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1995-96



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

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ICAR RESEARCH COMPLEX FOR GOA

(Indian Council of Agricultural Research)

ELA, OLD GOA - 403 402, GOA, INDIA

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DIRECTOR

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DIRECTOR'S INTRODUCTION

The Indian Council of Agricultural Research established the ICAR Research Complex for goa during 1975 to meet the agricultural research needs of Goa region under the administrative control of ICAR Research Complex for North Eastern Hill Region, Shillong. The management and administrative control of this Institute was transferred to Central Plantation Crops Research Institute, Kasaragod, in 1976. The Research complex was elevated to the status of an independent Institute from April, 1989, to enable it to effectively cater to the evergrowing agricultural research, education and extension needs of the state. A Krishi Vigyan Kendra was established in 1983, to meet the transfer of technology requirements of the farming community.

Mandate

The mandate of the Institute 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 potential agricultural and horticultural crops, livestock and fisheries in relevance to agro-climatic situations of Goa.
2. To disseminate the improved technology developed.
3. To act as a centre for training in updated technologies.
4. To collaborate with national and international Institutes/Agencies in developing and transferring new technologies.
5. To generate nucleus planting materials.
6. To provide consultancy services.
7. To act as a repository of information on Western Ghat Agricultural systems.

Staff and Budget

The total staff strength of the Institute and KVK was 77 and the annual expenditure including Plan (49.77 lakhs), Non-Plan (40.58 lakhs) and KVK (26.31 lakhs) for the year 1995-96 was 116.66 lakhs.

Research Activities

There were 20 ongoing research projects during the year under report, comprising seven in Crop Science, five in Horticulture, five in Animal Science & Fisheries and three in Transfer of Technology. All the research projects were aimed at increasing agricultural productivity of the region.

Research Advisory Committee

To suggest research programmes based on thrust areas and to review the res achievements of the Institute, the Research Advisory Committee was constituted with from 9th March, 1995. The committee met on 9-10 May, 1996 and gave suitable sugge for strengthening the ongoing research programmes.

Staff Research Council

The annual meeting of Staff Research Council is being held to review the progr individual research projects of the previous year and to finalise the technical programr the ensuing year. The present Staff Research Council was constituted by ICAR, New with effect from 14th July, 1994 comprising of subject matter specialists from outsi Institute, representing major disciplines of research.

Institute Management Committee

To review the progress of infrastructure development and to approve the imp financial and administrative proposals of the Institute, the Institute Management Com has met thrice (17.6.1995, 24.11.1995 and 16.3.1996) during the period.

Local Management Committee

The Local Management Committee consisting of representatives of both gover and non-government organisations, met on 24.11.1995 and reviewed the progress activities of Krishi Vigyan Kendra and approved the technical programme for 1995-96.

Institute Joint Staff Council

To increase the co-operation between the management and the employees promote harmony and relationship amongst staff, the Joint Staff Council met twice duri period under report.

Collaboration with Development Agencies/Organisations

A close collaboration is maintained with State Departments of Agriculture, Husbandry and Fisheries, through active involvement of the officers in the joint meeti decide the work priorities. There is an active involvement of the experts from neighb Agricultural Universities and other ICAR Institutes dealing with crops and livestock o importance, in the major Institute meetings. The different State Level Committees cons by Government of Goa are also being represented by the Director/Officers of the In The practicing farmers, rural youth and the departmental staff are being trained regul various farm technologies. A close liaison is maintained with other organisatio NABARD, CADA, Sanjivani Sugar Factory, Central Integrated Pest Management C Margao etc. The Institute is participating in the agricultural programmes of AI Doordarshan, Panaji. The Institute has chalked out the joint research programme University of Agricultural Sciences, Dharwad, through Inter-Institutional collabo

esides, the scientists of the Institute are also participating in the academic activities of ighbouring Agricultural Universities, Goa University, Government Polytechnic etc.

brary

The Institute is subscribing to 22 foreign and 25 Indian journals and has a collection of 26 books and 514 back volumes. Besides, KVK has got books covering various aspects of gricultural production.

rengthening of Research Facilities :

In order to strengthen the ongoing research activities, some of the advanced analytical uipments like High Performance Liquid Chromatography (HPLC), Kjelplus nitrogen alyser and UV Spectrophotometer with computer attachment were installed. An AT 486 mputer system with E-mail facility was established at the Institute. During the year, an tomatic Weather Station was installed in the Institute's farm for recording different weather arameters under local agro-climatic conditions.

out this Report

This Annual Report of the Institute for the year 1995-96, briefly highlights the research hievements, report on the ongoing and completed projects. General information on the portant committees of the Institute, the staff and budget position, visitors to the Institute, ppointments, transfers, participation of scientists and training associates in different minar/symposium, their publications and the weather data of Goa is provided for reference.

(D. G. DHANDAR)
DIRECTOR

2. Research Highlights

I. Crop Science

Rice

Among the medium duration rice varieties, the variety MO-7 outyielded the other varieties yielding 5.1 t/ha followed by the ruling variety Jaya (4.90 t/ha) and Pusa - 205 (4.60 t/ha) during Kharif season although they were at par in their yields during Rabi season in a varietal evaluation trial.

Among the nine short duration varieties evaluated, the variety Tulsi performed better over other varieties with an yield of 5.60 t/ha during Kharif and 5.50 t/ha during Rabi which was relatively higher than the ruling variety Jyoti (4.40 t/ha in Kharif and 5.20 t/ha in Rabi). This was closely followed by another variety Annada (4.00 t/ha in Kharif and 6.00 t/ha during Rabi).

Among the fine grained scented rice varieties tried during Rabi season, the variety Indrayani outyielded all the other varieties registering an impressive yield of 7.00 t/ha as against 3.25 t/ha of the control variety, Ambe Mohar. The variety Pawana recorded the second highest yield (5.58 t/ha) while Pusa Basmati (M-127) yielded 3.14 t/ha.

In a field trial to screen the rice varieties for salt affected soils, the variety CSR-4 outyielded (3.12 t/ha) all the other varieties and was followed by Palghar-1 (3.03 t/ha) and CSR-10 (2.96 t/ha) as compared to the local variety Korgut (2.02 t/ha).

Sugarcane

Evaluation of sugarcane varieties for the local agroclimatic conditions, revealed that the varieties CO-90009 and CO are suitable from the point of thei yield as plant crop (140 to 146 t/h ratoon (89 to 95 t/ha) and second rat to 92 t/ha), per cent brix (16.5 to 19 per cent sugar recovery (6.86 to 10.2

In a field trial to optimis scheduling of irrigation water for sugarcane production through drip with different IW/CPE ratios, ir through drip system recorded re more cane height, number of inter cane girth, individual cane weight yield (103.46 t/ha) and Commercial Sugar (9.53 t/ha). Drip system recorded higher water use efficiency t/ha cm) and better quality of ca compared to furrow method of ir (0.98 t/ha cm). Scheduling of irrigatio IW/CPE ratio of 1.00 recorded re better growth and yield of cane both (111.77 t/ha) and furrow (103.40 irrigation methods, which also resu better quality of cane.

Pulses and Oil seeds

In a trial to identify suitable puls oilseed crops and their varieties f fallows, cowpea variety V-118 was more promising with desirable growt yield attributing characters, yield (5.50 and net returns (Rs. 8390/ha).

As many as 14 insect species recorded on pulse crops grown in th based cropping system. Among them, pod borer *(Helicoverpa armigera)* miner *(Aproaerema modicella)* and pod borer *(Etiella zinkenella)* were re in severe to moderate extent. Enviro friendly insecticides like *B thuringiensis* and neem formulations used to manage the pest of which *B thuringiensis* was found promising.

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ers

Red cotton bug *(Dysdercus ulatus)* and tobacco cut worm *odoptera litura)* were reared under ratory condition successfully for the ic studies.

Horticulture

shew

A germplasm of 70 accessions was ntained. Balli -2, an elite local accession, rded a nut yield of 3.35 kg/tree with an rage of 1.68 kg/tree over the last six rs, as compared to the corresponding ues of, 4.3 and 1.78 of V-4, a standard ck. Unlike V-4 (38 g apple weight), li-2 had good apple weight (79 g) which lso an important trait in view of the feni ustry in Goa. Among the introductions n other states, VTH-59/2, M-26/2 and -1600 showed good performance.

Field trials with the new liquid neem nulation, Neem Suraksha (0.03% adirachtin) at 6 ml/l, gave promising ults in the management of cashew tea squito bug *(Helopeltis antonii)*.

ngo

The performance of the seventy four ries of mango germplasm was recorded. e promising seedling selection "Cardozo nkurad' is being monitored for further dies. Colaco Branca (20.52 kg fruits/tree) a local accession, Amrapali, Neelgoa, -56 and Kesar (all introductions), orded good yield performance (53.9, 4, 40.9 and 24.4 kg fruit/tree, spectively) during the year.

getables

Two local varieties of brinjal viz., gassaim' (long fruited) and 'Taleigao' (round fruited) and three types of local waal (fleshy podded, red and black seeded) were collected for evaluation.

Oilpalm

Evaluation of five oilpalm hybrids planted in 1991, revealed non-significant differences in respect of growth and yield parameters.

Coconut

In a field study on the selection of crops and varieties for intercropping in coconut, turmeric (variety PCT-13) was found more profitable (Rs. 14,419/ha net returns) and followed by ginger (Rs. 5,719 /ha net returns) among the annual intercrops. Among the seasonal vegetables studied for intercropping, okra (Arka Anamika/ Parbhani Kranti) was found more profitable for both Kharif (Rs. 7,140/ha net returns) and summer season (Rs. 1,090/ha) while brinjal (local Agassaim) was found more suitable for Rabi season (Rs. 12,060 y/ha). The per cent transmission of Photosynthetically Active Radiation (PAR) through the coconut canopy found to vary from 46 to 59 per cent of the open light conditions, depending on the season. Study on the shade tolerance of different intercrops indicated that pineapple and ginger were more shade tolerant and among the seasonals, brinjal was found more shade tolerant and was followed by okra and cluster beans.

III. Animal Sciences

Pig

In a study on cross bred pigs to find out appropriate age of marketing, the average litter size was more (9.5) in Landrace cross with more still births (2.0) as

compared to Yorkshire cross bred (litter size-5 and still births-nil). Similarly, the average birth weight (0.91 kg) and body weight at 12th week (9.5 kg) were more in Landrace cross as compared to Yorkshire cross (0.86 kg at birth and 8 kg at 12th week).

In another study on induced oestrous in different breeds, litter size at birth and weaning were 6.5 and 6.0 when it was natural oestrous, 5.5 and 4.5 when induced by Prostaglandin and 9.2 and 7.2 when induced by Prostaglandin and P.M.S.G. in combination.

Rabbit

In a study on litter size, with prostaglandin treatment and mating at different post partum intervals, all rabbits exhibited oestrous with average litter size of 4.0 and litter size improved by mating on the day of kindling.

Use of urea and molasses as additives for biodegradation of by- products with *Pleurotus,* increased the lignin degradation, as compared to other treatments. *Pleurotus* fermented cashew waste increased the digestability by eight per cent when incorporated in rabbit feed.

IV. Fishery Science

Under rice-freshwater prawn integration trial, the seeds of the rice variety Vyttila-1 identified for the combination were raised during Kharif 1995, with an yield 3.8 t/ha.

A small scale fish and prawn feed pelletizer was fabricated.

Under the project on the use of neembased pesticide in the eradication of weed fishes, nine species of local freshwater weed and carnivorous fishes were identified. The preliminary trial that at lower levels, neem cake did n any effect on the air breathing fish.

V. Transfer of Technology

During the year, the Krishi Kendra organised 79 skill oriented programmes under the disciplines Science, Horticulture, Animal S Home Science and Plant protection a participants comprising of three cat viz; practicing farmers and farm rural youths and grass root level ex functionaries were trained.

The courses like vermi groundnut technology, organic f mushroom cultivation, cashew and grafting, rabbitry, poultry and lo nutritious receipes had very good re Some of the trainees have started th enterprise like nursery, vermicom etc.

Under Lab to Land Prog during the year, 119 farm familie adopted by conducting a survey and based on need, were identifie supplied. The demonstration wit yielding variety rice (Annada) with critical inputs, registered an yield in of about 60 per cent over ruling varie whereas in case of groundnut, the Dh - 3-30 registered an impressive 76 per cent over the control variety under residual soil moisture condition

Similarly, improved varieti vegetables (viz. okra, raddish and beans) registered an increase of ab per cent over traditional varieties.

National demonstration, was co at Nerul village to demonstra profitability of a three crop se comprising of monocrop (rice), doub

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p (rice), double c

e- groundnut) and multiple crop
e-groundnut-cowpea) which showed the
sibility of raising three crops sequence
ugment farm family income.

Under the Client oriented Research
gramme, 38 families belonging to SC
mmunity were surveyed in poor resource
up and two models consisting of animal
s (poultry) and metallic chullas were
ntified as critical inputs and supplied.

Under Problem oriented Research,
farm families with field problems were
ntified and problems like protein calorie
nutrition in children, agalactia in rabbits
, were researched into.

The officers of the Institute and KVK
e participated in farmer's meetings organised by State Agriculture Department and offered technical advice, training, etc., under the centrally sponsored watershed programme.

Under the Front Line Demonstration on groundnut, 10 ha area was covered in Mencurem village of Bicholim Taluka covering 60 farmers. The results showed 73.2 per cent yield increase with application of gypsum and recommended package of practices.

During the year under report, the KVK organised one Kisan Mela, two field days, one Mahila Mandal meeting, eight film shows, three exhibitions, four radio talks, three Doordarshan programmes and prepared eight training notes.

3. Report on ongoing Projects

3.1 CROP SCIENCE

1. Screening of rice varieties suitable for Goa.

(H R Prabhudesai, S Modak)

With an objective to recommend a suitable alternative variety to replace the ruling medium duration variety, Jaya and short duration variety, Jyoti, the work of evaluating the performance of different varieties was taken up. The selection of varieties was made based on the performance recorded for last five years. Similarly, a new set of nine short-duration varieties was also evaluated. In the third set of fine grained scented group, four varieties evaluated during 1994-95 was continued.

All the three sets of experiments were conducted in a Randomised Block design, with a plot size of $10m^2$. Standard agronomic practices were followed in all the trials. The observations in respect of growth and yield contributing characters such as (1) height of plant (cm) (2) total number of tillers (3) number of productive tillers (4) length of panicle (cm) (5) number of grain panicle (6) no. of chaffy grains/panic panicles/m^2 (8) 1000 grain weight a yield/ha was recorded in all the three s trials.

In the medium duration group varieties were evaluated with replications during Kharif 1995. The r indicated that the variety MO-7 wa highest yielder (5.1 t/ha) followed b ruling variety Jaya (4.9 t/ha) and Pusa (4.6 t/ha). The varietal difference in was found to be statistically significa general there was a good corre between the various yield contri characters such as number of prod tillers, number of grains/panicle, len panicle, 1000 grain weight, and the yield (Table 1)

Among the nine short du varieties evaluated during Kharif 199 three replications, the variety outyielded other varieties with an yi 5.58 t/ha which was significantly highe the ruling variety Jyoti (4.42 t/ha). was good correlation between the v yield contributing characters and the yield (Table 2)

Table 1. Performance of medium duration rice varieties during Kharif 1995.

Variety	Plant height (cm)	Length of Panicle (cm)	Average number of tillers per hill	Average number of panicles per m^2	1000 grain wt (gm)	Yield (t/ha)
Jaya	101.0	22.3	11.8	597.6	31.5	4.9
Pusa - 205	92.4	23.9	12.5	582.4	30.3	4.5
CO - 44	91.9	22.3	11.8	603.6	28.3	4.6
Sarjoo - 52	92.2	22.6	12.3	615.0	31.2	4.4
MO - 7	98.6	25.3	12.6	654.4	30.6	5.1
SEM ±	0.67	1.09	0.97	8.15	0.23	0.1
C.D. (P=0.05)	0.75	0.30	0.82	11.52	0.32	0.14

In the third set of scented varieties, four varieties were evaluated with five replications. The results showed that the tillers, length of Panicle, number of filled grains, 1000 grain weight and the grain yield (Table 3). The much desired aroma

Table 2. Performance of short duration rice varieties during Kharif 1995.

Variety	Plant height (cm)	Length of panicle (cm)	Average number of panicles per m^2	Average number of productive tillers	Average number of grains per panicle	1000 grain wt (gm)	Yield (t/ha)
Annada	96.9	21.3	681.6	15.2	104.5	29.5	4.00
Vikas	98.6	23.4	909.3	14.7	102.9	28.1	4.16
Abhaya	98.2	19.4	896.0	14.5	103.8	25.2	3.67
Aditya	114.6	19.1	503.2	10.2	104.5	29.0	4.17
Jyoti	96.7	22.7	621.6	10.8	107.6	28.4	4.42
Prasanna	114.3	21.9	644.4	12.5	80.8	26.5	1.33
Tulsi	101.1	23.2	665.3	18.9	125.6	25.8	5.58
Ravi	111.7	23.5	610.6	12.8	88.5	26.5	3.03
Sasyashree	98.3	28.0	710.1	13.5	107.1	27.9	2.42
SEM ±	1.29	1.79	38.81	0.44	1.45	0.63	0.19
C.D. (P=0.05)	2.12	5.30	116.4	1.31	4.36	2.32	0.56

variety Pusa Basmati-1 (M-127) recorded significantly higher yield (3.24 t/ha) than the other varieties viz. Basmati - 370 (2.43 t/ha) and Basmati-385 (2.36 t/ha). There was a positive corelation between yield characteristics like number of productive

was also found satisfactorily in the grain indicating good prospects of these varieties.

During Rabi season of 1995-96, all the three sets of trials were repeated. However, in the short duration group, the number of varieties was reduced to seven

Table 3. Performance of fine grained/scented rice varieties during Kharif 1995.

Variety	Plant height (cm)	Length of panicle (cm)	Average number of panicles per m^2	Average number of productive tillers	Average number of grains per panicle	1000 grain wt (gm)	Yield (t/ha)
M-102	101.6	23.3	724.5	16.4	144.7	24.4	2.36
M-108	101.0	23.6	945.9	20.4	133.4	24.5	2.43
M-109	113.7	24.7	700.2	14.3	127.4	24.3	2.17
M-127	100.7	26.1	985.3	20.8	162.8	25.1	3.34
SEM ±	0.54	0.34	19.6	0.65	3.16	0.09	0.87
C.D (P=0.05)	1.29	2.27	60.9	2.01	9.75	0.26	0.19

by rejecting two poor yielders. An additional local scented variety Ambe Mohar was included in the scented group as control in addition to two new varieties viz., Indrayani and Pawana obtained from RRS Wadgao, Pune making the total to seven with three replications.

The results were however found to be n significant (Table 4).

Among the seven short durati varieties, the variety Annada (IET- 6233) c yielded all the other varieties with 6 t/ followed closely by Tulsi (5.5 t/ha). T locally popular variety Jyoti stood third (5

Table 4. Performance of medium duration rice varieties during Rabi 1995-96

Variety	Plant height (cm)	Length of panicle (cm)	Average number of productive tillers	Average number of panicles per m^2	Average number of grains per panicle	1000 grain wt (gm)	Yield (t/ha)
Jaya	98.0	20.7	18.5	679.6	164.9	30.6	5.1
Co - 44	84.5	21.6	16.3	604.3	151.9	28.4	4.8
Pusa - 205	92.4	21.0	15.2	606.3	151.2	30.0	4.9
Sarjoo-52	95.4	21.7	14.3	678.6	146.8	30.1	5.1
MO - 7	88.6	21.6	13.2	598.3	152.2	28.6	4.9
SEM ±	0.47	0.15	0.97	12.85	0.33	0.21	0.12
C. D (P = 0.05)	0.67	0.16	0.82	18.18	0.47	0.30	0.17

Table 5. Performance of short duration rice varieties during Rabi 1995 - 96

Variety	Plant height (cm)	Length of panicle (cm)	Average number of productive tillers	Average number of unpro-ductive tillers	Average number of grains per panicle	1000 grain wt (gm)	Yield (t/ha)
Aditya	79.8	18.5	22.1	1.5	104.5	23.6	2.75
Vikas	85.8	25.8	19.9	1.2	106.4	26.2	3.83
Abhaya	84.6	21.3	22.0	1.6	103.8	24.6	4.67
Ravi	95.4	23.6	18.8	0.7	93.2	26.2	3.91
Jyoti	79.5	19.6	23.0	0.3	100.6	27.3	5.20
Tulsi	88.1	21.6	22.5	1.8	119.8	23.9	5.50
Annada	85.9	21.7	26.2	0.8	120.8	29.0	6.00
SEM ±	1.61	0.78	1.75	0.49	9.56	0.07	0.24
C.D. (P=0.05)	4.36	2.42	5.39	1.50	29.46	0.23	0.71

In the medium duration varietal trial, the control variety Jaya yielded highest (5.1 t/ha) closely followed by MO-7 (5.05 t/ha). t/ha). The results however were found to non- significant. (Table 5).

In the third trial on scented fine grained varieties, the variety Indrayani gave significantly higher yield (7 t/ha) as against the control grain/panicle, 1000 grain weight and the grain yield (Table 6).

Table 6. Performance of fine grained/scented rice varieties during Rabi 1995-96

Variety	Plant height (cm)	Length of panicle (cm)	Average number of productive tillers	Average number of panicles per m^2	Average number of grains per panicle	1000 grain wt (gm)	Yield (t/ha)
M-127	100.3	25.3	25.8	971.0	174.0	21.5	3.14
M-108	107.2	27.3	19.6	952.6	156.4	20.0	2.33
M-109	131.9	26.0	22.9	747.3	163.4	20.0	2.83
M-102	103.4	29.3	21.7	768.0	150.1	18.0	2.16
Ambe Mohar	139.3	26.4	21.4	632.0	193.4	21.6	3.25
Indrayani	100.2	24.0	27.2	1014.0	248.0	20.8	7.16
Pawan	95.8	23.6	23.7	928.0	150.4	21.6	5.58
SEM ±	1.45	0.50	1.68	27.01	9.56		
C.D. (P=0.05)	4.48	1.56	5.18	83.8	29.46		

variety Ambe Mohar (3.25 t/ha). Another scented variety Pawana stood second with an yield level of 5.58 t/ha. The variety Basmati-385 stood third with an yield level of 4.25 t/ha.

The results showed good correlation between the number of productive tillers, length of panicle, number of filled

2. Screening of Salt tolerant rice varieties

(H M Wasnik)

An experiment with seven salt tolerant rice varieties i.e., CSR- 4, CSR-10, Palghar-1, Panvel-1, Panvel-2, CO-43 and Korgut, was conducted on farmer's field at Mayem, during the Kharif season of 1995-96, in a randomised block design with

Table 7. Performance of salt tolerant rice varieties during Kharif 1995

S. No.	Variety	Plant Ht (cm)	No. of tillers	Panicles/ m^2	1000 grain wt (g)	Yield t/ha
1.	CSR-4	88.4	6	285	25.4	3.12
2.	CSR-10	84.2	6	278	24.9	2.96
3.	Palghar-1	86.4	7	282	25.2	3.03
4.	Panvel-1	83.5	6	270	24.4	2.49
5.	Panvel-2	78.4	7	280	23.8	2.64
6.	Co-43	82.5	5	288	29.1	2.78
7.	Korgut	138.0	4	225	22.8	2.02
	C.D. (P = 0.05)	7.4	1.4	23	1.4	0.62

three replications. The results indicated that variety CSR-4 out yielded (3.12 t/ha) all the other varieties followed by Palghar-1 (3.03 t/ha) and CSR-10 (2.96 t/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 (Table 7).

3. Evaluation of high yielding varieties of sugarcane.

(H M Wasnik and B L Manjunath)

There were three varietal trials in the project, during the year under report.

First Trial :

This particular varietal trial was planted in January 1993 and harvested as second ratoon in January 1996 with 13 latest released varieties especially suited for peninsular coastal region of Western Gha The data revealed that the sugarca variety CO-90006 showed an excelle performance by recording an yield of 92 t/ with 17.60 per cent Brix and 8.25 per ce sugar recovery, followed closely by t more varieties namely CO-90009 recordi an yield level of 90 t/ha with 16.32 per ce Brix and 7.29 per cent sugar recovery; a variety CO - 90010 recording cane yield 88 t/ha with 17.35 per cent Brix and 9. per cent sugar recovery (Table 8). general there was a good relationship w source of the yield contributing charact such as girth, height and weight of cane a the cane yield.

Second Trial :

In all there were eight variet planted in January 1994 and the harvest was done for its first ratoon during Janu 1996. The results indicated that

Table 8. Performance of sugarcane varieties as second ratoon during 1995 - 96

S. No	Variety	Ht. (cm)	Wt. (kg.)	Girth (cm)	Brix (%)	Yield (t/ha)	Recove
1.	CO-90002	2.64	2.25	2.55	17.75	75	8.37
2.	CO-90004	2.72	2.02	2.30	18.25	65	9.07
3.	CO-90005	3.05	2.30	2.30	18.20	67	8.21
4.	CO-90006	3.10	2.37	2.44	17.60	92	8.25
5.	CO-90007	2.62	2.15	2.72	17.12	72	8.18
6.	CO-90008	3.25	2.72	2.42	16.15	72	6.85
7.	CO-90009	2.42	2.66	2.52	16.32	90	7.29
8.	CO-90010	2.47	2.54	2.20	17.35	88	8.03
9.	CO-8371	2.56	1.65	2.37	17.72	73	8.12
10	CO-85134	2.55	1.51	2.35	16.80	72	7.45
11.	CO-89018	2.85	2.38	2.74	17.42	75	8.60
12.	CO-86141	1.97	1.72	2.29	18.70	74	8.88
13.	CO-85135	2.78	2.33	2.21	20.20	73	10.59
	C.D. (P=0.05)					12.56	

garcane variety CO-90009 out yielded
t of the varieties by recording the highest
ld of 95 t/ha with 19.72 per cent Brix and
2 per cent sugar recovery. This was
lowed by the variety CO-85061 recording
yield level of 90 t/ha with 19.20 per cent
x and 9.71 per cent sugar recovery. The
rd variety CO-90006 recorded an yield
el of 89 t/ha with 18.12 per cent Brix and
21 per cent sugar recovery (Table - 9). In
neral there was good relationship with
urce of the yield contributing characters
like girth of cane, height of the cane, weight of the cane and yield of sugar cane.

Third Trial :

The best eight sugarcane varieties with high sugar content namely CO-7527, CO-89018, CO-90009, CO-740, CO-90006, CO-8041, COC-671 and CO-85061 were planted during January 1995 and harvested in January 1996. The results indicated that the sugarcane variety CO-90009 out yielded all the varieties by recording the highest

ble 9. Performance of sugarcane varieties as first ratoon during 1995-96

No	Variety	Cane ht (m)	Wt. of cane (kg.)	Girth (cm)	Brix (%)	Yield (t/ha)	Recovery (%)
	CO-90006	3.22	2.95	2.46	18.12	89	10.21
	CO-90009	2.66	2.75	2.42	19.72	95	9.82
	CO-85314	2.67	2.25	2.55	18.72	68	9.33
	CO-85016	3.06	2.00	2.60	19.20	75	9.91
	CO-86141	2.81	1.92	2.52	19.20	75	9.03
	Kolhapur	2.77	1.93	2.12	17.52	73	7.71
	CO-85061	3.20	2.10	2.22	19.20	90	9.71
	84WL22	2.74	1.90	2.19	15.19	62	6.28
	C.D. (P=0.05)					17.53	

ble 10. Performance of plant sugarcane during 1995-96

No	Variety	Cane ht (m)	Wt. of cane (kg.)	Girth (cm)	Brix (%)	Yield (t/ha)	Recovery (%)
	CO-740	2.20	1.17	2.18	20.87	112	11.21
	CO-7527	3.25	2.27	3.26	18.80	138	9.03
	CO-85061	2.67	2.07	2.24	17.20	125	7.70
	CO-8014	2.77	1.70	2.65	19.20	115	9.73
	CO-617	3.02	1.70	2.46	18.20	60	7.99
	CO-89018	3.00	2.17	2.87	20.50	120	10.66
	CO-90006	3.16	2.27	2.56	18.50	140	8.86
	CO-90009	2.82	2.33	2.70	20.30	146	10.26
	C.D. (P=0.05)					13.65	

plant cane yield of 146 t/ha with 20.30 per cent sugar recovery. This was followed by another sugarcane variety CO-90006 recording an yield level of 140 t/ha with 16.50 per cent Brix and 6.86 per cent recovery. The third variety CO-7527 also showed a good performance recording an yield level of 138 t/ha with 18.80 per cent Brix and 9.03 per cent of sugar recovery (Table 10).

4. Studies on water management in sugarcane

(B L Manjunath, Satish Modak)

With a view to optimise the scheduling of irrigation water for sugarcane production, the trial was continued during the year in ratoon sugarcane. The trial included evaluating the feasibility of drip irrigation over furrow irrigation with three irrigation schedules based on irrigation water depth to cumulative pan evaporation ratios of 0.5 (I_1), 0.75 (I_2) and 1.00 (I_3).

The pan evaporation during period recorded the highest (5.50 mm in May month and the lowest in Nove (3.0 mm/day). The rainfall distribution d the year showed a unimodal distributi its peak during July with a water d period of seven months during the (Table 11).

The growth and yield contrib characters of sugarcane were significantly influenced by irrig treatments. However, the drip irrig method has recorded relatively more height (2.49 m), number of internodes girth of cane (8.8 cm) and individual weight (1.27 kg/cane) as compare furrow method of irrigation (2.28 m, 22, cm and 1.05 kg/cane respectively). An the different irrigation levels, I_3 (IW/C 1.00) recorded relatively higher growth yield parameters both in drip and fu irrigation (Table 12).

Table 11. Water budgetting for different months during the year :-

Month	Av. Pan evaporation (mm/day)	Monthly Pan evap. (mm)	Actual Rainfall (mm)	Water defic (mm)
January	3.70	114.7	0.0	-114.7
February	4.60	133.4	0.0	-133.4
March	4.70	145.7	0.0	-145.7
April	5.10	153.0	2.3	-150.7
May	5.50	170.5	35.4	-135.1
June	4.25	127.5	785.2	+657.7
July	3.63	112.5	1526.1	+1413.6
August	3.31	102.6	737.9	+635.3
September	3.15	94.5	200.2	+190.7
October	3.08	95.5	252.4	+156.9
November	3.00	90.0	6.2	-83.8
December	3.30	103.8	0.0	-103.8

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and individual c
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tion (2.28 m, 22, 8
respectively). Am
levels, I_3 (IW/CP
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in drip and fur

Water deficit (mm)
-114.7
-133.4
-145.7
-150.7
-135.1
+657.7
+1413.6
+635.3
+190.7
+156.9
-83.8
-103.8

ble 12. Growth and yield contributing characteristics of sugarcane as affected by irrigation treatments :

igation ethod / vel		Height of cane (m)	No. of internodes	Girth of cane (cm)	Weight of cane (kg)	Millable canes (000 / ha)
	I_1	2.22	23	8.16	1.01	36.66
rip	I_2	2.46	24	8.50	1.05	38.70
	I_3	2.79	25	9.75	1.15	44.63
ean		2.49	24	8.80	1.27	40.00
	I_1	2.31	23	7.83	0.83	43.89
rrow	I_2	2.25	21	8.42	1.18	49.44
	I_3	2.29	23	9.08	1.18	47.04
ean		2.28	22	8.44	1.05	46.79

test: NS $I_1 : \frac{IW}{CPE} = 0.5$

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

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

able 13. Sugarcane yield and water use efficiency as affected by irrigation treatments :

rrigation method level		Irrigation water used (cm)	Yield (t/ha)	C.C.S (t/ha)	W.U.E (t/ha cm)
	I_1	50	88.98	8.09	1.78
Drip	I_2	75	102.32	8.74	1.36
	I_3	100	111.77	11.77	1.12
Mean		75	101.02	9.53	1.35
	I_1	50 + 20.5*	92.00	5.66	1.30
Furrow	I_2	75 + 30.75*	107.54	9.58	1.02
	I_3	100 + 41.00*	110.65	9.91	0.78
Mean		75 + 30.75*	103.40	8.38	0.98

F' test: NS $I_1 : \frac{IW}{CPE} = 0.5$

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

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

* Water lost in conveyance

Table 14. Quality parameters of sugarcane as affected by irrigation treatments:

Irrigation method / level		Brix (%)	Pol (%)	Purity (%)	Recov (%)
Drip	I_1	18.45	16.56	89.76	9.0
	I_2	17.92	15.81	88.23	8.5
	I_3	20.37	18.54	91.02	10.5
Mean		18.91	16.97	89.67	9.3
Furrow	I_1	15.42	12.53	81.26	6.1
	I_2	18.72	16.32	87.18	8.9
	I_3	18.32	16.37	89.36	8.9
Mean		17.49	15.07	85.93	8.0

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

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

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

Although the millable canes were relatively low in drip irrigation (40,000/ha) as compared to furrow irrigation (46,790/ha), the differences in cane yield were not significant, the drip method yielding 101.41 t/ha and the furrow method 103.46 t/ha. Among the irrigation levels I_3 recorded relatively more cane yield in drip (111.77 t/ha) and furrow (103.4 t/ha) irrigation. The commercial cane sugar followed a similar trend to that of cane yield.

Water use efficiency (WUE) was found to be significantly higher with drip system owing to savings in water conveyance accounting to nearly cent to produce similar cane yield as furrow irrigation. Among the irrigation I_1 (IW/CPE = 0.5) recorded relatively WUE (Table 13).

All the quality parameter sugarcane viz. POL, Brix, purit recovery per cent were more wi irrigation as compared to furrow irri Similarly fixing irrigation at higher I ratio (1.00) recorded better parameters (Table 14).

reatments:

Recovery (%)
9.09
8.54
10.53
9.39
6.15
8.91
8.95
8.00

ng to nearly 41 p
cane yield as that
g the irrigation leve
rded relatively high

ty parameters
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ere more with d
to furrow irrigatio
n at higher IW/CP
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PLATE 1



Fig 1 : Pusa Basmati - 1 (M-127), a fine grained scented rice variety for Goa.



g 2 : Tulsi - a promising short duration variety of rice for Goa.



Fig 3 : Pigeonpea - a promising pulse crop for rice fallows.



g 4 : *Helicoverpa armigera* - a serious pest of pigeonpea.

Studies on rice based cropping ystem for evaluation of cowpea, green am, pigeonpea and groundnut

(Satish Modak, B L Manjunath)

In a field trial to identify suitable pulse id oilseed crops and their varieties for rice llows, four pulse crops viz. cowpea arieties V-118 and local Alsano), eengram (varieties Pusa baisaki and S-16) Blackgram (varieties T-9 and K-3) d Pigeonpea (varieties ICPL-27, ICPL-87, 31 and DT-7) and one oilseed crop viz. oundnut (varieties DH 3-30 and DH-40) ere grown after a short duration rice ariety Annada) under residual soil oisture conditions.

The cowpea variety V-118 was found ore promising with many desirable aracters like short duration, determinate wering, higher branching habit (6 primary d 12 secondary) more number of pods r plant (20) resulting in higher grain yield 55 Q/ha) as compared to local Alsano 80 Q/ha) although the latter had higher st weight (20 gm) and haulm yield (600 ha).

Among the pigeon pea varieties, riety S-31, found more adaptable to local ro-climatic situations with higher plant ight (63 cm), more number of pods per plant (69) seeds per plant (115) and higher 100 seed weight (9 gm) leading to an yield of 2.64 Q/ha as compared to other varieties (Table 15).

Although the green gram varieties (Pusa baisaki and PS-16) are of shorter duration, their yield potential was found to be low (0.69 and 0.42 Q/ha respectively).

Among the two varieties of blackgram, variety K-3 found to yield better (4.17 Q/ha) as compared to variety T-9 (3.47 Q/ha).

The groundnut variety DH 3-30 found to have more number of pods per plant, pod weight, pod yield (4.77 Q/ha) with good shelling percentage as compared to variety DH-40.

Among the crops and varieties tested, cowpea variety V-118, found to give higher net returns (Rs. 8390/ha) and was followed by blackgram variety K-3 (Rs. 6815/ha). Although groundnut is a suitable crop for rice fallows, the crop recorded lower yields during the year owing to moisture scarcity at pod filling stage. Among the pigeonpea varieties, variety S-31 found remunerative (Rs. 4,600/ha net returns) as compared to other varieties tested. However, green gram was found not remunerative. (Table 16)

ble 15. Growth and yield contributing characters in different varieties of Pigeonpea

ariety	Plant ht (cm)	Branches / Plant	Fruited branches / plant	No. of pods /plant	No. of seeds / plant	100 seed wt (g)	Yield (Q/ha) Pod	Grain
-31	63.0	14	11	69	115	9.0	4.44	2.64
T-7	53.0	15	13	64	94	7.0	2.78	1.62
CPL-87	48.3	12	10	46	69	8.0	3.47	2.23
CPL-27	43.3	11	10	33	39	6.6	2.92	1.83

Table 16. Yield and economics of pulse and oilseed crops in rice fallows

Crop / Variety	Yield (Q/ha)	Gross * returns (Rs. / ha)	Cost of cultivation (Rs. / ha)	Net return (Rs / ha)
Groundnut				
DH - 3-30	4.77	6678	3000	367
DH - 40	4.05	5670		267
Greengram				
Pusa baisaki	0.69	1380	1400	-2
PS-16	0.42	840		-56
Blackgram				
K-3	4.17	8340	1525	681
T-9	3.47	6940		541
Cowpea				
V-118	5.55	9990	1600	839
Alsano	1.80	4500	1875	262
Pigeonpea				
S-31	2.64	6600		460
DT - 7	1.62	4050	2000	205
ICPL - 27	1.83	4575		257
ICPL - 87	2.23	5575		357

*** Saleable price of produce ":**

Groundnut	: Rs. 14/kg
Greengram	: Rs. 20 / kg
Blackgram	: Rs. 20 / kg
Cowpea	: Rs. 18 / kg (V-118)
	: Rs. 25 / kg (Alsano)
Pigeonpea	: Rs. 25 / kg

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

(Mani Chellappan and Chidananda Prabhu)

i) Survey, surveillance and monitoring of insect pests of pulses

Out of the total 14 insect species recorded (Table 17) on pulses, pulse podborer *(Helicoverpa armigera)*, leaf miner *(Aproaerema modicella)* and spiny pod borer *(Etiella zinkenella)* have occured in severe to moderate intensity; *H.arm* was particularly severe on red gram. from the insect pests, some of Hymenopteran parasitoids were noticed.

ii) Use of eco-friendly insecticides management of pulse pod borer *(H verpa armigera)*

Field trial was conducted during 1995-96 using biopesticide *(B thuringiensis)* and neem formulations

ows

	Net returns (Rs / ha)
n	
0	3678
	2670
0	-20
	-560
5	6815
	5415
0	8390
5	2625
	4600
0	2050
	2575
	3575

ble 17. Survey, surveillance and monitoring of insect pests of pulses and their natural enemies.

ame	Scientific name	Family
af hopper	*Empoasca kerri* Pruthi	Cicadellidae
hid	*Aphis craccivora* Koch.	Aphididae
hitefly	*Bemisia tabacii* G.	Aleyrodidae
d bug	*Clavigralla gibbosa* Spinola *Clavigralla horrens* Fb. *Riptortus pedestris* (L) *Annoplocnemis phasiana* Fb.	Coriedeae
rips	*Frankliniella schultzes* (Tryb.)	Thripidae
ing bug	*Coptosoma cribrarium* (Fb.) *Nezara viridula* Linn.	Pentatomidae
afminer	*Aproaerema modicella* Dev.	Gelichiidae
iny podborer	*Etiella zinkenella* Treit	Pyralidae
ume moth	*Exelastis atomosa* Meys.	Pterophoridae
ue butterfly	*Lampides boeticus* Linn.	Lycaenidae
d borer	*Helicoverpa armigera* (Hb.)	Noctuidae
d fly	*Melanagromyza obtusa* M.	Agromyzidae
wel beetle	*Sphenoptra parotetti* G.	Buprestidae
ite	*Aceria cajani* Channa.	Eriophyidae
atural Enemies	*Bracon* sp. *Apanteles* sp. *Trichogramma* sp. *Tetrastichus* sp.	

intensity; *H.armig*
e on red gram. A
ests, some of
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y insecticides in
se pod borer (*He*

conducted during
iopesticide (*Bac*
m formulations for

anagement of *H. armigera* on redgram. he experiment was laid out in RBD with ree replications.

Neem formulations [Neem Suraksha, leem Gold and Godrej Achook, all having qual concentration of azadirachtin (0.03%)] nd *Bacillus thuringiensis* were used in the tudy. The bio-efficacy was compared with the recommended chemical insecticides, endosulfan and monocrotophos. Treatments were given during flowering-pod initiation stage and 20 days thereafter and the observations were recorded on the per cent pod infestation.

Results have shown that chemical insecticide, endosulfan, at the

recommended dose was the most effective (23.37% infestation) in controlling the attack followed by monoctotophos and *Bacillus thuringiensis* (31.40 and 35.10% respectively) treatments (Table 18). An additive effect was observed in the *Bacillus thuringiensis* + neem formulation combinations. Among the neem formulations, Neem Suraksha (@ 0.5%) has performed well.

(Spodoptera litura) were reared u laboratory conditions on cotton seed castor leaves respectively. The total cycle of the test insects last for 38 an days respectively. (Table 19a & 19b). insect species were found to be idea mass culturing.

Table 18. Effect of neem based insecticides and *B. thuringiensis* (B.t.) for the manage of *H. armigera*

Treatment		Per cent pod infestation	
Control		41.07	(50.6)
Neem Suraksha	(0.5%)	38.03	(38.0) a
Neem Gold	(0.3%)	40.23	(41.7)
Achook	(0.5%)	40.17	(41.6)
B. t.	(0.5%)	35.10	(34.7) a
Neem Suraksha + *B.t.*	(0.25%) (0.25%)	37.00	(36.2) a
Neem Gold + *B. t.*	(0.25%)	38.17	(38.2) a
Achook + *B. t.*	(0.25%)	36.07	(34.7) a
Endosulfan	(0.1%)	23.37	(15.6)
Monocrotophos	(0.1%)	31.40	(31.4) a

CV = 9 .79 (at P = 0.05)

DMRT at P = 0.05

Arc sine $\sqrt{2}$ transformatio

values in the paranthesis are the original dat

7. Studies on biologically derived materials for the management of insect pests

(Mani Chellappan and Chidananda Prabhu)

a. Screening indigenous flora for pest management chemicals

Mass culturing of test insects

To test the insecticidal properties of local flora, red cotton bug *(Dysdercus cingulatus)* and tobacco cut worm

b. Management of cashew tea mosq bug, *Helopeltis antonii,* using n based insecticides

Field trials were conducted evaluate the bioefficiency of n formulations (Table 20) against cashew mosquito bug, *Helopeltis antonii,* compared with the recommended chem insecticide, endosulfan. The experi was laid out in RBD with three replicat during Rabi 1995-96.

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(50.6) a
(38.0) ab
(41.7) a
(41.6) a
(34.7) ab

(36.2) ab
(38.2) ab
(34.7) ab
(15.6) b
(31.4) ab

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0) against cashew
peltis antonii, a
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with three replicatio

le 19 a. Mass culturing of *Dysdercus cingulatus*

tage	No. of days
Egg	7
instar	2
instar	3
instar	5
instar	5
instar	6
Adult	10

Table 19 b. Mass culturing of *Spodoptera litura* Fb.

Stage	No. of days
Egg	3
I instar	1
II instar	2
III instar	3
IV instar	3
V instar	3
VI instar	4-5
Pupa	7

ble 20. Management of Tea Mosquito Bug using neem insecticides

Treatment	Per cent infestation		
	Flushing	Flowering	Fruiting
em Suraksha 1 %)	23.70 (16.2)^{b}	26.42 (19.8)^{b}	34.60 (32.3)^{b}
em Suraksha 3%)	21.18 (13.1)^{bc}	30.02 (25.0)^{a}	27.46 (21.3)^{d}
em Suraksha 5%)	20.78 (12.6)^{bcd}	23.26 (15.6)^{d}	30.54 (25.9)^{c}
em Suraksha .6%)	15.72 (7.3)^{e}	19.82 (11.5)^{ef}	22.76 (24.3)^{e}
F (0.3%)	18.48 (10.1)^{de}	23.42 (15.8)^{c}	28.60 (24.3)^{d}
F (0.6%)	16.68 (8.3)^{e}	20.94 (12.8)^{e}	27.12 (23.9)^{d}
eem Suraksha .3%) + Endo (0.05%)	8.64 (2.2)^{f}	17.40 (8.9)^{fg}	14.48 (6.3)^{g}
F (0.3%) Endo (0.05%)	17.10 (8.6)^{de}	20.94 (12.8)^{e}	17.04 (8.5)^{f}
ndosulfan (0.1%)	5.72 (1.0)^{f}	14.40 (6.2)^{g}	4.48 (0.9)^{h}
ontrol	22.02 (14.1)^{a}	26.84 (20.4)^{b}	39.00 (39.6)^{a}

DMRT at p = 0.05

Values following same letters are not significantly different

Values in the parenthesis are the original data

Neem formulations were tested in different concentrations at flushing, panicle initiation and fruit formation stages. Among the neem formulations, Neem Suraksha at its highest concentration (0.6%) was the best as an independent treatment. Neem formulations in combinations with chemical insecticide also found t effective in the management of the However, the endosulfan treatment ha least infestation by the pest.

ombinations with
e also found to
nagement of the p
ulfan treatment had
ne pest.

2 HORTICULTURE

Survey, collection, conservation and aluation of horticultural crops :

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

Cashew :

Among the local germplasm cessions, Balli-2, Balli-5, Paing-2 and I.A. rmagudi recorded cumulative yield of .05, 2.62,3.22, 2.61 kg/tree respectively er a period of last six years. Only Balli-2 rformed numerically on par with V-4 0.69 kg/tree). Similar trend was observed average yield per tree per year (Table). CHWL-1, Mardol-5, Malorem, IA rmagudi and Buipal-1 had the average it weight of more than 10 g, and were entified as bold nut types, whereas, ardol-5, Paing-2, I A Farmagudi and CHWL-1, besides bold nut feature, had good apple size also.

Table 22 reveals the performance of high yielding introductions over a period of last six years (1990-1995). Accessions VTH-59/2, M-26/2 and Hybrid HB-1600 recorded cumulative nut yield of 4.20, 5.88 and 7.27 kg/tree, compared to nut yield of 10.69 kg/tree in V-4. Similarly, HB-1600, HB-1608, HB-1598, M-26/2 and VTH-59/2 recorded a nut yield of 2.17, 1.28, 1.12, 1.12 and 1.10 kg/tree as compared to 4.3 kg/tree in V-4 during the year. However, the maximum average nut weight was recorded in VTH-154 (9.26 g) followed by HB-1608 (8.42 g) as compared to average nut weight of 7.04 g in V-4.

B) Mango :

Grafts of 'Cardozo Mankurad' are planted in the farm for further multiplication

ble 21. Performance of local cashew accessions during the year

Accession	Nut Yield (kg / tree) (1995)	Cum. Yield (kg / tree) (1990-95)	Av. Yield (kg / tree) per year	Av. Nut Wt. (g)	Av. Apple Wt. (g)
A Farmagudi	0.28	2.61	0.44	10.63	98.24
alli - 2	3.35	10.05	1.68	7.31	69.84
alli - 3	0.52	1.17	0.20	7.0	93.03
alli - 5	0.81	2.62	0.44	7.25	73.39
uipal - 1	0.43	0.97	0.24	10.60	57.20
-3	0.45	0.98	0.16	6.90	67.40
HWL - 1	0.15	0.22	0.04	13.00	92.50
etul - 1	0.06	0.48	0.08	6.86	82.71
urko	0.39	0.74	0.12	8.00	81.50
lardol - 5	0.19	0.93	0.15	11.89	117.76
lanora - 2	0.73	2.91	0.40	4.67	39.37
aing - 2	0.84	3.22	0.54	9.12	102.30
guem - 5	0.52	1.73	0.29	4.29	34.62
Vethal - 1	0.13	0.13	0.02	8.00	70.00
Malorem	0.06	0.24	0.12	11.00	78.00
/-4	4.30	10.69	1.78	7.04	38.13

* Planted in 1989, all others being 1987 with a spacing 2 x 2m.

Table 22. Performance of high yielding cashew accessions and hybrids introduced (1990

Accession	Nut Yield (kg / tree) (1995)	Cum. Yield (kg / tree) (1990-95)	Av. Yield (kg / tree) per year	Av. Nut Wt. (g)	Av. W
BLA - 39 - 4	0.64	1.86	0.31	3.46	1
VTH - 59 / 2	1.10	4.20	0.70	5.24	2
VTH - 30 / 4	0.05	1.15	0.19	4.62	3
VTH - 125	0.22	1.16	0.19	4.80	4
VTH - 539	0.09	4.28	0.71	6.87	4
VTH - 174	0.21	0.61	0.10	9.26	9
M - 26 /2	1.12	5.88	0.99	6.49	3
VTH - 107 / 3 I	0.46	0.47	0.24	7.00	5
BPP - 1	0.55	2.19	0.36	4.00	2
BPP - 2	0.43	3.99	0.66	3.55	4
BPP - 5	0.40	1.21	0.20	5.93	5
V-4	4.30	10.69	1.78	7.04	3
Hybirds					
HB - 1600	2.17	7.27	1.21	6.36	5
HB - 1608	1.28	2.41	0.40	8.42	8
HB - 1598	1.12	4.83	0.81	6.12	5

Spacing 2 x 2m.

Table 23. Comparison between Cardozo Mankurad and Mankurad.

Characteristic features	Cardozo Mankurad (Seedling Selection)	Mankurad (Parent Variety)
1. Bearing habit	Regular bearer	Alternate bearer
2. Fruiting season	Early (March - April)	Early (March-April)
3. Yield potential	Heavy yielder	Medium yielder
4. Fruit wt. (g) and size	320, medium to big	278, small to medium
5. Skin colour	Yellowish orange with deep pink blue	Yellowish orange
6. Flesh (%)	78.28	75.98
7. Texture (pulp)	Firm-melting	Firm
8. Flavour & aroma	pleasantt & strongly aromatic	Pleasant & aromatic
9. Fibre	None	Scanty
10.T.S.S. (%)	22.25	21.0
11.Stone weight (g)	22.67	28.5
12.Shelf life	Better (about one week)	Poor (3 days)

s introduced (1990-19

Av. Nut Wt. (g)	Av. Ape Wt. (
3.46	15.0
5.24	24.7
4.62	32.5
4.80	44.4
6.87	47.9
9.26	99.4
6.49	34.1
7.00	55.0
4.00	20.4
3.55	40.0
5.93	52.1
7.04	38.1
6.36	50.8
8.42	84.4
6.12	59.2

Mankurad (Parent Variety)

te bearer
March-April)
n yielder
all to medium
sh orange

nt & aromatic

days)

d detailed studies. Table 23 elucidates e comparison between Cardozo ankurad and its parent variety - Mankurad.

'Cardozo Mankurad' has several dvantages over the parental variety Mankurad' and thus deserves promotion as commercial variety for domestic as well as kport markets.

Out of several introduced varieties nder evaluation, Kalapady and Kesar, esides regular bearing habit recorded fruit eld of 26.61 and 24.43 kg/tree respectively uring the year. (Table 24). Fruit size was mall in Kalapady (122 g) while fruits were medium size (288 g) in Kesar. Ratnagiri lphonso was observed to show alternate irregular bearing habit.

A similar trend of yield performance as observed in respect of cumulative yield Table 25). Kalapady yielded 89.1 kg. of uits per tree with an average yield of 9.9 g/tree/year whereas the corresponding gures were 65.5 and 7.3 in Kesar. owever, taking into consideration the uality aspect, Kesar appears to be better han Kalapady in overall performance.

From among the hybrid introductions, leelgoa, Amrapali and HB-56 recorded a fruit yield of 54.45, 53.99 and 40.93 kg/tree respectively (Table 26). Fruit size was medium in Neelgoa (334 g) and HB-56 (302 g). But in Amrapali, more number of fruits/tree (398) was observed to be at the cost of fruit size (135 g). Other hybrids viz. HB-87, HB-45, and Ratna yielded 27.51, 19.54 and 12.37 kg. of fruits per tree with average fruit weight of 181, 318 and 247 g. respectively. The fruit size was very small in HB-151 (88 g). Arka Puneet came to bearing for the first time in this season.

Eleven of 68 local varieties flowered and fruited during the year. Of them, Colaco Branca recorded the maximum yield of 20.52 kg. (Table 27) with an average fruit weight of 255 g. This also showed the regular bearing tendency. Sakri and Maxima were other varieties which showed regular bearing habit although yielded comparatively less. Mankurad (K), Furtad (K), Fernandin (P) and Hilario (S) were other varieties which yielded more than 5 kg. of fruits per tree, but were observed to be alternate bearers excepting Furtad. Furtad (K), Malgesh, Ball (K) and Koita came to fruiting for the first time in this season.

able 24. Performance of introduced mango varieties during the year

Variety	Year of Planting	No. Fruits per tree	Av. Fruit wt. (g)	Yield (Kg / tree)
Kesar	1984	85.5	288	24.43
Neelum	1984	76.0	163	12.40
R. alphonso	1982	39.3	318	12.48
Kalapady	1984	219.0	122	26.61
Himayuddin	1990	4.0	365	1.46

Table 25. Cumulative performance of mango hybrids

Variety	Period (Yrs.)	Cumulative Yield		Av. Yield / tree / yea	
		No.s	Wt (kg)	Nos.	Wt (k
Kesar	9	261.5	65.5	29	7.3
Neelum	9	126.0	20.6	14	2.3
R. Alphonso	11	175.1	52.4	16	4.8
Kalapady	9	680.0	89.1	76	9.9
Himayuddin	2	5.0	1.7	3	0.8

Table 26. Performance of mango hybrids during the year

Hybrid	Year Planted	Fruits per tree	Av. Fruit wt (g)	Yield (Kg / tre
Amrapali	1984	398	135	53.99
Ratna *	1984	50	247	12.37
Neelgoa	1984	163	334	54.45
HB - 56	1984	136	302	40.93
HB - 87	1984	152	181	27.51
HB - 45	1991	61	318	19.54
HB - 151	1984	210	88	18.60
Arka Aruna	1989	9	374	3.60
Arka Anmol	1989	9	336	3.02
Arka Puneet **	1989	2	190	0.37
K X B	1990	9	194	1.81

* Alternate bearing tendency ** First bearing

Table 27. Performance of local mango varieties during the year :

Variety	Year planted	No. of fruits / tree	Av. Fruit weight (g)	Yield (kg / tree)	
1. Hilario (S)	1989	36	153	5.60	A.B.
2. Mankurad (K)	1989	30	262	7.85	A.B.
3. Salcete Musarat	1989	8	568	4.55	A.B.
4. Fernandin (P)	1989	26	237	6.15	A.B.
5. Colaco Branca	1989	80	255	20.52	R.B
6. Furtad (K)	1989	27	225	6.09	F.B.
7. Ball (K)	1989	5	282	1.48	F.B.
8. Koita	1991	4	313	1.25	F.B.
9. Sakri	1989	17	215	3.65	R.B
10. Maxima	1989	28	176	5.03	R.B
11. Malgesh	1989	8	313	2.50	F.B

AB - Alternate. Bearer, RB - Regular Bearer, FB - First Bearing

. Yield / tree / year	
	Wt (kg)
29	7.3
14	2.3
16	4.8
76	9.9
3	0.8

rt	Yield (Kg / tree)
	53.99
	12.37
	54.45
	40.93
	27.51
	19.54
	18.60
	3.60
	3.02
	0.37
	1.81

Yield (kg / tree)	
5.60	A.B.
7.85	A.B.
4.55	A.B.
6.15	A.B.
20.52	R.B.
6.09	F.B.
1.48	F.B.
1.25	F.B.
3.65	R.B.
5.03	R.B.
2.50	F.B.

Bearing

PLATE 2

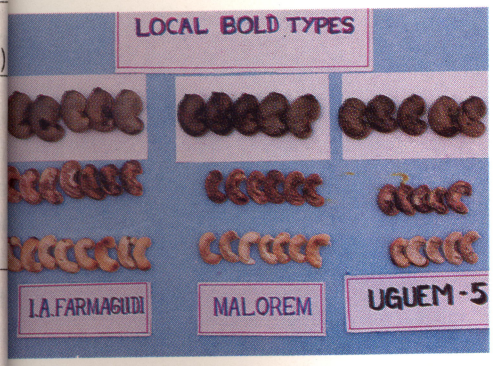


Fig 1 : Local germplasm collection for bold nut size in cashew

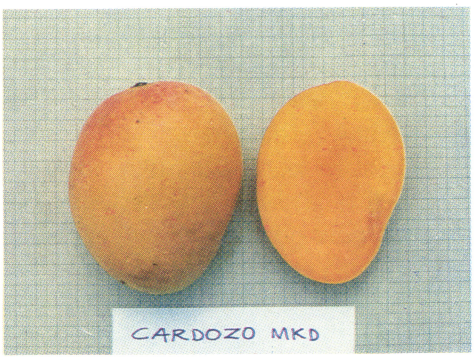


Fig 2 : Cardozo Mankurad - a local seedling selection of mango.



Fig 3 : Big sized fruit bunches in Tenera hybrids of oil palm.



Fig 4 : Local brinjal (Agassaim) - a profitable intercrop in coconut for October planting.

2. Evaluation of oilpalm combinations (D x P) under Goa conditions.

(P A Mathew, A R Desai and D G Dhandar)

The evaluation of five oilpalm hybrids planted in 1991 was continued during the year. Data on yield performance are presented in Table 28.

Table 28. Yield performance of oilpalm hybrids during the year.

Hybrid	No.	Weight of fresh fruit Bunches / palm (kg)
82 D x 266 P	2.26	6.01
124 D x 266 P	1	1.95
18 D x 32 P	1	1.92
35 D x 291 P	1	1.84
65 D x 111 P	1	1.72
'F' test	N.S	N.S

In general, there was no significant differences among the hybrids with respect to number and weight of fresh fruit bunches produced per palm. However, numerically, 82 D x 266 P was found to produce more number of fresh fruit bunches (2.26) with an average weight of 6.01 kg. per palm in the season. The weight of the fresh fruit bunch insignificantly varied from 1.72 kg (65 D x 111 P) to 6.01 kg. (82 D x 266 P).

3. Standardization of agrotechniques for pineappie in Goa.

(D G Dhandar, P A Mathew / A R Desai, S Modak)

In a field trial, potassium doses of 0, 6, 8, 10 and 12 g/plant were imposed on established plants of Kew pineapple with N @ 16 g/plant and P_2O_5 @ 4 g/plant as constant doses. The population was 43,500 plants per hectare. Observations on vegetative growth, flowering and yield were recorded during the year. The data indicated that there was no significant effect of the various levels of potassium doses on any of the growth and yield characters.

4. Studies on coconut based cropping systems

(B L Manjunath and Satish Modak)

Cropping system studies in coconut included seasonal rotation of locally preferred seasonal / annual intercrops with mango (variety Amrapali) as component crop in three replications, with an objective to increase the monetary returns from coconut- gardens through better utilisation of available resources. The per cent transmission of Photosynthetically Active Radiation through coconut-mango canopy found to vary with different seasons of the year and timings of the day ranging from 46 to 59 per cent with a mean of 54 per cent of the open light conditions at the noon time in a coconut garden of 8 years old.

During the year, among the annual intercrops, turmeric (variety PCT-13) was found more profitable (Rs. 14,419/ ha - net returns) with an yield level of 23.95 Q/ha and was followed by ginger (Sangli local).

For Kharif season, intercropping okra (Arka anamika) was found more remunerative with a net return of Rs. 7,140 for an yield of 10.12 Q/ha and foilowed by cluster beans (Pusa navbahar).

For Rabi season, brinjal (local Agassaim) found to suit better as intercrop in coconut with an yield level of 35.12 Q/ha leading to a net additional return of Rs. 12,062/ha, while chillies (Arka lohit) and cluster beans (Pusa navbahar) were not profitable.

To offset the vegetable scarcity during summer, a short duration vegetable

crop like okra is found to be more remunerative (Rs. 1,092 - net returns).

A study on the shade tolerance of different intercrops indicated that pineapple and ginger, were more shade tolerant and among the vegetables, brinjal found shade tolerant which was followed by and cluster beans and was varied different seasons of the year, sugge the choice of intercrops (Table 30).

Table 29. The performance of intercrops in coconut along with their economics.

Season / Crop	Yield (Q / ha)	Gross returns (Rs. / ha)	Cost of cultivation (Rs. / ha)	Net return (Rs. / ha)
Annuals :				
Ginger	11.75	35,250	29,531	5,719
Turmeric	23.95	45,591	31,172	14,419
Pineapple	23.33	11,665	8,900	2,765
Seasonals :				
Kharif				
Okra	10.12	10,120	2,980	7,140
Clusterbeans	5.60	5,600	3,500	2,100
Rabi				
Chillies	0.49	990	5,330	- 4,340
Brinjal	35.12	17,562	5,500	12,062
Clusterbeans	1.56	1,875	4,585	- 2,710
Summer				
Bhendi	3.81	4,572	3,480	1,092
Coconut	3326 nuts	16,630	5,940	10,690

Table 30. The productivity of intercrops in a coconut-mango garden as compared to light conditions.

	Intercrop yield under coconut-mango canopy (Q / ha)	Yield in open light conditions as monocrop (Q / ha)	Percentage o intercrop yiel
Annuals			
Ginger	11.75	13.98	84.05
Turmeric	23.95	29.17	82.10
Pineapple	23.33	25.42	91.78
Seasonals :			
Kharif			
Okra	10.12	30.30	33.39
Clusterbeans	5.60	27.04	20.71
Rabi			
Chillies	0.49	1.26	38.89
Brinjail	35.12	39.59	88.71
Clusterbeans	1.56	2.22	70.27
Summer			
Okra	2.94	3.81	77.16

les, brinjal found m
h was followed by o
and was varied w
f the year, suggest
ps (Table 30).

economics.

ation	Net returns (Rs. / ha)
	5,719
	14,419
	2,765
	7,140
	2,100
	- 4,340
	12,062
	- 2,710
	1,092
	10,690

n as compared to o

Percentage of intercrop yield
84.05
82.10
91.78
33.39
20.71
38.89
88.71
70.27
77.16

ble 31. Effect of intercropping on the yield of coconut.

	Nut Yield			
	Before intercropping (1992-93)	After intercropping		
		1993 - 94	1994 - 95	1995 - 96
o. of coconut palms	100	100	100	100
o. of nut bearing palms	40 *	72	88	89
er cent of trees bearing nuts	40	72	88	89
otal nut yield	516	2,142	3,326	3,411
ut yield / palm	13	30	37	39

Area - 0.6 ha

* Palms were eight years old.

Growing of intercrops in coconut arden found to have a positive influence in creasing the nut yield as reflected by percentage of trees bearing nuts and the nut yield per palm (Table 31).

3.3 Animal Sciences

1. Studies on crossbred pigs to find out appropriate age of marketing.

(A R Bhattacharyya, R N S Sundaram)

For the breeding stock two yorkshire crossbreds and two landrace crossbreds were identified. Their average age at maturity was 458 days and 298 days respectively. The gestation period for the same were 113 and 115 days respectively. From these crossbreds, two farrowings each were taken. The average litter size for the yorkshire crossbreds was 5.0 where as for landrace cross it was 9.5. Stillbirth in yorkshire was nil where as for landrace cross it was two. The average birth weight of yorkshire cross was 0.86 kg. and landrace 0.91 kg. The body weight on the 12th week for yorkshire was 8 kgs. and for landrace 9.5 kgs. The trial is continuing.

2. Effect of feeding microbial protein on tissue growth and muscle protein turn over in rabbit.

(R N S Sundaram)

Further studies were continued on the bio degradation of agro-by- products, to make use of them as animal feed.

The by-product, coir dust was treated with urea-molasses or potassium salt to enhance the biodegradation. The substrate which was treated with five per cent molasses and one per cent urea or potassium salt was autoclaved at 20 lbs pressure for 30 minutes, cooled and inoculated with five per cent *Pleurotus* spawn. The biomass fermented for 30 days was analysed for various proximate principles. Chemical composition of control and fermented by- product is presented in Table 32. The loss of lignin was fermented molasses - urea substrate (7.74%) as comp fermented potassium salt treated and untreated fermented substrat indicating that fermentatio urea-molasses treatment is more than the other two treatments.

Feeding trials were condu adult rabbits with fermented by-pr experimental feed was formulate per cent fermented coir dust, 25 wheat, 25 per cent groundnut ca per cent wheat bran. Data colle individual animal for seven d analysed statistically. The contro untreated coir dust was comp experimental feed through studies. The drymatter diges control and experimental feed per cent and 70.22 per cent re (Table 33). The dry matter inta body weight was 4.67 and 3.44 p control and experimental feed re (Table 33).

Similarly, the effect of ferme the digestibility of cashew apple studied through a feeding tria rabbits. The trial conducted with 2 fermented or non fermented cas waste in rabbit feed indicated fermentation of cashew apple *pleurotus* has increased the dig feed from 70.99 to 78.34 per ce matter intake per kg. body fermented and non fermented cas waste incorporated feed was 3.2 per cent respectively. The carca experimental and control feed per cent and 54.25 per cent r (Table 34).

ble 32. Chemical composition of coir dust fermented with additives

Nutrient	Control (Non fermented)	Fermented Molasses + urea treated	Fermented KH_2PO_4 treated	Fermented Without additives
ry matter loss (%)	4.24	16.46	19.42	18.74
cid detergent fibre (%)	72.7	66.26	69.14	64.17
gnin (%)	38.86	33.71	31.12	34.21
ellulose (%)	16.78	16.62	18.14	17.93

able 33. Nutritive value and digestibility of fermented coir dust in rabbit feed.

	Control feed with coir dust	Experimental feed with fermented coir dust
cid detergent fibre (%)	18.93	16.44
ignin (%)	8.66	4.16
otal dry matter intake / animal / day	91.11 ± 8.64	73.28 ± 12.25
ry matter digested (gm)	55.65 ± 3.98	48.46 ± 4.83
ry matter digestibility (%)	61.07 ± 2.29	70.22 ± 2.36
ry matte'r intake (g) / kg. body wt.	46.7	34.4

able 34. Nutritive value and digestibility of fermented cashew apple waste in rabbit feed.

	Control feed with cashew apple waste	Experimental feed with fermented cahsew apple waste
Acid detergent fibre (%)	12.79	10.52
Lignin (%)	5.16	4.66
Total dry matter intake (gm) / animal / day	70.11 ± 7.04	75.19 ± 13.26
Dry matter digested (gm)	48.80 ± 5.82	58.92 ± 10.45
Dry matter digestibility (%)	70.99 ± 1.40	78.34 ± 2.64
Dry matter intake / kg. body weight (%)	3.28	3.66
Feed :		
Wheat (%)	25	25
Wheat bran (%)	25	25
Groundnut cake (%)	25	25
Cashew apple waste (%)	25	25
+ Mineral vitamin suppliment		

3. Adoption of improved techniques to increase fertility and fecundity in pigs and rabbits.

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

Seventeen gilts and sows of different breeds viz. Yorkshire, Yorkshire cross and Landrace cross were studied for litter size at birth and weaning when they were bred after natural oestrous, oestrous induced by prostaglandine and oestrous induced by prostaglandin plus P.M.S.G. Results indicated that litter size at birth and weaning was 6.5 and 6 when it was a natural oestrous, it was 5.5 and 4.5 when oestrous was induced by prostaglandin and litter size was 9.2 and 7.2 when oestrous was induced using prostaglandin and P.M.S.G. in combination. In sows there was no adverse effect on litter size at birth and weaning when oestrous was induced artificially within 18-30 days after farrowing.

In rabbits litter size was studied by mating after prostglandin treatment. A rabbit group containing six rabbits was injected with 0.1 ml prostaglandin. All rabbits exhibited oestrous (acceptance of male). After mating five rabbits delivered and average litter size was four.

Litter size in rabbits was recorded by mating them on the day of kindling. In rabbit, does mated on the day of kindling or within 24 hours after kindling the average litter size was increased and there was no reduction in survival of kids. By increasing the remating interval i.e. 15 to 45 days there was no increase in average litter size.

Thirty semen samples were co
from two breeding bucks (Newzealanc
and Soviet Chinchilla one each).
collecting, semen samples were eva
for motility, total sperm count and live
sperm count before and after di
Motility of sperm was better in Newze
white than that of Soviet Chinchilla
diluted with sodium citrate-egg yolk c
Neat semen showed motility only f
minutes at room temperature wh
diluted semen showed motility fo
minutes. Diluted semen when preserv
refrigerator showed motility for 48 h
Total sperm count was 35 x 1(
Newzealand white and 32 x 16^6 in S
Chinchilla. Dead sperm count was 15
per cent in both these breeds. Fou
does were inseminated artificially of v
two does conceived and kidded two
each.

Attempt was made to super ov
three rabbit does and two fertilized
(eight celled embryos) which were colle
and examined under microscope. Fro
single rabbit doe, 26 young ones
obtained in a short period of 8 month
mating the doe on the day of kindling.

An ancillory work was done
"comparative efficacy of benzyle benz
and ivermectine in treatment of Ear Mi
rabbits" and it was observed that iverm
was comparatively suitable than ben
benzoate treatment for controlling ear m
in rabbits.

n samples were collec
bucks (Newzealand w
chilla one each). A
samples were evalua
perm count and live-d
fore and after dilut
as better in Newzeal
Soviet Chinchilla w
n citrate-egg yolk dilu
ved motility only for
temperature wher
howed motility for
emen when preserve
d motility for 48 hou
nt was 35 x 10^6
and 32 x 16^6 in So
perm count was 15 to
these breeds. Fourte
nated artificially of wh
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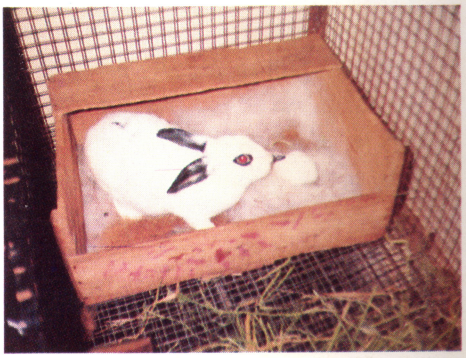
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PLATE 3



Fig 1 : Improved fecundity in Newzealand White rabbit.



ig 2 : A model of the kindling box suitable for rabbit rearing.



Fig 3 : Karad hay, an agro-waste inoculated with *Pleurotus* for use as rabbit feed.



ig 4 : Vyttila-1, a deep water rice variety suitable for rice fish integration.

3.4. FISHERY SCIENCE

Two new projects are started during the year under Fishery Science, relating to rice-freshwater prawn integration and freshwater weed-fish eradication.

1. Rice-freshwater prawn culture suitable for Goa

(S Subramanian, B L Manjunath, A V Nirmale)

Freshwater prawn is a commercially important species having both internal and export market. Encouraged by the results of rice- fish integration, this project was initiated to bring out a better economic returns from rice fields which are otherwise economically low yielders. The size of the prawn seed being small and exposed to the predation of endemic population in rice fields, the areas of water and operational management and the stocking time and density are to be studied and streamlined for getting better growth performance and yield.

Initially, seeds of the rice variety, Vyttila-1, identified as suitable for rice-fish integration in low-lying fields, have been raised during Kharif, 1995. Observations on the growth and yield performance of Vyttila-1 were also made, which gave an yield of 3.8 kg/ha.

Juveniles of freshwater prawn were procured from Fisheries College, Konkan Krishi Vidyapeeth, Ratnagiri and stocked.

A small scale prawn feed pelletiser was fabricated with the help of Govt. Polytechnique, Panaji, Goa, for making 2 to 5 mm size pellets. The total cost of the pelleting machine was Rs. 15,000/- with a capacity to produce 60 kg/hour.

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

(S Subramanian, Mani Chellappan)

The project was initiated with a view to evaluate the neem oil cake and neem based pesticides in the eradication / control of carnivorous and weed fishes of freshwater fish culture systems, as the neem pesticides are easily available, relatively cheaper and have no residual effects.

In a preliminary trial, neem oil cake was applied at 0, 10, 50, 100, 200 and 500 ppm levels and its efficacy in the control of *Heteropneustes* sp. (of 7 to 10 cm size) was evaluated. It was seen that none of the above concentrations had any detrimental effect on the air-breathing fish. Higher levels of neem oil cake and other products such as Achook, Bioneem and Nimbicidine containing Azadirachtin are to be tried on the same species, other carnivorous and weed fishes.

In a survey to identify carnivorous and weed fishes of freshwater culture systems, nine species have been so far identified with the help of Malaria Research Centre, Panaji. The identified species are : *Aplocheilus spp.* (2 species), *Rasbora daniconius, Danio aequipinnatus, Gambusia affinis, Chela cabuca, Punctius spp.* (4 species) *Anabas sp., Heteropneustes sp. and Clarias batrachus.* Of these, the first five are minnows and the last three are air-breathing fishes. The work is in progress.

3.5. TRANSFER OF TECHNOLOGY

The Krishi Vigyan Kendra (KVK) attached to the Main Institute serves as the extension wing of the Research Complex with a mandate to transfer proven agricultural technologies to the fields through various activities. From the year 1994-95, the Transfer of Technology projects were regrouped under the revised norms of the Council.

The work was carried out under three sub projects.

1. Training and other activities

(S Subramanian, V Y Gaonkar, H R Prabhudesai, Sunetra Talaulikar, A V Nirmale, H R Chidananda Prabhu, V. S. Sakharkar, K K Metar and Scientists).

During the year 1995-96, the Krishi Vigyan Kendra conducted 79 skill oriented, need based training programmes both on the campus as well as off campus in various disciplines like crop sciences, Horticulture, Animal Sciences, Home Science and Plant Protection and trained 1170 participants in three categories viz., practicing farmers and farm women, rural youths and grass root level extension functionaries comprising of 643 males and 527 female participants. The details of the trainings conducted in different disciplines are provided in Table 35.

Participation in other extension activities

During the year under report, KVK participated in various seminars, melas and special training programmes conducted by various agencies like State Depts, CADA, KRIBHCO, IFFCO, NA Nationalised banks, Farm clubs, Mandals and gave technical guida various topics of interest to participar

The KVK celebrated the Wor Day on October 16th, 1995 in collal with Department of Agriculture a Academy. A special lecture on the was delivered on the occasion. activities were published in newspapers on the theme of Wor Day viz., 'Food for all' both in Eng Marathi.

The KVK also organised Mela on March 26th, 1996 at the premises in which 250 farmers and from various departments alor Secretary (Agriculture) Govt. participated. An impressive exhibi also arranged on the occasion containing seeds, vermicompost, mango grafts, pesticides, poultr mushroom spawn etc. were distribu

In addition, the KVK participated in ten taluka level Kisa jointly organised by State Agril. De and KVK and delivered lectures o topics and also arranged for exhi all the sites during May, 1995.

Two field days were also by KVK during the year and th personnel participated in TV a programmes and wrote nine popul on various topics of topical interest

Table 35. Details of the training programmes conducted by KVK during 1995-96

Crop Science

Sl. No.	Title of the course	Duration (days)	No. of courses conducted			No. of Participants		
			ON	OFF	Total	Male	Female	Total
A.	**Practicing farmers and farm women**							
1.	Rice based cropping systems	2	1	2	3	23	9	32
2.	Sugarcane prodn. technology	3	1	1	2	24	-	24
3.	Groundnut prodn. technology	3	1	3	4	56	30	86
4.	Technology for Pulses cultivation	2	1	1	2	22	5	27
	Sub total		4	7	11	125	44	169
B.	**Rural youth**							
5.	Household garbage disposal	2	3		3	23	4	27
6.	Preparation of vermicompost	2	3		3	40	5	45
7.	Groundnut production technology	1	-	1	1	11	1	12
	Sub total		6	7	7	74	10	84
C.	**Grassroot level extn. functionaries**							
1.	Solid waste management in urban and rural areas	3	1	-	1	6	-	6
2.	Organic farming	2	1	2	3	36	8	44
3.	Post harvest technology for groundnut	2	-	2	2	32	1	33
4.	Modern irrigation systems	2	-	-	-	-	-	-
	Sub Total		2	4	6	74	9	83
	Grand total		12	12	24	273	63	336

Horticulture

Sl.	Title of the course	Duration (days)	No. of courses conducted			No. of Participants		
			ON	OFF	Total	Male	Female	Total
A.	**Practicing farmers/farm women**							
	a) Grafting techniques in cashew and mango	3	1	-	1	8	1	9
	b) Mushroom cultivation	1	4	-	4	44	16	60
	c) Kitchen gardening	1	1	1	2	6	13	19
	d) Coconut based cropping system	2	-	1	1	26	4	30
	e) Rose cultivation	1	2	-	2	9	3	12
	f) Cashew production technology	3	4	-	4	82	1	83
	g) Vegetable cultivation	1	-	1	1	28	-	28
	h) Improved cultivation practices for fruit crops	1	-	2	2	65	14	79
	Sub Total		12	5	17	268	52	320

Sl. No.	Title of the course	Duration (days)	Number of courses proposed	No. of courses conducted			No. of Partici	
				ON	OFF	Total	Male	Female
B.	**Rural Youth**							
	a) Grafting techniques in cashew and mango	3	1	2	-	2	23	-
	b) Mushroom cultivation and spawn production	2	1	1	-	1	5	3
	Sub Total		2	3	-	3	28	3
C.	**Extension functionaries**							
	a) Kitchen gardening	1	1	1	-	1	-	12
	Sub Total		1	1	-	1	-	12
	Grand Total (A + B + C)		20	16	5	21	296	67

Plant Protection

Sl. No.	Title of the training course	Duration (days)	Course conducted campus			No. of Partici	
			ON	OFF	Total	Male	Female
A.	**Practicing farmers/farm women**						
	1. Storage pests and their management	1	1	-	1	-	18
B	**Rural youth**						
	2. Plant protection equipments and their maintenance	1	1	-	1	5	4
C.	**Extension functionaries**						
	3. Integrated pest management	1	1	-	1	8	-
	Grand Total		3	-	3	13	22

Animal Sciences and Fisheries

Sl. No.	Title of the course	Duration (days)	No. of courses conducted			No. of Participants		
			ON	OFF	Total	Male	Female	Total
A.	**Practicing farmers/farm women**							
	a) Backyard poultry keeping	1	1	1	2	4	17	21
	b) Broiler farming	2	1	-	1	13	-	13
	c) Dairy farming	1	1	-	1	1	5	06
	d) Fodder production	1	1	-	1	1	9	10
	Sub total		4	1	5	19	31	50
B.	**Rural youth**							
	a) Poultry keeping	3	3	-	3	20	7	27
	b) Poultry fish Integrated farming system	1	1		1	5	-	5
	c) Broiler farming	2	-	1	1	7	-	7
	d) Dairy production	1	-	1	1	10	2	12
	Sub Total		4	2	6	42	9	51
	Grand Total (I + II)		8	3	11	61	40	101

Home Science

Sl. No.	Title of the course	Duration (days)	No. of courses conducted			No. of Participants		
			ON	OFF	Total	Male	Female	Total
A.	**Farmers / farm women**							
	1. Low cost nutritious receipes	1	3	5	8	-	136	136
	2. Receipes from mushroom	1	2	1	3	-	40	40
	3. Child care and preparation of weaning mixture	1	1	3	4	-	62	62
	Sub Total		6	9	15	-	238	238
2.	**Rural youth**							
	1. Home scale food preservation	4	2	-	2	-	16	16
	2. Crafts	8	1	-	1	-	7	7
	3. Bakery	3	1	-	1	-	9	9
	Sub Total		4	-	4	-	32	32
3.	**Extension staff**							
	Importance of food preservation	2	1	-	1	-	13	13
	Grand Total		11	9	20	-	283	283

2. Farm advisory services

(S Subramanian, V Y Gaonkar, H R Prabhudesai, Sunetra Talaulikar, A V Nirmale, H R Chidananda Prabhu, V S Sakharkar, K K Metar)

Under this sub project, three programmes viz., Lab to Land Programme, National Demonstrations and Frontline Demonstration on groundnut are included.

Lab to Land Programme

During the year, under the Lab to Land Programme, 119 farm families were selected in Taleigao, Saligao and Betki villages of Tiswadi, Bardez and Ponda Talukas respectively and bench mark survey was made for all the families. Suitable technologies for transfer to each of the farming families were identified and critical inputs like high yielding seeds of paddy, groundnut and veget smokeless chullas, poultry units, pig and pesticides were supplied to beneficiaries.

A. Crop Science

The Lab to Land Programme implemented in two villages viz., Talei Tiswadi Taluka comprising of 13 families and Saligao village of B Taluka comprising of 12 beneficiaries families in Taleigao were supplied with yielding paddy seeds, weedicides and based pesticides alongwith trainin beneficiaries in rice production techn The total demonstration area was hectares. The details of demonst results and the cost benefit analysi presented in Table 36.

Table 36. Achievements of demonstration under Lab to Land Programme.

Sl. No.	Village/ Taluka	No. of families adopted	Area in ha	Inputs supplied	Demo. yield (Q/ha)	Local check (Q/ha)	% incre (Q/
1.	Taleigao (Tiswadi)	12	2	'Annada' paddy seed Neem based pesticide weedicide.	48.0	30.0	60
2.	Saligao (Bardez)	13	2.5	Dh - 3 - 30 groundnut Gypsum	22.5	12.8	75

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% increase (Q/ha)
60.0
75.7

PLATE 4



Fig 1 : Dr. D. G. Dhandar, Director addressing Kisan Mela chaired by Shri Vivek Rae, Secretary (Agriculture) Govt. of Goa.



Fig 2 : Shri D. G. Narvekar - Hon'ble Minister for agriculture, Government of Goa interacting with participants of World Food Day.



Fig 3 : A view of the training programme on cashew production technology.



Fig 4 : A view of the training programme on low cost nutritious receipes.

During Rabi, the farm families at Saligao village were supplied with Dh-3-30 groundnut seeds. The beneficiaries were imparted skill oriented training in technologies for groundnut production. The total demonstration area was 2.5 ha.

In Taleigao village, where the high yielding rice variety 'Annada', was demonstrated during Kharif as against locally ruling variety 'Jyoti', the demonstration yield was 48 q/ha. At existing cost of Rs. 700/q the output was Rs.33,600/-. The cost of cultivation including the family labour worked out to Rs. 12,750/- ha. Thus a cost benefit of 1:1.63 was realised in the demonstration.

Similarly, in Saligao village, where groundnut variety Dh-3-30, alongwith Gypsum and other cultivation technologies were imparted, the demonstration yield was 22.5 Q/ha, as against the ruling variety which yielded 12.8 Q/ha. The gross returns of Rs. 30,500/- was realised considering the cost of groundnut pods @ Rs. 1400/q. The cost of cultivation was worked out to be Rs. 6250/ha leading to a cost-benefit ratio of 1:4.40.

B. Horticulture

Under Lab to Land Programme the techniques of improved cultivation practices for cashew (Var.V-4) and mango (Var. Amrapali) were demonstrated and critical inputs were supplied. Technology on improved cultivation practices for vegetables was also demonstrated in farmers field under LLP by giving the vegetable seeds of improved varieties.

Forty eight farm families from Taleigao and Betki villages were adopted. Vegetable seeds of improved varieties i.e. bhendi (parbhani Kranti), cluster beans (Pusa Navbahar) and radish (Pusa chetaki) were supplied to Taliegao farmers. The cashew (V-4) and mango grafts (Amrapali) were supplied to Betki farmers. The demonstration units were monitored regularly and results obtained are presented in Table 37 and cost benefit analysis is presented in Table 38.

Table 37. Results of the vegetable demonstrations under LLP

	Type of vegetable	method	variety	yield (q/ha)
1.	Bhendi	traditional	local	80
		improved	Parbhani Kranti	101
2.	Cluster beans	traditional	local	67
		improved	Pusa Navbahar	82
3.	Radish	traditional	local	152
		improved	Pusa Chetaki	192

Table 38. Cost benefit analysis of the vegetable demonstrations

	Type of vegetable	Av. yield (q/ha)	Cost of production	Gross returns	C.B. ratio
1.	Bhendi	101	9,300	32,000	1 : 3.4
2.	Cluster beans	82	10,500	35,000	1 : 3.3
3.	Radish	192	11,800	28,000	1 : 2.4

The high yields obtained from the demonstration plots was due to improved technology and the use of high yielding improved varieties of vegetables.

In order to improve the productivity of local cashew trees, 12 demonstrations on "cashew top working" were conducted during 1990-95. The average yield of the trees and the cost-benefit analysis is presented in Table 39. These demonstrations were conducted at farmers field in the villages of Tisk, Parye, Raia, Pali, Verna, Curti, Haveli, Valpoi and Madkai.

Table 39. Performance and C.B. ratio of top worked cashew trees

Year	Expenditure incurred/tree	Yield kg/tree	Income Rs/tree	C. ra
1st	50	–	–	5
2nd	40	0.30	11	3
3rd	50	1.45	52	1
4th	60	4.50	162	1
5th	70	6.90	248	1
6th	70	9.80	352	1

C. Animal Sciences

Under Animal Sciences, 22 farm families were selected in Taleigao and Nerul villages and 16 poultry units were supplied containing 10 female and one male bird per each unit. Similarly, four farm families at Nerul, Taleigao and Old Goa villages were supplied with pig units (1 male and 1 female) of Yorkshire breed and two farmers at St. Cruz and Velsao (Cansaul supplied with two Soviet Chinch breeds of rabbits (2 female and 1 the units are performing well.

D. Home Science

In Home Science, 15 fami selected from Taleigao village und Land Programme during the year Metallic portable chullas were give for the beneficiaries. The improve are scientific modifications of t chullas. They ensure proper co and reduce losses due to conve radiation and thus utilizes the hea fuel efficiently. It is observed improved chullas the consumption 50 per cent less than ordinary ch saving fuel and time in cooking. It require blowing and thus reduc hazard in women folks. It helps to drudgery in kitchen.

National Demonstration

During the period under report, National Demonstration was conducted at Nerul village of Bardez Taluka under three cropping sequences viz., Kharif-rice, Rabi-groundnut and summer-pulse each covering an area of 1.6 ha. In all 12 demonstrations were laid out to demonstrate the impact of improved package of practices of field crops and the new varieties. In all 4.8 ha was covered under these demonstrations.

dresser and gypsum were supplied. Training in groundnut production technology was imparted to all the beneficiaries in cultivation and post harvest methods. The crop was monitored regularly and compared with local variety. JL-24 grown in the adjoining area.

During the beginning of summer season (February), local variety of cowpea (Alsano) was sown in 1.6 ha as a third crop and harvested in April. The results are presented in Table 40.

Table 40. Performance of crops in different crop sequence under National Demonstration.

Season	Crop	Variety	No. of demon.	Area (ha)	Av. yield (Q/ha) demo.	Local check	% Increrase
Monocrop	Rice	Annada	12	4.8	46.2	32.5	42.1
Double crop	Rice	Annada					
	Groundnut	Dh-3-30	8	3.2	26.8	13.6	94.0
Multiple crop	Rice	Annada					
	Groundnut	Dh-3-30					
	Cow pea -	Local	4	1.6	8.4	4.6	50.0

During Kharif 1995, 4.8ha area was sown with a short duration rice variety Annada (IET-6223). Critical inputs were supplied to the farmers. Skill oriented training was imparted in nursery techniques and production of rice. The plots were visited at regular intervals. Plant Protection measures were taken in two plots where incidence of case worm was noticed.

During Rabi season, the second crop i.e. groundnut was grown in an area of 3.2 ha (double crop). Improved groundnut (variety Dh-3-30) seed alongwith seed

The results thus demonstrated the increase in productivity of these crops in different crop sequences with groundnut showing impressive per cent increase. This was possible by virtue of improved cultivation practices along with some of the critical inputs and timely practices like sowing.

The results also indicated an impressive cost benefit ratio in case of pulses and groundnut. The analysis of cost benefit ratio is presented in Table 41.

Table 41. Cost benefit analysis of cropping sequences under National Demonstr

Crop / sequence	variety	Yield (Q / ha)	Cost of production (Rs. / ha)	Gross Returns (Rs. / ha)	Net Returns (Rs. / ha)
Rice (Monocrop)	Annada	48	11,800	* 33,600	21,800
Rice	Annada	45	11,800	* 31,500	19,700
Groundnut (Double crop)	Dh - 3- 30	26.8	7,250	** 37,520	30,270
Rice	Annada	43.6	11,800	* 30,520	18,720
Groundnut	Dh - 3- 30	23.2	7,250	** 32,480	25,230
Cow pea (Multiple crop)	local	8.4	3,150	*** 21,000	17,850

* Saleable price of Paddy - Rs. 700 / Q

** Saleable price of Groundnut Pods - Rs. 1,400 / Q

*** Saleable price of Cow pea - Rs. 2,500 / Q

The National demonstration, thus clearly showed the possibility of raising three crops sequence to augment farm family income. The cost benefit ratio was found to be highest in case of pulse mainly due to lower cost of cultivation.

Frontline Demonstration

During the year, a target of 10 ha was set for the implementation of Frontline Demonstration on oil seeds (groundnut). Mencurem and Sal villages of Bicholim taluka were selected for implementing the programme covering 5 ha each. Thirty beneficiaries were selected in consultation with Directorate of Agriculture, Govt of Goa and were imparted training for groundnut preservation. Inputs like groundnut seed var. Dh-3- 30, Dh-40 and JL-24, Thiram, Rhizobium culture and gyps supplied. During the cropping s farmer's meeting was organis village in collaboration with Directorate of Agriculture, Govt. o demonstration site was visited re interculture operations like application, plant protection monitored.

The results of demonstrati that the application of gyp significant effect on the total pods/plant, number of pegs forme of filled pods, size of the pods, 100 kernel and the yield. The pe of varieties are detailed in Table 4

Table 42. Performance of three groundnut varieties under Frontline Demonstrations (FLD) during Rabi, 1995-96.

Sl.	Observations	Varieties		
		Dh - 3- 30	Dh - 40	JL - 24
1.	Avg. number of pods / plant	34.8	29.6	21.8
2.	Avg. pod length (cm)	3.57	3.29	3.67
3.	Avg. number of kernels / pod	2.68	2.03	2.83
4.	1000 Kernel weight (g)	49.8	43.1	41.0
5.	Shelling (%)	70.3	74.5	72.0
6.	Duration (days)	104	100	118
7.	Yield (Q / ha)	24.6	20.8	14.2

The data on average yield obtained and the highest yield achievable is tabulated in Table 43.

Table 43. Performance of three groundnut varieties under FLD during Rabi 1995-96

Variety	Area (ha)	No. of benefi-ciaries	Avg. Yield (Q / ha)		Highest demo. yield (Q/ha)	% Increase
			Demo	Local check		
JL - 24	6	18	14.2	14.2	18.4	19.5
Dh - 3-30	2	7	24.6	14.2	26.2	73.2
Dh-40	1	5	20.8	14.2	22.1	46.4
	10	30				

The results indicated that improved varieties Dh-3-30 and Dh-40 had significant yield increase (73.2 and 46.4% respectively) over the local check JL - 24.

Other activities

During the year, a total of 867 kg. of rice seed was produced for seed purpose.

Table 44. Quantity of rice seed material produced during 1995 - 96 (in kgs.)

Sl. No.	Variety	Kharif	Rabi	Total
I.	Medium Duration			
a.	MO-7	6.00	135	141.00
b.	Sarjoo-52	6.50	18	22.50
c.	Pusa-205	6.75	19	25.75
d.	CO-44	6.25	16	22.25

Sl. No.	Variety	Kharif	Rabi	Tot
e.	Annada	2.50	23.50	2
f.	Ravi	3.50	25.00	2
g.	Prasanna	6.00	–	
III.	Fine grained / scented			
a.	M-109	20.25	75.00	9
b.	M-108	24.25	30.00	5
c.	M-102	17.25	40.00	5
d.	M-127	27.25	75.00	10
e.	Indrayani	–	85.00	8
f.	Pawana	–	90.00	9
g.	Ambe Mohar	–	10.00	1
	Total	150.00	717.25	867

Nursery activities

During the year, the following planting materials were prepared to supply to the beneficiaries of Lab to Land Programme, research activities and for the general sale to farmers.

Cashew grafts (V-4)	- 3829	nos.
Mango grafts (Amrapali, Ratna, Mankurad etc.)	- 2921	nos.
Guava (L-49) layers	- 65	nos.
Bush peppers	- 92	nos
Arecanut (Mangala) seedlings	- 5000	nos.
Other ornamentals	- 1000	nos.
Total	12907	nos.

3. On Farm Research

During the year under report, the bench mark survey for identifying families has been completed and so far 100 families in Betki, Raigin and Gaune villages in Ponda have been selected to include two programmes viz. Client Oriented Research (COR) and Problem Oriented Research (POR). In addition, under the Wat Programme the KVK actively particip farmer's meetings at Quepem and Talukas organised by the Director Agriculture and delivered lectur technology for crops suitable watershed area.

a) Client Oriented Research

During the year under repo SC/ST families were given poultry un + 1) at Kundaim and Betki villages. Home Science, 30 SC/ST families selected in Kundaim/Raigin village metallic chullas and sanitary pipes given to the beneficiaries.

b) Problem Oriented Research

During the year, two farm f have been selected at St. Estevam a Goa villages. For overcoming the pr of Agalactia in does, balanced p rabbit feed was provided t beneficiaries. Some of the problem sweet potato weevil, stem bleed coconut etc., are identified and s

Total
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remedial measures to contain the field problem will be initiated during next year.

C. Watershed mnagement

During the year under report, the KVK participated in two meetings in watershed areas organised by Directorate of Agriculture at Kodar and Adnem watersheds and gave lectures on the water conservation practices and technology for crops in the watersheds.

4. Report on Completed Research Projects

4.1. Performance of crossbred pigs in Goa.

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

The project was initiated with the following objectives

1) To raise crossbred pigs by mating local sows with exotic boars and to study their performance under local condition.

2) To study the suitability of crossbreds for economic pork production.

3) To study the performance of pure bred and crossbred under field and stallfed condition.

The project was initiated in field condition till 1985. During the period, crossbred pigs were produced l young Yorkshire boar with loca overcome the body dispar performance of these crossbre typical field condition (scaven supplimentary feeding mainly fro waste) was studied. Farm facil created to study the perfor different exotic crosses unde condition in a systematic Accordingly, two exotic bre Yorkshire and Landrace were intr produce crossbreds with locals. 50 farrowings and 325 anim observed for their reproduc production performance. Besides of castration on pork production studied. The summary of the r presented in Tables 1, 2 and 3.

Table 1. Reproductive performance of pure bred and cross bred pigs.

Breed	Age at maturity (days)	Average Gestation period (days)	Average Litter size (No.)	Birth weight (kg)	N
Yorkshire	285	115.3	5.6	0.77	
Yorkshire cross	342	115.0	5.1	0.67	
Landrace cross	339	115.3	5.3	0.73	

Pure Yorkshire was found to be better in reproductive performance. Ho incidence of still birth was more. Among the crossbreds, the landrace cross was be

Table 2. Production performance of pure and crossbred pigs

Breed	Body weight (kg.)				Daily gain in body weight (g)			
	8^{th} week	12^{th} week	20^{th} week	30^{th} week	8^{th} week	12^{th} week	20^{th} week	30^{th} wee
Yorkshire	10.2	14.1	22.3	41.1	168.4	139.3	146.4	268
Yorkshire cross	9.6	14.9	20.3	42.7	159.5	189.3	96.4	320
Landrace cross	9.4	14.9	24.4	48.0	154.8	196.3	169.6	337

The performance of landrace was found to be superior to both pure Yorkshire and its cross.

The growth rate and gain in body weight was more in castrated group which may be due to deposition of more fat.

Table 3. Effect of castration on pork production

Age (week)	Body weight (kg)	
	castrated	control
8	10.69	10.60
12	16.57	15.20
16	21.90	20.40
20	27.60	24.90
24	34.30	29.80
	Fat deposition (cm)	
Back fat	4.0	3.0
Loin fat	4.9	3.2
	Daily gain in Body wt. (g)	
	210.8	171.4

It was found that by castrating at early age and slaughtering at early age upto seventh month, there was no remarkable fat deposition, which is important for lean pork production.

Publication

Bhattacharyya A.R., Sundaram R.N.S., Nair N.S. and Thomas V.J. 1983. Performance of crossbred piglets (Local x Yorkshire) under field condition in Goa. A short communication. Livestock Advisor, Vol. **3 (9)** : 9-10.

Bhattacharya A.R., Sundaram R.N.S. 1986. Studies in carcase characteristics of F_1 cross (Local x Yorkshire), VIIIth Workshop of AICRP on pigs at Tirupati. 25-27 Feb. 1988.

Bhattacharya A.R., Sundaram R.N.S. 1988. Performance of cross bred pigs under Goa conditions. *Indian J. Animal Res.* **22** (1) : 53- 54.

Results that had gone for technology transfer

Field units of crossbred pigs were established to study their performance under field condition for demonstration.

4.2 Introduction and performance studies of meat type rabbits in Goa.

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

The project was initiated with the following :

(1) To identify suitable meat type rabbits,

(2) Standardisation of husbandry practices to augment quality meat production and

(3) Diversification of livestock production practices.

Rabbit rearing for meat and wool has been gaining popularity in different parts of India in recent years. Exotic meat breed was introduced in 1979, in the sub-Himalayan region. Subsequently it was introduced in other parts of the country. Goa is a coastal state, having annual rainfall of 300 cm, restricted to four months (June to Sept.), with moderate temperature (20°C to 35°C) and high humidity (75% to 92%). It offers good scope for meat producing livestock because of the unique non-vegetarian food habits of the Goans as well as the demand due to heavy tourist inflow. In view of this, meat rabbits were introduced and their production performance was studied under local condition.

Rabbit Breeding :

Four exotic meat breeds of rabbit viz., Soviet Chinchilla (SC), New Zealand White (NW), Grey Giant (GG) and White Giant (WG) were introduced from Central Sheep and Wool Research Institute, (Division of Fur Animal Breeding, Garsa, Dist. Kulu, H.P.). These animals were maintained in individual cages under managemental and hygienic Various economic traits viz., cent, litter size and litter w recorded for each kindling analysed.

Among the four exotic m kindling (78.5%) and growth rat were higher in Soviet Chinchil litter size was higher in New Ze (6.7). The overall performance Chinchilla was better than ot under local conditions.

In view of the better perf Soviet Chinchilla, further observ made on this breed. The result is in Table 1 :

Table 1 : Performance of Chinchilla rabbit in G

Gestation period (days)	3
Litter size at birth	(
Litter size at weaning (28 days)	(
Litter weight at weaning (kg)	(
Birth weight (gm)	5
Weight at 16th week (kg)	(
Adult weight (kg) male	(
Adult weight (kg) female	(
Average daily weight gain upto 16 weeks (gm)	1

The performance of Soviet was satisfactory and comparab performance at the Himalaya indicating that the meat typ particularly Soviet Chinchilla successfully reared under coast conditions.

Cross breeding was ca between Soviet Chinchilla and adult rabbits to study the perfo

crosses. Adult animals were maintained under identical management conditions at the institute's farm in Goa. A total of 168 kits involving 70 SC, 52 cross bred (XB) and 46 L were available to study the growth. Data were analysed as per the procedure described by Snedecor and Cochran (1967) for various growth parameters and the same is presented in Table 2.

Table 2 : Comparative growth performance of exotic, cross bred and local rabbits.

	SC (Soviet Chinchilla	XB (Cross Bred)	L (Local)
Litter size at birth	7.00+1.24	5.20+1.03	4.6+0.90
Litter size at weaning	5.00 + 0.81	4.9 + 0.98	4.0 + 0.40
Litter weight at birth (kg)	0.38 + 0.05	0.27 + 0.05	0.21 + 0.04
Litter weight at weaning (kg)	2.10 + 0.44	1.73 + 0.45	1.77 + 0.28
Weight at 16th week (kg)	2.00 + 0.25	1.73 + 0.18	1.50 + 0.12
Average daily weight gain (g)	17.37	15.03	13.31

Thus, it can be interpreted from the present work that there is no advantage in cross breeding of meat type Soviet Chinchilla rabbit with local and it would be beneficial to go for pure breeding for better growth under the prevailing agroclimatic conditions.

Seasonal variation in the production performance of rabbit was recorded in 65 kindlings. It was identified that the daily weight gain of kit born in winter was higher (16.90g) than in summer 14.96 g) (Table 3).

Table 3 : Seasonal variation in production performance of rabbits.

	Birth wt. (g)	Litter size	Wt. at 30 d. (g)	Wt. at 60 d. (g)	Wt. at 90 d. (g)	LS weaning	ADG (g)
Summer	53.32	5.65	340.30	859.62	1400.08	4.40	14.96
Monsoon	54.41	5.15	426.11	853.15	1372.83	4.85	14.64
Winter	52.35	5.45	472.63	1020.52	1573.85	4.54	16.90

LS - Litter size. ADG - Av. Daily Gain.

There was no appreciable difference in litter size at weaning between SC and XB animals. However litter weight at weaning and weight to kit at 16th week was higher in SC than in other groups indicating its better growth rate (Fig. 1). The average daily weight gain was also significantly higher (P = 0.01) in SC.

From the overall studies it was observed that under the tropical coastal climatic conditions, the pure bred SC performed better in comparison to XB.

Feeding practices :

Feeding is the major maintenance expenditure in rabbit unit. Voluntary feed intake provides the basic information for optimum feeding of livestock. Available literature on this aspect is mainly pertaining to large animals like cattle, sheep etc.

Information pertaining to the feed requirement and management of rabbit, particularly for tropical coastal climate condition are lacking. In view of this, the optimum daily feed requirement of adult

animal was studied under the local climatic condition for Soviet Chinchilla and local animals.

The drymatter intake / kg body weight was higher in local rabbit (61.96 g) than in Soviet Chinchilla (52.26 g). The dry matter consumption and digestibility of the two groups are presented in Table 4.

Eight Soviet Chinchilla and New Zealand white rabbits of 45 days age were selected for the trials. Individua were weighed and fed adlibitum grass and concentrate feed and r under identical management con chemical composition of grass an given in Table 5.

The feed intake, leftover output were recorded daily for animal for one week after the p trial of three weeks. Dry matter i

Table 4. Dry matter intake and digestibility in exotic and local rabbits.

	Soviet Chinchilla	L
Av. DM intake/animal/day (gm)	139.55	
Av. body wt. of animal (kg)	2.67	
Av. DM c intake/kg body wt. (g)	52.26	
DE intake/day/animal (k. cal)	330.17	
DE intake/kg body wt. (K. cal)	123.65	
DE intake/W. 0.75 kg body wt. (K. cal)	158.73	
DM digestibility (%)	69.08	

Table 5. Chemical composition of grass and concentrate feed (on per cent DM

Particulars	Crude Protein	Crude Fibre	Ether Extract	Total Ash	Nitr
Con feed	18.25	8.15	3.15	9.70	
NB 21 grass	6.75	34.52	1.95	10.46	
Dung	12.75	21.60	4.82	6.45	

Table 6. Comparative performance of exotic meat rabbits on DM intake an digestibility.

Particulars	Soviet Chinchilla	New Zealand
Total DMI (g/day)	88.12 ± 6.15	81.99
TDM digested (g/day)	51.88 ± 3.17	49.65
DM digesstibility (%)	58.87 ± 2.14	60.55
DM intake / kg body wt (%)	9.27 ± 0.54	9.24
ADF digested (%)	40.02 ± 2.04	40.03
CP digested (%)	62.06 ± 2.81	65.66
Average body weight (g)	950.00	
Average daily weight gain (g)	24.60	

digestibility, were calculated based on the data collected during the feeding trial. Comparative performance of the breeds is presented in Table 6.

The average daily weight gain and feed intake per day were almost at par for both breeds. The digestibility of ADF was 40.02 and 40.03 for SC and NW breeds, whereas that of CP was 62.06 and 65.66 for SC and NW breeds, respectively. Evans *et al.* (1983) reported the DM intake of 7.83 to 11 per cent per kg body weight for young rabbits. The average intake of DM in the present study was 9.27 and 9.24 for SC and NW rabbits respectively. The DM digestibility was 58.87 and 60.55 for SC and NW breeds. Similar values have been reported by Battaglini and Grandi (1984) for young NW rabbits with mixed feed. The present observation is indicating that the DM requirement is around 9 per cent of the body weight for weaners, irrespective of the breed under tropical coastal climate conditions.

To identify the feed requirement of young rabbit, feed intake was recorded upto 120 days. Average daily feed intake at 30, 60, 90 and 120 days are presented in Table 7.

The roughage concentrate ratio was higher (1 : 1.7) at 30 days of age whereas it was lower (1 : 1.4) at 120 days indicating an increase in roughage intake as age advances.

Housing System :

Mortality among young animals was higher due to lack of milk secretion (Agalactia) by the doe. With a view to identify suitable management practices to reduce the incidence of agalactia, modified housing system was developed with laterite stone and wooden frames. The internal temperature of the rabbit house was reduced by 3°C by this modification (Fig. 2). The incidence of agalactia was lower (11.10%) in the modified housing system as compared to the cage system (44.4%).

Pelleted feed is essential for rabbit to avoid wastage and to give proper exercise to their teeth. The existing pelleting machine in the market are expensive and not suitable for small scale production. Hence pelleting machine was fabricated to produce 70 kg pelleted feed per hour. The machine operated with a 5 HP motor will cost around Rs. 18,000/-

Table 7 : Voluntary dry matter intake of Soviet Chinchilla rabbit at different ages.

Age (day)	Body wt.	Av. Daily Wt. gain (g)	Av. daily feed intake			Roughage-concentrate ratio
			Concerntrate (g)	Roughage (g)	Total (g)	
30	326.50	12.81	24.51	14.33	38.84	1:1.7
60	1191.66	29.56	54.82	41.62	96.45	1:1.3
90	1833.25	19.15	76.50	50.52	127.02	1:1.5
120	2050.00	17.80	77.82	52.56	130.26	1:1.4

Diseases in rabbits :

The outbreak of an epidemic was observed during June, 1990 at the institute's experimental unit. Initially it was observed that adult animals were dull, went off feed and water. Subsequently, a febrile condition with temperature of 49°C along with lacrimation and nasal discharge followed by

dyspnoea was observed. Affected animals died within 24 to 48 hours after onset of symptoms. At the time of death animals showed bleeding from nostrils. The outbreak lasted 10 days, during which 100% mortality was observed in adult animals. Those younger than 12 weeks of age remained healthy and did not show any symptoms.

Postmortem examination revealed profused haemorrhage in the lungs, inflammation with haemorrhagic streaks in the liver and petechial haemorrhage in the small intestine and subcutaneous tissue. No literature or information was available on the occurence of viral haemorrhagic disease of rabbits in India and hence this forms the published report from our country.

Publication :

Sundaram R.N.S. and Bhattacharyya A.R., Growth performance of exotic meat rabbit and its crosses under tropical coastal climatic condition. *Indian. Vet. J : 68 :* 693-694

Sundaram R.N.S. and Bhattacharyya A.R., 1992, Performance of exotic meat rabbit under tropical coastal climatic condition. *Indian. J. Anim. Res. 26* (2) : 109-110.

Sundaram R.N.S., Bha A.R., Nair N.S., and Maria Va Note on the incidence of ha disease in rabbits in Indian. *J. A Res. 14* (3) : 151.

Sundaram R.N.S., Bha A.R. and Nair N.S., Rabbit prod management. Tech. Bulletin in Ko

Results that has been passed extension / transfer of technolo

1. Exotic pure bred chinchil perform better than its cross local rabbits.

2. By suitable modification of th system with locally available m incidence of agalactia can be re

3. A pelleting machine h fabricated for the sma production of rabbit pelleted f

4. Feed requirement and grow exotic and cross bred rabbi worked out with a view t economic aspects of reari under the local condition.

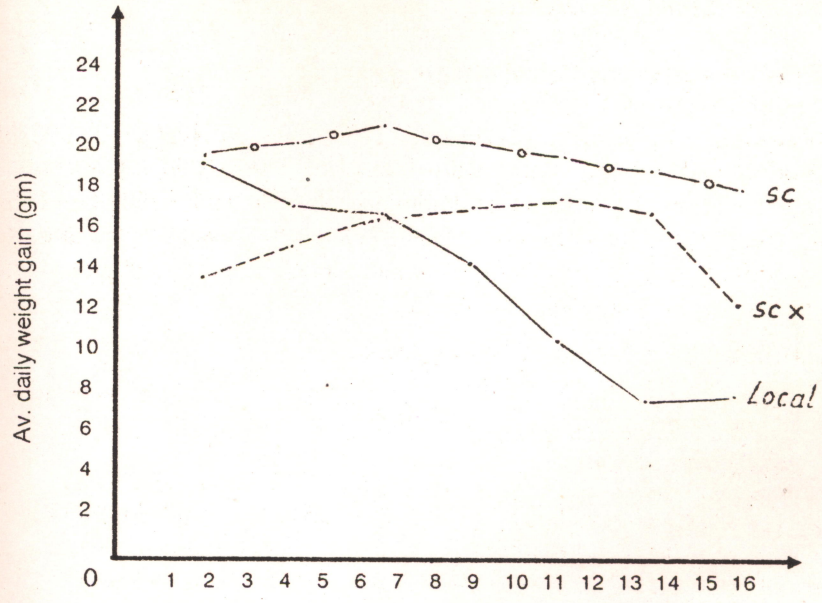


Fig. 1. Daily weight gain of SC, SCX and Local rabbits

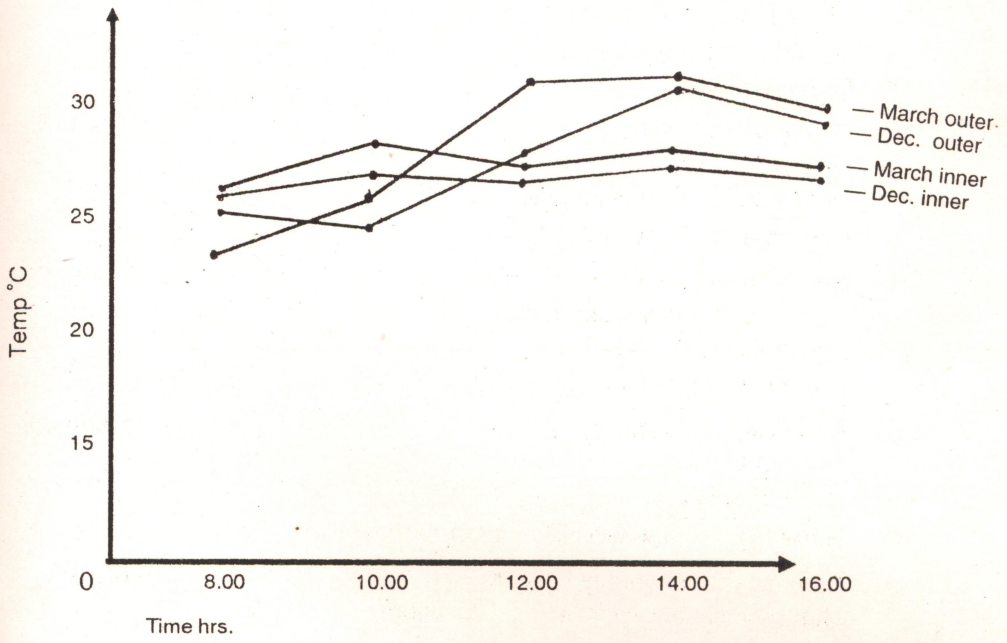


Fig. 2. Effect of modified housing system on internal temperature of rabbit house.

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

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

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

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

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

10. Dr. K. D. Patil / - Member Secretar
Dr. A. R. Bhattacharyya,
Principal Scientist, ICAR Research Complex,
Ela, Old Goa - 403 402.

5.3 Staff Research Council

The Indian Council of Agricultural Research, Krishi Bhavan, New De constituted the Staff Research Council Committee for the Institute with effect fr 14-7-1994 for a period of three years. The powers and functions of the Staff Resea Council include (i) consideration and evaluation of the new research project propos (ii) Consideration and evaluation of the ongoing projects to make spec recommendations about the achievements and short comings of the projects advise on the fostering of linkages between the groups / divisions / Institutes respect of multi-disciplinary projects / multi locational projects and (iv) monitor follow-up action on the recommendations of QRT's with respect to techn programmes of the Institute. The Research Council met on 20-21, July 1995 and November 1995 during the period under report.

The Committee consisted of the following members :

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) Sanjay Building, Narayanpur,
Dharwad - 580 005.

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

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

5. All the Project Leaders - Members

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

5.4 Local Management Committee (K.V.K.)

The Local Management Committee which comprises of both government officials and non-governmental representatives of different categories such as farmers, farm women, social worker etc., who are directly or indirectly associated with the agriculture development of the State, is periodically monitoring the activities of Krishi Vigyan Kendra attached to the Institute. During the period under report, the Committee met on 14-11-1995 and reviewed the progress of work and approved the technical programmes for the year.

The following were the members of the new committee:

1. Dr. D. G. Dhandar, - Chairman
Director,
ICAR Research Complex for Goa.

2. Director of Agriculture, Govt. of Goa - Member

3. Director of A.H. & V.S., Govt. of Goa - Member

4. District Animal Husbandry Officer, - Member
Directorate of AH & VS, Govt. of Goa

5. Assistant Director (Training), FTC, Ela, Old Goa. - Member

6. Shri Vithal Benaulikar - Member representative of small farmers.

7. Shri Tatyasaheb Shinde - Member representative of big farmers.

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	
A. R. Desai, M.Sc. (Ag)	Scientist	Horticulture	from 13-2
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	
H. R. Chidananda Prabhu, M.Sc. (Ag)	Training Associate (T-6)	Plant Protection	from 2-9-1
V. S. Sakharkar, Ph.D	Training Associate (T-6)	Ag. Extension	from 11-10-199
K. Manikandan, Dip. (Ag)	Technical Officer (T-5)	Agronomy	upto 31-7-
K. K. Metar, Dip. (Ag)	Training Asst. (T-4)	Agrl. Extn.	
Premlatha Lade, M.Sc. (Home Sci.)	Training Asst. (T-4)	Home Science	upto 30-10-199
Administrative			
S. Sadashiva	Asst. Admn. Officer	from 6-6-1995	
A. P. Shenoy	Asst. Fin. & Accts. Officer	from 8-3-1996	
M. K. Lekshmikutty	Superintendent		
Jagadish Ramani	Superintendent	from 11-3-1996	

5.7 Transfers

Name & Designation	From	To	Date (w.e.f.)
1. Dr. K. D. Patil, Principal Scientist	ICAR Research Complex, Goa	NRC Sorghum, Hyderabad (A.P.)	30-9-1995
2. Shri P. A. Mathew, Senior Scientist	ICAR Research Complex, Goa	Indian Institute of Spices Research, Calicut,Kerala.	25-9-1995
3. Shri S. Chander Rao Scientist (Sr. Scale)	ICAR Research Complex, Goa	NRC on Oil palm, Eluru Andhra Pradesh.	26-8-1995
4. Shri A. R. Desai, Scientist	ICAR Research Complex for NEH Region, Meghalaya	ICAR Research Complex, Goa.	13-2-1996
5. Shri K.Manikandan, Technical Officer (T-5)	ICAR Research Complex, Goa	CPCRI, Regional Station, Vittal	31-7-1995

5.8 Appointments

Name	Post	Date of Joining
1. Shri H. R. Chidananda Prabhu	Training Associate T-6	2-9-1995
2. Shri V. S. Sakharkar	Training Associate T-6	11-10-1995
3. Shri S. Sadashiva	Asst. Admn. Officer	6-6-1995
4. Shri A. P. Shenoy	Asst. Fin. & Accts. Officer	8-3-1996
5. Shri Jagadish Ramani	Superintendent (Admn.)	11-3-1996
6. Kum. Pratibha Revodker	Junior Clerk	26-9-1995
7. Kum. Montia Rita D'Souza	Junior Clerk	30-9-1995
8. Shri Prakash Porwar	Supporting Staff (Gr. I)	10-1-1996
9. Shri Vilas Gaonkar	Supporting staff (Gr. I)	5-1-1996
10. Shri Suresh M. Gomes	Supporting staff (Gr. I)	5-1-1996
11. Shri Prabhaker Gaonker	Supporting staff (Gr. I)	8-1-1996
12. Shri Gokuldas Gawas	Supporting staff (Gr. I)	8-1-1996
13. Shri Sitaram G. Kuncolker	Supporting staff (Gr. I)	9-1-1996
14. Shri Ashok N. Raut	Supporting staff (Gr. I)	19-1-1996

5.9 Resignation

Name	Post	Date of Resignation
Mrs. Premlata Lade	Training Assistant (Home Science)	30-10-1995

Total staff strength of ICAR Research Complex and KVK, Goa, as on 31-3- 1996 and number of SC/ST amongst them

Category	Post sanctioned			No of employees in position			No. of vacant posts			No. of SC employed	No. of ST employed
	MI	KVK	T	MI	KVK	T	MI	KVK	T		
1	2	3	4	5	6	7	8	9	10	11	12
Scientific	20	1	21	8	-	8	12	1	13	2	-
Technical	21	13	34	10	7	17	11	6	17	4	-
Administrative	16	3	19	11	3	14	5	-	5	3	1
Auxiliary	2	2	4	1	2	3	1	-	1	1	-
Supporting	33	7	40	30	5	35	3	2	5	5	-
Total	92	26	118	60	17	77	32	9	41	15	1

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

Fig



Fig



PLATE 5



Fig 1 : Release of Institute's publication on the eve of Seventh Annual Research Council meeting.



Fig 2 : Dr. R. N. Pal, A.D.G. (P.C.), ICAR, New Delhi and Shri Ramalinga Reddy, Hon'ble members of Institute Management Committee on a field visit.



Fig 3 : Dr. M. Mahadevappa, V.C., U.A.S. Dharwad on a field visit to rice varietal trial.



Fig 4 : A view of the deliberations of Institute Management Committee meeting.

5.10 Budget of the Institute for the year 1995-96

	Sanctioned RE (In Rs)	Actual Expenditure (in Rs.)
Plan	50,00,000	49,77,134
Non Plan	40,60,000	40,57,946
KVK	28,00,000	26,31,371
Total	1,18,60,000	1,16,66,451

5.11 Important visitors

Dr. Sewa Ram, Project Co-ordinator (Agronomy), Project Directorate for Cropping Systems Research, Modipuram (U.P.).

Dr. M. V. Dhoble, Director of Instruction, College of Agriculture, Parbhani.

Prof. D. J. Bhat, Head of the Dept. of Botany, Goa University.

Dr. A. D. Rangwala, Assoc. Professor of Horticulture, Konkan Krishi Vidyapeeth, Dapoli.

Dr. K. V. Ahamed Bavappa, FAO consultant, Kerala.

Dr. G. D. Radder, Director of Research, University of Agricultural Sciences, Dharwad.

Prof. T. J. Verghese, Retd. Director of Instruction, College of Fisheries, (U.A.S.), Mangalore.

Dr. R. T. Gunjate, Retd. Professor & Head, Division of Horticulture, KKV, Dapoli.

Dr. J. V. Goud, Ex. Vice-Chancellor, University of Agricultural Sciences, Dharwad.

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

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

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

Shri Ramalinga Reddy, IMC Member, Somajiguda, Hyderabad.

Shri Tomy Thomas, Journalist and IMC Member, New Delhi.

Shri S. K. Patak, Finance & Accounts Officer, CIFE, Bombay.

Shri Vivek Rae, Secretary (Agriculture) Govt. of Goa.

Shri P. B. Hawaldar, Director, Directorate of Agriculture, Government of Goa.

Shri P. N. Shukla, Deputy Director (seeds), Directorate of Agriculture, Government of Goa.

5.12 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, Kasargod; Horticulture Society of India, New Delhi and Indian Science Congress, Calcutta.

Dr. K D Patil

Life member of the Indian Society for Plant Physiology; Member of the Indian Society of Agricultural Sciences; Association of Maharashtra Agricultural Research; Indian Society for Coastal Agricultural Research.

Dr. A R Bhattacharya

Founder member of Indian Society for the Study of Animal Reproduction.

Dr. S Subramanian

Full member of Asian Fisheries Society, Manilla, Philippines. Life Member of Inland Fisheries Society of India, CIFRI, Barrackpore; Marine Biological Association of India, CMFRI, Cochin; Agricultural Research Association, Karnal; Indian Fisheries Association, CIFE, Bombay; Association of Aquaculturists, CIFA, Bhubaneshwar; Member of Association of Rice Research Workers, CRRI, Cuttack; Botanical Society of Goa, Panaji; Indian Science Congress, Calcutta.

Dr. H M Wasnik

Life member of Maharashtra Journal of Agricultural University, College of Agriculture, Pune, Maharashtra.

Dr. R N S Sundaram

Life member of Animal Nutrition Society of India.

Shri P A Mathew

Life member of Indian Society for Plantation Crops, CPCRI, Kasargod, Kerala; Horticultural Society of India, New Delhi; Indian Society for Root crops, CTCRI, Trivandrum, Kerala; Member Agricultural Sub- committee of the Goa Chamber of Commerce and Industry, Panaji, Goa.

Shri A R Desai

Life member of Indian Association of Hill farming, ICAR Research Complex for NEH Region, Barapani, Meghalaya; Member, Horticultural Society of India, IARI, New Delhi.

Shri B L Manjunath

Life member of Indian Society for Weed Science.

Dr. Mani Chellappan

Member of Pesticide Society of Goa; Entomological Society of India, IARI, New Delhi.

Shri V Y Gaonkar

Member of Botanical Society of Goa; Mushroom Society of India; Local Advisory Committee, All India Radio, Panaji.

Shri H R Prabhudesai

Executive member of Botanical Society of Goa; Member of Indian Science Congress, Calcutta; Deccan Sugar Technologists Association (DSTA).

Smt. Sunetra Talaulikar

Member of Nutrition Society of India, NIN, Hyderabad; Association for Food Technology, CFTRI, Mysore.

Dr. V S Sakharkar

Life member of the Maharashtra Society of Extension Education; Society of Extension Education, TNAU, Coimbatore; Member of Agricultural Extension Review, Directorate of Extension, New Delhi.

5.13 Participation in Seminar / Symposium / Workshop / Conference

The XII biennial workshop of All India Co-ordinated Research project on cashew from 12th to 16th October 1995 at CPCRI Kasaragod.
D G Dhandar and Mani Chellappan

The Biennial Workshop of palms from 20th to 24th December, 1995 at CPCRI Kasargod.
D G Dhandar

Workshop on soil Resources of Goa for prospective landuse planning from 23-24 August 1995 at Panaji organised by NBSS & LUP, Nagpur and Department of Agriculture, Government of Goa.
D G Dhandar, S Subramanian, H M Wasnik, B L Manjunath and V Y Gaonkar

Workshop on the application of electronics in the development programmes in Goa on 1st February, 1996 organised by the Department of Science and Technology, Government of India at Panaji, Goa.
S Subramanian, R N S Sundaram, B L Manjunath and Mani Chellappan

National Symposium on managing water resources for sustainable agriculture and environment organised by Indian Society for water management from 5th to 7th October 1995 at Gujarat Agricultural University Campus, Navsari, Gujarat.
B L Manjunath

Seminar on zoonosis organised by Goa Veterinary Association on 10th January, 1996.
E B Chakurkar

Crop and Horticultural Seminar organised by RCF, on 21st May, 1995 at Agonda,Goa.
V Y Gaonkar

Crop and horticultural seminar organised by KRIBHCO on 24th June 1995 at Assolna, Goa.
V Y Gaonkar and H R Prabhudesai

Crop and horticultural seminar organised by PPCL, on 25th June, 1995 at Benaulim, Goa.
V Y Gaonkar and H R Prabhu Desai

National workshop on KVK's and TTC's from 9th to 13th September 1995 at Tirupati, Andhra Pradesh.
V Y Gaonkar

Seminar on organic farming organised by Lions Club of Canacona on 23rd September 1995 at Canacona.
H R Prabhudesai

Technical seminar on canine medicine organised by Goa Veterinary Association, in July 1995.
A V Nirmale

Workshop on "Training Management" from 24th to 29th April, 1995 at Gujarat Agricultural University Campus, Anand, Gujarat.
A V Nirmale

Seminar on Drip Irrigation in oil palm organised by Godrej Soaps Limited and Jain Irrigation Systems on 22nd December 1995 at Ponda, Goa.
V S Sakharkar

5.14 Important Meetings attended

Sixth Staff Research Council Meeting (20-21 July, 1995) ICAR Research Complex for Goa.

The Chairman SRC, outside experts, all scientists, KVK training personnel and farm superintendent.

Mid term Staff Research Council meeting (25th November, 1995) ICAR Research Complex for Goa.

The Chairman SRC, outside experts, all scientists, KVK training personnel and farm superintendent.

KVK Local Management Committee meeting (24th November, 1995) ICAR Research Complex for Goa.

The Chairman, member secretary of LMC, KVK, training personnel, invited members, all scientists and farm superintendent.

Mid Year Review Week meeting of the Directors of the ICAR (9-15 July, 1995) at ICAR Head Quarters, New Delhi.
D G Dhandar

Regional Committee meeting (7th October 1995) at CIFE, Bombay.
D G Dhandar

The DIA's meeting at the Directorate of Plant protection, Quarantine and Storage, Faridabad, Haryana (6th November 1995).
D G Dhandar

The ICAR Director's meeting (3-7 December, 1995) at ICAR Head Quarters, New Delhi.
D G Dhandar

Rural programme Advisory Committee Meeting of All India Radio, Panaji, Goa (6th December 1995)
S Subramanian

Fifth State Level Committee meeting on National Watershed Development Project for Rainfed Areas (15th January, 1996) at Secretariate, Panaji.
S Subramanian and B. L. Manjunath

Meeting on the Inter-Institutional Collaborative Research (6th February, 1996) at University of Agricultural Sciences, Dharwad.
S Subramanian and B L Manjunath

The 22nd meeting of official language implementation committee (21st August, 1995) at Panaji, Goa.
H M Wasnik

Zonal Level meeting of KVK (15th April, 1995) at NDRI, Bangalore.
V Y Gaonkar

Rural Advisory Committee meeting of All India Radio (13th September 1995) at AIR, Panaji.
V Y Gaonkar

Meeting of "Floriculture Development in Goa" (2nd February, 1996) at Secretariate, Panaji.
V Y Gaonkar

Farmer's Club Meeting (16th March 1996) organised by Bank of India and NABARD at Shiroda, Goa.
H R Prabhudesai

Rice Minikit meeting (18th April, 1995) organised by Directorate of Agriculture, Government of Goa.
H R Prabhudesai

5.15 Lectures Delivered

Lecture on advanced technologies of rice production (12-09-1995 and 6-3-1995) organised by Directorate of Agriculture, Government of Goa, at Ela, Old Goa.
B. L. Manjunath

Lecture on water management in rice (13-9-1996) organised by Directorate of Agriculture, Government of Goa at Ela, Old Goa.
B. L. Manjunath

Lecture on dairy farming organised by Directorate of Agriculture, Govt. of Goa at Ela, Old Goa.
E. B. Chakurkar

Lecture on mushroom pests and their management (22-8-1995) organised by Farmer's training Centre, Govt. of Goa.
Mani Chellappan

Lecture on pests of rice, millets, groundnut and pulses (7-3- 1996) organised by Directorate of Agriculture, Government of Goa.
Mani Chellappan

Lecture on organic farming (12-7-1995) organised by Zuari Agro Chemicals and Directorate of Agriculture, Govt. of Goa at Old Goa.
H. R. Prabhudesai

Lecture on groundnut and sugarcane technologies (25-4-1995) organised by Directorate of Agriculture, Govt. of Goa at Old Goa.
H. R. Prabhudesai

Lecture on Vermiculture (21-8-1995) organised by G.V.M. College, Goa.
H. R. Prabhudesai

Lecture on biopesticides for IPM (11-10-1995) organised by IPM Centre, Margao at Sanguem.
H. R. Prabhudesai

Lecture on garbage disposal by vermiculture (13-11-1995) organised by Lions Club of Paroda at Margao.
H. R. Prabhudesai

Lecture on groundnut technologies (14-11-95 and 15-11-95) organised by Directorate of Agriculture, Govt. of Goa at Old Goa.
H. R. Prabhudesai

Lecture on Organic farming (21-12-95) organised by Directorate of Agriculture, Govt. of Goa at Old Goa.
H. R. Prabhudesai

Lecture on 'nutritional requirements for school going children' (19-11-95) organised by Innerwheel Club at Ponda, Goa.
Sunetra Talaulikar

Lecture on 'Poultry farming' (10-1-96) organised by Extension Training Centre at Old Goa.
Avinash V. Nirmale

Lecture on 'Diseases of mango, cashew and their management' (27- 12-95) organised by Directorate of Agriculture, Govt. of Goa at Old Goa.
H.R. Chidananda Prabhu

Lecture on 'pests of cashew and their control' (13-2-96) organised by Cashew Development Board, Cochin, at Old Goa.
H.R. Chidananda Prabhu

Lecture on 'diseases of vegetables and their control' (13-2-96) organised by Directorate of Agriculture, Govt. of Goa at Old Goa.
H.R. Chidananda Prabhu

Lecture on 'pests of cashew and their control' (23-2-96 and 29.2.96) organised by Directorate of Agriculture, Govt. of Goa at Old Goa.
H.R. Chidananda Prabhu.

5.16 Participation in extension oriented programmes

Field day on red palm weevil/bud rot (26-5-95) organised by Directorate of Agriculture, at Valpoi, Goa.
Mani Chellappan

Field day on fruitfall in chicku and nursery diseases in mango (13-9-95) organised by Directorate of Agriculture, at Kalay, Goa.
Mani Chellappan

Kisan Mela (nine) organised by Directorate of Agriculture, Govt. of Goa at Old Goa on 31-5-95, at Tivim on 15-5-95, at Bicholim on 20-5-95, at Ponda on 23-5-95, at Sanguem on 25-5-95, at Pernem on 27-5-95, at Cancona on 31-5-95, at Poryem on 1.6.95 and at Pisurlem on 10-6-95.
V.Y. Gaonkar, H.R. Prabhudesai and Sunetra Talaulikar

World food day (16-10-95) jointly organised by the Institute and Directorate of Agriculture, Govt. of Goa at Panaji, Goa.
Scientists and KVK staff

Horticulture show (11-11-95 to 14-11-95) organised by BPS club at Margao, Goa.
V.Y. Gaonkar and Vilas Sakharkar

Productivity day (12-12-96) at the Institute.
Scientists and KVK staff

Field days on cashew (three) organised by Directorate of Agriculture, Govt. of Goa, at Canacona on 20-4-95, at Valpoi on 25- 4-95 and at Barcem on 28-4-95
V.Y. Gaonkar

Farmers Mela (21-5-96) organised by Indian Potash Ltd. at Agonda, Goa.
H.R. Prabhudesai

Kisan Mela (26-3-96) jointly organised by the Institute and KVK at Old Goa.
Scientists and KVK staff.

Women in Agriculture day (4-12-95) organised by the Institute.
Sunetra Talaulikar

Field day for Women (29-3-96) organised by KVK at Bhoma, Goa.
Sunetra Talaulikar

5.17 Programmes in electronic media

i) Radio (AIR), Panaji.

Role of trees in conserving water (Konkani), (20-4-95).
V.Y. Gaonkar

Rose pruning techniques (Konkani), (13-7-95).
V.Y. Gaonkar

Activities of KVK (Konkani), (27-11-95)
V.Y. Gaonkar

Intercropping in sugarcane (Konkani), (5-4-95).
H.R. Prabhudesai

Plant protection in Kharif rice (Konkani), (4-7-95)
H.R. Prabhudesai

Water for life (Konkani), (28-9-95)
H.R. Prabhudesai

Plant protection without chemicals (Konkani), (5-1-96)
H.R. Prabhudesai

Sugarcane research done by ICAR in Goa (Konkani), (24-1-96)
H.R. Prabhudesai

Importance of vegetables in diet (Konkani), (5-7-95).
Sunetra Talaulikar

ii) Television (Doordarshan, Panaji)

Discussion on 'Management of horticulture crops, (Konkani), (22-6- 95).
V.Y. Gaonkar

Interview on 'Use of manures and fertilisers for horticulture crops, (Konkani), (5-7-95).
V.Y. Gaonkar

Interview on 'Insect pests of rice and their control' (Konkani) (26-7-96).
H.R. Prabhudesai

Panel discussion on 'Organic farming' (Konkani), (18-8-95).
H.R. Prabhudesai

Discussion on 'Food for all' (Konkani), (16-10-95).
V.Y. Gaonkar.

5.18 Publications

i) Review Article/Book Chapter

Rao P.J. and Mani, C., 1996, Neem and insect pest management, *Shashpa* 3(1) : 57 - 72.

Rao, P.J. and Mani, C., 1995, Botanicals as a source of insect pest management chemicals. In *pesticides, crops protection and environment.* Ed. S. Walia and B.S. Parmar, Oxford and IBH, New Delhi, PP 57 - 73.

ii) Research articles

Mathew, P.A. and Dhandar D.G., Two lesser known tree spices of Goa, Paper sent to Indian Spices (In press)

Sundaram R.N.S., Chakurkar, E.B. and Bhattcharya A.R. Voluntary feed intake and nutrient digestability of exotic meat rabbit under tropical climate. Paper sent to *Indian Vet.* J. (In press).

iii) Popular articles

V.Y. Gaonkar, D.G. Dhandar, Coconut cultivation -2, Nursery techniques in coconut (Marathi), Sahakar Surabhi (Monthly) May 1995.

V.Y. Gaonkar, D.G. Dhandar, Coconut cultivation - 3, Planting of coconut and after care (Marathi), Sahakar Surabhi (Monthly) May 1995.

V.Y. Gaonkar, D.G. Dhandar, Coconut cultivation - 4, Mannuring of coconut (Marathi) Sahakar Surabhi (Monthly), June 1995.

V.Y. Gaonkar, D.G. Dhandar, Coconut cultivation - 5, Intercropping in coconut gardens (Marathi), Sahakar Surabhi, (Monthly), August 1995.

V.Y. Gaonkar, D.G. Dhandar, Coconut cultivation - 6, Diseases of coconut and their control (Marathi), Sahakar Surabhi, (Monthly), September 1995.

V.Y. Gaonkar, D.G. Dhandar, Coconut cultivation - 7, coconut pests and their control (Marathi), Sahakar Surabhi, (Monthly), October 1995.

V.Y. Gaonkar, D.G. Dhandar, Improve the productivity of horticulture crops (Marathi), Gomantak (Daily), October, 95.

V.Y. Gaonkar, D.G. Dhandar, Coconut cultivation - 8, Harvesting, yield and economics of coconut (Marathi), Sahakar Surabhi, (Monthly), January 1996.

H.R. Prabhudesai, Towards organic food for all (English), Herald (Daily), October 1995.

Sunetra Talaulikar, Food and diet (Konkani), Navaprabha (Daily), October 1995.

Nirmale A.V. and Subramanian S., Livestock in provision of food (English), Goamantak Times, October 95.

iv) Reports, Proceedings etc.

ICAR research complex for Goa, Annual Report 1993-94.

(Eds: B.L. Manjunath, Mani Chellappan and A.R. Bhattacharyya: 58p)

ICAR research complex for Goa, Annual Report KVK 1995-96.

(Eds: V.Y. Gaonkar)

5.19 Trainings Undergone

Second SERC School on Agrometeorology: Agriculture droughts-data base management organised by India Meteorological Department and Indian Institute of Tropical Meteorology at Pune from 27th November to 16th December 1995.
B.L. Manjunath

A course on training of trainers organised by National Academy of Agricultural Research Management (NAARM) at Hyderabad from 5th to 6th September 1995.
H.R. Prabhudesai.

Training course on integrated pest management in horticultural crops at Indian Institute of Horticultural Research, Bangalore from 5-10-1995 to 12-10-1995.
H.R. Chidanand Prabhu.

5.20 Participation in Inter Institutional and Inter Zonal Sports meet

A 14 member Sports contingent of the Institute participated in Inter Institutional Sports meet held from 9-13 October, 1995 at CAZRI, Jodhpur. The Institute participated in Football, Volleyball and Athletics. In Athletics, Shri Anil Khandeparkar won the first place in 1500 mts

and second place in 800 mts race. Similarly in 4 x 100 meters relay, Institute team (Shri Edward, Ravi, Ashok & Ramesh) got second place at the Inter-Institutional Sports meet.

Shri Anil Khandeparkar participated in the Interzonal sports meet which was held at IIHR, Bangalore from 8-10 May, 1996. In 1500 mts race, Shri Anil Khandeparkar got the second place. Shri M.S. Balbatti was the Team Manager for the Inter-Institutional sports meet and Shri Edward Crasta was the Team Manager for the Inter Zonal sports meet.

5.21 WEATHER DATA

	Temperature °C			Relative humidity (%)		Rainfall (mm)	
	Mean Max.	Mean Min.	Mean	5.30 hr.	23.30 hr	Normal	Actual
1995							
April	33.2	25.3	29.2	75	67	018.4	002.3
May	33.8	26.1	30.0	74	65	086.6	035.4
June	31.3	25.8	28.5	87	82	869.4	785.2
July	28.3	24.0	26.2	94	87	923.4	1526.1
August	29.7	24.5	27.1	92	84	456.2	737.9
September	30.1	27.5	27.3	89	82	252.7	200.2
October	31.5	24.1	27.8	87	79	118.9	252.4
November	32.6	21.7	27.1	79	62	035.8	006.2
December	33.0	20.6	26.8	74	59	003.0	000.0
1996							
Jan.	32.2	20.2	26.2	78	56	001.7	000.0
Feb.	33.1	21.1	27.1	77	58	000.1	000.0
March	33.6	25.9	29.1	71	52	000.7	000.0
Total						2,766.9	3,545.7