

**ALL INDIA COORDINATED RESEARCH
PROJECT ON CASHEW**

ANNUAL REPORT 1993-'94

PROJECT COORDINATOR

DR. EVV BHASKARA RAO (Upto November 30th 1993)



NATIONAL RESEARCH CENTRE FOR CASHEW

(Indian Council of Agricultural Research)

PUTTUR 574202, Dakshina Kannada

KARNATAKA, INDIA.

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ABOUT THIS REPORT

This is the tenth Annual report of the All India Coordinated Research Project on Cashew. The first three Annual reports pertain to the years 1984-85, 1985-86 and 1986-87 wherein the reporting period was 1st. July to 30th June of the subsequent year.

Based on the decisions of the Director's/Project Coordinator's Conference of Horticulture division of ICAR, held at IIHR, Bangalore during 8-11 April 1988, the reporting period was changed to January to December from the year 1988. However, the ICAR has decided to once again change the reporting period to 1st April to 31st March there by bringing an uniformity in the reporting period. This report covers the work carried out from 1st April 1993 to 31st March 1994.

There are seven project centres, four on the East Coast of India (Jhargram, West Bengal; Bhubaneswar, Orissa; Bapatla, Andhra Pradesh; and Vridhachalam, Tamilnadu) Two on the West coast (Madakkathara, Kerala; Vengurla, Maharashtra) and one in the Maidan parts of Karnataka (Chintamani) were implementing the research programmes. There are nineteen research projects pertaining to Breeding (5), Agronomy (5), Horticulture (3) and Entomology (6) disciplines. The results reported by each centre, discipline wise are presented in this report.

This report consists of two chapters, i.e.,

1. **TECHNICAL** - Consisting of project wise experimental results from different centres and
2. **ORGANISATION** - Consisting of history, functioning, budgetary provisions, staff, action taken on workshop recommendations, meteorological data and research publications.

Puttur 574202
November 1994

E.V.V. BHASKARA RAO
Project Coordinator
(Cashew)¹/_C

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CHAPTER I : TECHNICAL

COORDINATOR'S REPORT

The all India Coordinated spices and cashew nut improvement project was started during the fourth five year plan in 1971. During the Seventh plan the ongoing (All India Coordinated Spices & Cashew nut Improvement) project was bifurcated into two separate projects one on Cashew and another on Spices. During the same plan period the Coordinator's Cell for cashew was located in National Research for cashew, Puttur and for Spices in NRC - Spices Calicut. The All India Coordinated Research project on cashew has seven centres of which four were started at the inception of AICS & CIP in the year 1971 (Bapatla, APAU; Anakkaayam, KAU; Vengurla, KKV and Vridhachalam, TNAU). During Vth plan period one centre at (Bhubaneswar, QUAT) and two more were added during VIth plan (Jhargram, BCKV and Chintamani UAS). During VIIIth plan one new centre was sanctioned in Madhya Pradesh and the same is to be located at Jagadapur under IGKV. The budget allocation of the project for the year 1993-94 is Rs. 24.89 lakhs (Rs. 18.67 lakhs ICAR share). During 1993-94 the expenditure was Rs. 25.91 lakhs (Rs. 19.43 lakhs ICAR share). The project mandate is to give additional thrust to cashew research for increasing production and productivity through:

- * Evolving high yielding varieties with export grade Kernels, tolerant/resistant to pests and diseases.

- * Standardizing agro techniques for the crop under different agro-climatic conditions and

- * Evolving cost effective and efficient pest and disease management practices.

The XI Biennial Workshop of the project was held at UAS Bangalore (Karnataka) during 18-20 Aug. 1993. The Technical programmes decided at the workshop were implemented by the centres. Summary of the results of current year are presented below.

CROP IMPROVEMENT

A total of 855 cashew germplasm accessions (Bapatla- 127; Bhubaneswar-79; Chintamani-114; Jhargram-124; Madakkathara-120; Vengurla-161 and Vridhachalam-130) are being maintained and evaluated in different centres. In the germplasm evaluation the highest yield at Bapatla was recorded in T.No. 18/1 (66.2), T.No. 3/33 (42.2 kg) and T.No. 10/19 (22.5 kg), at Chintamani in 3/108 Gubbi (22.5 Kg), 5/37 Manjeri (21.7 kg), 13/5 Kodur (20.65 kg), ME-4/4 (17.55 kg), 2/77 Tuni (16.9 kg), 8/46 Taliparamba (14.05 kg) and 1/64. Mahuranthakam (10.50 kg), at Jhargram in JGM 71/5 (16.50 kg), at Madakkathara M 26/2 (8.3 kg) and M 15/4 ((23.5 kg) at Vridhachalam. The two hybrids H-1598 and H-1608 of Madakkathara are released as Kanaka and Dhana respectively. Dhana was accepted for release at National level during the XI Biennial Workshop. During the year a total of 72 new collections (Bapatla-4; Bhubaneswar-3; Chintamani-34; Jhargram-13; Madakkathara-5; Vengurla-13) showing promising characters were added to the germplasm by different centres. From the germplasm collection assembled earlier a total of 239 accessions have been clonally multiplied and planted in the conservation block by Madakkathara (56), Vengurla (75) and Vridhachalam (108).

In multilocation trial, varieties collected from different centres are being evaluated. The highest yield was obtained from Bapatla-6 (8.99 kg) at Chintamani; VTH -59/2 (6.73 kg) and H-2/16 (5.89 kg) at Jhargram.

Evaluation of F1 hybrids showed that two hybrids from Bapatla Viz., H 3/28 (T. No. 56 x M 10/4) and H 2/16 (T. No. 1 x T. No. 40) gave the maximum yield of 28.0 kg and 18.1 kg respectively.

A hybrid from Vridhachalam i.e., H 13 (M 26/2 x 26/4) recorded the highest mean yield of 4.50 kg/tree, and two hybrids from Vengurla (H. 255 and H. 367) gave the highest yield of 33.395 kg and 22.46 respectively.

CROP MANAGEMENT - A. AGRONOMY

In NPK trial, application of 500g nitrogen, 250g phosphorous and 250g potassium (N₂ P₃ K₃) per tree per year recorded the highest nut yield (13.68 Kg/ha) compared to the control trees in Chintamani. At Jhargram 300g nitrogen, 200g phosphorus and 600g potassium recorded the maximum yield per plant.

Foliar application of urea (2%) along with insecticides gave higher yields at Bapatla, Bhubaneswar, and Jhargram centres, 9.6 kg/tree with returns of Rs. 27,260/ha in Bapatla, 6.15 kg/plant in Bhubaneswar and 6.09 Kg in Jhargram respectively. The foliar nutrition of urea 4% along with endosulfan spray (T-4 treatment) registered the highest yield 6.35kg/tree and the highest nitrogen content in Vridhachalam and 9.85 kg/tree at Vengurla centre respectively.

In spacing trial, the maximum yield per plant and yield per block were recorded in 10m x 5m rectangular system with 50 percent thinning of plants and 6m x 6m x 6m triangular system in Jhargram centre.

Third leaf from the top of a crown showed higher values of all the nutrients studied, at Bapatla which can be used as index leaf, maximum accumulation of nutrients was noticed at 60 days after fertilizer application and there after it declined. The lowest value of all the nutrients was observed at advanced fruiting stage.

In the cashew based cropping systems, trial at Bapatla with annuals, cluster, bean, cowpea has given a yield of 1200 kg/ha, and 80 kg/ha respectively tried during Kharif whereas the rabi inter crops failed to come to maturity. In Vridhachalam Redgram Co. 6 gave the maximum yield of 313 kg/ha out of the annuals tried, but in redgram intercropped areas the growth of the main crop cashew, was found to be affected.

CROP MANAGEMENT - B. HORTICULTURE

Soft wood grafting was found to be the most successful method for vegetative propagation of cashew. The highest percentage of graft success was recorded during December (71%) and January (82%) at Bapatla; September (76.25%), August (69.53%) and July (63.66%) at Bhubaneswar; September (44.8%), October (39.3%) and November (43.3%) at Chintamani, July (61%), August (65.5%) and September (59.0%) at Jhargram; January (75.1%) and December (63.1%) at Vridhachalam.

A good graft success in top working

was obtained at Bapatla (75%), Bhubaneswar (63.3 - 84.0%). The success was low (7.6 - 36.1%) at Jhargram centre. At Vengurla centre five year old top worked trees (10 nos.) gave a mean yield of 8.64kg/tree.

Screening of root stock for dwarfing characters at Madakkathara revealed the possibility of identifying the less vigorous from the more vigorous ones using morphological characters, phenolic contents in leaves, stomatal index, bark percentage in root as criteria at the very seedling stage.

CROP PROTECTION

Treatment T-5 (spraying of monocrotophos 0.05% during flushing, endosulfan 0.05% during flowering and carbaryl 0.1% during fruiting stage) was found to be superior over other treatments in controlling tea mosquito bug and other pests at Bapatla, Bhubaneswar and Jhargram centres whereas, T-4 (spraying of monocrotophos 0.05% at flushing and endosulfan 0.05% at flowering stage) treatment was found to be superior at Chintamani centre and T-7 treatment (endosulfan at flowering and carbaryl at fruiting) at Vridhachalam and Vengurla in the control of major and minor pests.

In the trial on control of foliage/inflorescence pests of cashew with neem products, neem cake extract 5% spray was found to be effective and cost effective at Bapatla centre, neem seed kernel extract 5% followed by neem oil 2% have recorded the minimum tea mosquito damage at Vridhachalam centre.

At Bapatla and Bhubaneswar neem

oil 5% swabbing on the uninfested trunk during April month was found to be a good prophylactic measure for stem and root borer. Sevidol 4g (150 g/tree) and neem oil (5%) at Jhargram; sevidol (50g/tree) and neem oil 5% at Madakkathara were effective against stem and root borer.

Survey of pest complex in Andhra Pradesh by Bapatla centre revealed that cashew plantations in high altitude areas of northern coastal districts of Andhra Pradesh are more prone to tea mosquito bug infestation followed by fungus than parts in southern coastal districts. A moderate intensity of damage by tea mosquito bug was observed for the first time at Bhubaneswar. Two new insect pests of order hemiptera (bugs) and two hymenopteran parasites were recorded by Chintamani centre.

Leaf and blossom webber, leaf minor and leaf thrips were found to be more injurious than tea mosquito bug in Jhargram and cashew growing tracks of West Bengal. At Madakkathara natural enemies on tea mosquito were noticed to be spiders, mirid bug and chrysopa larvae.

Leaf and blossom webber were found to be heavily parasitized by *Brawn brevicornis* at Chintamani centre.

Screening of germplasm to locate tolerant/resistant types to major pests of the region have been carried out. V-5 showed the lowest infestation against shoot tip borer at Bhubaneswar; Brazil-120, Brazil-239, Brazil-244, Anakkayam-1, Madakkathara-1, K-22-1, H-3-13, H-3-17, H-680 H-682, H-719, H-1596, H-1597, H-1598 H-1600, H-1602, H-1608, H-1610, M-1

2, A-26-2, K-16-1 were comparatively tolerant to tea mosquito bug at Madakkathara. At Vridhachalam H-1598 (among MLT entries) VR-49, NR-59, M-60/4, NR - 34 (among new germplasm entries) recorded the least damage of tea mosquito bug incidence.

V-2, M-26/2 were free from shoot and blossom webber damage, V-2, V-4, V-5, M-26/2, M-44/3 and M-59/2 were free from incidence of ash weevil and M-9/3 (new germplasm entry) from damage of shoot and blossom webber.

EXPERIMENTAL RESULTS

I. CROP IMPROVEMENT

Gen. I : Germplasm collection, maintenance and description of types

(Bapatla, Bhubaneshwar, Chintamani, Jhargram, Madakkathara, Vengurla and Vridhachalam).

Objective

The objective of this project is to evaluate the available germplasm and collection of accessions with desirable characters, such as bold nut, cluster bearing, short flowering duration types and establishment of germplasm conservation blocks with clonal progenies.

BAPATLA

During the period four more accessions were added to the existing 123 germplasm collections there by making the total to 127 accessions. Among these, 104 accessions were multiplied vegetatively and planted in the new orchard area and also supplied to other Research Stations at Venkata Ramanna Gudem, Aswaraopet, Kavali and Pandirimamidi.

The following released varieties of cashew from two Research stations were

collected during 1993 and planted to evaluate their performance under agroclimatic conditions of Bapatla along with other released varieties.

1. Bhuvaneshwar - Bhuvaneshwar - 1
2. Jhargram - Jhargram - 1

BHUBANESHWAR

The germplasm block consists of 76 accessions which were planted from 1990 to 1993 with clonal planting materials. The plants are yet to reach the bearing stage.

Three elite types with cluster bearing habit were collected during 1993-94. The description of types are given in Table - 2.

The following released varieties of cashew from different Cashew Research stations were collected and planted at Bhubaneshwar.

Table 1. Description of Cashew types collected at Bapatla centre.

S.No.	Source	No. of accn. collected	Description of types collected
1.	Kavali	2	Bold size 9g. Cluster bearing yielding 18kg/tree
2.	Aswaraopeta	1	Cluster bearing intensive branching yielding 22kg/tree
3.	Muthayapalem	1	Compact canopy. Boldnut size (10g yielding 15kg/tree)

Table 2. Description of cashew types collected during 1993-94 at Bhubaneswar centre.

Source	No. of accn. collected	Description of material collected
1. Isaneswar, Puri	1	Cluster bearing, 10-12 nuts/panicle average nut weight 5.6 g with approximate yield 25kg/tree. Red apple colour.
	2	Cluster bearing 30-40 nuts/panicle, average nut weight 4.2g with approximate yield of 30 kg/tree. Synchronization of flowering and fruiting.
2. Narsinghpur, Cuttack	1	Cluster bearing 8-10 nuts/panicle, average nut weight 7.0g with average yield of 16 kg/plant, early bearing type.

Table 3. Collection of released varieties of Cashew from different research stations at Bhubaneswar centre.

Name of the Research Station	Year of planting	Variety
1. Bapatla (Andhra Pradesh)	1990	BPP 1, 2, 3, 4, 5 & 6
2. NRC-Cashew (Puttur)	1990	Selection 1 & 2
3. Ullal (Karnataka)	1990	Ullal 1 & 2
4. Vridhachalam (Tamilnadu)	1990	VRI-1, VRI-2
5. Jhargram (West Bengal)	1990	Jhargram-1
6. Bhubaneswar (Orissa)	1990	Bhubaneswar-1
7. Madakkathara (Kerala)	1991	Anakkayam-1, K 22-1, Madakkathara 1 & 2
8. Vengurla (Maharashtra)	1990	Vengurla 1, 2, 3 & 4
	1992	Vengurla-6

CHINTAMANI**1.1 Germplasm evaluation:**

Out of 114 germplasm collections, 72 accessions were evaluated for yield and yield parameters.

Among the twelve accessions the highest nut weight of 7.0g was recorded in 8/46 Taliparamba and 6.8g in ME4/4

(Table-4). A high shelling percentage of 32.2 was recorded in 1/64 Madhuranthakam 32.0 in 5/23 Coondapur, 31.2 in 8/46 Taliparamba, and 31.0 in ME4/4 respectively. The least shelling percentage of 22.0 was in 1/61 Alangudi. 5/23 Coondapur has a compact canopy while all other six accessions displayed medium canopy.

Table 4. Yield performance of promising germplasm accessions at Chintamani centre.

Sl. No.	Accession No.	Source of collection	Year of planting	Cumulative yield for 9 years (kgs.)	Yield of reporting year (1993)	Mean Nut Weight (g)	Shelling (%)	Flower-habit	Average apple weight	Type of canopy	
1.	8/46	Taliparamba	Ullal	1982	64.85	14.05	7.0	31.2	Mid	34.0	Medium
2.	1/64	Madhuranthakam	Ullal	1982	58.20	10.50	4.1	32.2	Early	25.0	Medium
3.	3/108	Gubbi	Ullal	1982	75.30	22.50	4.0	27.8	Early	20.0	Medium
4.	4/62	Alangudi	Ullal	1982	57.49	7.30	3.7	28.4	Mid	20.0	Medium
5.	1/61	Alangudi	Ullal	1982	57.35	9.30	3.9	22.0	Mid	17.0	Medium
6.	5/23	Coondapur	Ullal	1982	48.70	7.80	4.8	32.0	Mid	27.0	Compact
7.	ME 4/4		Ullal	1983	62.90	17.50	6.8	31.0	Mid	27.0	Medium
8.	2/77	Tuni	Ullal	1982	48.55	16.90	—	—	—	—	—
9.	9/66	Chirala	Ullal	1982	64.58	8.60	—	—	—	—	—
10.	4/43	Wynad	Ullal	1982	40.28	9.50	—	—	—	—	—
11.	13/5	Kodur	Ullal	1983	41.55	20.65	—	—	—	—	—
12.	5/37	Manjeri	Ullal	1985	34.40	21.70	—	—	—	—	—

JHARGRAM**(i). Germplasm evaluation**

A total of 124 accessions are maintained in germplasm conservation block for evaluation. The accessions planted during 1983 to 1985 were evaluated and yield performance of 15 promising types are given in table-5. The highest yield of 16.50 kg/tree was recorded in type JGM 71/5 a cumulative yield of 36.79 kg/6 yrs and JGM 24/2, 8.97 kg/tree a cumulative yield of 23.80 kg respectively. The maximum mean nut weight of 6.0g was observed in JGM 57/1 and 5.6g, 5.4g and 5.2g in JGM 11/4, JGM 20/6 and JGM 17/1 respectively. The maximum shelling percentage was in the accession JGM 75/6 (36.1%) and (34.9%) in JGM 24/2, (33.7%) in JGM 19/1 and (33.5%) in JGM 12/2.

(ii). Collection of germplasm

The survey was undertaken in

collaboration with scientist of NRCC, Puttur to collect the cluster bearing types and other diverse material from eastern part of Midnapore district. Thirteen elite plants were selected during April, 1993 and the scion sticks of the same were collected during October '93 (Table-6).

MADAKKATHARA

A total of 120 accessions collected till 1994 are planted for evaluation in the clonal germplasm conservation block. Five varieties/types were collected during the period under report. Vetore-56 and Kankadi types are identified as the male for hybridization programme, KTR-1-254, KTR-1-306 (from District Agricultural Farm, Kottarakkara) and K-1 (from Kairarappatta, Palakkad districts) which are semidwarf were added to the collection. The details are given in Table - 7.

Table 5. Yield performance of promising germplasm accessions during 1993 at Jhargram centre.

Sl. No.	Accession No.	Source of collection	Year of planting	Cumulative yield for 6 years (kgs.)	Range (kg)	Yield of reporting year (1993) (g)	Mean Nut Weight (g)	Shelling (%)
1.	JGM 11/4	CRS, Bhubaneswar	1983	14.29	0.19 -7.04	7.04	5.6	33.2
2.	JGM 17/1	CRS, Bhubaneswar	1983	20.07	1.41 -7.32	7.32	5.2	32.9
3.	JGM 20/6	CRS, Bhubaneswar	1983	28.54	2.27 -7.76	7.76	5.4	32.4
4.	JGM 75/6	CRS, Bhubaneswar	1983	19.09	1.33 -8.11	8.11	3.1	36.1
5.	JGM 12/2	CRS, Madakkathara	1983	18.10	1.33 -7.39	7.39	4.4	33.5
6.	JGM 24/2	CRS, Madakkathara	1983	23.80	0.53 -8.97	8.97	3.9	34.9
7.	JGM 71/5	CRS, Madakkathara	1983	36.79	1.28 -16.50	16.50	4.9	30.1
8.	JGM 19/1	CRS, Vengurla	1984	15.23	1.21 -6.46	6.46	4.2	33.7
9.	JGM 29/2	CRS, Bapatla	1984	12.05	0.04 -6.65	6.65	5.1	30.4
10.	JGM 72/7	CRS, Bapatla	1984	15.32	1.51 -7.38	7.38	4.3	32.1
11.	JGM 48/4	CRS, Vridhachalam	1985	14.38	0.89 -6.93	6.93	4.6	31.8
12.	JGM 56/4	CRS, Vridhachalam	1985	15.58	1.37 -7.22	7.22	4.6	29.9
13.	JGM 57/1	CRS, Madakkathara	1985	13.27	0.82 -6.38	6.38	6.0	30.4
14.	JGM 63/10	ARS, Ullal	1985	13.56	1.34 -8.61	8.61	3.9	27.1
15.	JGM 63/11	ARS, Ullal	1985	9.57	0.82 -6.22	6.22	3.0	31.6

Sl. No. 8-10, Cumulative yield for last five years.

Sl. No. 11-15, Cumulative yield for last four years.

Table 6. Description of germplasm collected during 1993 survey in Jhargram centre.

Sl. No.	Source of collection	No. of accessions collected	Description of types collected
1.	Private orchard of Sri Sasankha Roy, Depal, Midnapore	1	Plant is 14-15 years old, plant habit is erect, intensive branching, medium canopy, Pyramidal panicle, 3-5 nuts per panicle with average nut weight 7.5g, medium yielder.
2.	Orchard of Sri Kausshik Roy, Depal, Midnapore.	1	Age of plant is 11-12 years, erect and spreading type, intensive branching, medium canopy, conical panicle, 2-3 nuts/panicle, nut weight 8.0g, medium yielder.
3.	Orchard of Lt. Himasu Roy, Depal, Midnapore	1	38-40 years old plant, erect and spreading type, intensive branching, medium canopy, conical panicle, 7-8 nuts/panicle, nut weight 7-5g, high yielder.

Sl. No.	Source of collection	No. of accessions collected	Description of types collected
4.	Orchard of Sri Vijay Krishna Dutta, Depal, Midnapore.	1	Plant is 20-25 years old, erect and spreading type, intensive branching, medium canopy, conical panicle, 3-4 nuts/panicle, nut weight 7.5g, high yielder.
5.	Orchard of Sri Radha Gobinda Dutta, Depal Midnapore.	1	Age of plant is 28-30 years, erect and spreading type, intensive branching, medium canopy, conical panicle, 2-3 nuts per panicle, mean nut weight 8.0g, medium yielder.
6.	Private farm of Sri Trilok Mahanta, Barbaria, Chandaneswar	2	(i) 6-7 year old plant, erect type, intensive branching, sparse canopy, conical panicle, cluster bearing, 8-10 nuts/panicle, mean nut weight 7.0g, high yielder. ii) Plant is 6-7 years old, erect type, intensive branching, medium canopy, conical panicle, 3-4 nuts per panicle, mean nut weight 7.5g.
7.	Private farm of Sri Hemanta Roy, barbaria, Chandaneswar	1	Age of plant is 6-7 years, erect type, intensive branching, medium canopy, conical panicle, cluster bearing, 12-20 nut per panicle, mean nut weight 4.0g, high yielder.
8.	Private farm of Sri Rajani Pradhan, Barbaria, Chandaneswar	1	22-25 years old plant, erect and spreading type, intensive branching, medium canopy, conical panicle 2-3 nuts per panicle, bold nut type weighing 8.0g/nut.
9.	Private orchard of Sri Sudhansu Jana, Hameerpur, Midnapore	3	i) Plant is 13-15 year old, erect and spreading type, intensive branching, medium canopy, conical panicle, cluster bearing, mean nut weight 7.5g, high yielder. ii) Age of plant is 35-40 years, erect and spreading type, intensive branching, medium canopy, pyramidal panicle, cluster bearing, 15-32 nuts per panicle, nut weight 5.0g, high yielder. iii) 32-35 years old plant, erect and spreading type, medium canopy, pyramidal panicle, cluster bearing, 10-25 nuts per panicle, mean nut weight 5.0g, high yielder.

Sl. No.	Source of collection	No. of accessions collected	Description of types collected
10.	Private orchard of Sri Nalinakya Jana, Hameerpur, Midnapore	1	Plant is 22-25 years old, erect and spreading type, intensive branching, medium canopy, pyramidal panicle, cluster bearing, 6-20 nuts per panicle, high yielder.

REMARKS :

- i) All accessions are growing on sandy soil without any improved cultural practices.
- ii) All accessions are of middle-late and late flowering type and harvesting generally completed during end of May.
- iii) No tea mosquito infestation was observed in accessions collected from Barbaria village but minimum tea mosquito infestation and thrips damage was observed in accessions collected from Depal and Hameerpur village.

Table 7. Cashew accessions collected by Madakkathara centre.

S.No.	Source of Collection	No. of accessions collected
1.	Republic of Panama	14
2.	Cashew Farm, Kottarakkara	13
	CRS, Madakkathara	26
	CRS, Anakayam	24
3.	NRCC, Puttur	8
4.	Bapatla	8
5.	Vengurla	8
6.	Jhargram	1
7.	Vittal	2
8.	Farmers fields in Kannur & Palghat Districts of Kerala	16
	Total	120

Brazil-239 has recorded the maximum (hundred) nut weight of 1412g, apple weight of 145g and H-1589 (1248g) respectively.

VENGURLA

Out of the existing 161 accessions

in gene bank, 80 types have already been evaluated and planted in conservation block at closer spacing (4m x 4m) and the remaining 81 types are being evaluated. The information of some promising selection has been given in Table-8.

Table 8. Information of promising germplasm at Vengurla centre.

Sl. No.	Accession	Year of planting	Cumulative yield for 6 years	Range	Yield of reporting year 1994 kg/nut/tree	Mean Nut Weight (g)	Shelling (%)
1.	2.	3.	4.	5.	6.	7.	8.
1.	80/2/4	1977	45.295	3.967 to 8.250	6.130	5.17	27.15
2.	83/5/3	1977	53.427	6.035 to 10.070	6.035	6.08	27.65
3.	87/9/2	1977	40.640	3.395 to 8.315	5.975	5.25	24.85
4.	89/12/3	1977	52.715	3.395 to 13.345	13.345	5.30	30.72
5.	94/11/3	1977	60.910	6.075 to 14.385	10.125	71.00	23.00
6.	95/11/3	1977	39.390	2.230 to 10.130	2.680	6.70	23.00
7.	96/11/5	1977	43.100	3.872 to 9.130	6.035	5.44	22.00
8.	98/12/4	1977	68.065	2.495 to 14.681	2.495	6.30	21.00
9.	109/22/2	1979	39.580	2.100 to 8.990	4.240	5.00	25.00
10.	124/15/3	1979	41.270	1.305 to 9.471	8.700	6.80	29.55
11.	126/17/2	1980	44.665	2.127 to 7.195	5.075	6.00	28.49

In addition to above, 75 bold nut types have been procured from 1988 to 1993 and planted in the field. During the year under report the accessions have come to bearing. The three promising bold types have been identified as parents and included in the breeding programme

of 1992-1993 and 1993-94. The brief information of three bold types is given in Table-9. During the year under report total 13 bold nut types (grafts) have been collected from I.C.A.R. Complex, Goa and planted in the field for further evaluation.

Table 9. Bold types identified for breeding programme at Vengurla centre (season 1994).

Sl. No.	Accession No.	Nut wt. (g)	Shelling (%)	Av. wt. of kernel (g)	Yield		Av. wt. of apple (g)	Tree canopy
					1993	1994		
1.	1	12.0	25.0	3.4	5.470	6.580	80	Medium
2.	22	12.0	24.0	3.2	5.780	5.790	86	Medium
3.	65	12.0	28.0	2.8	3.650	4.650	82	Medium

VRIDHACHALAM

The yield characters of the promising types in the earlier seedling germplasm accession planted during 1964 are furnished in Table-10. In the type M 15/4 the highest yield of 23.50kg and a cumulative

yield of 162.90kg/10 yrs was recorded. The highest nut size (7.52g) was recorded in the type E 3/1. The shelling percentage was the highest (30.50) for the type A 7/2 and (28.60) in M 15/4.

Table 10. Yield character of promising types in the seedling germplasm at Vrindhachalam centre.

Sl. No.	Accession No.	Year of planting	Cumulative yield for 10 years (kgs.)	Range (kg)		Yield of reporting year 1993 (g)	Mean Nut Weight (g)	Shelling (%)
1.	2.	3.	4.	5.		6.	7.	8.
1.	M 3/2	1964	96.90	0.46 to	18.55	Nil	—	—
2.	M 15/4	1964	162.80	7.73 to	30.20	23.50	6.86	28.60
3.	M 26/1	1964	83.60	0.00 to	23.55	—	—	—
4.	M 26/2	1964	101.50	0.00 to	22.58	—	—	—
5.	M 44/3	1972	79.50	0.00 to	22.01	—	—	—
6.	M 55/4	1964	134.20	3.85 to	17.10	9.71	5.99	28.00
7.	ME 15/4	1964	83.90	1.10 to	18.25	3.92	5.28	24.20
8.	A 7/2	1964	140.20	0.30 to	27.70	4.43	6.74	30.50
9.	E 3/1	1965	33.36	0.00 to	10.06	10.06	7.52	26.50

A total of 130 types are available in the clonal germplasm and the same were evaluated. The yield characters of promising types in the germplasm planted during 1989 are furnished in Table-11. The highest yield recorded was in M3/2 (1.15kg) and M 24/2 (0.66kg). The mean nut weight was the highest (8.61g) in the type M 108/4 (8.61g) and M 33/3 (8.3g) respectively. The type E 3/1, M1/4, M 4/3, M 17/4, S.10, N.R.19, N.R. 32 and PU. 2 have registered the mean nut weight of more than 7g.

The highest shelling percentage of 35.6 was registered in the type M 3/2.

One hundred and eight types, were multiplied from the earlier seedling germplasm and planted in November 93. But, they were damaged due to the cyclone and the subsequent heavy rains during December '93. The grafts of these types were again produced and are available for planting during the ensuing monsoon.

Table 11. Yield characters of promising types in the new germplasm at Vridhachalam centre.

Sl. No.	Accession No.	Year of planting	Yield of reporting year 1993 (kg)	Mean Nut weight	Shelling (%)
1.	2.	3.	4.	5.	6.
1.	M 1/4	1989	0.400	8.0	23.4
2.	M 3/2	1989	1.150	4.2	35.6
3.	M 4/3	1989	0.410	7.7	27.7
4.	M 15/4	1989	0.500	6.3	30.0
5.	M 17/2	1989	0.420	6.5	32.8
6.	M 17/4	1989	0.500	7.2	27.8
7.	M 18/4	1989	0.500	5.20	32.7
8.	M 24/2	1989	0.660	6.1	30.8
9.	M 26/2	1989	0.550	6.9	30.4
10.	M 33/3	1989	0.510	8.3	24.8
11.	M 37/3	1989	0.410	6.20	32.3
12.	M 45/4	1989	0.500	5.50	29.1
13.	M 55/4	1989	0.420	5.81	30.8
14.	M 87/1	1989	0.500	4.52	30.3
15.	M 88/4	1989	0.500	5.10	28.5
16.	M 105/3	1989	0.350	5.64	31.2
17.	M 108/4	1989	0.270	8.61	26.7
18.	M 110/1	1989	0.280	5.01	29.5
19.	A 5/2	1989	0.250	6.1	29.2
20.	G 21	1989	0.350	6.6	30.0
21.	S. 10	1989	0.500	7.7	24.7
22.	NR. 19	1989	0.500	8.1	25.5
23.	NR. 32	1989	0.250	7.3	26.7
24.	NR. 33	1989	0.350	6.1	30.1
25.	NR. 49	1989	0.200	5.7	30.2
26.	NR. 51	1989	0.500	5.7	31.3
27.	PU. 2	1989	0.270	7.7	28.0

Gen. 3 : Expt. 1 : Varietal Evaluation Comparative Yield Trial

(Bapatla, Chintamani).

BAPATLA

(Final report of the experiment):

The Secondary selections from the seedlings population of T.No. 39, T.No. 1(BPP-5) and T.No. 56 (BPP-6) were evaluated based on the characteristics of promising types viz. yield per tree, cumulative yield, nut weight and shelling percentage.

- A. Seedling progeny of T.No. 39 were planted as guard row in the comparative yield trial during 1974.
- B. Seedling progeny of T.No. 1 (BPP-5) were planted as experimental plants in the old and concluded NPK trial during 1972.
- C. Seedling progeny of T.No. 56 (BPP-6) were planted as guard row in the old concluded NPK trial during 1972.

Results and Conclusions:

The secondary selections from the seedlings population of T.No. 39, T.No. 1 (BPP-5) and T.No. 56 (BPP-6) were made. Twenty four promising types were identified based on characteristics viz., yield per tree, cumulative yield, nut weight and shelling percentage and statistically analysed data is presented in the Table-12.

The seedling population that have recorded a cumulative yield of more than 120 kg over the last 10 years (1983-92) with a nut weight of more than 5 grams are listed below.

Tree 30/1 (progeny of T.No. 39) gave the maximum cumulative yield of 316.7 kg with a nut weight of 6.8g and 1/11 with 220.6 kg and 5.8g of nut weight respectively.

In tree 3/33 (progeny of T.No. 56) a cumulative yield of 242.2 kg and in tree 9/11 241.2 kg were recorded respectively.

In the tree 10/19 (progeny of T.No. 1) the maximum cumulative yield of 248.5 kg with nut weight of 5.0g was recorded.

All the three promising ones are included in II MLT.

CHINTAMANI

The trial was planted during December 1986 with ten clonal progenies of Bapatla and Vengurla in R.B.D. with 3 replications. The growth parameters viz., plant height, stem girth, canopy shape, flowering period and nut yield is furnished in Table-13.

The highest plant height was recorded in variety Vengurla-3 (4.92m), Vengurla-1 and Vengurla-2 (4.82 and 4.75m) respectively and the lowest (4.34m) was in Bapatla-5.

The highest stem girth (66.37cm) was recorded in Vengurla-3, Vengurla-1 (65.05cm) and Vengurla-2 (64.34cm) respectively and the differences being non-significant.

Table 12. Performance of seedling population of secondary selections at Bapatla centre.

Sl. No.	Accession No.	Source of collection	Cumulative yield for 9 years	Yield of reporting year (kg)	Mean Nut wt. (g)	Shelling (%) (g)
T.No. 39						
1.	1/11	BPP	220.6	24.0	5.8	28.0
2.	2/1		147.3	6.5	5.4	28.0
3.	18/1		138.3	66.2	5.4	28.5
4.	30/1		316.7	30.0	6.8	28.0
5.	32/10		174.1	16.7	5.3	26.5
6.	28/20		170.4	15.5	7.4	27.0
T.No. 56						
7.	3/33	Local	242.2	42.2	6.7	25.5
8.	12/17		162.5	14.4	5.7	26.0
9.	14/17		199.6	10.6	5.6	26.0
10.	19/9		161.5	5.0	5.4	28.0
11.	9/1		149.9	20.5	5.1	28.0
12.	9/11		241.2	32.2	5.7	28.0
13.	9/15		145.6	15.2	6.0	27.0
14.	17/10		145.3	6.2	5.4	29.0
15.	17/32		164.5	2.5	5.9	25.0
16.	21/23		143.6	4.7	5.8	26.0
T.No. 1						
17.	7/11	Local	149.5	17.5	5.2	28.0
18.	10/19		248.5	22.5	5.0	28.0
19.	11/30		209.7	19.0	5.1	25.0
20.	15/32		142.3	12.2	5.0	25.0
21.	16/4		191.6	6.7	5.5	26.0
22.	16/24		198.5	10.5	5.0	28.0
23.	20/11		138.2	7.2	5.0	25.0
24.	20/12		171.7	14.7	5.6	27.0
SEM				1.96		
CD				5.75		

Table 13. Growth and Yield parameters of varietal evaluation - CYT in cashew at Chintamani centre.

Sl. No.	Variety	Plant height (m)	Stem girth (cm)	Canopy shape	Yield/kg/plant	Flowering period/season
1.	V-1	4.82	65.05	Compact	6.74	Medium
2.	V-2	4.75	64.34	Medium	7.31	Long
3.	V-3	4.92	66.37	Sparse	8.32	Medium
4.	V-4	4.57	59.93	Sparse	2.15	Medium
5.	V-5	4.53	60.54	Compact	6.72	Medium
6.	BPP-1	4.69	60.40	Compact	3.25	Medium
7.	BPP-6	4.41	63.94	Compact	8.99	Medium
8.	BPP-3	4.68	63.42	Medium	4.68	Medium
9.	BPP-4	4.62	61.57	Medium	5.58	Long
10.	BPP-5	4.34	57.86	Compact	5.71	Medium
	SEM+/-	0.28	2.22	—	1.34	—
	C.D.(.05%)	NS	NS	—	3.98	—
	NS - Non Significant					

The highest nut yield (8.99 kg/plant) was in Bapatla-6, Vengurla-3, Vengurla-2, Vengurla-1, Vengurla-5, Bapatla-5 and Bapatla-4 (8.32, 7.31, 6.74, 6.72, 5.71 and

5.58 kg/plant) respectively and they were at par. The lowest (2.15 kg/plant) was in Vengurla-4.

Gen. 3 : Expt. 2: Varietal evaluation multilocation trial with varieties from Vittal, Vridhachalam, Vengurla and Bapatla.

(Bapatla, Bhubaneshwar, Chintamani, Jhargram, Madakkathara, Vengurla and Vridhachalam).

The trial was laid out with clonal progenies. The following varieties are under evaluation in different centres:

Bapatla	T 129, T 40, H 2/15, H 2/16
Madakkathara.....	H 1598, H 1600 H 1608, H1610
Vittal	30/4, 59/2, 44/3
Vengurla	V-2, V-3, V-4, V-5, M 44/3
Vridhachalam	M 33/3, M 44/3, M 26/2

Design : RBD Replication: Three

BHUBANESHWAR

The trial was laid out with 16 entries replicated twice in randomised block design. Observations on plant height, growth, canopy shape, flowering period, yield/plant and nut size were recorded (Table-14). The plant height and girth significantly varied among the types. Highest plant height was observed in V-2 and H-2/16 (3.43m) and the minimum height in VTH 44/3 (1.99m). The maximum girth was recorded in VTH 30/4 (53.25cm) and the minimum in M 44/3 (25.0cm).

Table 14. Growth and Yield performance of cashew varieties in multilocal trial at Bhubaneshwar centre.

Variety	Height (m)	Girth (cm)	Canopy shape	Flowering period/season	Yield/kg/plant	Nut Weight (g)
H 1598	2.94	37.65	Compact	Early	1.225	5.20
H 1600	2.53	34.87	Compact	Late	0.717	6.36
H 1608	3.21	49.40	Compact	Mid	2.890	7.6
H 1610	3.40	47.50	Medium	Late	0.837	8.2
T.No. 129	2.67	36.37	Sparse	Mid	1.380	4.3
BPT 40	2.76	44.12	Compact	Early	1.507	4.5
H 2/15	3.05	42.87	Compact	Early	1.845	8.2
H 2/16	3.43	46.27	Compact	Early	2.194	8.0
M 44/3	2.02	25.00	Compact	Early	1.000	4.6
M 26/2	2.36	37.63	Compact	Mid	1.900	4.8
VTH 44/3	1.99	32.50	Compact	Early	0.950	4.5
VTH 30/4	3.02	53.25	Sprase	Late	0.866	7.5
VTH 59/2	2.22	27.15	Medium	Mid	0.600	5.2
Veng. 2	3.43	48.00	Compact	Early	2.050	4.4
Veng. 3	3.16	40.43	Sparse	Late	1.570	7.5
Veng. 4	2.94	34.90	Sparse	Mid	1.980	7.2
S.E. (m)+/-	0.321	5.73	Sparse	Mid	0.561	—
C.D. (5%)	0.684	12.20	—	—	1.19	—

Table 15. Growth and yield parameters of varietal evaluation - Multilocation trial with varieties from Vittal, Vridhachalam, Vengurla and Bapatla (Chintamani centre).

Sl. No.	Varieties	Plant height (m)	Stem girth (cm)	Canopy shape	Yield/kg/tree
01.	H-1610	4.27	64.48	Medium	5.39
02.	H-1600	4.17	63.35	Compact	6.10
03.	H-1608	3.94	57.68	Medium	5.79
04.	H-1598	4.25	56.57	Medium	5.67
05.	TN-129	4.21	61.50	Medium	5.13
06.	TN-40	3.55	59.30	Compact	7.29
07.	Hyb. 2/15	3.99	54.13	Compact	4.19
08.	Hyb. 2/16	4.08	57.31	Sparse	3.13
09.	33/3 (VRI)	3.69	54.26	Compact	8.05
10.	M 44/3 (VTH-12)	4.03	60.67	Medium	5.09
11.	M 30/4 (VTH-30)	4.12	58.80	Medium	3.65
12.	59/2 (VTH-59)	3.86	52.36	Sparse	5.45
13.	V-3	3.67	49.29	Sparse	4.99
14.	V-4	3.84	52.00	Sparse	6.07
15.	V-2	3.83	51.47	Medium	3.83
16.	M 44/3 (Vengurla)	3.95	55.11	Compact	2.84
17.	H-24 (do-5)	4.08	60.63	Compact	5.21
SEM+/-		0.16	2.24	—	1.06
CD (P=0.05)		NS	6.46	—	NS

NS - Non Significant

The maximum nut yield/plant was recorded in H-1608 (2.890 kg) and minimum in VTH 59/2 (600g) and H 1600 (717g). Nut weight was the maximum in H-1610 and H-2/15 (8.2g) and Veng-3 (7.5) respectively. The minimum nut weight less than 5g was recorded in TN-129 (4.3g), Veng-2 (4.4g), BPP-40 (4.5), VTH-44/3 (4.59), M-44/3 (4.6g) and M-26/2 (4.8g). The cashew types H-2/15, H2/16, M-44/3, Veng-2, H-1598, BPP-40 and VTH-44/3 were early flowering types whereas H-1610, VTH-30/4, H-1600 and Veng-3 were late flowering and remaining were found to be midseason flowering types.

CHINTAMANI

The trial was laid out during December, 1986 with 19 varieties distributed in R.B.D. and replicated thrice. Instead of varieties 44/3 and M 26/2 (from Vridhachalam) varieties Ullal-1 and Ullal-2 were planted during 1992. The growth parameters and yield are furnished in Table-15.

The highest plant height (4.27m) was noted in H-1610 and the lowest (3.55) in T.No. 40.

Significant differences were observed

Table 16. Growth and yield performance of varieties in multilocation trial at Jhargram centre.

Sl. No.	Varieties	Plant height (m)	Stem girth (cm)	Canopy shape	Yield/kg/tree
01.	H-1598	4.06	52.38	Medium	3.74
02.	H-1600	3.53	43.27	Medium	3.83
03.	H-1608	4.02	53.99	Compact	4.62
04.	H-1610	4.53	55.61	Medium	3.91
05.	T.No. 129	4.27	50.47	Medium	4.65
06.	T.No. 40	3.59	46.99	Compact	3.72
07.	H-2/15	4.03	48.56	Compact	5.14
08.	H-2/16	4.04	51.01	Medium	5.89
09.	M-33/3	4.32	47.83	Medium	4.08
10.	M-26/2	3.21	39.20	Sparse	4.01
11.	M-44/3	2.84	32.82	Medium	3.17
12.	VTH-30/4	4.42	53.03	Compact	5.24
13.	VTH-59/2	4.35	51.76	Medium	6.73
	S.Em (+/-)	0.10	1.68	—	0.36
	C.D. at 5%	0.30	4.90	—	1.05

in stem girth amongst the varieties. The highest stem girth (64.48cm) was in H-1610 and by H-1600 (63.35cm) respectively. The least stem girth (49.29cm) was in Vengurla-3.

The highest nut yield (8.05 kg/plant) was recorded in variety M33/3 (Vridhachalam), T.No. 40 (7.29 kg/plant) and the lowest (2.64 kg/plant) was in M 44/3 (Vengurla).

JHARGRAM

The growth parameters and yield performance were recorded and is furnished in Table-16. The significant variations were observed with respect to plant height, girth and yield among the varieties. The maximum height (mean) of 4.53m and girth of 55.61cm was recorded in the variety H-1610, plant height recorded were VTH-30/4 (4.42m), VTH-59/2 (4.35m) and M-33/3 (4.32m) and H-1608 (53.99cm), VTH-30/4 (53.03cm) and H-1598 (52.38cm) in respect of girth. The least mean height and girth was noticed in the variety M-

44/3, 2.84m and 32.82cm respectively. The highest nut yield per tree was recorded in VTH-59/2 (6.73kg), H-2/16 (5.89kg), VTH-30/4 (5.24kg) and H-2/15 (5.14kg). The lowest yield was observed in M-44/3 (3.17kg). Varieties V2, V3, V4 and V5 were replanted during the year 1990.

MADAKKATHARA

Observations on plant height, stem girth (0.5m above the ground), canopy spread, flowering period, panicle and nut characters, apple characters and nut yield were recorded (Table-17).

The yield data is not furnished since the harvest is not complete. Statistical analysis of last year's data is given in table-18. Performance of all the varieties improved considerably during the 6th year and the highest nut yield (8.3kg/tree) was obtained from the variety M-26/2 followed by M-44/3, H-1600, H-1608, H-1598 and V-3 all recording nut weight of more than 5g/tree.

Table 17. Growth and yield characters of different cashew varieties in MLT at Madakkathar centre.

Sl No.	Varieties	Plant height (m)	Stem girth (cm)	Canopy shape	Date of first flowering	No. of nuts/ panicle	Apple weight	Nut weight
01.	H-1598	5.7	74.9	Compact	12.10.93	5.5	73.7	6.3
02.	H-1600	5.2	76.4	Medium	21.10.93	4.3	81.2	8.8
03.	H-1608	5.3	72.7	Compact	05.11.93	4.5	77.1	9.2
04.	H-1610	6.0	83.1	Medium	17.10.93	3.4	94.2	11.1
05.	VTH-30/4	5.4	69.7	Compact	12.10.93	5.8	52.6	6.5
06.	VTH-59/2	5.4	70.0	Medium	16.10.93	4.0	85.4	8.2
07.	T-129	5.3	71.0	Medium	11.10.93	3.9	69.1	6.2
08.	T-40	5.0	67.8	Compact	02.10.93	4.0	71.9	5.6
09.	H-2/15	5.4	70.4	Compact	10.10.93	4.0	87.4	8.3
10.	H-2/16	5.3	64.9	Medium	13.10.93	4.1	85.7	9.5
11.	V-2	5.9	66.2	Medium	15.10.93	3.9	67.2	6.3
12.	V-3	6.4	73.8	Sparse	02.11.93	4.8	78.6	9.2
13.	V-4	5.7	69.0	Medium	26.10.93	4.4	83.2	9.3
14.	V-5	5.6	64.5	Compact	15.10.93	9.2	30.3	4.6
15.	M-33/3	5.1	61.8	Medium	15.10.93	4.7	84.5	8.8
16.	M 44/3	4.8	58.1	Compact	10.10.93	5.0	41.8	5.8
17.	M-26/2	5.0	70.4	Compact	25.10.93	5.1	67.4	8.2
18.	Anakkayam-1	5.1	63.0	Medium	08.10.93	6.3	56.0	6.0

Table 18. Yield characters of different cashew varieties in Multilocation trial at Madakkathar centre.

Sl. No.	Varieties	No. of nuts/ plant	Nut yield/ tree	Nut weight
01.	H-1598	8.33	6.960	7.30
02.	H-1600	7.41	7.630	7.33
03.	H-1608	6.41	7.180	8.87
04.	H-1610	7.89	6.160	7.79
05.	VTH-30/4	7.79	5.550	6.70
06.	VTH-59/2	6.03	5.810	7.67
07.	T-129	5.35	4.020	5.67
08.	T-40	5.58	4.210	5.83
09.	H-2/15	5.90	3.910	8.20
10.	H-2/16	6.47	5.520	8.50
11.	V-2	7.14	5.190	5.47
12.	V-3	8.31	6.740	7.93
13.	V-4	7.93	6.140	8.07
14.	V-5	9.39	6.160	4.57
15.	M-33/3	6.71	6.400	7.64
16.	M 44/3	6.29	7.920	5.57
17.	M-26/2	7.69	8.300	6.33
18.	Anakkayam	7.01	6.050	6.45
	CD (0.05%)	1.50	—	0.7067

VENGURLA

H.1600 (Madakkathara) produced the maximum yield 4.44 kg, Tree No. 40 (Bapatla) 4.36kg and H.1610 (Madakkathara) 4.05 kg respectively (Table-19).

The variety Vengurla-3 had maximum girth (62.16cm) and height (4.06m) amongst all the varieties.

VRIDHACHALAM

The morphological characters of the 17 entries of the MLT are furnished in the table-20. The maximum height of (445cm) was in H-1608 and the girth in M-33/3 (85.2cm). Medium canopy was observed in H-1610, M-33/3 and VTH - 30/4 and remaining entries had compact canopy shape.

Table 19. Multilocation trial in cashew growth and yield data 1994 season at Vengurla centre.

Sl. No.	Varieties	Av. girth (cm)	Av. Height (m)	Av. yield kg nut/tree
01.	Vengurla-2	50.96	3.93	3.298
02.	Vengurla-3	62.16	4.06	2.794
03.	Vengurla-4	52.43	3.68	3.884
04.	Vengurla-5	49.00	3.25	3.376
05.	VTH-59/2	51.43	3.88	3.624
06.	VTH-30/4	57.43	3.59	3.144
07.	M-44/3	46.16	2.94	3.141
08.	Hy. 2/15	41.66	2.79	2.779
09.	Hy. 2/16	47.83	3.13	3.019
10.	Tree No. 40	61.16	3.62	4.364
11.	Tree No. 129	42.27	3.12	3.586
12.	Hy. No. 1598	55.10	3.99	3.494
13.	Hy. No. 1600	56.66	3.14	4.441
14.	Hy. No. 1608	55.16	3.45	3.951
15.	Hy. No. 1610	58.93	3.84	4.054

Table 20. Performance of different varieties in MLT (1993) at Vridhachalam centre.

Sl. No.	Varieties	Plant height (m)	Stem girth (cm)	Canopy shape	Flowering period
01.	H-1598	374	61.4	Compact	Late
02.	H-1600	378	60.3	Compact	Late
03.	H-1608	445	52.6	Compact	Late
04.	H-1610	374	67.0	Medium	Late
05.	T.129	382	70.5	Compact	Early
06.	T.40	366	57.0	Compact	Early
07.	H-2/15	395	62.4	Compact	Mid
08.	H-2/16	355	56.8	Compact	Mid
09.	M-33/3	430	85.2	Medium	Early
10.	M-44/3	350	55.8	Compact	Early
11.	M-26/2	285	45.6	Compact	Mid
12.	VTH-30/4	392	67.8	Medium	Mid
13.	VTH-59/2	415	72.3	Compact	Mid
14.	V-2	421	70.0	Compact	Early
15.	V-3	372	62.6	Compact	Mid
16.	V-4	397	67.6	Compact	Mid
17.	V-5	411	62.2	Compact	Early

Gen. 3 : Expt. 3 : Multilocation trial (MLT-92) with varieties from Bapatla, Vengurla, Vridhachalam and NRC Cashew Puttur

(Bapatla, Bhubaneshwar, Chintamani, Jhargram, Madakkathara, Vengurla and Vridhachalam).

The trial was laid out with clonal progenies. The following varieties are under evaluation in different centres:

Bapatla	T.No. 30/1, 3/33,10/19 and H-3/28
Vengurla	H-68, 303, 367, 320 and 255
Vridhachalam	M 44/3 and M-15/4
NRC Cashew Puttur....	107/3 and 40/1

out in new orchard area during January 1993 by obtaining scion material and grafts of above cashew entries from different co-ordinating centres. Similarly planting materials was supplied to different co-ordinating centres for laying out the new multilocation trial experiment.

Growth measurement are presented in Table-21. Vengurla entry H.No. 320 and Bapatla entry No. 10/19 recorded the maximum height of 85.5cm and 84.5cm respectively.

BAPATLA

The multilocation trial-92 was laid

Table 21. Growth measurements of cashew varieties in multilocation trial at Bapatla centre.

Sl. No.	Varieties	Plant height (m)	Stem girth (cm)	Canopy shape	Yield/ kg/tree
Bapatla					
01.	T.No. 30/1	63.5	18.5	—	—
02.	T.No. 3/33	75.5	10.5	—	—
03.	T.No. 10/19	84.5	10.0	—	—
04.	H-3/28	72.5	10.5	—	—
Vengurla					
05.	H.68	82.5	10.5	—	—
06.	H.303	80.5	8.5	—	—
07.	H.320	85.5	7.0	—	—
08.	H.367	70.5	8.0	—	—
09.	H.255	65.5	6.5	—	—
Vridhachalam					
10.	M.44/3	68.5	10.5	—	—
11.	M.15.4	55.0	6.0	—	—
NRCC					
12.	107/3	70.5	8.5	—	—
13.	40/1	68.0	6.5	—	—

BHUBANESHWAR

The MLT-92 was laid out with thirteen varieties (2 from NRCC, 4 from Bapatla, 5 from Vengurla and 2 from Vridhachalam) were replicated thrice in a randomised block design in the year 1992.

Maximum plant height was recorded in type H-320 (1.26m) and the minimum height in NRCC-2 (0.73m) and NRCC-1 (0.74m) respectively (Table-22). The maximum girth of the plant was observed in H-320 (12.7cm) and the minimum girth in M-44/3 (7.7cm). In the type M-15/4 the maximum mortality (in replication 1 & 3) was recorded.

Table 22. Vegetative growth of cashew types at Bhubaneswar centre.

Sl. No.	Varieties	Plant height (m)	Stem girth (cm)
01.	NRCC-1	0.74	8.0
02.	NRCC-2	0.73	8.0
03.	BPP-3/33	1.13	9.3
04.	BPP-3/28	1.11	10.6
05.	BPP-10/19	1.15	12.3
06.	BPP-30/1	1.23	12.0
07.	H-302	1.23	12.1
08.	H-68	1.06	10.3
09.	H-255	1.19	11.7
10.	H-320	1.26	12.7
11.	H-367	1.14	10.0
12.	M-44/3	0.84	7.7
13.	M-15/4	0.93	9.0
"F" test		Sig.	Sig.
S.E. (m)+/-		0.103	1.19
C.D. (5%)		0.212	2.45

CHINTAMANI

The trial was planted during August 1992 with three replications in R.B.D. The growth parameters such as plant height and stem girth were recorded. The data indicated that the differences among varieties in respect of both plant height and stem girth were non significant (Table-23).

JHARGRAM

The trial was planted during 1992 with 13 varieties which were replicated thrice. All the plants in M-15/4 died. The height of the plant varies from 1.47m to 1.01m (Table-24). The cashew type M-44/3 showed the maximum plant height

Table 23. Growth parameters of multilocation trial-92 with varieties from Bapatla, Vengurla, Vridhachalam and NRCC Puttur at Chintamani centre.

Sl. No.	Varieties	Plant height (m)	Stem girth (cm)
01.	H-68	122.2	15.15
02.	H-367	147.8	12.56
03.	H-302	131.2	13.41
04.	H-255	128.0	14.00
05.	H-320	112.0	13.25
06.	M-44/3	138.4	13.83
07.	M-15/4	151.6	14.47
08.	NRCC-1	140.7	13.67
09.	NRCC-2	131.3	12.84
10.	TN-30/1	153.0	13.24
11.	TN-3/33	131.7	11.59
12.	TN-10/19	108.7	13.37
13.	TN-3/28	144.1	12.64
SE (m)+/-		12.56	0.97
CD (P=0.05)		NS	NS
NS=Non Significant			

Table 24. Growth of different cashew cultivars under multilocation trial -92 at Jhargram centre.

Sl. No.	Name of cultivar	Plant height (m)			Mean
		R1	R2	R3	
01.	T.No. 30/1	0.92	1.02	1.09	1.01
02.	T.No. 3/33	0.97	1.44	1.23	1.21
03.	T.No. 10/19	1.24	1.27	0.90	1.13
04.	T.No. 3/28	1.23	1.15	1.29	1.22
05.	H-68	1.11	1.03	1.22	1.12
06.	H-367	1.35	1.31	1.71	1.45
07.	H-303	1.29	0.80	1.28	1.12
08.	H-255	1.07	1.29	1.51	1.29
09.	H-320	1.04	1.28	1.17	1.16
10.	M-44/3	1.38	1.62	1.42	1.47
11.	NRCS-1	1.06	1.38	1.36	1.26
12.	NRCS-2	1.08	1.15	1.40	1.21

(1.47m) and the minimum plant height was recorded in T.No. 30/1 (1.01m).

MADAKKATHARA

Soft wood grafts of the varieties have been collected from the concerned centres. The experiment was laid out during October 1993.

VENGURLA

This centre has procured the scion sticks from all the centres and the grafts have been prepared for planting. How-

ever, the type T.No. 3/28 and T.No.3/33 from Bapatla did not establish and the same are to be gap filled.

VRIDHACHALAM

This trial with 13 entries was laid out during November, 1993 as per the programme, but all the newly planted grafts were damaged in the December cyclone. This trial will be relaid during the ensuing monsoon after collecting the grafts from other centres.

Gen. 4 : Hybridization and Selection

(Bapatla, Bhubaneshwar, Jhargram, Madakkathara, Vengurla and Vridhachalam).

Objective

The objective of this experiment is to utilize the best yielders selected from germplasm and cross them with the parents having other desirable traits like bold nuts, cluster bearing habit and compact canopy. The F1 progenies are to be close planted in initial selection plot and selected hybrid plants are to be clonally multiplied for yield evaluation in a multilocation trial in different centres.

BAPATLA

During the period, hybridisation was done with the cross combinations presented in Table-25.

The hybrid seedlings obtained from hybridisation programme with selected parents of different cross combinations were planted during the period under report in

the main field for studying their performance.

The existing hybrid seedlings were evaluated and the performance of promising types are presented in Table-26.

Results

The existing hybrid progenies were evaluated and those yielding more than 10kgs of nuts in 10th/12th year of orchard life and having nut weight of more than 5g are given in Table-26. The maximum yield of 28.0kg was recorded by H-3/28 (T.56 x M-10/4). Among the different hybrids evaluated 4/1, 5/2, 3/25, 2/15 and 2/3 were found to be promising.

- a) BPP-5 and BPP-6 are high yielders and released types with nut weight more than 5g.

Table 25. The details of hybridisation at Bapatla centre.

Sl. No.	Cross combination	Total No. of crosses made	No. of nuts obtained	Percentage of success
01.	BPP-5 x H-2/22	300	62	20.6
02.	BPP-6 x H-2/22	300	54	18.0
03.	H-2/22 x BPP-5	300	60	20.0
04.	H-2/22 x BPP-6	300	48	16.0
05.	BPP-1 x BPP-5	260	42	16.1
06.	BPP-2 x BPP-5	260	38	14.6
07.	BPP-1 x T-273	260	36	13.8
08.	BPP-2 x T-273	260	40	15.3
Total		2240	380	16.8

Table 26. Evaluation of F1 hybrids at Bapatla centre.

Sl. No.	Hybrid	Cross combination	Mean yield for the 10 years (kg)	Highest yield and age (kg)	Yield of 1993 (kg)	Apple weight (g)	Nut weight (g)	Shelling percentage (%)	
01.	1/7	1 x 40	8.0	16.8 (10th year)	11.6	60.5	6.2	32.0	
02.	2/3	39 x 129	12.7	23.8 "	14.8	50.0	6.0	30.0	
03.	2/15	1 x 40	10.6	12.3 "	10.9	60.0	5.5	30.0	
04.	2/16	1 x 40	21.5	27.5 "	18.1	70.0	8.2	29.0	
05.	3/10	56 x 40	9.0	14.2 "	14.2	30.0	7.0	27.0	
06.	3/13	56 x 40	12.7	26.5 "	10.2	25.0	5.0	30.0	
07.	3/25	56 x M-10/4	9.9	20.5 "	15.0	45.0	5.5	33.0	
08.	3/28	56 x M-10/4	24.6	37.3 "	28.0	42.0	6.7	28.0	
09.	4/1	1 x 100	8.7	16.7 (12th year)	16.0	51.0	5.0	30.0	
10.	5/2	1 x M-10/4	8.5	17.5 "	15.9	60.0	5.2	28.0	
SEM +/-					—	1.54			
C.D.					—	4.82			

Table 27. Crosses used for hybridisation at Bhubaneswar centre.

Cross combinations	Total No. of crosses made	No. of fruits	Percentage of success
1. Bhubaneswar-1xVTH-711/4	146	26	18.49
2. Bhubaneswar-1xKankadi	150	5	3.33
3. Bhubaneswar cluster-1xVTH-711/4	159	20	12.58

- b) H-2/22 is a bold nut type with a nut weight of 7.5g.
- c) T.No.1 and T-273 are parents of BPP-1 and BPP-2.

VTH-711 (Brazilian type) from NRCC, Puttur were collected and planted during 1992 for hybridisation programme.

MADAKKATHARA

The following cross combinations were identified for further hybridisation.

1. BLA-139-1 x Vetore-56
2. BLA-139-1 x VTH-711
3. BLA-139-1 x Kankadi types

BHUBANESHWAR

During the year 1994 hybridisation was done with the cross combinations given in Table-27. The seedlings of F₁ progenies will be raised during the ensuing season.

JHARGRAM

The clonal material of bold nut types Vetore-56 and Kankadi from Vengurla and

The programme will be started after the establishment of male parents. However during January, 1993 hybridisation was

Table 28. Details of hybridisation (1993-94) at Madakkathara centre.

Female parent	Male parent	Number of flower pollinated	Initial set recorded	Fruits harvested till 31-3-93
1. BLA-139-1 x	P-3-2	23	10	3
2. BLA-39-4 x	P-3-2	85	30	17
3. V-5 x	H-1591	19	7	0

started with available material. The crosses made were:

1. BLA-139-1 (Early type) x P-3-2 (Panama, bold nuts, less vigorous type)
2. BLA-30-4 (Medium) x P-3-2 (Panama, bold nuts, less vigorous type)
3. V-5 (Vengurla cluster bearing) x H-1591 (Bold nut)

Fifty six seedlings obtained by hybridisation during 1993 were planted in the field during August. During 93-94 the process was repeated and 20 nuts were collected. The details are presented in Table-28.

VENGURLA

During the year 1993-94, the crossing work was undertaken with the cross combinations as shown in the Table-29&30. The seedlings of F-1 progenies will be raised soon and be planted in the field during June, 1995.

The total 1431 F-1 hybrid have been planted during the period 1983 to 1991 and are under evaluation. The performance of 11 promising hybrids which were planted during 1983 and 1984 is given in Table-31.

The cumulative yield of past eight years was maximum in Hybrids No. 255 (77.685kg) and Hybrid No. 367 (66.785kg). The highest yield was obtained in Hybrid No. 255 (33.395kg) and Hybrid No. 367 (22.465kg). The nut weight and shelling percentage in all the hybrids were above 6.00 and 27.0 respectively. Hybrid No. 255, 303, 320 and 367 are included in MLT-92 as decided in the last workshop meeting.

VRIDHACHALAM

One hundred and forty five F1 trees of different cross combinations were planted during 1987 and evaluated for yield. In H-13 (M 26/2 x 26/4) highest mean yield of 4.23 kg/tree/year and the highest mean yield of 4.50kg/tree/four years was recorded (Table-32). In H-16 highest apple weight of 82 grams was recorded. In hybrid progenies nut weight was found to be ranging from 5.1 to 6.1 grams. The highest shelling percentage of 30.9 percent was recorded in both the hybrids H-13 and H-15.

During 1993 the crossing work was repeated with the following combinations VRI-2 x ME-3/2; VRI-2 x H-1608; VRI-2 x 2/15; VRI-2 x 33/3; VRI-2 x 2/16.

Table 29. Details of cross combinations undertaken at Vengurla centre.

Sl. No.	Cross combinations	No. of nuts collected
1.	Vengurla-2 x Bold type No. 1	108
2.	Vengurla-2 x Bold type No. 22	84
3.	Vengurla-2 x Bold type No. 65	74
4.	Vengurla-5 x Bold type No. 1	41
5.	Vengurla-5 x Bold type No. 22	54
6.	Vengurla-5 x Bold type No. 65	58
7.	Vengurla-4 x Hy. No. 2/16	54
8.	Hy. No.2/6 x Vengurla-4	57

Table 30. Cashewnut hybridization programme 1993 at Vengurla centre.

Sl. No.	Cross combinations	No. of seedlings obtained
1.	Vengurla-2 x Bold type No. 1	11
2.	Vengurla-2 x Bold type No. 22	62
3.	Vengurla-2 x Bold type No. 65	31
4.	Vengurla-5 x Bold type No. 1	11
5.	Vengurla-5 x Bold type No. 22	38
6.	Vengurla-5 x Bold type No. 65	34
7.	Vengurla-4 x Hy. No. 2/16	17
8.	Hy. No.2/6 x Vengurla-4	15

Among these 88 seedlings were maintained prior to the cyclone. During 1994 again the types selected for the crossing work were MR-33/3 x ME-3/2; M-33/3 x H-2/15; M-33/3 x H-2/16 but the fruit set was very poor.

Due to heavy cyclone during the month of December 1993, eight trees of this trial were uprooted and fifty percent of the hybrid seedlings were damaged.