'weed control' at ETC, Ela, Old Goa during November 1994.
Satish Modak

Lecture on 'Agronomic practices for rice' (26-10-94 & 1-2-95) at FTC,Ela,Old Goa.
Satish Modak

Special lecture on 'Technologies for groundnut and pulses at Veroda, Cuncolim (22-2-95).
H R Prabhudesai

Special lecture on 'sugarcane farming' at Sanquelim (16-2-95).
H R Prabhudesai

Special lecture on "Importance of nutrition" at inner wheel club, Ponda (15-1-1995).
Sunetra Talaulikar

Special lecture on Anganwadi worker at ACDLS's Anganwadi worker's training Centre, Alto Porvorim, Goa (24-3-1995).
Sunetra Talaulikar

4.17 Important meetings attended.

Divisional meeting of Horticulture Division (27-31, December, 1994 and 12-16 March, 1995) at ICAR Head Quarters New Delhi.
D G Dhandar

ICAR Regional Committee meeting (8th July 1994) at Bhopal.
D G Dhandar

Scientific panel meeting on Horticulture (5-6 July, 1994) at ICAR, New Delhi.
D G Dhandar

Horticulture Division meeting (7-9 November, 1994) at ICAR, New Delhi.
D G Dhandar

KVK Local Management Committee meeting (11 May, 1994), ICAR Research Complex, Goa.
The Chairman, Member Secretary of LMC, KVK Training Personnel, All Scientists, Farm Superintendent.

Fifth Staff Research Council Meeting, (17-18 June, 1994), ICAR Research Complex Goa.
Chairman SRC, outside experts, all Scientists; KVK Training Personnel, Farm Superintendent

Quinquennial Review Team meeting (11-13, November, 1994), ICAR Research Complex, Goa -
Chairman, members of QRT, all Scientists, KVK Training Personnel - Farm Superintendent.

State Level Review meeting on National Watersed Development Project for Rainfed Areas (1-2 June, 1994)
D G Dhandar and B L Manjunath

Meeting on tissue culture (8,June,1994) organised by Godrej Soaps Limited, Ponda.
V Y Gaonkar

Local Advisory Committee meeting (10, June, 1994) organised by All India Radio, Panaji.
V Y Gaonkar

Farmer's Meeting (14,December,1994) at Pilar, organised by NABARD).
V Y Gaonkar

Meeting on use of need based pesticides (23 January, 1995) organised by Godrej Soaps Limited at Directorate of Agriculture Panaji, Goa
D G Dhandar, and V Y Gaonkar

Meeting Cum special training for sugar factory personnel (12, January, 1995) at Sanjivani Sugar Factory Goa.
H R Prabhudesai

Farmer's Club meeting (6, February, 1995) organised by Bank of Maharashtra, at Cumbharjua.
H R Prabhudesai

Technical session on "Important poultry diseases and biosecurity measures in Poultry management organised by Goa Veterinary Association at Stockman Training Centre, Curti-Ponda. (4-2-1995)
E B Chakurkar and Avinash Nirmale

4. 18 Participation in Extension Oriented Programmes:

World Food Day (16, October, 1994) Organised jointly by ICAR Research Complex Goa and Department of Agriculture, at FTC Old Goa.
All KVK staff and Scientists.

Integrated Pest Management Field Day (27 October, 1994) at Sangolda
S Chander Rao, B L Manjunath

Kissan mela (12th June, 1994) Organised by Lions Club of Valpoi, at Navadya Vidyalaya. Valpoi.
V Y Gaonkar

Cashew Field Day (13-5-1994) at FTC, Ela, Old Goa organised by Department of Agriculture, Goa.
V Y Gaonkar

IPM Training programme at Saligao, Goa on 25th August, 1994
D G Dhandar, Chander Rao and B L Manjunath.

Ex-trainees convention of Krishi Vigyan Kendra at ICAR Research Complex, Ela Old, Goa (1-3-1995)
All KVK staff and Scientists.

Training programme on poly houses at FTC, Ela, Old Goa (22-12-1994)
V Y Gaonkar

Programmes in electronic media

(i) Radio (AIR) Panaji
Drip irrigation (English) April 13, 1994.
B L Manjunath

Sesbania rostrata - an ideal green manure for rice, April 17, 1994 (English)
Satish Modak

Kitchen garden for health and wealth, April 17, 1994 (Konkani) May 31, 1994
V Y Gaonkar

Cultural practices for rabi vegetables (Konkani) November 21, 1994.
V Y Gaonkar

Inter cropping in sugarcane (Konkani)
H R Prabhudesai

ii) Television (Doordarshan, Panaji)
Grafting techniques in cashew (Konkani) August 30, 1994.
V Y Gaonkar

Water for life - Panel discussion on World food day (Konkani) October 16, 1994
H R Prabhudesai.

4.19 Publications

(i) Review Articles:

Chander Rao, s and D G Dhandar 1995, Mushroom cultivation in Goa. *In Advances in Horticulture* 13 (405-411).

Dhandar, D G and Mathew, P A (1994) Horticulture in Western Ghats and coastal plains. *In conservation Horticulture on Alternative sustainable land use* organised by VIII International soil conservation organisation New Delhi.

Rao, P J and Mani (1994). Effect of botanicals on the reproductive biology of insects. *In Recent Advances in Chemical Ecology of phytophogons Insects* T N Anantha Krishnan Oxford and IBH New Delhi pp. 55-61

Subramanian S. (1994) Inland fisheries potential and its development in Goa. *In contributions to the Fisheries of Inland open water systems in India* part II. (Eds:4.19 Publications

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T N Anantha Krishnan Oxford and IBH New Delhi pp. 55-61

Subramanian S. (1994) Inland fisheries potential and its development in Goa. *In contributions to the Fisheries of Inland open water systems in India* part II. (Eds: K Manas, Das and P K Chakraborty) Inland Fisheries Society of India, Barrackpore pp 20-27.

(ii) Research Articles

Chander Rao, S Gaonkar, V Y and Dhandar, D G 1994. Utilisation of mushroom spawn as biodegradable agent for efficient recycling of paddy stubbles and enrichment of Soil. *In National Symposium on Agriculture in relation to environment* (16-188 Jan 1995) IARI, New Delhi.

Manjunath B L, Mishra P K, Rao J V and Subba Reddy, (1994) Water requirements of vegetables in dryland watersheds. *Indian J. Agri. Sci* **64**:845-846.

(iii) Paper presented in Symposia/Seminar/Workshop.

Mathew P A and Dhandar D G (1994). Two lesser known tree species of Goa. PLACROSYM, NRC Calicut.

Wasnik H M (1995) Change in nutrient status of soil and leaf samples of cashew *(Anacacardium occidentale L)* due to organic and chemical fertilizers under mine rejects soils off Goa. (Abatract) *In National Symposium on Agriculture in relation to Environment* 916-18 January, 1995) IARI, New Delhi pp. 52.

(iv) Popular articles

Gaonkar V Y and Dhander D G Water for Life (Marathi) Ggomantak Daily, October 19, 1994.

Gaonkar V Y and Dhandar D G Coconut cultivtion I (Marathi) Sahakar Surabhi February 1995.

Gaonkar V Y and Dhandar D G Coconut cultivation -II (Marathi) Sahakar Surabhi March, 1995.

Manjunath B L and Dhandar D G Water an indispensible resource for life - (English) Navhind Times daily, October 16, 1994

(v) Reports, proceedings, folders, training notes

D G Dhandar and Gaonkar V Y (1994) KVK Report for the Lok Sabha Secretariate, New Delhi. ICAR Research Complex for Goa (1994), Annual Report 1992-93. Eds: S Subramanian. H R Prabhudesai and Mani Chellappan: 76 p.

4.20 Trainings Undergone

23rd short term training programme on the use of computers in agriculture research at IASRI, New Delhi from April 1-15, 1994
Satish Modak.

State level training on the use of biofertilizers in Agriculture, organised by Regional biofertilizers Development Centre, Nagpur and Department of Agriculture, Goa at FTC, Ela, Old Goa (13-2-1995)
Satish Modak and H R Prabhudesai,

Subject Mater training (ARS) at I.A.R.I New Delhi from 19th April to 18th Oct. 1994.
Mani Chellappan

State level trainin cum workshop on water shed management at FTC, Old Goa 15-16 February 1995.
B L Manjunath V Y Gaonkar and H R Prabhudesai

Training programme on Agricultural Journalism at FTC, Ela, Old Goa, 19-22, September 1994.
V Y Gaonkar, A V Nirmale.

Training on pulse and oilseeds organised by Regional pulse Research Station at Raichur, Karnataka from 14-16, January 1995
H R Prabhudesai.

Training of trainers - An advanced training course at NAARM, Hyderabad from 6.17, November 1994.
A V Nirmale

4. 21 Participation in ICAR Zonal Sports meet:

A 12 member sports contingent of the Institute which won the Inter-Institutional football match held at Bhopal, participated in Inter zonal sports meet held at Jhansi from 4th October to 7th October 1994. The team was led by Shri Edward Crasto and Dr.Avinash Nirmale was the team manager.

In the Inter zonal football event, the Institute played against IARI, New Delhi in the semi-finals and won the match. In the finals, the Institute team played against CICFRI, Barrackpore and lost the game by 1-0, thus becoming Runners up at the Inter zonal level.

4.22 ORBITUARY

Dr N S Nair

Dr.N S Nair, Scientist Sl. Grade (Poultry Science) expired on 26-3-1995.
Dr.Nair, who was having M.V.Sc.degree in Poultry Science & NDPH from IVRI, Izatnagar. He joined the Agricultural Research service (ARS) in 1976 as Scientist. He was promoted to the Grade of Sr.Scientist (Selection Grade) in 1984. Among other things his ccontributions were development of hybrid layers for backyard poultry rearing in Goa, homeopathic remedies for Poultry diseases and introduction of duck and Japanese quials in Goa.
He is survived by his wife and two daughters.

Shri Nuno Chudu Karanzalkar

Shri Nuno who was born on 9-6-1962, joined the service during October 1986 as S.S.Grade I (Mazdoor). The Institute staff deeply mourn his untimely demise on 19-9-1994. He is survived by his mother and three brothers.

4.23 WEATHER DATA OF GOA

	Temperature °C			Relative humidity (%)		Rainfall (mm)	
	Mean Max.	Mean Min.	Mean	5.30 hr.	23.30 hr.	Normal	Actual
1994							
April	33.1	25.4	29.3	85	79	018.4	018.7
May	33.4	26.7	30.0	82	77	086.6	031.6
June	29.6	25.1	27.3	91	84	869.4	767.8
July	28.6	24.1	26.4	91	92	923.4	896.5
August	29.0	24.3	26.7	92	91	456.2	666.9
September	29.9	23.4	26.7	93	88	252.7	228.7
October	31.6	23.8	27.7	93	90	118.9	283.0
November	33.2	22.5	27.9	79	78	035.8	001.2
December	32.2	19.6	25.9	77	74	003.0	000.0
1995				8.30 hr	17.30 hr		
January	31.2	19.6	25.4	73	56	001.7	009.9
February	31.8	20.9	26.4	78	61	000.1	000.0
March	32.1	22.5	27.3	79	62	000.7	000.0