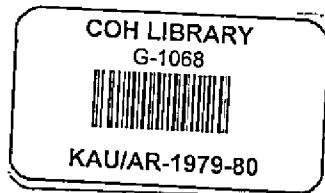


ANNUAL REPORT

1979—'80

G 1068



KERALA AGRICULTURAL UNIVERSITY
VELLANIKKARA, TRICHUR

English

ANNUAL REPORT, 1979-'80

Copies-500

March, 1981

Compiled and Edited by

The Planning Cell

Directorate of Research

Published by

Directorate of Extension Education

Kerala Agricultural University

Vellanikkara, Trichur, Kerala (680 654)

Printed at

Kerala Agricultural University Press,

Mannuthy.

CONTENT

	Page
GENERAL REPORT	i
GENERAL ADMINISTRATION	1
EDUCATION	
College of Agriculture, Veliayani	9
College of Horticulture, Vellanikkara	14
College of Veterinary & Animal Sciences, Mannuthy	20
College of Fisheries, Mannuthy	29
Institute of Agricultural Technology, Tavanur	31
RESEARCH	
Agricultural Research Stations	38
Agricultural Research Schemes	45
Veterinary & Animal Sciences	
Research Stations/Farms	49
Other Schemes/Projects in Veterinary and Animal Sciences	51
<i>Research Report</i>	
<i>Agriculture</i>	
Rice	52
Coconut, arecanut and oil palm	90
Spices, cocoa and other beverage crops	100
Cashew and fruit crops	114
Vegetable and tuber crops	129
Pulses and oil seeds	139
Essential oils and medicinal plants	149
Post harvest technology and nutrition	151
Sugarcane and other miscellaneous crops like cotton, jute	153
Fodder crops	157
Plant Protection	160
Soils and Agronomy	166
Farm Economics and Extension	170
Soil conservation and mechanisation	174
Cropping patterns and farming systems	176

	<i>Veterinary & Animal Sciences</i>	-
	Cattle and Buffaloes	177
	Goat improvement	179
	Poultry and ducks	181
	Artificial insemination and animal reproduction	182
	Animal diseases	182
	<i>Fisheries</i>	186
IV	EXTENSION EDUCATION	191
V	ENGINEERING WING	207
VI	FINANCE AND ACCOUNTS	211
VII	ESTATE	213
	Map showing the Campuses, institutions and Research Stations.	
	<i>Appendices</i>	
	Members of the Statutory Authorities	1
	Sub-committees of the University	11
	Details of staff at Headquarters	19
	List of staff at Colleges and Research Stations	22
	List of publications	45
	Project co-ordination groups	68
	List of new Research Schemes approved during 1979-80	71
	Statutes amendments issued during 1979-80	85
	Abstract of work expenditure in Research Stations under K. A. U. during 1979-80	86
	Annual statement of receipt and expenditure for 1979-80	87

General Report

The Executive Committee of the Kerala Agricultural University has great pleasure to present to the General Council, the Eighth Annual Report of the University for the period from 1.4.1979 to 31.3.1980.

The report presented in the following chapters pertains to General Administration, Education, Research, Extension Education, Works, Finance & Accounts and Estate. Membership of the Statutory bodies like the General Council, the Academic Council etc. as well as the list of staff, list of publications by the members of the teaching staff etc. have been appended.

Sri. N. Kaleeswaran, I. A. S. continued as the Vice-Chancellor of the University during the year under report. Sri. E. Damodara Marar, Additional Secretary to the Government of Kerala continued as the Registrar. Dr. V. S. S. Potti gave leadership to the University's Extension Education programmes as the Director of Extension Education. Dr. U. P. Bhaskaran was the Director of Research upto 26.12.1979. Following a brief illness Dr. Bhaskaran expired on 14.2.1980. Sri. P. N. Pisharody, Professor (Project Co-ordinator, Rice) held charge of the post of the Director of Research from 26.12.1979 for the remaining period. In the Faculty of Veterinary and Animal Sciences, Dr. P. G. Nair continued as the Dean upto 4.2.1980, after which Dr. A. Venugopalan Nambiar, Professor (Research Co-ordination) held charge of the post. Dr. Nair, till he left the University to return to his parent Department, was the Dean of Post-Graduate Studies also. Since 4.2.1980, the duties and functions of the Dean of Post-Graduate Studies were looked after by the concerned Deans/Associate Dean of the respective Colleges. Dr. N. Sadanandan continued as the Dean of the Faculty of Agriculture. The Faculty of Fisheries was established during the year and Dr. M. J. Sebastian assumed charge of the Dean on 29.1.1980. Sri. N. Sivathanu Pillai continued as the Director of Physical Plant.

Dr. P. C. Sivaraman Nair continued as the Associate Dean of the College of Horticulture. The Head of the Institute of Agricultural Technology was re-designated as Director from September, 1979. Sri. N. N. Ramankutty took over as the Director of the Institute from Professor P. N. Pisharody on 20.5.1979.

The budget for the year was for an income of Rs. 582.34 lakhs and an expenditure of Rs. 611.17 lakhs disclosing a deficit of Rs. 28.83 lakhs. The main source of income continued to be the grant-in-aid from the State Government.

The General Council, the supreme authority of the University, was reconstituted on 31.1.1980 excluding the representatives of the Kerala, Calicut and Cochin Universities and the representatives of the State Legislature (These positions were filled up after 1. 4. 1980). The General Council held three ordinary meetings and one special meeting during the year.

The Executive Committee, the Chief Executive body of the University, held 12 ordinary meetings and two special meetings during 1979-80. The Academic Council held three ordinary meetings and one special meeting during the period.

Twelve amendments to the existing statutes were issued during the year under report (annexure VIII).

I TEACHING

Five teaching institutions functioned under the University.

They are:

- 1 College of Agriculture, Vellayani, Trivandrum,
- 2 College of Horticulture, Vellanikkara, Trichur,
- 3 College of Veterinary & Animal Sciences, Mannuthy, Trichur,
- 4 College of Fisheries (Temporarily located at Mannuthy, Trichur),
and
- 5 Institute of Agricultural Technology, Tavanur, Malappuram

Courses leading to graduation in Agriculture, Horticulture, Veterinary & Animal Husbandry, Fisheries Sciences, Masters degree in Agriculture, Horticulture, Veterinary Sciences and Ph.D. in Agriculture, Horticulture and Veterinary Sciences as well as a post Graduate Diploma in Natural Rubber Production were offered. Diploma in Agricultural Sciences was offered at I. A. T., Tavanur.

There were 359 teachers in the four colleges and the Institute of Agricultural Technology. Eighty nine of the teachers were Doctorates. The number of teachers in the different teaching institutions is shown category-wise:

	College of Agri.	College of Hort.	College of Vety.	College of Fish.	I. A. T Tavanur	Total
Dean	1	1*	1	1	...	4
Professor Associate	10	13	24	...	...	47
Prof. Assistant	34	14	42	...	1**	91
Prof. Junior Asst.	42	27	36	...	5	110
Prof.	32	26	45	3	1	107
	119	81	148	4	7	359

* Associate Dean ** Director

Additional teaching posts created during the year 1979-80 for the Colleges of Agriculture/Horticulture/Veterinary & Animal Sciences/ Fisheries and I. A. T., Tavanur were as follows:

Posts	College of Agri.	College of Hort.	College of Vety.	college of Fish.	I. A.T. Tavanur
Dean	1	...
Professor	1	2	...
Assoc. Prof.	...	2	5	6	...
Asst. Prof.	...	1	...	7	...
Jr. Asst. Prof.	...	7	1	4	...

Sixteen members of the staff from the teaching institutions were allowed deputation for higher studies leading to Ph. D. for the improvement of the Faculties. Dr. P. C. Sivaraman Nair, Associate Dean College of Horticulture visited some of the Institutions and Centres of Research & Education in G. D. R. and U. K. Under the Colombo plan, Dr. C. C. Abraham, Professor of Entomology attended a study programme on "Aquatic weed management" at U. R. D. oxford, C. I. B. C. Trinidad, University of Khartoum and the Centre for Overseas Pest Control, U. K. Dr. M. J. Sebastian, Dean, Faculty of Fisheries visited the Oceanic Institute of Hawaii and the University of Fisheries, Tokyo under a scheme financed by the International Foundation for Science, sweden. International Seminars were attended by four members of the staff. 34 attended National Seminars and 57, State Level Seminars,

A new Department of Plant Breeding was organised at the College of Agriculture, Vellayani.

At the College of Horticulture, Vellanikkara, programmes for Masters degree were started in Agricultural Engineering, Plant Breeding and Agricultural Economics.

Two hundred and ninety one students were admitted for the graduate programmes and 51 for the Diploma in Agricultural Sciences. For the Masters degree programme, 74 were admitted in the Faculty of Agriculture and 36 in the Faculty of Veterinary Sciences. Ten were admitted for Ph. D. in Agriculture, six for Horticulture and two for Veterinary Sciences. Seven students were admitted for the Diploma in Natural Rubber Production.

The total number of students of the University in the various teaching Institutions are as follows:

	College of Agri.	College of Hort.	College of Vety. & An.Sc.	College of Fisheries	I.A.T Tava-nur	Total
Graduate programme	300	266	249	28	...	843
Masters programme	86	71	61	...	...	218
Doctoral programme	24	6	16	...	...	46
Post graduate Diploma in Natural Rubber Production	...	7	...	...	...	7
Diploma in Agril. Sciences	...	...	...	...	152	152
	410	350	326	28	152	1266

One hundred and twenty were students from other states and eight from other countries. 748 students were benefited by scholarships and awards of the I. C. A. R., KAU and other funding agencies.

Hostel facilities were availed by 1089 students of the University. Students of the College of Fisheries were accommodated in the hostels of the College of Veterinary Sciences.

During the period, 159 students graduated, 16 obtained Masters degrees and three were awarded Doctoral degree.

The Kerala State Co-operative Diamond Jubilee Endowment lectures were delivered by Sri. P. R. Dhubhasi, Ministry of Home Affairs, Government of India. Extension lectures were also arranged in the Colleges. The students of the University actively participated in the N. S. S. and other activities,

II RESEARCH

The policy for implementation of the research programmes by the Kerala Agricultural University has been re-oriented aiming at the maximisation of production per unit area with a view to increasing the net income of the farmer, formulation of a farming system for the efficient utilisation of natural resources and generation of additional employment. Research programme of the University has now been made more comprehensive by undertaking location specific, problem oriented research on all the economically important crops cultivated in the State, new crops that can be successfully introduced and animal and fish farming. Studies on the basic concepts of the problems are carried out in the constituent educational institutions of the University through departmental research investigations and post graduate

students programmes. Need based and problem oriented research programmes are carried out in the 23 Research Stations under the University.

The strength of teaching staff in the Research Campuses of the University is given in appendix IV.

Additional teaching posts created during the year under report were the following:

Campuses/Institutes	Prof.	Assoc. Prof.	Asst. Prof.	Jr. Asst. Prof.
1 Scheme for the study of possible changes in the Eco-system of Kuttanad consequent on the construction of Thanneer-Mukkam Barrier	...	...	...	4
2 Scheme for the propagation and farming of frogs, attached to C. R. S., Kumarakom	...	...	1	1
3 Scheme for the establishment of Nematology field laboratories for advisory work on control of slow wilt disease	...	...	...	2
4 Kerala Agril. University Hqrs.	1*	...	...	...
5 Peechi Command Area Res. Centre, Vellanikkara	1	..	...	7+6**
6 Extension Education Centre, Kayamkulam	...	1	...	2
7 Co-ordinated project for research on chemistry of submerged soils under rice cultivation	...	.	2	2***
8 Horticultural Research Unit, R. R. S., Pattambi	...	...	...	1
9 Instructional Farm and Fisheries Stn., Puduveyypu	...	...	1	...

* *Special Officer*

** *6 P. G. hands to start with Rs. 700/-*

*** *Research fellow.*

Vacancies existed during the year in the various Colleges and Research Stations are given below:

Posts	College of Agri.	College of Horti.	College of Vety & An. Sc.	College of Fisheries	I. A. T. Tavanur
Dean	...	...	...	...	...
Professor	1	2	...	2	...
Assoc. Professor	3	1	6	7	...
Asst. Professor	9	6	13	8	...
Jr. Asst. Prof.	1	...	...	7	...

Research stations / Campuses	Pro-fessor	Assoc. Prof.	Asst. Prof.	Jr. Asst. Prof.	Language Editor
1 Main campus, Vellanikkara	1	...	...	...	...
2 P. R. S., panniyur	2	...	...
3 AICARP, Kozhikode	1	...	...
4 H. R. S., Ambalavayal	2	...	...
5 R. R. S., Pattambi	2	...	...
6 B. R. S., Kannara	3	...	...
7 C. R. S., Pampadumpara	2	...	...
8 R. R. S., Kayamkulam	1	...	...
9 R. R. S., Moncompu	2	...	...
10 Res. Stn. & Instr. Farm., Mannuthy	1	...	...
11 A. R. S., Chalakudy	1	1.	...
12 Directorate of Extn. Education	...	1	2	...	2

The members of the teaching staff of the University published 314 research papers apart from 102 research notes and extension articles (appendix V).

The fourth meeting of the Research Council was held on 28th and 29th June, 1979 and approved the ongoing research projects in progress

upto April, 1979 and reviewed the concluded projects upto 1979. The Faculty Research Committee for Agriculture met four times and Veterinary & Animal Sciences, once. A total number of 293 research projects including post-graduate programmes under the Faculty of Agriculture, 130 in the Faculty of Veterinary & Animal Sciences and two in the Faculty of Fisheries was approved during the year for implementation (appendix VII). During the year under report, sanction from the ICAR for the following schemes was received.

- (i) Soil test crop response studies in Kerala.
- (ii) Intensification of research and training in pulses and oil seeds.
- (iii) Research on chemistry of submerged soils under rice culture in high rainfall areas.
- (iv) Co-ordinated project for research and development of farm implements & machinery and prototype manufacturing workshop & implements testing unit for improved implements under actual field conditions.
- (v) Influence of varying energy and protein ration on growth response, meat production and carcass quality of pigs slaughtered at different market weights.
- (vi) Propagation and farming of frogs.

A review team of the ICAR for the National Agricultural Research Project visited the various Institutions of the University in connection with the implementation of NARP and for conducting the research review. Another four-member team from the ICAR visited the University to review the progress made by the University and suggest sixth plan allocation to the University by the ICAR.

Work group meetings were conducted on rice, soils and cattle & buffaloes to review the results of research and to identify the research gaps.

The research highlights are detailed below:

A AGRICULTURE

1. RICE

(i) Crop improvement

Breeding to evolve varieties with pest resistance and high yield potential even under adverse soil conditions is an important area where the main thrust in rice improvement programme was made. The culture M. 15-36-2 of the cross between IR. 11-1-66 and Kochuvithu has been recently recommended for release by the State Seed Release Committee. This high yielding strain possesses tolerance to BPH, sheath blight and sheath rot. Twenty other lines with multiple resistance have been evolved using BPH resistant donors Ptb. 19, Ptb. 33 and ARC 6650-6 and are

under preliminary trials. Pure line selection of varieties and hybrid cultures suited to special situations like salt inundated soil, deep ill-drained soils and high altitude regions have been evolved. Pure line selection of saline resistant variety "Cheruviruppu" has yielded two promising cultures, 74 and 174 suited for deep water salinity conditions. The culture 174 has been recommended to the State Seed Release Committee for approval and the State Seed Sub-committee has since decided to release the culture 174 as 'Vytila-2'. At Kayamkulam, hybridisation programme has yielded six promising cultures in the early duration group which have been found to thrive well in the deep ill-drained soils. One culture, 31-1 from a cross between Kottarakkara-1 and Poduvi has been recommended for release to the State Seed Release Committee. Attention was also bestowed in quality rice production. Cultures 534 and 537 from pure line selection of Jeerakasala and Gandhakasala are in the process of further progeny tests.

(ii) Crop management

Studies on the harvest of rice at different physiological maturity stages have revealed that Jyothi (short duration) and Jaya (medium duration) can be harvested 30 days after 50 percent flowering during the first crop season and 20 and 25 days respectively after 50 percent flowering during the second crop season. The effect of skipping P and K application on the yield of rice was investigated at Chalakudy with rice variety Triveni. The study indicated that without any significant reduction in grain yield, application of P can be skipped for two seasons, while skipping of K considerably reduced grain yields. Water management studies conducted revealed that during summer about 20 to 30 percent more area can be irrigated with the available water resources by adopting phasic stress irrigation practices developed at Chalakudy.

(iii) Plant protection

Pot culture studies indicated that BPH population did not develop resistance to the commonly used granular insecticides Carbofuran and Phorate. Varieties Bhadra, Triveni, MO3, Cul. 28, Jyothi, Sabari, IR-28, Jaya, IR. 22 and Kanchi were found to be less affected during storage by the grain moth. Fungicidal trial for the control of sheath blight disease of rice revealed that application of fungicides like Thiram and Bavasticol to soil followed by a foliar spray of Hinosan would give effective control of the disease. It was also observed that low level of application of N and higher level of K application significantly reduced the severity of disease, while P had no influence. Foliar application of Dithane Z-78 gave effective control of *Helminthosporium* blight of rice. Investigations on earhead complex of rice indicated that a combination application of Furadan with Ekalux and Hinosan/Bavistin reduced the loss of grain to a considerable extent. Weed control trial conducted at Moncompu revealed

(viii)

that spraying Stam F. 34 @ 1 kg. ai/ha + MCPA @ 0.5 kg. ai/ha + 3 percent fresh urea had the best weed control efficiency.

2. COCONUT

Hybrids involving three parental combinations i. e. West coast tall x Lacadive Dwarf, West coast tall x Gangabondam and West coast tall x Malayan Dwarf Yellow were evolved under project for production of new cross combinations by isolating the most compatible and productive hybrids.

3. SPICES

Hybridization and selection for crop improvement were continued. Based on morphological, sexual and yield characters, 56 promising cultures in pepper were selected for multiplication and further evaluation.

Nursery practices for cardamom were standardised. Pods harvested during the month of September were found to yield good seeds. Germination of ripe seeds was higher than that of over-ripe and unripe seeds. GA, cow dung slurry and scarification and hotwater soaking enhanced germination of seeds. Storage of seeds in the capsule form was found better than extracting the seeds and storing. Row spacing at 6, 8 and 10 cm. at a constant seed rate gave vigorous seedlings. *Phytophthora* attack on cardamom was completely inhibited by drenching with Agaloi-3.

Hand pollination of nutmeg increased fruit set considerably. Bavistin and Thiride were found to control the leaf blight disease of clove. Varietal trial on ginger revealed that varieties Nadia, Bajpai, Maran and Narasapattam were high yielders for dry ginger while maximum oleoresin content was recorded by Rio-de-Janeiro. Variety Karachal had the highest oil content.

The turmeric types Amrithapani-Kottapetta and Chayapasupa were found to be the top yielders from the varietal trial conducted. Mannuthy Local recorded maximum curcumin and oleoresin content.

Propagational techniques for cocoa have been standardised.

4. VEGETABLES

Two hybrids in chillies, namely, Purple Round x Vellanotchi and Pant C-1 x Purple Cluster have shown promise. Seven hybrid progenies in Sweet potato gave 31.25% to 84.64% yield increase over the highest parental values. Medium sized cormals of colocasia have been identified as the best planting material. Work on evolving bacterial wilt resistant tomatoes is in progress.

5. MEDICINAL AND ESSENTIAL OIL PLANTS

Medicinal plants - *Costus speciosus*, *Dioscorea floribunda* are being developed as commercial crops of tomorrow. Work on bettering the performance of lemongrass, paimarosa etc. is in progress.

6. SUGARCANE

Variety 62175 out yielded the popular variety Co. 997. Several other promising varieties are being evaluated.

7. FODDER CROPS

Guinea grass was found to give better yield when grown in coconut garden than Hybrid Napier. *Stylosanthes* is another promising leguminous forage crop suitable for coconut gardens.

8. POST HARVEST TECHNOLOGY AND NUTRITION

It has been demonstrated that neera can be preserved for about six months without losing its quality by concentrating it under vacuum and sterilizing by steam.

9. PLANT PROTECTION

It has been found that Carbofuran application after 60th day of ransplantation of paddy is not advisable, as residues of the chemical were eft in straw and grain.

Drying the field to hair cracking stage and keeping the moisture at field capacity reduced BPH population to minimum.

10. FARMING SYSTEMS AND CROPPING PATTERNS

Studies on intercropping of tapioca with cowpea, groundnut and maize revealed that the yield of main crop has not been affected by the raising of intercrops. Growing groundnut as intercrop was found to give maximum economic returns.

Relay cropping trials conducted at Pattambi indicated that maize, bajra and castor can be successfully relay cropped in modan lands.

Raising two short duration high yielding rice varieties and a tapioca crop (H-165) was found to be the best cropping sequence under Karamana conditions. This cropping pattern was found to be superior to other crop sequences tried with regard to both profit and production of food material.

B. VETERINARY AND ANIMAL SCIENCES

1. CATTLE AND BUFFALOES

The main thrust of research on cattle was on utilization of agricultural and industrial wastes as feed ingredients to lower the feed cost. The cost of production of one kg of milk was less by nine paise when coffee husk was incorporated at 20% level in concentrate mixture.

It has been found that coir waste (coconut pith) which contained 70% soluble carbohydrates with a DCP of 0 and TDN of 63 could be incorporated up to 20% level in the concentrate ration for growing

calves. Attempts to increase the level upto 30% for buffaloes have been made.

Feeding experiments showed that spent anatto seeds were palatable to buffaloes and they consumed upto 2 kg/day. The studies also showed that incorporation upto 20% level in the concentrate mixture for calves is possible.

Buffalo calves fed with rubber seed cake upto 20% in the concentrate ration for four months showed 440 g. average daily gain in body weight as compared to 319 g. in the control.

Paddy straw can be fortified and made more palatable by the addition of 2% urea and 10% molasses. Attempts were made to establish a correlation between blood constituents and the future milk producing capacity of heifers for the purposes of selection. Composition of milk of crossbred cattle (Brown Swiss and Jersey) and factors that modify the composition have been investigated upon.

2. GOAT

In Malabari, the average increase was from 6.6 kg at four months to 15.0 kg at 12 months. The Sannen half bred exhibited higher growth rate, the corresponding figures being 8.8 kg and 19.32 kg.

3. POULTRY AND DUCKS

In terms of 10th week body weight, pure bred White Plymouth Rock was found to be superior as a broiler bird in comparison to ALP, R. I. R. or crosses containing these breeds. In the case of White Leghorn male, one kg body weight could be obtained in 12 weeks using broiler ration and in 14 weeks using layer type ration.

A coop of 120 x 90 x 60 cm was found to be adequate for 10 birds as night shelter in backyard system. Feeding 50% of birds requirement as balanced feed and the balance as household waste could maintain fair degree of egg production.

4. ARTIFICIAL INSEMINATION AND ANIMAL REPRODUCTION

The buck semen could be stored upto 60 hrs. in Tris-skim milk-citrate-fructose-glycine at 5°C.

Incidence, nature and magnitude of prevalence of infertility conditions among cross bred Brown Swiss heifers were investigated.

Administration of progesterone in doses of 5-8 mg immediately after insemination improved conception rate in dairy cattle.

Equipment for diagnosis and treatment of tubal patency has been fabricated.

5. ANIMAL DISEASES

The Primary etiology of sinus tumours and winter pneumonia were identified as viruses.

Secondary bacterial complication was responsible for mortality. Definite indications have been obtained to suggest that environmental pollution in industrial areas has harmful effect on animal health. Investigations have shown that improved management practices can minimise the incidence of post-natal mortality of kids.

C. FISHERIES

Work done during the last three years indicated that fishes such as *Etrophus*, *Goramy*, *Tilapia* and common carp are suitable for culture along with paddy in pokkali areas. Projects are in progress to ascertain the feasibility of raising a crop of fish after the harvest of paddy. Nursery rearing practices suitable to the locally available species of prawns and fishes were also investigated. Survival of 40% for *Penaeus monodon* and more than 90% for *chanos* was obtained. Mixed culture experiments with *Etrophus suratensis*, *Chanos chanos* and *Mugil cephalus* at 5:5:1 ratio and 5500/ha density without supplementary feeding produced 1353 kg/ha in 7½ months. Fishes in the ponds where pig dung was applied exhibited a better rate of growth.

III. EXTENSION EDUCATION

Dr. V. S. S. Potti continued as the Director of Extension Education during the period.

1. TRAINING PROGRAMMES

Two training units are functioning in the University—one at the headquarters and another at Vellayani. A total number of 28 training programmes were conducted during 1979–80 of which ten were under Veterinary and Animal Sciences. The training programmes included training the personnel of the Department of Agriculture, Animal Husbandry, Dairy Development, School teachers, Farmers, Bank officers, Railway staff, Staff of Co-operative Societies, Land mortgage banks and rural women including adivasis.

2. FARM ADVISORY SERVICE AND SEMINARS

A farm advisory service was started in May 1979 at the Directorate of Extension Education, to enable the farmers to discuss and solve technical problems confronted and to expose specialists of the University to various needs of the farmers in the State. Thirty four district level seminars were arranged for achieving the above objectives and the participant farmers were given necessary technical advice. As a part of FAS, group discussions and field visits were organised and a farm advisory counter set up at Velanganoor.

3. WORKSHOP ON PACKAGE OF PRACTICES

A package of practice workshop was organised to discuss supplementary recommendations during August 1979.

4. EXTENSION ADVISORY COMMITTEE & EXHIBITIONS

Two exhibitions one at Palghat and other at Trichur and 11 mini exhibitions were conducted during the year. The EAC approved the plan of work for 1980.

5. GRAPHIC SERVICE AND TEACHING AIDS

430 numbers of colour and black & white slides were prepared for purposes of teaching. In addition, 65 photographs, 22 charts and 16 diagrams were prepared for publication.

6. PUBLICATIONS

Monthly publication of 'KAU news letter', bimonthly farm magazine 'kalpadhenu', two research journals (Agriculture and Veterinary Sciences), abstracts on Agriculture, Horticulture, Animal Sciences etc. were published regularly during the year.

7. BOOKS, BULLETINS & BOOKLETS

Three technical books in English, five booklets in Malayalam and two pamphlets were published. Technical booklets on various crops were under preparation.

8. INFORMATION DISSEMINATION & RADIO PROGRAMMES

The Karshikarangam columns of local Malayalam dailies were regularly contributed with scientific articles numbering 157 under agriculture, animal husbandry, fisheries and horticulture. The different programmes broadcast, where KAU staff participated, include answering questions of farmers, participation in farm and home programme, weekly and fortnightly broadcasts and farm lessons.

9. UNIVERSITY PRESS

The total expenditure of the press during the year under report was Rs. 3,55,171.12, of which Rs. 78,714.10 was spent on machinery and other equipment. The white print paper purchased for Rs.64,000/- from M/s. Hindustan Paper Corporation was not utilised during the year. The press executed works for a value of Rs. 2,47,824.70 during the period. The total receipt during the year was Rs. 2,50,352.64, including the cost of waste paper sold.

Altogether, 28 publications were printed during the period under report, which include the regular publications such as the Research Journals, College Magazines, Annual Report, Budget, Research Report etc. Some of the other important publications released during the year are given below:

Technical Books

Cassava	— P. K. Thampan
Research on cashew in India	— V. K. Damodaran
Extension lectures	— Lakshmana Panicker

Booklets

ശുദ്ധജല വിതരണത്തിന്റെ
ലക്ഷ്യമേറിയ മാതൃകകളുടെ
ഗവേഷണപ്രവർത്തനം

ഡോ. ഡി. എ. തമ്പി
പി. ജി. ഭട്ടാർ

കൃഷി ശാസ്ത്ര പ്രസിദ്ധീകരണം

കൊക്കോ
പോഷകത്തോട്ടം

ഡോ. വി. എസ്. എസ്. പോറ്റി
ഡോ. പി. കെ. ഗോപാലകൃഷ്ണൻ
ഡോ. കെ. വി. പീറ്റർ
ശ്രീ. രാജമോഹൻ

ലഘുഭാഷ്യം

തലയോട്ടിലെ ക്യാൻസർ, കന്നുക-ലികളിൽ
കൃഷിവിജ്ഞാനകേന്ദ്രം,

10. KRISHI VIGNAN KENDRA

The Kendra functioned at the R. R. S. Pattambi from 2nd October 1979. Nine training programmes on homestead farming, nursery techniques, scientific methods of farming, plant protection and fish culture were arranged and conducted.

11. VILLAGE ADOPTION SCHEME

The University village adoption programme, to develop closer relations between scientists and farmers and to provide technical assistance to the cultivators, was continued. Thirteen villages were adopted adjacent to University Campuses and Research Stations. At Keezhayoor and Thrithala, 40 ha were brought under HYV of paddy through demonstration plots. In Asamannoor, the services of the mobile soil testing laboratory was used and results were passed on to the farmers quickly. A large number of improved planting materials, fish fingerlings and female chicks were distributed through different agencies in the villages. A Charcha Samithi with 25 members was organised at Mookanikkara.

12. KRISHI VIGNAN MELA AND SEMINARS

A Krishi Vignan Mela, eleven seminars and three training programmes were conducted at the H. R. S., Ambalavayal.

13. LAB TO LAND PROGRAMME

As part of the ICAR Golden Jubilee celebrations, lab to land programme was organised in two villages selected under village adoption programme. The programme was inaugurated on 5-1-1980 at Muttakkad and on 11-12-1979 at Kalliyur villages. Six hundred farm families were selected, production plans prepared and financial assistance of Rs. 200/- per family provided. A Kissan Mela, Seminar and Exhibition were organised in Muttakkad village. Five demonstration plots on multi-tier cultivation of banana garden were laid out. At Kalliyur, a Kissan Mela,

Seminar and Field Day was organised. In the Main Campus, the programme was implemented in Ollukkara, Panancherry and Kuzhukully villages. Thirty farmers were selected and all necessary inputs were supplied. One training camp, Kissan Mela and study tour were conducted.

14. EXTENSION EDUCATION CENTRE, KAYAMKULAM

An Extension Education Centre attached to the R. R. S., Kayamkulam was set up to meet the needs of Onattukara farmers. At Kodungalloor, a seminar on betelvine, cocoa seminar at Thekkekara, and one day training camp on pulses at Thazhakkara were organised. Improved pulse varieties C—152, PTB—1 of cowpea, KM—1 of blackgram, T—15 Co.2 and Co.3 of red gram and SA—2 of castor were distributed for trial cultivation among the farmers.

15. NATIONAL DEMONSTRATION PROJECT

This project envisages laying out demonstrations to convince farmers the production potentialities of every unit of land in their farm by following latest agro-techniques and management practices. During the period, 25 demonstrations were laid out. Demonstration of raising two paddy crop + pulse, groundnut/horse gram as companion crops with tapioca/groundnut in rice fallows were organised. Yield of paddy in the demonstration plot was 4256 kg/ha and of groundnut 947 kg/ha.

16. DRY FARMING SCHEME

This scheme envisages the formulation of suitable crop sequences in the drought prone areas of Chittur block in Palghat district. Five field trials with 12 cropping sequences and 25 demonstrations were organised. Relay crop of cotton 10 days before harvest of groundnut or relay crop of tapioca, one month after sowing of groundnut were observed as highly remunerative and adaptable under adverse weather conditions. Sowing groundnut during late monsoon will be a failure due to attack of tikka disease.

17. NATIONAL SERVICE SCHEME

The Director of Extension Education continued to be the NSS programme Co-ordinator during the period. The Kerala Agril. University student units took active part in various programmes like Kissan Mela, Agril. Exhibitions. Livestock and Poultry Management, lay out of Kitchen gardens, conducting film shows etc. in the adopted villages. The Vellanikkara NSS unit organised an agricultural seminar at Don Bosco School on 30-10-1979 and a ten-day camp at Mar Thiomothos Memorial Orphanage at Kalathodu. This unit conducted a socio-economic survey of Harijans at Pattalakunnu. Collection of soil samples, campaign on bunchy top eradication and rodent control were other activities organised in the Mullakkara (adopted) village.

The Vellayani NSS unit extended their activities in adodted villages of Muttakkad and Kalliyur. Running a community centre at Keezhoor celebration of Vanamahotsava, Gandhi Jayanthi and tree planting campaign were arranged, A camp was organised at Kalliyoor Panchayat. Distribution of seedling, group discussions and rural road construction were organised.

The Mannuthy unit of Veterinary College conducted a camp at Madakkathara village. House visits, seminars on economic milk production, diseases of udder, fodder cultivation etc. were arranged. Eggs were distributed free to children as parts of celebrations of the International year of the child. Distribution of grass slips, vaccination against Ranikhet disease etc. were also arranged. A Plan for goat rearing in the village was prepared.

IV WORK

Sri. N. Sivathanu Pillai continued as Director of Physical Plant. The major work taken up during the year was the construction of a Ladies' Hostel at the main campus, Vellanikkara.

V FINANCE

Sri. P. Rajagopal continued as the Comptroller during the year under report. Four local audits and one special audit were conducted. The break up of expenditure during 1979-80 was as follows:

University Administration	Rs. 44.61 lakhs
Teaching	Rs. 187.92 "
Research	Rs. 159.07 "
Extension Education	Rs. 12.30 "
Works	Rs. 53.22 "
Estate	Rs. 7.50 "
Debt & Suspense Account	Rs. 56.49 "
Total	Rs. 521.11 lakhs

VI ESTATE

Sri. T. Ebrahimkutty continued as the Estate Officer. A quantity of 53,367.8 kg of finished rubber was produced. The total receipts from the estate amounted to Rs. 7, 31, 391.13

CHAPTER I

General Administration

The Kerala Agricultural University came into existence with effect from 24th February, 1971 under the Kerala Agricultural University Act, 1971 (Act 33 of 1971).

The Main Campus of the University is located at Vellanikkara. The University is also having two other teaching campuses at Mannuthy and Vellayani. The work relating to the establishment of the campus of the Fisheries College at Panangad, near Cochin is in progress. In addition to these, there are 23 Research Stations for Agriculture and Animal Husbandry. The total area of land under the University is 1910.24 hectares, which includes 1.24 hectares of land taken advance possession of during March, 1980 at Panangad for the establishment of Fisheries College. It is proposed to acquire a total area of 30 hectares for the development of the campus for the College of Fisheries, for which sanction has already been accorded by the Govt. An area of 233 acres of land in Puduveypu, Cochin was assigned in favour of the Kerala Agricultural University for the establishment of a Research-cum-Instructional Farm. The land was taken possession of by the University on 6.7.79. (A map showing the Campuses and Research Stations under the University is appended).

The main construction works of the University are undertaken with the financial assistance of the ICAR. The University also receives liberal financial assistance from the State Government for its planned growth and smooth functioning. Besides, financial assistance is also received from outside agencies for the implementation of the research schemes under the Kerala Agricultural Development Project, Swedish International Development Agency etc.

2 Officers of the University and the administrative set up

<i>Chancellor</i>	: Smt. Jyothi Venkitachellam Governor of Kerala
<i>Pro-Chancellor</i>	: Smt. K. R. Gouri, Minister for Agriculture and Social Welfare

<i>Vice-Chancellor</i>	: Sri. N. Káleeswaran
<i>Registrar</i>	: Sri. E. Damodara Marar
<i>Comptroller</i>	: Sri. P. Rajagopal
<i>Director of Physical Plant</i>	: Sri N. Sivathanu Pillai
<i>Librarian</i>	: Vacant
Deans of Faculties	
<i>Agriculture</i>	: Dr. N. Sadanandan
<i>Vety. & Ani. Sciences</i>	: Dr. P. G. Nair upto 4.2.80. Dr. A. Venugopalan Nambiar (Prof. Research Co-ordination) was holding the charge thereafter till the assumption of the charge by Dr. M. Krishnan Nair on 3.9.80.
<i>Fisheries</i>	: Dr. M. J. Sebastian assumed the charge of Dean on 29.1.80; till then, he was holding addl. charge of the post.
<i>Director of Students Welfare</i>	: Vacant
<i>Director of Research</i>	: Dr. U. P. Bhaskaran upto 26.12.79 Thereafter he entered on leave and expired on 14.2.80 following brief illness. Prof. P. N Pisharody (Project Co-ordinator-Rice) held addl. charge from 26.12.79 onwards.
<i>Director of Extension</i>	
<i>Education</i>	: Dr. V. S. S. Potti

The Administrative hierarchy of the University begins with the Governor of Kerala as the Chancellor of the University. The Minister for Agriculture is the Pro-Chancellor, The Vice-Chancellor is the Principal Executive and Academic Officer of the University. He is the Ex-Officio Chairman of the General Council, the Executive Committee and the Academic Council.

The Vice-Chancellor is a full time Officer of the University and the immediate overall control is vested with him. Administrative control of the University is vested with the Registrar. The preparation of the budget, statement of accounts and audit are controlled by the Comptroller. The research administration, the extension activities and public relations are handled by the Director of Research and the Director of Extension Education, respectively. The Director of Physical Plant is the custodian of all properties and he is responsible for the construction works, maintenance of buildings, purchase of vehicles etc. The resident teaching programmes, professional competence evaluation and improvement of

curriculum activities are managed by the Deans of the Faculties. The posts of the Librarian and the Director of Students Welfare were vacant during the period under report.

3 Authorities of the University

The Statutory authorities of the University are:

The General Council. The Executive Committee.

The Academic Council.

The Faculties.

Board of Studies of Faculties.

The Finance Committee.

The list of members of these authorities is given in appendix I.

i. The General Council

The General Council is the supreme authority of the University. The Council comprises of 17 Ex-Officio members, 20 elected members and 17 nominated members. The Council meets once in four months and is reconstituted every three years.

The Council was reconstituted on 31.1.80 excluding the positions of the representatives of Kerala, Calicut and Cochin Universities and representatives of the Legislative Assembly. The above positions were filled up after 1.4.80.

The General Council held three ordinary meetings and one special meeting during the year under report.

ii. The Executive Committee

The Executive Committee is the Chief Executive body of the University. The Committee consists of the Vice-Chancellor, three Ex-Officio members, six elected members and the member representing the ICAR in the General Council. The Executive Committee held 12 ordinary meetings and two special meetings during the period under report.

Important decisions of the General Council and the Executive Committee included:

a) decision to start a Provident Fund Scheme to the labourers under the University from 1.4.1979 and

b) decision to extend the benefit of reservation of seats for admission to the Diploma/Undergraduate courses to the children of farmers in the State and to the children of farm labourers of the University.

iii. The Academic Council

Maintenance of the standards of instruction, education and examinations within the University is the responsibility of the Academic Council. The Academic Council also exercises such other powers and performs such other functions conferred or imposed upon it by Statutes. The Council held three ordinary meetings and one special meeting during the period under report.

Altogether, eight resolutions were moved by the members, of which four were passed, three not accepted and one withdrawn.

In the meeting of the Academic Council held on 26.1.1979, it was decided that the date of effect of award of degree will be the date of declaration of the results by the University. Another decision was to permit the teachers to retire on the date of superannuation itself. It was also decided that if the retirement date of a teacher falls due in the middle of a trimester, such teacher need not offer courses in that particular trimester.

In the meeting of the Academic Council held on 14.8.1979, it was decided to start the following courses

- 1 Ph.D. in Horticulture and Plant Breeding.
- 2 M. Sc. (Ag.) in Plant Breeding.
- 3 M. Sc. in Agricultural Engineering.
- 4 M. Sc. in Agricultural Statistics.
- 5 M. Sc. in Agricultural Economics.
- 6 Degree in Fisheries (B. F. Sc.)

In the meeting of the Academic Council held on 12.11.1979, it was decided to start the following courses:

- 1 Post-graduate Diploma in Soil Science.
- 2 Post-graduate Diploma in Land and Water Resources Development and Management.
- 3 Post-Graduate Diploma in Plant Protection.

iv. Board of Studies

Board of Studies is constituted for each Faculty. The Boards of Studies look into the Academic standards in the respective Faculties.

v. The Finance Committee:

The Finance Committee consists of the Vice-Chancellor, Finance Secretary to the Government of Kerala, the Comptroller and two members chosen by the Executive Committee—one from among the non-official members and the other from among the Ex-Office members. The Finance Committee met once during the period under report to finalise the budget for 1980-81 and the revised budget estimate for 1979-80.

vi. The Sub-Committees

The Sub-Committees mentioned below continued to function during the period under report.

Research Council

Faculty Research Committees (Agriculture; Vety. & Ani.
Sciences)

Research Advisory Committee

Variety Evaluation Committee

Selection Committees

Student's Welfare Committee
Committee for deputation of Academic Staff
Selection Committees for post-graduate courses
Selection Committees for under-graduate courses
Sports Board
Extension Advisory Committee
Planning and Development Committee
Statute Sub-Committee

The list of members of the various Sub-Committees are given in appendix II.

4. University Organisation

There were three Faculties, viz., the Faculty of Agriculture, the Faculty of Veterinary and Animal Sciences and the Faculty of Fisheries. The Faculty of Fisheries was established during the period under report. Action pertaining to the establishment of the College of Fisheries and the Fisheries Research Complex at Panangad and Puduveypu was in progress. The Kerala Agricultural University Act also envisages the establishment of Faculties of Basic Sciences and Humanities, Co-operation, Home Science, Forestry, Agricultural Engineering and Technology etc.

The Research Council, the Research Advisory Committee and Faculty Research Committees are the bodies responsible to formulate the research programmes of the University. The Research Council is constituted by giving representation to the Scientists of other Universities like University of Agricultural Sciences (Bangalore), Tamil Nadu Agricultural University (Coimbatore) and Andhra Pradesh Agricultural University (Rajendra Nagar) and the representatives from the sister Universities of Kerala. The Research Advisory Committee with a broadbased representation has also been constituted.

The Extension Advisory Committee renders advice on Extension Education activities of the University. The activities are organised through the Director of Extension Education.

5 Faculty Improvement

The staff members were provided with facilities to acquire higher qualifications by granting deputation, study leave and leave for study purpose. Staff members were also sent for short term training courses in various specialisations and to attend seminars and symposia organised by different scientific agencies/ICAR/institutes. The contributions of staff were published in various scientific journals and also in publications like Anivet abstracts, Agri. abstracts and Hort. abstracts.

6 Officers' meeting

Meetings of the Deans, Directors, Associate Dean, Registrar and Comptroller are held periodically with Vice-Chancellor presiding to

**Details of number of Applications and number of
Admissions (1979—80)**

Post-graduate courses

	No. of applicants	No. of admissions
1 M. Sc. (Ag.)	151	66
M. Sc. (Hort.)	31	8
2 Ph. D. Agriculture	13	10
Ph. D. Horticulture	10	6
3 M. V. Sc.	30	36*
4 Ph. D. Vety. & A. H	3	2
5 PG Diploma in Natural Rubber Production	7	7

* 24 out of 30 applicants were selected. In addition, 12 candidates sponsored by the Department were also admitted.

Other matters

The University conducted refresher courses in 'office procedure, service rules, codes and regulations' to the different batches of Assistants. A full fledged Record Section was started in the University Office during the year under report. The Govt. of Kerala recognised the Diploma in Agrl. Sciences offered by the University.

CHAPTER II

Education

A. THE COLLEGE OF AGRICULTURE, VELLAYANI

1 Brief History

The College of Agriculture, situated at Vellayani, 11 km. from Trivandrum on the Trivandrum-Kovalam road, was started in the year 1955 with the object of imparting scientific agricultural education leading to the Bachelors Degree in Agriculture. The Campus is surrounded on three sides by the Vellayani lake. Consequent on the establishment of the Kerala Agricultural University, it became one of the constituent colleges of the University in 1972. The trimester system of instruction is being followed.

2 Departments

This College continued to be headed by the Dean, Dr. N. Sadanandan, under whom the following 12 departments functioned.

Agronomy, Agricultural Botany, Plant Breeding, Agricultural Chemistry, Agrl. Entomology, Agrl. Extension, Agrl. Economics, Agrl. Statistics, Plant Pathology, Agricultural Engineering, Horticulture and Animal Husbandry.

The first 11 departments were under Faculty of Agriculture while the Department of Animal Husbandry was under the technical control of the Dean, Faculty of Veterinary Sciences. The Instructional Farm, Vellayani is also attached to the College of Agriculture.

Teaching Staff

There were 10 Professors, 34 Associate Professors, 42 Asst. Professors and 32 Jr. Asst. Professors attached to the various departments. A list of academic staff attached to various departments is given in the Appendix IV.

Faculty improvement programme

Deputation of three members, one each from Agricultural Statistics, Agricultural Engineering and Agricultural Extension for Ph. D. courses was continued during the year.

Seminars, Workshops, Extension Lectures, Training programmes conducted

Extension lectures on "T & V System", "Eco-system of Silent Valley", and "Plentiful Bread Basket" by Drs. Daniel Benor, Satheesh Chandran and K. Gopalakrishna Pillai were arranged. The Kerala State Co-operative Bank Diamond Jubilee Endowment Lecture series for the year 1980 was delivered by Sri. P. R. Dhubhashi of Ministry of Home Affairs, Govt. of India. A two-day seminar on Post Harvest Technology of cassava was held in February 1980. A book entitled "Indian Dishes with Cassava" was released during the seminar.

Seminars, workshops etc. attended by the staff

Twenty one members of the Academic staff attended the seminar on "Internal Evaluation System" held at the College of Horticulture, Vellanikkara during April 1979.

Publications:

Ninety three research papers and eighteen popular articles were published during the period. The details are given in Appendix V.

Radio Talks:

The teaching staff attached to the various Departments actively participated in the AIR programmes.

3 Academic Programmes:

In addition to the B. Sc. (Ag.) course, M. Sc. (Ag.) and Ph. D. were also offered in the departments of Agronomy, Agricultural Botany, Agricultural Chemistry, Plant Breeding, Agricultural Entomology and Plant Pathology. In the Department of Agricultural Extension, M. Sc. course was started during the year.

A Department of Plant Breeding was newly organised and started during the year.

i) U. G. Programme.

Details of student strength of the year under report are given below:

B. Sc. (Ag.)	Men	Women	Total
I Year	20	36	56
II Year	30	22	52
III Year	59	37	96
IV Year	54	42	96
Total	163	137	300

ii) P. G. Programme:

	Men	Women	Total
M. Sc. (Ag) I Year	20	13	33
II Year	29	24	53
Ph. D. Junior	8	2	10
Senior	10	4	14
Total (PG)	67	43	110

iii) Number of outside students:

A total number of 13 students from outside the State were undergoing training in this College. The details are given below:

Nagaland, Meghalaya, Sri Lanka and Malaysia	— One each
Karnataka	— Two
Andhra Pradesh	— Seven

iv) Practical Training Programmes:

With a view to imparting practical experience and confidence in tackling field problems, work experience programme was instituted for the B. Sc. (Ag.) students. This is distributed over the entire four year period of the U. G. programme. Accordingly, the first B. Sc. (Ag.) students raised tapioca, second year students banana, third year students pulses, vegetables and fodder maize. The final B. Sc. (Ag.) students cultivated paddy (punja season). In addition to this, all the students were allotted perennial crops for maintaining them properly during the entire period of the B. Sc. (Ag.) programme.

The final B. Sc. (Ag.) students were taken to various Research Stations under the University to acquaint them with the research activities of the Stations and to impart farm training under the direct supervision of the Heads of the Research Stations. The students were evaluated by the detailed viva-voce examination based on the reports submitted, for successful completion of this training.

Final year B. Sc. (Ag.) students were given practical field training in the Agricultural Development Projects for a period of two weeks, monitored by the Department of Agricultural Extension of the College in collaboration with State Department of Agriculture. During the training, the students were taken to IPD Units under the direct guidance and supervision of the Officers of the Department of Agriculture.

v) Study Tours:

The third year B. Sc. (Ag.) students were taken on all India study tour to different places and institutions of agricultural importance.

vi) *Scholarships, Awards and Aids:*

The following scholarships/educational concessions were awarded to the students during 1979-80 :

KAU Fellowship to Ph. D. scholars	—	3
KAU fellowship to M. Sc. [Ag.] students	—	51
I. C. A. R. Senior fellowships	—	7
I. C. A. R. Junior fellowships	—	12
I. C. A. R. Merit cum-means scholarship	—	15
National merit scholarship [U. G.]	—	34
National Loan scholarship [U. G.]	—	22
K. A. U Merit scholarship	—	32
Educational concession under K. P. C. R.	—	36
Educational concession to ST/SC	—	26
Educational concession to OBC	—	2
Educational concession to Lakshadweep students	—	3
Scholarship awarded by P & T	—	1
Stipend by Govt. of Meghalaya	—	1
		245
Total		245

vii) *Hostel Strength:*

One hundred and sixty one boys [124 undergraduate and 37 post-graduates] and 138 girls were provided accommodation in the College Hostels during the year.

4. **Extra-curricular and Co-curricular activities**

The college union for the year 1979-80 functioned with Dr. N. Sadanandan as the Patron, Sri. P. S. John as the president and Sri. Jose Joseph as the General Secretary. The following members of the staff were nominated to the various offices.

President, Speakers club	—	Dr. A. M. Thampi.
do Athletic Association	—	Prof. J. B. Rose
do Planning forum	—	Dr. Skariah Oommen.
do Arts club	—	Prof A. T. Abraham,
Programme Officer, N. S. S.	—	Dr. Skariah Oommen.
Staff Editor, College Magazine	—	Dr. V. G. Nair.
Co-ordinator, Hobby Centre	—	Prof. A. G. G. Menon.
Treasurer, College Union	—	Sri. Mohammed Hussain.

The students union of the College of Agriculture was inaugurated on 20 th February, 1980.

Students of the college participated in the Fourth University Youth Festival held during May-June, 1979 and the College of Agriculture won the overall Championship.

The N. S. S. Unit of this college had 150 volunteers. Their activities included running of a community centre, conducting sports, games

and cultural programmes to encourage local talent, visiting houses and rendering advice on improved Agricultural practices, house keeping, health, cleanliness, family and child care etc. The International Literacy Day was celebrated and an exhibition of books arranged for the neoliterates. The unit also celebrated Vanamahotsava and Gandhi Jayanthi in a befitting manner. Film shows, cleaning campaigns, blood donation programme etc. were conducted.

A special campaign was also organised during September-October 1979 in which the volunteers reconstructed a road of one km. distance from Keezhoor to Palappoor. Another road was repaired and made motorable between Vandithadam and Palappoor.

The third year B.Sc. (Ag.) students participated in the consumer contact programme organised by the Madras Fertilizers Limited, in Malappuram Dist during their inter trimester break in May, 79.

The inter-house competitions on sports and games were held during March, 1980, Olympian Suresh Babu was the chief Guest at the closing ceremony.

The College teams participated in the Seelabhadran Memorial Football Tournament and in the Trivandrum District Basket Ball League Championship. Students of this College represented the Kerala Agricultural University in different Inter-University matches (Basket ball for men at Hyderabad, Basketball for Women at Bhojal, Football for men at Tirupathy and Volley ball for men at Vellanikkara.

5. College Library:

During the year, 4520 titles were added making the total stock of books to 21680 as on 31.3.1980. Subscription to 190 journals was continued. A Book Bank scheme also operated during the year. The library functioned from 8 a. m. to 8 p. m on all working days.

6 Instructional Farm

The Instructional Farm attached to the College of Agriculture, Vellayani, comprised of 180 ha. of land including Kayal lands, and was mainly intended for imparting practical training to the students and providing land for research activities of various departments. During the year under report, seedlings, planting materials, and quality vegetable seeds were distributed to the cultivators. The details are given below:

Graft, layers and seedlings.

Jack graft	6074
Mango	3710
Sapota	1015
Guava	7500
Cherry	2100
Lovi Lovi	1250

Jamba	1650
Malta Lemon	2300
<i>Bougainvillea</i>	140
Rose apple	40
<i>Haemelia</i>	16
Jasmine	279
Litchi	150
Curry leaf	350
Coconut [seed nut]	162893
Vegetable seeds distributed [Kg].	
Chillies	19.60
Brinjal	17.13
Bhindi	14.48
Snake gourd	7.05
Cucumber	6.50
Cowpea	6.00
Bitter gourd	4.25
Sword Bean	3.10
Cluster Beans	2.75
Amaranthus	35.12

7 Distinguished visitors

The following personalities visited the college during 1979-80.

- 1 N. A. R. P. Team headed by Dr. N. K. Anantha Rao.
- 2 Dr. G. A. Hall, Lincoln College, New Zealand.
- 3 I. C. A. R. Visiting Team headed by Dr. S. Y. Padmanabhan.
- 4 Mrs. Niggeman, Programme Officer. F. A. O.
- 5 Dr. Daniel Benor, Extension Expert: World Bank.
- 6 Dr. V. Nagarajan, Assistant Director General (Nutrition), ICAR.
- 7 Sri. P. K. Vasudevan Nair, the then Chief Minister of Kerala.
- 8 Sri. A. L. Jacob, the then Minister of Agriculture, Kerala.
- 9 Dr. V. K. Sukumaran Nair, Vice-Chancellor, Kerala University.
- 10 Professor, P. G. K. Panikker, Director, Centre for Development Studies.

B THE COLLEGE OF HORTICULTURE, VELLANIKKARA

1 Brief History

The College of Horticulture, established in October, 72, is located at Vellanikkara 10 km. from Trichur, on the Trichur-Palghat highway. It was temporarily located at Mannuthy till its shifting to the present premises in November 1977, after the inauguration of the new academic buildings by Shri. Morarji Desai, the then Prime Minister of India. Dr. P. C. Sivaraman Nair took charge as Associate Dean on 31-5-1978.

2 Departments

Dr. P. C. Sivaraman Nair continued to be the Associate Dean during the year under report. Fourteen departments viz., Pomology & Floriculture, Plantation crops & Spices, Olericulture, Processing Technology, Agronomy, Agril. Botany, Soil Science & Agricultural Chemistry, Agril. Entomology, Plant Pathology, Agril. Economics, Agril. Engineering, Agril. Statistics, Agril. Extension and Agril. Meteorology functioned in the College.

The Kerala Agricultural Development Project, Pepper Research Scheme, Sugar Cane Research Scheme, AICRP on Biological control of crop pests and ICAR Scheme on Germplasm collection of Jack fruit were being implemented in the Campus. The Instructional Farm & Rice Research Station, Mannuthy was also attached to this College

Teaching Staff

The staff consisted of the Associate Dean as the head of the Institution under whom 13 Professors, 14 Associate Professors, 27 Asst. Professors and 26 Junior Asst. Professors worked in the various departments. The details are furnished in Appendix iv.

Faculty Improvement Programme

Dr. P. C. Sivaraman Nair, Associate Dean visited Institutes and Centres of research and education in GDR & U. K. during May-July 1979. Dr. C. C. Abraham, Professor of Entomology attended a study programme on aquatic weed management under the Colombo plan at W. R. O., Oxford, C. I. B. C Trinidad, University of Khartoum, and Centre for Overseas Pest Control, U. K. Sri. Mathew Jacob, Jr. Asst. Professor was deputed for a three-month training on "Assessment of protein quality & quantity in cereal crops" at NRL, IARI, New Delhi.

Seminars, Workshops, Extension Lectures and Training conducted

A 10-day training on "tree planting for railway staff" was organised from 11.1.80 to 21.1.80 by the Pomology and Floriculture Department. The Department of Agronomy conducted a three days training on production, pruning and processing of cocoa for the Officers of Department of Agri., Kerala. Under the KADP, refresher training to the JAO's (17.12.79 to 24.12.79) and Dist. level officers (18.12.80 to 27.12.80) of SADU were conducted. A one day seminar on cocoa was organised by the Department of Plantation Crops and Spices on 30.5.79. The Department of Processing Technology organised a training course of three weeks duration between 4 and 24 October 1979 in "food processing and preservation" to the village development officers of the Kuriakose Elias Service Society, Nadathara. The staff of various departments took classes during several farmer's camps and seminars conducted by the Directorate of Extension Education. Eighteen seminars were organised during the year involving the academic staff and post-graduate students.

Seminars and Workshops attended by the Staff

Dr. K. M. Narayanan Namboodiri, Prof. Agrl. Botany participated in the Peninzular Zonal meeting on Sugarcane held at Pune on 30th and 31st January, 1979. Dr. C. K. Peethambaran, Asst. Professor attended the Annual workshop of Mango Research workers held at Goa on 5.5.1979. Dr. Abicheeran, Dr. P. J. Joy and Dr. T. S. Venkitesan attended the PLACROSYM II held at Ootacamund from 26th to 29th January, 1979. Dr. T. S. Venkitesan attended the district level pepper development symposium at Cannanore on 20.7.79. Mr. G. Madhavan Nair attended the International Seminar on Agriculture for Tropical climates at New Delhi from 21st February to 4th March 1980. Dr. Jose Samuel, Professor of Agrl. Engg. attended ICAR Scientific panel meeting of Agrl. Engg. held at New Delhi during March, 1980.

Publications:

During the period under report, 57 research/scientific articles, 32 popular articles and one book were published by the academic staff. The details are furnished in the appendix V.

3 Academic Programmes:

i) U. G. Programme:

Initially, 20 students were admitted for the B. Sc. (Hort.) degree course of four years duration. Subsequently, the annual intake was increased to 30 excluding sponsored candidates from other States and Institutions, B. Sc. (Ag.) degree course was also introduced from 1977-78 with an intake of 50 students. The first batch of B. Sc. (Hort.) students graduated in 1976.

During 1979, 103 students were newly admitted—62 for B. Sc.(Ag.) and 41 for B. Sc.(Hort).

The class strength of students were as follows:

B. Sc. (Hort.)	Men	Women	Total
I Year	18	21	39
II Year	20	19	39
III Year	18	18	36
IV Year	17	17	29
Total	68	75	143
B. Sc. (Ag.)			
I Year	32	28	60
II Year	44	19	63
Total	76	47	123
Total U. G. Strength	144	122	266

The fourth batch of B. Sc. (Hort) students (1975 admission) completed their degree programme and 19 of them graduated during the year under report.

ii) *P. G. Programme.*

During the year under report, Ph. D. in Horticulture, M. Sc. in the disciplines of Agrl. Engineering, Plant Breeding, and Agrl. Economics were started. A Post-Graduate diploma course in Natural Rubber Production was also started. During the period, new (1979) admissions to the M. Sc. (Ag.) courses were for Agronomy (5), Agrl. Botany (2), Plant Breeding (2), Agricultural Chemistry (2), Agrl. Entomology (3) Agrl. Engineering (4) and Agrl. Economics (6). M. Sc. (Hort), Ph. D. and P. G. Diploma in Natural Rubber Production had 8,6 and 7 students. respectively,

The strength of P. G. Students was as given below:

M. Sc. (Hort.)	Men	Women	Total
I Year	3	5	8
II Year	4	8	12
Total	7	13	20
<hr/>			
M. Sc. (Ag.)			
I Year	15	9	24
II Year	19	8	27
Total	34	17	51
<hr/>			
Ph. D. I Year	5	1	6
P. G. Diploma in NRP	5	2	7
Total P. G. Strength	51	33	84

Six students each in M. Sc. (Hort.) & M. Sc. (Ag.) programmes successfully completed their courses.

(iii) *Outside Students:*

A total number of 68 students from outside the State were on the rolls in this college under various academic programmes. The details are given below;

Lakshadweep	5
Pondicherry & Mahe	14
Sikkim	2
Tripura	21
Manipur	23
Andra Pradesh	3
Total	68

iv) *Practical Training Programme:*

Besides regular practical classes, the U. G. students were given special assignments viz. Plot cultivation (5 cents) of various annual crops (tapioca, vegetables etc) and maintaining perennial crops (mango, sapota, guava, coconut, cocoa & spices) under the work experience programme to impart practical skill and to make them capable of tackling

field problems connected with these crops. Their performance was evaluated by a *viva voce* examination and based on the field practical records maintained by them. Apart from this, the students were involved in layout of farms, peg marking for planting, landscaping and nursery practices during off hours and were paid @ Re 1/-per hour of work.

v) *Study Tours:*

The first, second and third year U. G. students were taken on tour with in the State and also to Institutions of agricultural importance outside the State.

vi) *Scholarships Awards and Aids:*

A total of 209 students of the College availed of scholarships, fellowships etc. of various types during 1979-80. These include National Merit Scholarship to 21 students, KAU merit scholarship to 63 students and ICAR Jr. Fellowships to six students. The details of scholarships and educational concessions availed of by students are given below:

Kind of concession/Scholarship	Number of students availed
1 SC/ST students Xian converts	28
2 SEBC and foward communities	33
3 National Merit Scholarship	21
4 National Loan Scholarship	11
5 K. A. U. Merit scholarship	20
6 K. A. U. Fellowship – M. Sc.	38
7 K. A. U. Fellowship – Ph. D.	5
8 Merit –cum - means Scholarship	17
9 Fellowship from outside agencies	1
10 Lakshadeep students/Manipuri SC/ST	5
11 Nominees	16
12 NRP, Tripura	3
13 SC/ST, Pondicherry	3
14 Junior Fellowship	6
15 Senior Fellowship	1
16 Post-Doctoral Fellowship	1
	209
Total	

vii) *Hostel Strength:*

153 boys and 135 girls were accommodated in the Hostels during the year.

4 **Extra Curricular and Co-curricular Activities:**

The students union of the College for 1979-80 was inaugurated by the Honourable Minister of Agriculture Smt. K. R. Gowri on 25-2-80 The following were the office beareers:

Patron	:	Dr. P. C. Sivaraman Nair
Assoc. Patron	:	Dr. Abi Cheerañ
President	:	Sri. P. J. Ranjith
Vice-President	:	Kumari Darley Jose
General Secretary	:	Sri. M. C. Narayankutty
Assoc. Secretary	:	Kumari K. E. Usha
President, planning forum	:	Dr. V. Radhakrishnan
Secretary, planning forum	:	Sri. S. Mohankumar
President, Atheletic Association, Arts Club	:	Sri. K. Narayankutty Nair
Secretary, Atheletic Association, Arts Club	:	Sri. Raju George
Secretary, Arts Club	:	Sri V. S. Jayaram
President Quiz Club	:	Dr. A. I. Jose
Secretary, Quiz Club	:	N. V. Jayachandran
Staff Editor	:	Dr. K. M. N. Namboodiri
Student Editor	:	Sri. A. V. Rajesh
President, S. S. league	:	Dr. P. Balakrishna Pillai
Secretary S. S. league	:	Sri. G. Sudarsanan

Sri. P. M. Abraham, A. P. C, and Professor S. Ramanujan inaugurated the planning forum and Arts club, respectively. The arts club organised various programmes, one union day, KAU Youth festival and College day. The College Quiz Club secured the rolling trophy at Kerala Agrl. University intercollegiate competition. The publication of the monthly quiz bulletin of the club was also continued. The College hosted the KAU Youth festival for the year.

The student volunteers under N S S scheme actively participated in the various programmes organised under V. A. P., by conducting free tuition classes, lay out of demonstration plots, model kitchen gardens other social and philanthropic activities. Dr. P. Balakrishna Pillai continued as programme officer for N. S. S.

5 College Library

The library facilities of the College were considerably improved by providing additional titles and reference items. During the year under report 5438 new titles were added, making the total stock of books to 12500. The College subscribed to 100 Journals. The book bank scheme was continued during the year., A book exhibition was also organised. The library functioned from 8 A. M. to 7 P. M. on all working days.

6 Instructional Farm

The Instructional Farm attached to this college comprises of two units, one located at Mannuthy (33.7 ha) and the other at Vellanikkara (95.3 ha.) with a total area of 129.0 ha. All facilities required for imparting practical training on crop cultivation & nursery practices to the

students and for research work of staff on various crops were provided from this farm.

The farm maintains a nurseery for production and distribution of quality seed and planting materials to the cultivators.

The following quantity of seeds and planting materials were distributed during the period:

Paddy seeds	:	7395 kg.
Cowpea seeds	:	172.3 kg.
Vegetable seeds	:	117 kg.
Coconut seedlings	:	2750 Nos.
Fruit & Spices plants	:	12968 Nos.
Ornamental plants	:	5048 Nos.

7 Distinguished Visitors:

The following distinguished personalities visited the College during the year.

Dr. R. Manciot, IRHO, Adibjam, Ivory Coast.

Dr. John Bene, Senior Advisor, IDRC, Ottawa, Canada.

Dr. J. Reghotham Reddy, Vice-Chancellor, Andhra Pradesh Agril. University, Rajendranagar.

Dr. J. Thuljaram Rao, Zonal Co-ordinator, ICAR, New Delhi.

Sri. S. Thillai Raja, World Bank Office, New Delhi.

Dr. H. C. Dass, Project Co-ordinator (Fruits) IHR, Bangalore.

C. THE COLLEGE OF VETERINARY & ANIMAL SCIENCES, MANNUTHY

1 Brief History

The Veterinary College was established in 1955 at Mannuthy and it became a constituent unit of the Kerala Agricultural University when it came into existence in 1972.

1 Departments

Dr. P. G. Nair continued as Dean upto February 1980 after which Dr. A. Venugopalan Nambiar, Professor (Research Co-ordination) was in charge of the Dean. The following 18 departments-Anatomy, Animal Management, Animal Reproduction, Animal Breeding and Genetics, Clinical Medicine, Dairy Science, Extension, Microbiology, Nutrition, Parasitology, Pathology, Pharmacology, Physiology, Poultry Science, Preventive Medicine, Surgery, Veterinary Public Health and Statistics functioned during the year. Two Veterinary Hospitals-one at Mannuthy and the other at Trichur along with the Livestock Farm, the Poultry Farm, the Pig Breeding Farm and the A. I. Centre served as the instructional units.

Teaching Staff.

The staff consisted of the Dean as the head of the College under whom 24 Professors, 42 Associate Professors, 36 Asst. Professors and 45 Junior Asst. Professors worked in the various departments. The details of staff are furnished in the Appendix IV

Faculty Improvement Programme.

Dr. C. K. S. V. Raja, Dr. A. K. K. Unni, Dr. Kurian Thomas, Dr. M. V. Sukumaran, Dr. A. M. Jalaludhin, Dr. K. M. Alikutty Dr. K. T. Punnoose, Dr. M. K. Rajagopalan and Dr. R. Padmanabha Iyer were deputed for higher studies for improving and strengthening the various departments.

Seminars, Workshops, Extension lectures conducted by the College

Seminars, Exhibitions, Animal Husbandry Melas and Sterility camps were conducted in the adopted villages and other parts of the State. One 'Mrigasamrakshana Mela' was organised by the Planning forum. During May 1979, a workshop on elephant was conducted. Workshops and State level seminars were conducted to review the package of practices for cattle, poultry pigs and goats.

The 33rd annual conference of the Indian Society of Agricultural Statistics was organised in the College of Veterinary and Animal Sciences from 21.12.1979 to 23.12.1979.

Seminars attended by the Teaching staff

The teaching staff actively participated in the Seminars, workshops etc: conducted by various other outside agencies. Members of the Staff, attended 56 seminars/lectures in the State and 23 workshops/summer institutes outside the State.

Publications

During the period, 102 scientific articles, and 44 popular articles were published by the academic staff. The details are furnished in appendix V.

Radio Talks

The following topics were broadcast through the All India Radio, Trichur.

- a) Poultry breeding.
- b) Tapioca leaf poisoning in cattle.
- c) Food poisoning in cattle.
- d) Profitable broiler industry.

The Department of Poultry Sciences in collaboration with All India Radio, Trichur and Animal Husbandry Department broadcast serialised lessons on profitable poultry farming.

3 Academic programmes

i) U. G. Programme

During the year, 70 students were admitted to the B. V. Sc. & A. H course. The strength of students was as follows.

B. V. Sc. & A. H.	MEN	WOMEN	TOTAL
New admission	54	16	70
Total	202	47	249

37 Students graduated during the year under report

ii) P. G. Programme

During the year 36 students were admitted to M. V. Sc. programme and two to Ph. D. programme.

The total strength of postgraduate students was as follows.

M. V. Sc.	Men	Women	Total
New Admission	30	6	36
Total	53	8	61
Ph.D.			
New Admission	1	1	2
Total	13	3	16
Total P. G. Strength	66	11	77

Nine M. V. Sc. and two Ph. D. students completed their programme during the year.

iii) No. of outside students

Forty five students from outside the State were on the rolls of the College, as shown below.

Malaysia	:	2
Mauritius	:	1
Kenya	:	1
West Indies	:	1
Nigeria	:	1
Goa	:	1
Lakshadweep	:	4
Pondicherry	:	4
Bhutan	:	2
Jammu & Kashmir	:	26
Himachal Pradesh	:	2
Total		45

iv) Training Programme

A number of training programmes were conducted at the College by the different Departments to Officers of the Animal Husbandry Department, the Kerala Agricultural University staff and the Public.

A nine months training programme was conducted for Senior Officers of the Animal Husbandry Department. A short term training for Veterinary surgeons on the "Assessment of nutritional status of animals by serum analysis" was also conducted.

Fifteen persons attended the training to pre-release Defence personnel in poultry farming conducted from 1.12.1979 to 1.1.1980. One hundred persons attended the one day contact programme in poultry farming conducted from 15th to 20th December 1979. From 1.2.1980 to 28.2.1980 a training in poultry management was conducted. Classes were also conducted for the Village Development Officer trainees under I. R. D. P.

A one month training on "Dairy Farming" was conducted for 25 AFPRO trainees, 29 Defence personnel and 10 farmers from the KESS, Nadathara. A training in milking was conducted for six weeks to the Lakshadweep nominees from 31.7.1979. A two week refresher training for 55 Dairy Farm Instructors of the Dairy Department was conducted.

A training in statistics for research workers in Agronomy and Agricultural Chemistry was conducted by the Department of Statistics from 17.9.79 to 12.10.1979.

v), Study Tours

The Third year B. V. Sc. & A. H. students were taken on all India study tour to different places and Institutions of Animal Husbandry importance in the country.

vi) Scholarships, Awards and Aids

The following scholarships/Educational concessions were awarded to the students during 1979-80.

1	SC/ST	20
2	Kumara Pillai Commission	36
3	Fee concession to OBC/OEC	2
4	Educational concession to students of Jammu & Kashmir from their Government	
	a) Post metric scholarship	4
	b) Educational loan from J K & Bank	21
5	Educational concessions for Nagaland nominees	—
6	Educational concession for Meghalaya nominees	—
7	Educational concession for Lakshadweep nominees	4
8	Educational concession for Bhutan nominees	2

9	Full fee concession for children of political sufferers	—
10	Scholarship for proficiency in sports	—
11	Government of India General Cultural Scholarship	1
12	KAU Merit scholarship	39
13	National Merit scholarship	5
14	ICAR Merit-cum-means scholarship	10
15	National Science Talent scholarship from ICAR	—
16	National Loan Scholarship	6
17	KAU Junior Fellowship for P. G. students	15
18	KAU Senior Fellowship	—
19	ICAR Junior Fellowship	3
20	ICAR Senior fellowship	4
	Total	172

vii) Hostel Strength

Three hundred and twenty four students (280 undergraduate and 44 post graduates) were provided accommodation in the College Hostels during the year. Of these, 58 were girls.

4 Extra-curricular and Co-curricular activities

Besides the sports and athletic activities, the students participated in N. S. S. and Village Adoption programmes. The College Student's Union arranged competitions in literary activities and Arts and Dramatic activities.

Students also participated in intercollegiate Quiz competitions, debates, Chitra Kala-mela, Youth Festival, Drama competitions etc.

5 College Library

During the year under report, 1222 titles were added making the total stock of books to 17579 as on 31.3.1980. Subscription to 300 Journals continued during the year. A book bank scheme continued to be operated. An exhibition of latest books and journals was also organised during the year.

6 Instructional Farms/Hospitals

i) University Livestock Farm, Mannuthy.

This is one of the oldest livestock farms in the state, established in 1921. During the year 1972 it was transferred from the Government to Kerala Agricultural University.

The stock position during the year was as follows:

	At the beginning of the year.	At the end of the year
Milking cows	112	113
Dry cows	57	53
Young stock: Male	53	13
Female	37	30
Bullocks	5	4
Total	264	213

The quantity of milk produced during the year was 2,53,394 kg. The lactation average of the herd was 1,848 kg. in 323 days

Receipts and Expenditure

	Receipts Rs.	Expenditure Rs
Proceeds from sale of milk produced	5,06,788.60	—
Proceeds from sale of farm yard manure	38,693.00	—
Proceeds from sale of animals for meat	23,493.00	—
other miscellaneous	705.00	—
Establishment		1,16,176.38
Contingencies		6,48,608.16
Total	5,69,679.60	7,64,784.54

ii) Fodder Research & Development Scheme, Mannuthy

The scheme was established in 1975 and covers an area of about 65 hectares.

A total quantity of 26,55,757 M. T. of grass worth Rs. 3,98,363.55 was produced. The scheme earned a net profit of Rs. 53,881.40 even after including the establishment charges.

iii) University Poultry Farm, Mannuthy

The farm has an area of 5.26 hectares. The stock position during the year was:

	At the beginning of the year.			At the end of the year.		
	Poultry	Duck	Total	Poultry	Duck	Total
Stock position (No. of birds)	6845	185	7030	5262	35	5297
Birds sold: Poultry	27,959			Duck	64	
Eggs sold: Hen eggs	1,81,867			Duck eggs		4,569

The working of the farm has been made profitable during the year

Expenditure	Rs. 3,11,820/-
Receipts	3,26,451/-
Expenditure on establishment	76,287/-

iii) *University Pig Breeding Farm, Mannuthy.*

The Pigs produced in the farm were sold to the Government Meat Factory, Koothattukulam, SFDA, Trichur and also to some farmers.

Stock position during the year was as follows:

Classification of stock	At the beginning of the year	At the end of the year
Sow with litter	6	14
Breeding boars	11	13
Adult females (sows)	121	99
Young boars	21	14
2 to 6 months: Male	—	3
Female	—	8
0 to 2 months: Male	20	46
Female	28	102
Total	207	299

Six students participated in an "earn-while-you-learn" project. Fifteen pigs, weighing on an average 38 kg. were reared to an average weight of 59 kg. on kitchen waste. This enabled the students to earn Rs. 345,18 per student.

Expenditure and receipts.

	Receipts	Expenditure
Establishment		66,185.07
Labour charges		94,732.04
Feed		1,48,111.69
Contingencies		10,971.91
Pigs sold to M. P. I. Pig Development office, SFDA and to Farmers	84,280.00	
Miscellaneous receipts	1,680.00	
Total	85,960.00	3,20,000.71

iv) *Livestock Research Station, Thiruvazhamkunnu*

This farm was started on 8th April, 1950. It has an area of 163.3 hectares. The total expenditure during the year was Rs. 9,80,690.15 and the receipts, Rs. 3,15,963.63.

The herd average milk yield per day was 3.71 kg. and the average milk yield per milking cow per day was 5.20 kg.

v) *Cattle Breeding Farm, Thumburmuzhi*

This farm is located 15 km. from Chalakudy in the Sholayar route and has an area of 25 hectares

This is only an ancillary farm for rearing calves. After the female calves acquire maturity and conceive, the pregnant ones are returned to the other farms.

During the year, 52 cross bred pregnant heifers were transferred to Livestock Farm, Mannuthy.

A total of 1,164 Metric tonnes of green grass costing Rs 1.4 lakhs was produced in the farm, of which 80 M. T. were supplied to Mannuthy farm during the summer months. The quantity of grass produced has replaced 388 M. T. of paddy straw at the straw/grass ratio of 1:3. The cost came to Rs. 2.9 lakhs and this made a saving of Rs. 1.5 lakhs to the Kerala Agricultural University, compared to an all-straw ration otherwise needed.

vi) *Veterinary Hospital, Mannuthy*

No. of cases treated during the year.

Horse	5
Cattle	7,250
Others	4,887
	<hr/>
Total	12,142

Daily average attendance was 33.26.

During the year under report, 108 castrations, 597 surgical operations (of which 60 were major operations), 6558 preventive inoculations (eight against Foot and Mouth disease and 6550 against Ranikhet disease) and 72 anti-rabic vaccinations (63 for dogs, six for cattle and three for goats) were done.

vii) *Veterinary Hospital, Trichur*

There are three residential quarters provided at the Veterinary Hospital, Trichur to facilitate attending to emergency cases at all hours. The students are being given clinical training in the two veterinary hospitals.

In Clinical Laboratory attached to the Veterinary Hospital, Trichur a total of 11,474 clinical materials were examined, including 973 materials referred to from outside.

The other details regarding the Hospital are given below:

No. of cases treated	31,493
No. of castrations done	95
Major surgical operations done	21
Minor surgical operations done	267

Preventive inoculations of birds	
against Ranikhet disease	15,304
Anti-rabic vaccinations	35
Daily average attendance	86

viii) Artificial Insemination Centres

The two Artificial Insemination centres functioned satisfactorily. A total number of 6756 cows and 1216 buffaloes were inseminated and a total revenue of Rs. 30,946 was collected.

The Artificial Insemination for goats was also continued and functioned satisfactorily.

ix) Other activities

The "Mobile Sexual Health Control Programme" "Veterinary preventive measures in adopted villages of the KAU" as well as a examination and diagnosis of clinical materials from the hospital, villages and farms" were carried out during the period under report.

7 Distinguished visitors

- 1 Dr. Lr. H. Bekkar, Department of Animal Husbandry, Agricultural University. Netherlands.
- 2 Dr. U. S. Krishna Moorthy, Head of the Department of Genetics, Madras Veterinary College.
- 3 Dr. B. R. Deshpande, Professor & Head, Department of Surgery, Bombay Veterinary College.
- 4 Dr. A. Ramohnn Rao, Professor (Animal reproduction), Veterinary College, Tirupati.
- 5 Dr. S. P. Arora, Nutritionist
- 6 Dr. M. Anantharaman, Retired Professor of Parasitology.
- 7 Dr. Goerham, Scientist, N. I. A. H., U. S. A.
- 8 Dr. Francis, Pathology Division, Queensland University, Australia.
- 9 Dr. G. Winguist, Professor. Royal Veterinary College. Sweden, FAO Expert.
- 10 Dr. M. Y, Mangrulkar, former Principal, Veterinary College Jabalpure.
- 11 Dr. R. M. Acharya, Director, Central Sheep & Wool Research Institute.
- 12 The High Power Committee appointed by Government of Kerala for finalisation of Cattle Breeding Policy of the State comprising of the following members:
 Dr. P. N. Bhat, Head of Division of Genetics, IVRI; Dr. S. Krishnamurthy, Deputy Commissioner, Ministry of Agriculture, Govt. of India; Dr. M. N. Menon. Retired A. H. Commissioner Dr. Darias, Economist; Dr. Abraham Mathew, Indo-swiss Project; Sri. Gopalan Nair, Managing Director, KLD & MM Board and Sri. Alexander Joint Director, Dairy Department.

- 13 ICAR Visiting team comprising five scientists
- 14 Dr. K. L. Sahni, Project Co-ordinator
- 15 Sri. J. Raghotham Reddy, Vice-Chancellor of Andhra Pradesh Agricultural University
- 16 Sri. John. R. Gorham, Research Leader, Science and Education Administration, U. S. A.

D COLLEGE OF FISHERIES

1 Brief History:

The College of Fisheries started functioning at Mannuthy from October, 1979 onwards. It will be shifted to Panangad, Cochin soon. The ICAR visiting team which examined the proposal of the University to start a College of Fisheries under it recommended the starting of a College in the Greater Cochin area. The Government of Kerala approved the proposal of the University to start the College of Fisheries during 1979-80 academic year. Till the completion of acquisition of land and construction of the buildings at Panangad, the proposed college was temporarily located at Mannuthy.

The College of Fisheries offers a four year professional degree course leading to the degree of Bachelor of Fishery Science (B. F. Sc.). The minimum qualification for admission is a pass in the Pre-Degree Examination with Physics, Chemistry and Biology as the optional subjects. The number of students admitted to the course during the year was 30, of which nine seats were reserved for fishermen students. 10 seats were offered on open merit basis and 11 seats on the basis of communal reservation. The trimester system of education is followed.

2. Departments

Dr. M. J. Sebastian assumed charge as Dean, Faculty of Fisheries on 29.1.80. Till then, he was holding charge of the post. Seven departments viz. Department of Aquaculture, Department of Fishery Biology, Department of Fishery Hydrography, Department of Fish Processing Technology, Department of Fisheries Engineering, Department of Fishing Technology and Department of Management Studies were created under the faculty of Fisheries. Posts of Professors, Associate Professors, Assistant Professors and Junior Assistant Professors, were created in the different departments and action taken to fill these posts.

Teaching staff

Pending selection and appointment of the full complement of staff during 1979-80, the College functioned with limited staff members (appendix-IV).

Seminars, symposia, conferences attended:

Dr. M. J. Sebastian, Dean attended the International Symposium on Coastal Aquaculture, organised by the Marine Biological Association

of India held at Cochin from 12th to 18th January 1980. He attended the conference convened by the Chairman. MPEDA on 18.1.1980 for co-ordination of fisheries research and developmental works by different agencies. Dr. Sebastian visited the Oceanic Institute, Hawaii and the University of Fisheries, Tokyo from 4.2.1980 to 22.2.1980 under a scheme financed by the International Foundation for Science, Sweden.

Publications:

Two research papers and two booklets were published by the members of the Staff (appendix V)

Radio talks:

Radio talks on fish culture and prawn farming were given by Dr. M. J. Sebastian, Dean and Dr. D. M. Thampy, Associate Professor (Fishery) Vyttila.

3 Academic Programmes:

i) Undergraduate Programme:

During 1979-80, 28 students were admitted to the 1st year of the B. F. Sc. degree course. Out of the 28 students eight were girls.

ii) Outside students:

Of the 28 students, one was from Bihar State and another from Laccadives.

iii) Hostel strength:

The students of the College of Fisheries were accommodated along with the Veterinary students in their hostels.

iv) Scholarship, Awards and Aids for students;

The following scholarships/educational concessions were awarded to the students during 1979-80

	No. of awards
National Merit Scholarship	2
KAU Merit Scholarship	3
Fisheries Scholarship	6

4 Extra Curricular and Co-curricular Activities:

The College Union functioned with Sri. S. Ratnakumar as President and Sri. H. V. Narayana as General Secretary. Dr. M. J. Sebastian, Dean was the Patron of the Students Union and Shri. G. S. Narayana was the Associate Patron. Dr. S. D. Ritakumari was the Staff Editor. The College Union was inaugurated by Sri. S. Sreenivasan, Hon'ble Minister for Fisheries and Revenue.

5 Library:

The College Library had 3373 books by the end of March 1980.

6 Instructional Farm

An Instructional Farm for brackishwater fish/prawn culture is being constructed at Puduveypu in Cochin, in an area of more than 100 ha. assigned to the Kerala Agricultural University by the Government of Kerala. A laboratory building in this Instructional Farm and Research Complex is under construction.

7 Distinguished visitors

A special ICAR Visiting Team headed by Dr. S. Z. Qasim, Director of National Institute of Oceanography, Panaji, Goa, visited the Panangad site proposed for the College of Fisheries on 20.8.1979. In January 1980, Dr. P. S. B. R. James, Joint Director of Central Marine Fisheries Research Institute visited the College and addressed the students on the recent developments in fishery biological studies.

E. THE INSTITUTE OF AGRIL. TECHNOLOGY, TAVANUR

1. Brief History:

The IAT is located in Tavanur village of the Malapuram District about 7 kms. from Kuttipuram Railway Station and 12 kms. from Ponnani. The Institute was established in 1963 as Rural Institute and offered various Diploma and Certificate courses. The institute was taken over by the KAU on 12.12.1975 and was renamed as the 'Institute of Agril. Technology during 1977.

The institute is a training centre for farmers, students, and field level workers of selected Government Departments in Kerala. The Institute has successfully implemented the village adoption programme and lab to land programme.

The Institute is under the direct control of the Director of Extension Education, Kerala Agricultural University. The head of the Institute was designated as 'Special Officer' and later changed as 'Director' from september, 1979. The Director of IAT, Tavanur is in the cadre of Associate Professor.

2. Courses offered:

The Institute offered Diploma course in Agricultural sciences of two year duration. under trimester system. The Livestock Assistants Training course was also conducted here. In addition to the above courses, the Institute also arranged facilities for the inservice training courses of Agricultural Demonstrators.

Teaching staff:

The teaching staff consisted of one Director (Associate Professor) as the Head of the Institution, five Asst. Professors and 14 Jr. Asst. Professors. The details of staff are furnished in the Appendix IV.

Faculty improvement programme:

Sri. Alexander David, Asst. Professor, Sri. P. J. Joseph and Sri.

Vilasachandran, T. Jr. Asst. Professors were granted leave for study purpose for undergoing Ph. D. programme.

Seminars, Workshops and Extension lectures and training conducted:

A Seminar was conducted on 30.8.1979 in connection with the inaugural function of the 'Lab to Land' programme. 164 farmers and 63 officials including the Scientists [of KAU and Agrl. Department attended the Seminar. Training in selected aspects of Agriculture and Animal Husbandry was offered to 30 marginal farmers.

Ten guest lectures were arranged for the benefit of the trainees of the LSA Training course by the officers of the Animal Husbandry Department/KAU. Special guest lectures were also arranged by the officers of KAU/Agrl. Department for the benefit of the inservice trainees.

Training programmes were also conducted in different aspects of Agriculture as part of the village adoption programme. Altogether 172 farmers attended the programme.

3. Academic programme:

i) Diploma in Agrl. Sciences

The 3rd batch of 50 students were admitted on 1.8.77. They completed their course including field training on 22.3.80. Forty one students came out successful. The students of the institute went on strike from 3.12.79 to 25.2.1980.

The 4th batch of the D. A. Sc. course was started with 51 students on 17.8.78. They completed four trimesters out of the seven trimesters during the period under report. The course is now in progress.

The 5th batch of the D. A. Sc. course was started with 51 students on 10.9.79. This batch completed one trimester out of the seven trimesters during the period under report. The course is now in progress. Till now 3 batches of students have completed the course including field training.

ii) Agricultural Mechanic Course:

The duration of the course is one year consisting of 3 trimesters. The third batch of the course was started with 20 students on 12.12.78. They completed the course on 20.12.79. Seventeen students came out successful.

iii) Livestock Assistants Training course:

The 3rd batch of Livestock Assistants Training course commenced on 16.7.79 and terminated on 15.6.80.

Eighty candidates were admitted to the course at the beginning, comprising of 58 candidates sponsored by the Animal Husbandry Department, six by the Union Territory of Lakshadweep and 16 by the Kerala Agricultural University. Later, four candidates discontinued the course and one candidate did not appear for the examination. The remaining candidates were admitted to the final examinations conducted during June, 1980.

The training programme was of 11 months duration comprising of 9 months on-campus training conducted at the Institute and 2 months field training conducted at different veterinary Hospitals, A. I. Centres of the Animal Husbandry Department and the Kerala Agricultural University. During the period of institutional training, theoryclasses, practical classes, presentation of assignments by the trainees, periodical class tests, screening educative films, guest lectures and study tours etc. were conducted.

(iv) *Inservice Training Course for Agricultural Demonstrators:*

The period of the Inservice Training Course is six months of which the first three months is devoted to Institutional training. During the next three months the trainees are deputed to five different Research Station namely, Coconut Research Station, Pilicode, Horticultural Research Station, Ambalavayal, Rice Research Station, Pattambi, instructional Farm, Mannuthy and Banana Research Station, Kannara, in batches of 10-15 for the field training of credits.

The table below shows the details regarding trainees admitted for the 3rd and 4th batches of training course during the period under report.

Batch	Date of starting	No. of trainees admitted	No. of trainees discontinued before completion of the course	No. of trainees completed the training successfully.
3rd batch	25.10.79	75	1	67 (Completed on 24.4.79)
4th batch	10.10.79	64	1	28 (Completed on 9.4.80)

(v) *Practical Training Programme:*

Practical Training Programme was conducted as per the syllabus of the Diploma Courses and Training for the students and trainees.

(vi) *Study Tours.*

Study tours were conducted to the Regional Poultry Farm, Malampuzha, Livestock and Poultry Feed Compounding Factory, Malampuzha, Bull Station, Dhoni, Dairy plant, Edappally, Factory of Meat Products of India at Koothattukulam and Livestock and Dairy Farm at Madupatty.

(vii) *Scholarships, Awards and Aids*

Under the 3rd, 4th and 5th batch of students of the Diploma course in Agrl. Sciences, 23 SC/ST students were sanctioned the Harijan Welfare educational concession. Thirty-nine F. C. students and 49 SEBC students were sanctioned the educational concessions under KPCR Scheme.

(viii) *Hostel strength*

112 boys and 18 girls were provided accommodation in the institute hostel during the year.

4 Extra-Curricular and Co-curricular Activities

The office bearers who were elected in Nov. 1978 continued to hold the respective offices till March, 1980. They relinquished the office after the valedictory functions. The students Union conducted Arts festivals, symposia, and 'Kaviyarangu' in May 1979. The Institute day was celebrated during July, 1979. The second issue of the Institute magazine was released in the month of November 1979. Debates, film shows etc. were the other activities of the Union.

The 34th Anniversary of the United Nations was celebrated on 24.10.79 by conducting competitions in elocution and essay writing. The staff and students of the Institute paid homage to Lok Nayak Jaya Prakash Narayan on 28.10.79 when the urn containing his ashes was brought to Tavanur for Public Veneration.

The Institute teams participated in the inter Collegiate tournaments in Volleyball and Athletics conducted at Vellayani and in ShuttleCock and Table Tennis at Tavanur.

During June, 1980 the InterCollegiateTournaments in Shuttle Cock and Table Tennis were organised at Tavanur.

The Volleyball team took part in the league matches of the District Tournament organised by the District Volley ball Association of M. E. S. Ceilege, Ponnani.

5 Institute Library

The Institute Library has over 16,000 titles as on 31.3.80. Subscription to 30 Journals also continued during the year.

6 Instructional Farm, Veterinary Hospital & A. I. Centre

(i) *Instructional Farm*

The total area of the farm is approximately 40 ha. Out of this only 26 hectares are under cultivation of different crops. The farm provides facilities for the practical classes of the Diploma students in Agriculture and Departmental trainees.

The following seeds and seedlings were distributed during the year.

Seeds: Paddy seed	6126 kg.
Cowpea seed (Kanakamani)	74.7 kg.
Cowpea seed (New Era)	17.2 kg.

Cowpea seed (Co. 3)	40.0 kg.
Bhindi seed	3.27 kg.
Bittergourd seed	0.175 kg.
Cucumber seed	0.525 kg.
Amaranthus seed	0.135 kg.
Gingelly seed	50.4 kg.
Coconut seed	932 Nos.

Seedlings/Other planting materials

Coconut seedlings	156 Nos.
Nutmeg seedlings	11 Nos.
Pepper cuttings	52 Nos.
Nendran suckers	1225 Nos.
Tapioca stems	3000 Nos.

Extra inputs listed below were distributed to 30 selected marginal farmers under Homestead Development during 1979-80.

1 Coconut seedlings (T x D)	129 Nos.
2 Cocoa seedlings	150 Nos.
3 Rooted pepper cuttings	350 Nos.
4 White leghorn chicks	80 Nos.

(ii) Veterinary Hospital and A. I. Centre

The Unit started functioning from February, 1977. The Junior Assistant Professor (Animal Husbandry) and one Livestock Assistant Grade-II are attending to the hospital duties in addition to the classes and their duties in the Poultry and Dairy Units of the Instructional Farm.

Total number of 1379 cases brought by the public were treated in the hospital during the period.

Cattle	839
Goats	305
Dogs	21
Birds	214
Total	<u>1379</u>

Besides, 72 artificial insemination cases were also attended to.

(iii) Dairy and Poultry

The stock as on 31.3.80 was follows.

Cow	17	
Bullocks	1	
Calves (including heifers)	10	28
Poultry		<u>40</u>

7 Distinguished visitors :

The following distinguished personalities visited the Institute during the year:

Sri. A. L. Jacob, former Agrl. Minister of Kerala.

Sri. P. K. Vasudevan Nair, Former Chief Minister of Kerala.

8 Other Extension Activities:

An advisory Council has been constituted for proper planning and implementation of extension activities of the Institute under the Chairmanship of the Director.

The members of Council are as follows:-

President, Tavanur Panchayat

Ward Members (2)

Progressive farmers (10)

Block Development Officer, Ponnani

Jr. Agrl. Officer, IPD Unit, Tavanur

Asst. Engineer, Minor Irrigation

President of Co-op. Society

Veterinary Surgeon, Vety, Hospital

Research Asst., IAT, Tavanur

A village samiti, viz. 'Kerala Karshika Sarvakalasala Tavanur Village Samiti' has been registered and started functioning with effect from 8.12.1979. Two technical staff of the Institute have been nominated to the Samiti for technical guidance.

CHAPTER III

Research

In the fields of Agriculture, Veterinary & Animal Sciences and Fisheries, research projects were implemented in 23 Research Stations spread out in the State and in the constituent Colleges, namely, College of Agriculture (Vellayani), College of Horticulture (Vellanikkara), College of Veterinary and Animal Sciences (Mannuthy) and College of Fisheries (Mannuthy).

Dr. U. P. Bhaskaran continued as the Director of Research upto 26.12.1979. Dr. Bhaskaran expired on 14.2.'80 after a brief illness. Sri. P. N. Pisharody, Professor (Project Co-ordinator-Rice) took additional charge of the post of Director of Research w. e. f. 26.12.1979 and continued to be in charge during the period under report. There were three full time Professors & Project Co-ordinators for Rice, Soils & Agronomy, and Cattle & Buffaloes. Prof. P. N. Pisharody continued as Professor & Project Co-ordinator (Rice) and Dr. K. P. Rajaram as Professor & Project Co-ordinator (Soils & Agronomy). Dr. T. R. Bharathan Namboodiripad, Professor & Project Co-ordinator (Cattle & Buffaloes) expired on 12.2.80 and the post remained vacant thereafter. Sri. P. G. Veeraraghavan functioned as Associate Professor (Research) during the period under report.

The research activities in the University are monitored and evaluated by the Project Co-ordination Groups, the Faculty Research Committees in each Faculty and ultimately by the Research Council and the General Council. [The Research Council of the University had its 4th meeting on 28th and 29th June, 1979 when it approved the research projects in progress upto April, 1979 and reviewed the concluded projects upto 1979.

The Faculty Research Committee (Agriculture) met four times during the year while the Faculty Research Committee (Vety & Ani, Sciences) met once. A total number of 293 research projects under the Faculty of Agriculture, 30 research projects under the Faculty of Veterinary & Animal Sciences and two in the Faculty of Fisheries were approved for implementation.

There are 15 co-ordination groups in the Faculty of Agriculture and seven in the Faculty of Veterinary & Animal Sciences. Information on the Groups, Co-ordinators and the initial membership of the

groups is given in appendix VI. Other Scientists can join the groups according to the field of their interest by addressing the Co-ordinator who will get the necessary approval of the Director of Research. Co-ordination groups are yet to be formed in the new Faculty of Fisheries.

A summary on the administration aspects of the Research Stations/Farms of the University where the various schemes are implemented are as follows. A list of Research Stations/Farms and the details of staff working there are given in appendix IV. List of publications by the Research Staff is given in appendix V.

a) AGRICULTURAL RESEARCH STATIONS

1. Rice Research Station, Pattambi

This is a major research station for studies on rice, established with the objective to evolve high yielding rice varieties suited to the different agro-climatic conditions of the State. The Station also undertakes intensive research with multi-disciplinary approach on the production and protection technology of rice.

Sri. K. J. James, Associate Professor continued to be in charge of the Station. Out of the total sanctioned strength of eight Associate Professors, 13 Assistant Professors and 11 Junior Assistant Professors, eight, five and eight, respectively were in position. The total sanctioned administrative and supporting staff was 58, of which 51 were in position. Thirty four out of the 38 class IV employees were also in position. There were 56 permanent labourers attached to the Station.

Fiftythree research projects-39 on rice and 14 on pulses were in progress. A "Co-ordinated scheme for research on the chemistry of submerged soils in the high rainfall areas" was sanctioned during the year by the ICAR.

Apart from this, a unit for research on cocoa, coconut and pepper was started during the year under report. A small dairy unit with 15 milch cows and a deep litter poultry unit with 100 birds were set up under a scheme for rice-based mixed farming. Multiplication of fresh water fishes utilizing the tanks available and a mini-pilot project on growing medicinal plants have also been started. An "All India crop-weather studies scheme" in collaboration with the Meteorology Department, Poona also functioned in the Station. A Krishi Vignan Kendra has been attached to this Station, the activities of which have been explained in the chapter on Extension Education.

Total expenditure of the Station was Rs. 16,44,300.45 and the receipts, Rs. 2,16,984.77.

2. Rice Research Station, Moncompu

This station was established to evolve high yielding paddy strains suited to Kuttanad region. The Station also undertook research on other problems of rice cultivation in the area.

Sri. N. Rajappan Nair, Associate Professor continued to be the Head of this Station during the year. All the Associate Professors (4), Assistant Professors (6) and six of the eleven Junior Asst. Professors were in position during the year. Sixteen of the Administrative and supporting staff were also in position. Of the two Drivers, five class IV employees and two Fishermen-cum-watchmen, one Driver and four class IV employees were in position. Nine permanent labourers worked in the station.

Altogether, 50 research projects on rice and one on coconut were in operation. Two schemes—one for the study of the possible changes in the eco-system in Kuttanad and the other the development of rice varieties resistant to BPH and GSV continued to function during the year. A Fisheries Research Centre was also started.

The "Operational research project on intergrated control of rice pests in Kuttanad" functioned at the Station. The project is fully financed by the ICAR. The chief objectives of the project are [the introduction and practice of integrated control of rice pests with special reference to BPH, evaluation of the efficacy of integrated method over insecticidal control, etc. The major activities of the project are concentrated in two operational villages viz. Pulincunnu and Kizhimukkumbhagom. Two other villages—Champakulam and Kuzhimukku served as the control.

Dr. N. K. Anant Rao, Dr. Nirmalendu Mukerji, the NARP review team and Dr. M. S. Swaminathan visited the Station during the year.

A total expenditure of Rs. 4,62,550.30 was incurred against a receipt of Rs. 46,058.24.

3. Rice Research Station, Kayamkulam

The main objectives of the Station are the evolution of rice and sesamum varieties suited to the sandy tract and the formulation of improved cultivation practices for the Onattukara region.

Sri. A. E. Sreedhara Kurup, Associate Professor was in charge of the Station. All the teaching posts of Associate Professor (1) Assistant Professors (2) and Junior Asst. Professors (2) were filled up except that of Assistant Professor (Agron.).

Thirty nine research projects - 21 on rice, eight on sesamum, four on groundnut, two on blackgram, three on coconut and one on tapioca were in operation.

The scheme for the establishment of the Extension Education Centre (Pulses and Oilseeds) was sanctioned during the year.

The Station incurred an expenditure of Rs. 2,73,885.50 against a receipt of Rs. 65,342.37.

4. Rice Research Station, Vyttila

The Station was established to evolve rice varieties suitable for cultivation in the coastal saline marshes - the Pokkali lands.

Sri. P. J. Tomy, Associate Professor was in charge of the Station. All the Associate Professors (3), Assistant Professor (1) and three of the four Junior Asst. Professors were in position. Seven administrative and supporting staff, four class IV employees and three permanent labourers were also in position.

Eighteen projects were in operation - 10 on rice, one on coconut and seven in fisheries.

The NARP review team headed by Dr. N. K. Anant Rao, Dr. Sudhir, D. Ghutnekar, ICAR team headed by Dr. S. Y. Padmanabhan, Dr. Reghotam Reddy (Vice-Chancellor, APAU), Dr. C. P. Natarajan (Director, CFTRI) and Sri. Satish Chandra visited the Station during the year.

The expenditure for the year was Rs. 3,38,055.16 against a receipt of Rs. 17,223.37.

5. Model Agronomic Research Station, Karamana

The Station is engaged in conducting model agronomic experiments of the AICARP, simple fertilizer trials of the KAU, standardisation of the experimental plots, etc. Production of foundation seed is also taken up.

Sri. V. Ramachandran Nair, Associate Professor was in charge of the Station from 1.4.79 to 18.5.79. Sri. K. Sivasankara Pillai, Associate Professor took charge of the Station on 18.5.79. In addition to the Assoc. Professor, one Junior Asst. Professor, two administrative staff, three supporting staff and two class IV employees were also in position. There were 10 permanent labourers in the Station.

Of the 15 research projects, 12 were AICARP projects and three KAU projects.

The AICARP review team headed by Dr. Shekhon and three other ICAR Scientists visited the Station.

The total expenditure of the Station was Rs. 89,341.00 against a receipt of Rs. 12,098.41.

6. Agronomic Research Station, Chalakudy

The Station was established to develop suitable cropping patterns for varying water management and fertility situations in the command area of Chalakudy irrigation project.

Sri. N. N. Ramankutty, Assoc. Prof. was in charge of the Station till 21.5.79, after which Sri. R. Raveendran Nair (from 22.5.79 to 13.9.79) and Sri. T. P. George (from 14.9.79 to 4.2.80) held charge. From 5.2.80 onwards Sri. T. F. Kuriakose was in charge of the Station. All the Assoc. Professors (3) were in position. Of the five posts of Jr. Asst. Profs., one was vacant from 10.9.79 onwards. There were eight administrative and supporting staff, one class IV employee and 17 permanent labourers.

A total of 22 research projects were in progress during the year, out of which 14 were ICAR aided and eight funded by the University.

Dr. G. N. Kulkarni, Assoc. Project Co-ordinator CPRWM, ICAR, visited the Station during the year.

The total expenditure for the year was Rs. 2,77,745.87 against a receipt of Rs. 16,623.92.

7. Research Station & instructional Farm, Mannuthy

The Station is functioning as a part of the College of Horticulture, to serve as an instructional unit for the students. Experiments were conducted in rice, rice-based cropping systems as well as in other crops.

Dr. V. K. Sasidhar, Assoc. Prof. was in charge of the Station. There were two Assoc. Professors, one Asst. Prof. and three Jr. Asst. Profs. apart from five administrative and supporting staff, four class IV - employees and 20 permanent labourers.

Thirtyone research projects - 13 on rice, seven on tuber crops, two each on turmeric, ginger and banana, three on vegetables, one on horsegram and one on pulses were in progress during the year.

Two Co-ordinated projects - the All India Co-ordinated Rice Improvement Project and the All India Co-ordinated Tubercrops Improvement Project functioned in this station.

8. Coconut Research Stations, Pilicode/Nileswar

The station has been established to study the cultural, manurial and other agronomic practices for coconut and also to formulate the best agronomic practices for the red sandy loam and gravelly laterite soils. The adaptability trial of exotic varieties are also undertaken. Another important aspect is to evolve economic multiple crop systems in coconut gardens.

Dr. P. K. Narayanan Nambiar, Assoc. Professor, continued to be in charge of the two Stations. In addition, there were two more Assoc. Professors, two Research Officers, two Asst. Professors and two Jr. Asst. Professors. A total of 20 administrative and two other supporting staff, 26 class IV employees and 22 permanent labourers were also attached to the Stations.

Twenty nine research projects were in progress-26 in coconuts, two in cocoa and one in tapioca. The All India Co-ordinated Coconut and Arecanut improvement Project functioned in the Stations.

The total expenditure during the year was Rs. 6,26,148.48 against a receipt of Rs. 3,27,748.51.

9. Coconut Research Station, Kumarakom

The Station has been established with a view to conducting varietal, cultural, manurial and plant protection trials on coconut under the agroclimatic conditions prevailing in the back water areas of Kuttanad with special reference to root (wilt) disease of Coconut.

Sri. G. Mathai, Assistant Professor was in charge of the Station, till 9.5.79. Sri. B. Thomas, Associate Professor took over the charge of

the Station from 10.5.79. The teaching staff available at the Station were one Associate Professor (from 10.5.79), three Assistant professors and four Jr. Asst. Professors.

One post of Asst. Prof. (Fishery Science) and three of Jr. Asst. Professors (Agronomy, Vet. Science, Fisheries) were vacant during part of the year. There were eight administrative and supporting staff, seven class IV employees and seven permanent labourers.

During the year, 24 research projects were in operation-18 on coconut, four on farming systems and two in Fisheries. A new scheme on "Propagation and Farming of frogs" was sanctioned during the year.

The NARP review team headed by Dr. N. K. Anant Rao visited the Station during the year.

The expenditure totalled Rs. 2,87,078.39 against the receipts of Rs. 1,05,924.44.

10. Coconut Research Station, Balaramapuram

Varietal, manurial and cultural trials on coconut are conducted at the Station to arrive at suitable cultivation practices for coconuts in the red loamy soils of Kerala.

Sri. E. P. Koshy, Associate Professor was in charge of the Station. In addition, there were two Assistant Professors, Six administrative and supporting staff as well as four Class IV employees were in position.

There were six research projects on coconut in progress during the year.

Mr. Brain S. Gray (Tropical Tree Crop Advisor, World Bank), Mr. E. L. M. Kramer (World Bank) and Mr. Paul F. Dax (Economist, World Bank) were the distinguished visitors to the Station during the year.

As against the total expenditure of Rs. 2,52,164.69, the receipts totalled Rs. 1,69,347.74.

11. Cardamom Research Station, Pampadumpara

The Station is one of the co-ordinating centres for research on cardamom, under the All India Co-ordinated Spices & Cashew Improvement Project.

Dr. S. Balakrishnan, Associate Professor was in charge of the Station till 7.5.1979. From 8.5.79 onwards, Dr. L. Rema Devi, Associate Professor held the charge of the Station. Besides the Assoc. Prof., there were three posts of Asst. Prof. and three of Jr. Asst. Profs. sanctioned for the Station. Out of these, the Asst. Prof. (Entomology) was in position. Of the 11 Administrative and supporting staff, eight were in position during the year. All the six Class IV employees were also in position. There were 36 permanent labourers available in the Station.

Twenty research projects-19 on cardamom and one on pepper were in progress. Work under the All India Co-ordinated Spices and and Cashewnut Improvement Project was also in progress.

The total expenditure during the year was Rs. 7,40,595/- out of which Rs. 52,221/- were spent for the purchase of laboratory equipment and glassware. The receipts totalled Rs. 3,13,650/-

12. Horticultural Research Station, Ambalavayal

The Station has been established with the objective of carrying out research on various aspects of agricultural improvement in Wynad. This has now become one of the most important stations in Kerala where intensive research on fruits, spices and essential oils are undertaken. Work on scented paddy also is in progress.

Sri. M K. Mammen, Assoc. Prof. continued as the Head of the Station. Of the four Asst. Profs., the Asst. Prof. (Plant Pathology) only was in position. Of the two posts of Jr. Asst. Professors, one was vacant during the period. All the 24 posts of administrative and supporting staff as well as 21 Class IV employees were in position. There were 65 permanent labourers attached to the Station.

Thirty six research projects-13 in citrus, six in ginger, one in turmeric, four in essential oils and medicinal plants, three in tapioca, one in grapes, one in sericulture, five in rice and two in sugarcane were in progress during the year. Of these, 'studies on the performance of grape varieties under the agroclimatic conditions of Wynad', 'introduction and adaptation of aromatic plants under sub-tropical conditions and 'effect of growth substances on rhizome formation and diosgenin content of *Costus speciosus*' were started during the year.

Dr. H. C. Dass, Dr. Fernandas, Dr. M. K. Nair, Dr. Sethumadhavan Dr. (Mrs.) Rohini Aiyer, Dr. C. K. George, Sri. P. K. Thampan, Dr. Bopaiah and Dr. Ganapathy visited the Station during the year.

The total expenditure of the Station was Rs. 10,60,573.73 against a receipt of Rs. 4,11,353.81,

13. Lemongrass Research Station, Odakkali

The main objective of the Station is to investigate the agronomic, botanical, processing and bio-chemical aspects of essential oil yielding crops.

Sri. E. V. G. Nair, Assoc. Prof. was in charge of the Station during the year. Of the other teaching staff, one Asst. Prof. was in position upto October 79. Only one of the two Jr. Asst. Profs. was available till December 79, after which the two posts were filled up. The total number of 10 administrative and supporting staff and three class IV employees were in position. Two permanent labourers were attached to the Station.

A total of 13 research projects were in progress-four in lemon-grass, three each in palmarosa and dioscorea, and one each in vetiver, turmeric and other essential oils.

The total expenditure incurred was Rs. 2,73,713.68 against a receipt of Rs. 54,062/-

14. Pepper Research Station, Panniyur

The main objectives of this Station are to evolve high yielding varieties of pepper, to conduct trials on the control of insect pests and diseases and to standardise the manurial requirements of the crop.

Sri. V. Sukumara Pillai, Assoc. Prof., was the Head of the Station. The teaching staff sanctioned for the Stations were Assoc. Professors-2 Asst. Profs.-2 and Jr. Asst. Profs.-2. Two posts of Asst. Profs. (Aronomy and Pl. Pathology) were vacant. There were ten administrative and supporting staff at the Station. Three class IV employees and 11 permanent labourers were also attached to the Station. 18 projects in pepper were undertaken during the year.

The NARP team consisting of three Scientists visited the Station under the leadership of Dr. N. K. Anant Rao.

The total expenditure was Rs. 3,84,868.54 while the receipts totalled Rs. 46,567.47. One 'B' class Agro-meteorological station was established during the year under report.

15. Banana and Pineapple Research Station, Kannara

The objectives of the Station are to evaluate and select superior varieties of banana and pineapple from among the indigenous and exotic varieties for different purposes, to standardise the cultural and manurial practices, time and method of planting, and to suggest control measures against pests and diseases.

Sri. P. C. Jose, Assoc. Prof. was in charge of the Station. All the teaching posts (Assoc. Professors-3, Asst. Professors-2, Jr. Asst. Profs-5) except that of one Asst. Prof. (Botany) were filled. Among the 13 administrative and supporting staff sanctioned, 12 were in position. The class IV employees were 7 and permanent labourers, 15.

A total of 28 research projects were taken up-19 in Banana and 9 in pineapple.

Dr. S. N. Rao, Sr. Scientist of the Fruit Research Station, Sangaraddy, Andhra Pradesh visited the Station.

The expenditure incurred was Rs. 3,61,806.24 against the receipts of Rs. 81,562.88.

16. Cashew Research Station, Anakkayam

The Station was established to undertake research on cashew to augment cashew production in the State.

During the year, Sri. M. G. Vasavan. Assistant Professor (from 1.4.79 to 27.5.79, from 14.7.79 to 30.8.79 and from 2.9.79 to 26.12.79), Dr. K. M. Sukumaran, Assoc. Professor (from 28.5.79 to 13.7.79 and from 31.8.79 to 1.9.79), Sri. V. P. Sukumara Dev. Asst. Prof. (from 8.12.79 to 6.1.80) and Sri. V. K. Raju, Jr. Asst. Prof. (from 7.1.80 to 31.3.80) held charge of the Station. The sanctioned posts of teaching staff were one Assoc. Prof., one Asst. Prof., one Asst. Professor and one Jr. Asst. Prof. The posts of Assoc. Prof. and Asst. Prof. were vacant for some part of the year. There were two supporting staff, four class IV employees and one permanent labourer.

There were eleven research projects in Cashew in progress at the Station.

Two Scientists visited the Station during the year-Sri. D. N. Pathak, Department of Horticulture and Soil conservation, Manipur and Sri. V. S. Halpe, F. A. O., Expert from Srilanka.

The total expenditure was Rs. 79,550.44 and receipts 19,737.72.

17. Sugarcane Research Station, Thiruvalla

The station was established in 1976 to intensify research on sugarcane, particularly fertilizer, varietal and zonal trials.

Sri. P. K. Chellappan Nair, Assoc. Prof., headed Station during the year. One Asst. Prof. and one Jr. Asst. Prof. were in position, while two posts of Jr. Asst. Profs. were vacant. There were four administrative and supporting staff, one class IV employee and one permanent labourer. There were 15 research projects on sugarcane and three on jute.

Dr. Krishan Singh, Director, Sugarcane Research Institute, Lucknow, Dr. S. C. Sreevastava, Co-ordinator and Dr. Nirmalendu Mukerji, Co-ordinator visited the Station.

The total expenditure was Rs. 1,58,962.61, while the receipt was Rs. 72,815.74.

b. AGRICULTURAL RESEARCH SCHEMES

1 All India Co-ordinated Spices and Cashew Improvement Project, Madakkathara

The main objectives of the scheme is to develop high yielding varieties of cashew by screening the germplasm collection.

Sri. K. K. Vidyadharan, was in charge of the scheme from 1.4.79 to 11.5.79 and Dr. P. K. Vijayan took over from 12.5.79 onwards. Apart from the sanctioned posts of one Assoc. Prof. and one Jr. Asst. Prof., there were two supporting staff also. One post of class IV employee was vacant.

There were eight research projects in cashew under implementation.

The expenditure was Rs. 86,911.96.

2. Pepper Research Scheme, Vellanikkara

The scheme envisages studies on pepper with reference to cultural, fertilizer and varietal trials. Collection and maintenance of germplasm is also envisaged.

Dr. Abicheeran, Assoc. Prof., was in charge of the scheme. One Jr. Asst. Prof., one Agrl. Demonstrator, one Asst., one Peon and one watchman were attached to the scheme.

Seven research Projects were in progress. In addition, a central nursery for hybrid pepper also functioned.

Dr. John Bene, Senior Advisor, International Council for Research in Agro-forestry visited during the year. The expenditure during the year totalled Rs. 98,709.29 against a receipt of Rs. 7,018.38.

3. All India Co-ordinated Floriculture Improvement Project, Vellanikkara

Testing the performance of Indian cultivars of roses, genetic improvement of hibiscus, marigold, standardisation of cultural practices etc. are envisaged under the scheme.

Sri. S. Ramachandran Nair, Assoc. Professor was in charge of the scheme till 28.8.79 after which date Sri. K. M. George, Assoc. Prof. took-over. Two Jr. Asst. Professors were in position, while two posts of class IV employees were vacant.

Six research projects were laid out—two in tube roses, two in marigold and one each in rose and hibiscus.

A total expenditure of Rs. 1,12,500 was incurred during the year.

4. Scheme for research on the integrated use of ground water, surface water and rainfall for crop production (SIDA)

The Scheme was in operation in the command area of Ponnani river basin in Palghat district. Studies on water, irrigation and drainage requirements for rice, irrigation requirement for cocoa etc. were conducted.

Sri. R. R. Nair, Assistant Professor held full additional charge of the Scheme. He was supported by two Research Associates, four work Assistants and four part-time observers engaged on fellowship basis.

The scheme has helped to generate valuable data on effective rainfall, water requirement of crops and soil moisture characteristics. The need for developing practices to utilise efficiently the immensely available rainfall and recycling it for crop production has been highlighted. The water requirement of rice has been estimated for the autumn and winter seasons at four centres. Studies on the water requirements of cocoa were also conducted, besides work on irrigation requirements of cowpea, groundnut, blackgram and sesamum.

The following eminent scientists from the SIDA visited the project area and appreciated the progress of work. Professor Y. Gustafsson, Consultant, SIDA., Professor Ingemar Larsson, Royal Institute of Technology, Sweden, Mrs. Inger Aernfast, Agricultural Division SIDA, Stockholm. Mr. Mats Ahnfors Project Adviser, SIDA and Dr. Danfors, Consultant. Dr. Danfors also gave a seminar on soil moisture characteristics at the College of Horticulture, Vellanikkara. Mr. Holms Bery, Projects Adviser, SIDA and Sri. K. C. B. Raju, Director, Central Ground Water Board, Coimbatore also visited the project area during the progress of study and gave useful suggestions and guidance in executing the programmes.

The total expenditure of the scheme was Rs. 3,99,705.34 out of which Rs. 1,28,186.16 was spent for the purchase of a jeep with trailer and other equipments.

5. Scheme for the intensification of sugarcane research in Kerala

The scheme started functioning from 1978-79 in Idukki, Punalur, Thiruvalla, Vellanikkara and Chittoor with the objective of studying the botanical and cultural aspects of sugarcane and to screen out varieties suitable for the State.

Dr. K. M. Narayanan Namboodiri, Professor of Agrl. Botany took over as the Head of the Scheme on 7.5.1979 from Dr. N. Mohanakumaran, who held charge of the post. Apart from the Professor, six Assistant Professors, eleven Jr. Asst. Professors as well as seven administrative and supporting staff were sanctioned for the scheme. Two class IV employees were also sanctioned for the scheme. Three posts of Asst. Professors, three of the Jr. Asst. Professors, and two of Drivers were vacant during part of the year.

Twentyseven research projects were implemented during the year at the four centres.

Out of the allotment of Rs. 2,71,600/-for 1979-80 the expenditure totalled Rs. 2,16,026.01.

6. AICARP—ECF Kottayam and Kozhikode Districts

Sponsored by the I. C. A. R. the scheme is directed to study the comparative performance of pre-released and popular crop varieties of rice and to study their nitrogen requirements under irrigated and assured water supply conditions. Sri. K. I. James, Associate Professor, Rice Research Station, Pattambi was in charge of the administration. The technical control was vested with Sri. T. F. Kuriakose, Associate Professor till 17.5.1979 and with Sri. V. Ramachandran Nair, Associate Professor from 18.5.1979. Of the two posts of Assistant Professors sanctioned, one in Agrl. Chemistry was vacant since August, 1979. The post of Junior Assistant Professor was vacant from October, 1979. There was one Assistant Grade I and two Class IV employees.

At ECF, Karaparamba—five Assistant Professors held charge during various periods (upto 9.5.79 Sri. Madhusoodhanan Nair, from 10. 5. 79 to 22.5.79 Sri. J. Thomas, from 23.5.79 to 13.7.79 Sri. C. T. Abraham, from 14.9.79 to 23 9.79, Sri. P. Gangadharan and from 24.9.79 Sri. S. Janardhanan Pillai). There were eight Agrl. Demonstrators, one Assistant Grade II, one Jeep-Driver and one Watch man.

At the Kottayam Unit, Sri. K. Sankara Panicker, Assistant Professor was in charge. Eight Agrl. Demonstrators, one Assistant Grade II, one Jeep Driver and one Watch man were in position.

Two types of experiments were conducted. "A" type and "B" type for both the kharif and rabi crops. A total of 94 experiments were conducted at Kozhikode and 172 at Kottayam.

Dr. Sekhon and Sri. Kulkarni visited the Pattambi Station and the fields in Kottayam.

The expenditure was Rs. 3, 45,052.13/-

7 Command area Research Scheme for intensification of research on pulses and oil seeds

The Scheme was initiated during 1979, covering command areas of Malampuzha, Peechi and Chalakudy. Varietal screening trials on pulses like cowpea, blackgram, green gram and oil seeds like sesamum and groundnut were laid out.

Sri. P. N. Pisharody, Professor (Research Co-ordination-Rice) was in charge of the scheme upto 10.1.1980, when Sri. T. F. Kuriakose, Associate Professor, took over. Of the one Professor, six Junior Assistant Professors, seven Senior Research Fellows and nine administrative and supporting staff, two posts of Jr. Asst. Professors, three of Senior Research Fellows and eight of Agrl. Demonstrators were vacant.

The scheme was started on 3.10.1979. 228 trial plots in cowpea, 99 each in greengram, sesamum and groundnut and 81 in blackgram were laid out during the year.

The expenditure during the year totalled Rs. 14,696.78.

8 ICAR Ad-hoc scheme for survey, collection and evaluation of germplasm of jack

The adhoc scheme to conduct a detailed survey, collection and evaluation of germplasm of jack was sanctioned by the ICAR with effect from 1.7.1978.

Dr. K. Kumaran, Associate Professor continued to be in charge of the scheme during the year. Two Jr. Assistant Professors and one Agrl. Demonstrator were attached to the scheme.

During the year under report, the work was mainly concentrated on collection of superior types of jack from five districts of the State.

Work on standardisation of vegetative propagation methods also continued.

The total expenditure during the year came to Rs. 50,449.35.

9 Kerala Agricultural Development Project

The sub-project for research and training under the Kerala Agricultural Development Project continued functioning during the year. The project envisages intensive research on coconut, cashew, pepper and cocoa.

Dr. P. C. S. Nair, Associate Dean, College of Horticulture, continued as the Co-ordinating Officer. The project had a sanctioned strength of four Professors, three Associate Professors, three Assistant Professors and three Jr. Asst. Professors. Necessary administrative and supporting staff have been provided by the Kerala Agril. University.

Altogether, 46 research projects were initiated during the year-14 on coconut, 10 on cashew, 14 on pepper and eight on cocoa.

During the year under report, laboratory equipment worth Rs. 6.08 lakhs were purchased. The total expenditure during the year was Rs. 10,03,479.48.

C VETERINARY & ANIMAL SCIENCES - RESEARCH STATIONS/ FARMS

1 University Livestock Farm, Mannuthy

The farm functions as a teaching, research and extension unit. The farm maintained crossbred dairy cattle of the breeds Jersey, Brown Swiss and Holstein.

Dr. M. S. Nair was in charge of the Farm from 1.4.79 to 14.5.79 after which Dr. P. Ramachandran took over. In addition to the Associate Professor, there were one Jr. Asst Professor and six administrative and supporting staff. There were seven permanent labourers attached to the farm in addition to one Dairyman and one watchman.

The herd strength on 1.4.79 was 264 and at the end of the year 213. The total milk production during the year was 2,53,394 kg. The lactation average of the herd was 1848.2 kg. in 323 days. The expenditure during the year was Rs. 7,64,784.54 against a receipt of Rs. 5,69,679.60

2 Livestock Research Station, Thiruvazhamkunnu

Situated in the Mannarghat taluk of Palghat District the Station is to undertake projects on breeding of buffaloes and cattle.

Dr. C. S. James was in charge of the Station during the year. In addition, there were two Assistant Professors and three Jr. Asst. Professors sanctioned for the Station. During the year under report, one post of Asst. Professor and two of Jr. Asst. Professors were vacant.

There were 20 administrative and supporting staff, 21 Class IV employees and 56 permanent labourers.

Two research projects-one on the feeding value of tea waste for the growth in buffaloes and the other on effect of rubber seed cake on growth rate in buffalo calves were in progress. The herd strength during the year was 222. 602 animals from outside the station were treated and 78 inseminated. The herd average was 3.71 kg. and the average yield/milking cow/day was 5.2 kg.

The total expenditure was 9,80,690.15 against a receipt of Rs. 3,15,963.63

3 Cattle Breeding Farm, Thumburmuzhi

The farm is mainly intended as an ancillary farm rearing calves. At the time of calving, they are transferred to Mannuthy. Cultivation of fodder grass is also undertaken.

Dr. K. Parameswaran Nair, Associate Professor was in charge of the farm. In addition, there were one Farm Supervisor, two Livestock Assistants, one Pharmacist, one Agrl. Demonstrator, six class IV employees, one Grade II Assistant and 27 permanent labourers.

Three research projects were in operation at the Station during the year. The herd strength at the beginning of the year was 152 and at the end, 224.

4. University Poultry and Duck Farm, Mannuthy

The primary objective of the Farm is to impart training to the students of the Veterinary College.

Dr. G. Reghunathan Nair, Assistant Professor was in charge of the Station. In addition, there were one Jr. Asst. Professor, six supporting staff, four class IV employees and ten permanent labourers. Out of these, one post of Class IV employee was vacant during the year.

There were 6845 poultry and 185 ducks at the beginning of the year as against 5262 and 35 at the close. During the year, 27959 poultry, 64 ducks, 1,81, 867 fowl eggs and 4,569 duck eggs were sold.

The total expenditure was Rs. 3,11,820/-against a receipt of Rs.3,26,451/-

5. University Pig Breeding Farm, Mannuthy

Apart from serving as a training unit for the students, the farm serves as a breeding centre for the multiplication of exotic stock of pigs for the swine industry of the State.

Dr. P. C. Saseendran was in charge of the Station. In addition, there was one Asst. Professor, one Jr. Asst. Professor, five administrative and supporting staff, four class IV employees and 16 permanent labourers.

The stock position at the beginning of the year was 207 and at the end, 299.

Two research projects were in operation.

The expenditure during the year was Rs.3,20,000.71 against a receipt of Rs.85,960/-. The value of stock as on 31.3.89 was Rs.1,00,400/-

6. University Veterinary Hospital, Kokkalai, Trichur.

The Hospital provides instructional facilities and practical training to the students of the Veterinary College.

Dr. K. Ramdas, Associate Professor was in charge of the Hospital. In addition, three supporting and four class IV employees worked in the Hospital during the year.

Eightyfour undergraduate students were given practical training in various aspects of clinical diagnosis and treatment of animal diseases. Four post-graduate students did their advanced training at the Hospital. Veterinary aid was also given to 31493 animals in and around Trichur. The daily average attendance was 86. The construction of a clinical laboratory was completed during the year.

The expenditure came to Rs. 1,20,127.19

D. OTHER SCHEMES/PROJECTS IN VETERINARY & ANIMAL SCIENCES.

1. University Veterinary Hospital, Mannuthy.

The Hospital has been established to serve as an instructional unit for the students of the Veterinary College and to provide facilities for their practical training. During the year under report, a total of 12,142 cases were treated (7,250 cattle, 5 horses and 4887 other animals). The daily attendance averaged to above 33. In addition, 108 castrations, 597 surgical operations, 6558 preventive inoculations and 72 anti-rabies vaccinations were done.

2. Fodder Research & Development Scheme, Mannuthy.

The scheme was under the technical control of Dr. M. S. Nair, Associate Professor who had the support of one Research Officer, one Jr. Asst. Professor and eight administrative & supporting staff.

Due to adverse climatic conditions and due to lack of transportation facilities in the peak seasons, there was a shortfall in the fodder production. During the year, a total quantity of 2655.757 M. T. grass was supplied to different stations at Mannuthy. The expenditure during the year was Rs. 4,47,339.62 and the receipts Rs. 5,01,212.02.

3 AICRP for investigation on Agri. Bye Products and industrial waste materials for evolving economic ration for livestock

The project envisages to consider agricultural waste, forest products and bye products of agriculture based industries as possible sources of cattle feed.

Dr. C. R. Ananthasubramanyam, Associate Professor was in charge of the scheme. In addition, there were one Asst. Professor and one Jr. Asst. Professor attached to scheme. There were seven administrative and supporting staff as well as two Class IV employees.

Attempts to utilise various agricultural by products and waste materials available in large quantities as components of cattle feed were made. Six projects were in progress during the year.

4 AICRP on goats, Mannuthy

The project envisages the evaluation of cross bred goats suited to the agro-climatic conditions of Kerala, with good milk yield potential.

Dr. B. R. Krishnan Nair, Associate Professor was in charge of the project. In addition, there were one more Associate Professor, three Assistant Professors and three Jr. Asst. Professors. Eleven administrative and supporting staff, ten Class IV employees and ten permanent labourers were also attached to the scheme.

Fourteen research projects were in progress during the year, six in breeding and genetics, two in nutrition and six in pathology.

Dr. R. M. Acharya, Director, Central Sheep and Wool Research Institute, visited the project on 24.4.1979. Other visitors included members of the "High Power Committee for finalisation of Cattle Breeding Policy of the State", I.C.A.R. visiting team and Sri. Ragotham Reddy (Vice-Chancellor, A.P.A.U.)

5 AICRP on poultry for eggs, Mannuthy

The objective of the project is to produce poultry for eggs suited to Kerala conditions.

Dr. C. K. Venugopalan, Senior Scientist was in charge of the project. In addition, there were one Associate Professor, two Assistant Professors, one Jr. Poultry Geneticist and three Jr. Asst. Professors attached to the scheme. There were eleven administrative and supporting staff as well as eleven Class IV employees.

During the year, Dr. B. K. Soni, Dy. Director General, I. C. A. R. visited the project.

The Total expenditure during the year was Rs. 2,55,662.35 against receipts of Rs. 1,76,304.60.

A. AGRICULTURE

1 RICE

CONCLUDED PROJECTS

(i) Crop improvement

Preliminary yield trial series II (Rice Research Station, Moncompu)

The experiment conducted between 1976 and '78 consisted of 20 varieties of rice. The analysis conducted during 76-77 showed significant differences among the treatments. Maximum yield was recorded by

culture M24-1-84-1, giving a per hectare yield of 5555 kg. followed by culture M24-182-1 with 5512 kg. per hectare. All the cultures were subjected to BPH screening. The high yielding cultures were also found to be tolerant to BPH.

During 1977 also the entries showed significant differences among them. Highest yield was recorded by culture M24-76-4 (3781kg.) followed by culture M24-204-2 (3775 kg.).

During '77-'78 highest yielders were M24-76-4 (5680 kg.) and culture M24-109-1 (5532 kg.). The culture M24-76-4 recorded moderate resistance to BPH and BLB.

Five cultures having good yield and resistance to pests and diseases will be put under CYT for further assessment.

Evaluation of the selected cultures of the cross 'M24' (Kochuvithu x IR.8)/(Mo.1 x IR.8) (Rice Research Station, Moncompu)

The yield potential of five advanced cultures selected from the above cross was assessed under CYT and district trials. Statistical analysis showed no significant difference among the five cultures during the additional crop season 78-79. However, during the additional crop season 79-80, the cultures showed significant difference in grain yield. Culture M24-76-4 recorded the highest yield (4355kg.) which was statistically on par with that of the standard-Jaya (4247kg.).

Evaluation of advanced cultures of different crosses (Rice Research Station, Moncompu)

Five cultures which were evaluated in the IET and preliminary yield trials for three seasons were compared with Jyothi and Bharathi as standards. During the 77-78 (Puncha) season maximum yield was recorded by the culture M15-36-2 (6256 kg.). Based on yield, BPH resistance, disease resistance and duration, three cultures viz. M8-88-2, M13-116-1 and M15-36-2 were selected for district trial during the 1978 additional crop season. The culture M15-36-2 gave maximum yield in three locations while the standard Bharathi topped the list in one location. The former was found superior to the other standard Jyothi in two locations.

During the 78-79 (Puncha) season the trial had to be abandoned due to damage by floods.

In 1979 additional crop season, the trial was laid out at Rice Research Station, Moncompu and in cultivators' fields. Culture M15-36-2 recorded maximum yield. During 1979-80 (Puncha) season also the culture M-15-36-2 ranked first (4756 kg).

The yield data over 8 locations for three seasons when pooled and analysed indicated that culture M15-36-2 was superior.

Considering the yield, quality of the grain and better tolerance shown to BPH, BLB, Sheath Blight and Sheath rot, this culture M15-36-2

was recommended to the State Variety Release Committee and later released as "Bhadra".

Project for evaluating varieties and cultures supplied by cultivators (Rice Research Station, Moncompu)

The performance and suitability of three cultures (NP-3, NP-73 and NP-93) were compared with those of three standards (Jyothi, Bhadra and Jaya).

During the 1977-78 (puncha) season, the entries did not show statistically significant differences with respect to yield of grain and straw. The trial had to be abandoned during 78-79 puncha season due to flood damage. During the 79-80 puncha season, the entries showed statistically significant differences. However, the standard Bhadra and the culture NP-93 which recorded the highest yield were statistically on par.

Evaluation of the selected cultures from the cross Jaya x MO. 1 (Rice Research Station, Moncompu)

Nineteen cultures of the cross Jaya x MO.1 were evaluated to assess their yield potential.

During the 1977 additional crop season 12 cultures were selected based on panicle characters, duration and pest and disease tolerance.

During the 77-78 puncha season the above 12 cultures along with the standards Jaya and Jyothi were put under a field trial. Nine cultures were selected based on yield, BPH resistance, duration and other pest and disease tolerance.

In the 1978 additional crop season, the nine cultures selected along with standards Jaya and Bharathi were put under a preliminary yield trial. The maximum yield was recorded by the culture M22-65-2-3-1 followed by culture M22-147-1-1. The trial repeated during 78-79 puncha season was abandoned due to flood damage. In the 1979 additional crop season and also during 79-80 puncha season, the preliminary yield trial was repeated. The yield data for the three seasons when pooled and analysed showed significant differences between the treatments. The culture M22-65-2-3-1 recorded maximum yield (5516 kg.) and was significantly superior to Jaya and Bharathi.

This culture has been carried forward to the project on 'Evaluation of selected cultures of the cross IR-8 x Karivennel' for district trials along with two cultures possessing resistance to BPH.

Pure line selection in Cheruvirippu and district trial of Cheruvirippu culture (Rice Research Station, Vyttila)

The objective was to evolve a better yielding variety from the popular Pokkali variety-Cheruvirippu by pure line selection. The work was initiated in 1959 by collecting 500 ear heads from different Pokkali areas

from which by 1960, thirty one selections were made for further studies. Based on the trials during 1962, 1963 and 1964, 16 entries were selected. Ultimately, based on the performance during 1965 to '67, seven entries were selected.

A comparative yield trial was conducted with these seven cultures and bulk Cheruvirippu as control. Cultures 74 and 174 gave highest yield, the percentage increase over the control being 116.8 and 110.4, respectively. The CYT repeated during 1976 also gave similar results, the percentage increase over the control being 156.2 and 148.9, respectively. The trial during 1977 was damaged as a result of water pollution. During 1979, cultures 174 and 74 gave the highest yield (1725 kg.).

On the basis of the result obtained during 1975 and 1976, 30-multi-locational trials were conducted in Ernakulam and Alleppey districts with the two cultures. Results from 19 locations only could be obtained, the rest of the trials being affected by flood or severe salinity. In these trials also, culture 174 was found to be superior. In another multi-locational trial during 1979 at four locations, culture 174 gave the highest yield of 1544 kg./ha. as against 1159 kg. given by the bulk Cheruvirippu. Proposals were made to release culture 174 as an improved variety "Vytila-2" suitable for cultivation in the Pokkali areas of Ernakulam and Alleppey districts. The State Seed Sub-Committee has since decided to release the culture 174 as "Vytila-2".

Brown Plant Hopper resistant variety trial-1 (Rice Research Station, Moncompu)

Thirty Six BPH resistant cultures received from AICRIP, Hyderabad were tested along with Jaya and IR-26 as check varieties to evaluate their performance. These cultures were found to have good resistance to BPH. All the cultures were found to have non-lodging character. Except eight cultures which showed moderate resistance, all the others were susceptible to sheath blight.

During 1979-80, 16 BPH resistant cultures received from AICRIP were tested. All the cultures were found to have non-lodging character. Eleven had moderate resistance to BPH. Three cultures had good resistance to sheath blight while 12 had moderate resistance. Nine cultures had moderate resistance to sheath rot. Seven cultures showed good resistance to BLB.

Brown Plant Hopper resistant variety trial-2 (Rice Research Station, Moncompu)

Thirty one BPH resistant cultures received from AICRIP were tested. Eight cultures showed good resistance to BPH while nine had moderate resistance.

Pure line selection in Jeerakasala (Horticultural Research Station, Ambalavayal)

The objective was to evolve a high yielding strain from Jeerakasala (white scented rice) by pure line selection.

Three cultures of Jeerakasala viz. JS 179, 190 and 534 were put under a PYT along with ryots' sample. The trial was conducted at the Station as well as in three cultivators' fields.

There was no significant difference in yield between the bulk and the cultures isolated. The project has been discontinued.

ii) Crop management

Studies on increasing population density by paired row technique for increasing rice yield (Rice Research Station, Pattambi)

Considering the mean values for the five spacing treatments [10 x 10 cm, 10 x 15 cm, 10 x 20 cm, 10 (20 x 10) cm, 10 (30 x 10 cm)], the treatments 10 x 15 and 10 x 20 recorded highest yield during the virippu season; but the differences were not significant. During the mundakan season, 10 x 10 cm. recorded highest yield. This was statistically significant only during the 1977-78 season. The new method (paired row) did not prove superior to the existing method in the production of more tillers per unit area and enhanced grain yield.

Studies on the harvest of rice at different physiological maturity stages (Rice Research Station, Pattambi)

The varieties Jyothi (short duration) and Jaya (medium duration) were harvested 20, 25, 30, 35 and 40 days after 50% flowering. The experiment was conducted for four seasons. The results indicated that Jyothi can be harvested 30 days after 50% flowering during the first crop season and 20 and 25 days, respectively after 50% flowering during the second crop season.

Optimum date of harvest for the other popular rice varieties cultivated in the different agroclimatic regions has to be worked out.

Nitrogen economy through organic manures (AICARP)

A trial was conducted to examine the possibility of economising nitrogenous fertilizers through the use of organic manure in a crop sequence.

The yield data of rice for kharif and rabi seasons and of cowpea for the summer seasons for three years were pooled and combined analysis carried out. The results indicated that there was no significant effect on rice yield during the kharif season by the treatments tried. During the rabi season, fertilizer application of N gave significant increases in yield. There was no residual effect of the organic matter applied during the first crop season on the grain yield of the second crop rice. It was further observed that the application of FYM during the first crop season and

fertilizer N during the second crop rice did not produce any significant effect on the yield of cowpea raised during the summer (third crop season).

Technique for increasing nitrogen use efficiency of urea (Rice Research Station, Moncompu)

The objective was to find out the most suitable method of application of urea to paddy. 90 kg. N per ha, applied as per the package of practice recommendations along with 45 kg. each of P_2O_5 and K_2O served as the control. The treatments consisted of application of nitrogen (90 kg. 60 kg. and 45 kg./ha.) in the form of urea in mud balls (basal), urea in paper balls (basal), urea mixed with goat manure (basal) and urea mixed with six fold soil (basal).

Basal application of 90 kg. nitrogen per hectare in the form of urea in paper balls was equally effective as its split application as per package of practices. These treatments were found significantly superior to all the others. It was also observed that the production of paddy is considerably affected when nitrogen was reduced from the recommended dose of 90 kg. per hectare.

Efficiency of rock phosphate as a source of phosphorus to rice and its residual effect on the succeeding crop (Model Agronomic Research Station, Karamana)

The experiment was conducted to ascertain the comparative efficiency of Mussorie rock phosphate over super phosphate with and without farm yard manure and to find out the residual effect of this on the succeeding crop. The statistical analysis of the yield data of two seasons revealed that application of P_2O_5 either in the form of rock phosphate or as super phosphate with and without farm yard manure had no significant effect on increasing the grain yield during the kharif season or rabi season.

Fertilizer requirements of new varieties of rice (Model Agronomic Research Station, Karamana)

Five varieties namely Jaya, Aswathy, Cul. 79/60, Cul. 1065 and R. P. 4-14 were included in the study. The treatments consisted of all combinations of nitrogen (0,60 and 120 kg.) and P_2O_5 (0,30 and 60 kg. per ha). The grain yield data of two rabi seasons subjected to pooled analysis showed that Jaya is superior to cul. 79/60 and 1065. There was no significant difference between Jaya, RP. 4-14 and Aswathi. While Jaya, Aswathi, cul. 79/60 and cul. 1065, responded only upto 60 kg. N per ha., Cul. RP. 4-14 responded significantly upto 120 kg. N per ha. The culture RP. 4-14 with 120 kg. N per ha. and Jaya with 60 kg. N per ha. produced more or less the same yield.

Skipping P and K application in the rice manurial schedule (Agronomic Research Station, Chalakudy)

The effect of skipping P and K application on the yield of rice was investigated with Triveni. The treatments consisted of applying P during

all seasons, applying P in the alternate seasons (starting from the first season), applying P in alternate seasons (starting from second seasons and applying P once in three seasons (starting from second season). Next set of treatments consisted of applying K in alternate seasons as in the case of P. Application of nitrogen alone in all the seasons was also one of the treatments.

Pooled analysis of the grain yield indicated significant effect due to the treatments. The study indicated that application of P can be skipped for two seasons without any significant reduction in the grain yield. It was also indicated that current season application of K is necessary to obtain better yields.

Effect of timing and frequency of N and K application, leaching loss of nutrients and yield response of rice under different water management practices (Agronomic Research Station, Chalakudy)

The objectives were to find out the optimum stage and frequency of application of N and K for medium duration rice in sandy loam soils and to estimate leaching loss of nutrients. The results indicated that application of N and K in five equal splits tended to give higher yield in most of the areas, especially under 5 cm. continuous submergence. In areas where paddy is irrigated at saturation point, three split applications will be equally effective as five split applications under continuous submergence.

Effect of N:K ratio on BPH resistance and yield of rice. (Rice Research Station, Moncompu)

The main objective of the experiment was to examine the incidence of BPH at varying N:K ratios. The treatments consisted of nitrogen at 90kg. per ha., P_2O_5 , at 45 kg. per ha. and varying levels of K_2O (45, 90, 135 and 180 kg. per ha.). Application of 135 kg. K_2O per ha. along with 90kg. N and 45 kg. P_2O_5 induced some resistance to BPH incidence in the susceptible variety Jaya.

Micro-nutrient studies with zinc and copper (Rice Research Station, Pattambi)

Two micro-nutrients namely zinc and copper in two methods of application (soil and foliar) in three soils (Pattambi, Eruthempathi and Chittoor) constituted the treatments over and above 90:45:45 NPK. Zinc and copper were applied at 10 kg. per ha. to the soil. These micro-nutrients were applied at 100 ppm. to the foliage also. There was also a control without micro-nutrients.

During the kharif season, zinc and copper showed marked effect on tiller production. Copper applied to soil was found to be superior to foliar application. Between copper and zinc, copper was better. With reference to plant height and panicle length, no significant effect was observed. As far as grain yield was concerned, copper had no effect in Pattambi soils. In Chittoor and Eruthempathi soils, copper applied through soil gave

good response; but during the kharif season only. Zinc also gave response only in kharif season.

Response of rice to micro-nutrients in the irrigated sandy loam soils (Agronomic Research Station, Chalakudy)

The objective was to assess the response of rice to the application of manganese, zinc, magnesium and copper. Application of cattle manure at 5 M. T. per ha. along with the recommended NPK dose (90, 45, 45 kg. per ha) was also one of the treatments.

During both virippu and mundakan seasons, highest yield was obtained with cattle manure and recommended dose of NPK. The micro-nutrient treatments did not exhibit much influence on the yield of rice.

Micronutrient trial on rice (Research Station & Instructional Farm, Mannuthy)

The objective was to study the effect of copper and zinc in combination with NPK on the yield of Triveni.

The three-year study indicated that there was no significant response by the variety Triveni to the application of micronutrients. It was concluded, based on the pooled analysis, that there was no effect of zinc and copper on paddy under Mannuthy conditions.

Determination of critical moisture stress at different growth stages on crops following climatological approach (Agronomic Research Station Chalakudy)

The experiment was laid out with the objectives of finding out the optimum moisture status for the different growth stages, working out the crop susceptibility factors from the yield date for different stress levels and scheduling an economic irrigation under situations of limited water supply.

The experiment was initiated in 1974-75 with nine irrigation levels in the main plot and five varieties (Triveni, Bharathi, Aswathi, Sabari and IR-20) in the sub-plots. Among the varieties, Triveni and Bharathi recorded yield depression under moisture stress conditions.

The mean water requirement was 127.02 cm, in plots maintained at 5 cm. continuous submergence. By intermittent irrigation, this could be reduced by 52% with a yield reduction of only 21.6%. Therefore under limited water resources, intermittent irrigation at hair cracking stage in any single phase can be profitably practiced without any significant loss in yield.

The highest grain yield (2051 kg) was recorded when the crop was given 5 cm. irrigation on attaining saturation point during vegetative and maturity phases. During panicle initiation and development phase, the crop was maintained at 5 cm. continuous submergence. Under limited water resources, the phasic stress irrigation can be practiced to command more area than that could be covered under 5 cm. continuous submergence, without any significant yield reduction.

Maintaining 2 to 5 cm. continuous submergence in the generative phase (maximum tillering to heading) and intermittent irrigation on attaining saturation point or hair cracking of ground surface in the vegetative and post heading phase, recorded grain yield almost comparable to that of 2 to 5 cm. continuous submergence all through crop growth.

It has been concluded that during summer, about 20 to 30% more area can be irrigated with the same water resources when any of the following phasic stress irrigation practices is adopted with only negligible reduction in yield.

Schedule	Growth phase		
	Rooting to max. tillering	Max. tillering to heading	Heading to maturity
5 cm irrigation on attaining	Continuous submergence	Saturation point	Saturation point
'do'	Saturation point	Continuous submergence	Continuous submergence
'do'	Continuous submergence	Continuous submergence	Hair cracking of surface
'do'	Hair cracking of surface	Continuous submergence	Hair cracking of surface

Studies on various forms of water loss and total water requirement of rice (Agronomic Research Station, Chalakudy)

Water losses due to evaporation, transpiration and percolation were assessed by drum culture technique in eight seasons. During the kharif season, evaporation and transpiration losses were generally low and percolation loss high. It might be due to high percolation rate observed in early period till high ground water table was established. The percolation loss in rabi season was low due to high water table built up by the monsoon. During the summer season, the percolation loss was very high due to low ground water table.

Studies on the effect of water logging (partial submergence) on growth and yield attributes of rice (Chalakudy)

During the year 1975-76, the varieties IR-8 and Mashoori were tested for their tolerance to flooding. The latter exhibited better tolerance to flooding. During the years 1977 to 1980, IR-8 and H-4 were the test varieties. Except in 1979-80 when IR-8 out-yielded H-4, there was no significant difference between the varieties with respect to grain production. In general, IR-8 had shown better performance compared to H-4 when subjected to flooding to a height of 30 to 45 cm.

Under flooded conditions comparatively higher mean yields were recorded by aged seedlings.

Flooding to a height of 30 cm. or 45 cm. in different growth stages had not shown any significant effect on grain yield. However, a tendency towards reduction in grain yield could be noticed with respect to IR-8 under 30 cm. water logging between 73 and 84 days after transplanting.

Study on the effect of impervious layers to prevent percolation loss for increasing irrigation efficiency (Agronomic Research Station, Chalakudy)

In this experiment, the efficiency of different puddlers in reducing percolation loss in paddy fields was compared. Another objective was to compare the impervious layer formation by puddling and sub-soil compaction.

The differences of water loss or grain yield were not influenced by the treatments. In most of the seasons, the results indicated that a good puddle with a view to reduce high percolation loss in paddy fields could not be achieved in sandy loam soils. Sub-soil compaction at 30 cm. depth and soil dressing with lateritic loam are also not effective in sandy loam soils in reducing percolation loss. Hence minimum tillage only can be recommended in such soils.

Alternate technology to conserve a large quantity of irrigation water lost through percolation in paddy fields, especially in sandy soils, has to be worked out.

iii) Plant Protection

Resistance spectrum of BPH to different insecticides (Rice Research Station, Moncompu)

The pot culture studies indicated that BPH population did not develop resistance to the commonly used granular insecticides, Carbofuran and Phorate.

Susceptibility of different varieties of paddy to infestation by storage pests (Rice Research Station, Moncompu)

The relative susceptibility of different new paddy strains to insect infestation in storage was worked out. The results indicated that out of the 25 varieties tested, 10 viz. Bhadra, Triveni, MO-3 Cul-28, Jyothi Sabari, IR-28, Jaya, IR-22 and Kanchi were affected by grain moth to lesser extent while the remaining 15 were affected to a higher degree. The maximum damage was in the culture RP-4-14.

Detection of seed borne micro-organisms of rice (Rice Research Station, Pattambi)

Analysis of seeds collected from experimental plots (treated with seven different fungicides for the control of brown spot) revealed that the intensity of infection was of a very high magnitude and that none of the fungicides could control seed infection to an appreciable extent.

Fungicidal trial for the control of sheath blight disease of rice (Rice Research Station, Pattambi)

The experiment with the variety Jyothi was conducted during four seasons. The fungicides tested were Thiram, P C N B (Brassicol), Kitazin 17 G, Kitazin 48 E C, Benlate, Vitavax and Bavistin. Soil application and foliar sprays were tried. The studies revealed that application of fungicides like Thiram and Brassicol to soil followed by a foliar spray of Hinosan would give effective control of sheath blight disease of rice.

Studies on sheath blight of rice with special reference to survival of the causal organism and control of the disease (College of Agriculture, Vellayani)

The organism on rice *Rhizoctonia solani* (perfect stage of *Thanatophorus cucumeris*) was isolated from rice and its pathogenicity was established. This isolate was compared with three more isolates of *R. solani* obtained from cowpea, jack and cotton. The pathological reactions of these four isolates varied when they were tested against a few common plants. The isolates from rice and cowpea resembled very much in their pathogenicity and symptoms produced. Tapioca and onion were found to be hosts of this pathogen.

Neem cake and groundnut cake (under dried conditions) and elluppa cake and gingelly cake (under flooded conditions) reduced the viability of the *sclerotia*.

Among the various herbicides tested Saturn was significantly superior to others in reducing the radial growth of the pathogen. Studies on the comparative effects of various soil fungicides revealed that Agallol was effective in reducing the viability of *sclerotia* in soil even at a very low concentration of 50 µg/per gram of soil.

Studies on sheath blight of rice (Rice Research Station, Moncompu)

Seven fungicides were tried with an untreated control. All the fungicides were applied to soil during late tillering. Systemic fungicides viz., Benlate, Bavistin and Vitavax gave significant control of the disease. Different doses of major nutrients viz, nitrogen, phosphorus and potash were tried. The results indicated that low level of nitrogen and high level of potash significantly reduced the severity of disease. Phosphorus did not influence disease incidence.

Inoculation of the organism causing sheath blight disease has been done at different growth stages of plant viz., seeding, early tillering, mid-tillering, late tillering, panicle initiation, flowering, milky stage, dough and ripening stage. The results indicated that if the disease occurs at or after the milky stage, the grain yield is not affected.

Fungicidal trial for the control of Helminthosporium blight of rice (Rice Research Station, Pattambi)

The fungicidal efficiency of Hinosan, Dithane-Z 78, Dithane-M 45, Difolatan, Fytolan, Aureofungin sol and Kitazin-48 E. C. in the

control of *Helminthosporium* blight of rice was investigated. The studies revealed that foliar spraying of Dithane-Z 78 gave effective control of *Helminthosporium* blight of rice. This treatment recorded 28.7% decrease in the incidence over the control, with yield increases of 13.1%. Dithane-M 45, Hinosan and Kitazin were effective; but the yield increase was not commensurate with their cost.

Studies on ear-head complex of rice (Rice Research Station, Moncompu)

Bavistin, Hinosan, Ekalux and Furadan alone and in combinations were tested for their efficiency in controlling the disease. Field trials conducted consecutively for three seasons indicated that significantly higher grain yield could be obtained in plots applied with nematicide (Furadan 3g @ 50 kg. per hectare) Combination of Furadan with Ekalux (insecticide) and Hinosan/Bavistin (fungicide) gave the highest yield.

Weed control trial for direct sown rice in Kuttanad (Rice Research Station, Moncompu)

Stam F.34.2 kg. ai/ha, MCPA-1 kg. ai/ha, Stam F 34-1 kg ai/ha + MCPA 0.5kg. ai/ha+urea 3%, Fernoxone-1 kg ai/ha, and handweeding and unweeded control were the treatments. This experiment was conducted with the variety Jaya. 700 litres per hectare of spray liquid was used in each case.

Spraying Stam F 34 @ 1 kg/ai per hectare + MCPA @ 0.5 kg/ai per hectare + 3% fresh urea had the best weed control efficiency among the different treatments.

ONGOING PROJECTS

i) Crop improvement

Breeding lodging resistant, fertilizer responsive, medium height rice varieties suited for cultivation in Kerala (Pattambi)

Culture 1907, a semi-tall derivative identified earlier from the cross between Triveni and Bhavani, was yield tested in State Seed Farms during the second crop season. This culture recorded higher grain yield and higher straw yield than the check variety Triveni in most locations. It is indicated that culture 1907 is a promising medium tall short duration variety suitable for Kerala.

Breeding for non-shattering in the rice variety Jyothi (Pattambi)

This project was undertaken with the objective of improving rice variety Jyothi by reducing grain shattering. One culture from re-selection in Jyothi (Culture 1999) and another from irradiation of Jyothi (Culture 1998) were compared during the first crop season of 1979-80. Based on non-shattering characters, the culture 1999 was finally selected for further trial in the second and third crop seasons. In this selection, the percent grain shattering was reduced, as shown in the next page.

% shed grain in	I Crop	II Crop	III Crop
Jyothi (Check)	3.20	1.49	1.26
Culture 1999	0.60	0.45	0.40

Breeding for disease resistance in rice with special reference to sheath blight and stack burn (Pattambi)

Seventy nine cultures were evaluated for resistance to sheath blight and stack burn. Out of these, 14 cultures were found to be promising in the previous year. Eleven of these cultures showed multiple resistance in the National Screening Nurseries under the AICRIP during the year under report.

Breeding cold tolerant varieties of rice for high altitude regions of Kerala (Pattambi)

The F4 generation of the crosses Jaya x CH-1039 and IR.8 x CH-1039 were grown during the year and a total number of 76 plants selected for further testing and evaluation under high altitude conditions.

Breeding rice varieties suited to Kerala's deep water regions (Pattambi)

During the year, the F3 generations of two crosses made earlier were raised. None of the materials appeared to offer promise and hence selections for this objective could not be made. Further crosses and selections will be made.

Screening of rice cultures/varieties suited for dry sowing during virippu season (Pattambi)

The materials under the 'International Rice Low Land Rainfed Observation Nursery' (IRLRON) obtained from the IRRI, Philippines were grown and 16 promising entries selected. Eighteen promising lines of the previous year were also multiplied. The selected material will be tested in the coming season.

Breeding for rice varieties resistant to BPH (Moncompu)

This project was started with the objective of evolving varieties with BPH resistance suitable for Kuttanad region. During the report period, 210, F6 cultures and 46, F4 cultures were grown. Sixty one plants from F6 and 21 plants from F4 generations were selected with desirable attributes like panicle characters and tolerance to BPH.

Evolving a short duration semi-tall variety of rice (Moncompu)

F3, F4 and F6 cultures were grown during additional crop season of 1979. Observations were recorded on the date of flowering, number of productive tillers/hill, count of stem borer, incidence of pests and diseases etc. Five plants were selected from the F6 and 24 from F4. The seeds of the selected plants were carried forward as F7 and F5 cultures during punja season of 1979-80. Two plants were selected

from the F7 cultures and nine from the F5 cultures. Nine early and semitail plants selected from F7 generation cultures of another project were added to this project.

Evolving high yielding acid tolerant varieties of rice (Moncompu)

The objective of this project was to evolve varieties of rice suitable for growing in acid soils of Kerala. Seven acid soil tolerant cultures derived from the three crosses viz. Jaya x MO 1, IR.8 x Kari-vennel, and Kochuvithu x IR.8//MO.1 x IR.8, were compared with three standards for two seasons. Cultures M. 22-65-2-3 and M. 24-204-2 were found to be good yielders.

Inheritance studies on BPH resistance in Ptb. 19, Ptb. 33 and ARC. 6650 (Moncompu)

During the previous year, crosses were made and F1 seeds collected. The F1 population was also raised and the F2 seeds collected. During the year under report, since sufficient population of BPH was not present, screening could not be undertaken in the F2 generation.

To evolve high yielding photosensitive varieties suited to the different agro climatic zones (Moncompu)

During the previous year, 163 plants were selected for further testing. From the F4 and F3 generations planted at Kayamkulam during mundakan season, a total number of 956 plants were selected from four crosses.

Screening of rice varieties for salinity tolerance (Vyttila)

This project was started with the objective of screening high yielding photo-insensitive saline resistant varieties for Pokkali soils of Kerala. Out of a total of 135 entries, 48 were selected based on survival on flood, salinity tolerance, duration, plant height and other favourable factors for pokkali region. Three cultures are seen to be very promising.

Hybridization programme (Vyttila)

The objective of this project is to breed high yielding varieties suitable for pokkali area by top crosses between the present pokkali varieties and high yielding varieties such as Jaya, T (N)-1 etc. Cultures 5-1 & 4-4 from the cross Pokkali x T (N)-1 are the two promising tall hybrid cultures with 2875kg/ha. and 2650 kg/ha. yield potential respectively which can be carried forward to comparative trials with Vyttila-1 as control. Nine promising cultures were selected from the cross Pokkali x Jaya, during 1979.

Breeding for earliness in the variety Mashoori by induced mutations (Vyttila)

The objective of this project is to reduce the duration of the variety Mashoori by using physical mutagens. The seeds of the variety Mashoori were subjected to gamma irradiation at 10,20 and 30kr exposures. The M1 generation was raised in 1978 and all the M1 plants were harvested

separately. The M2 population was raised during the year under report. The earliest plant had a flowering duration of 91 days. One hundred and twenty five plants were selected. These plants have total duration of 120 to 130 days.

Collection, maintenance and utilization of saline resistant rice varieties (Vytila)

Nine new varieties were collected during the year under report. All the 30 varieties including the nine new varieties were raised during the year and their various characters such as plant height, flowering duration, plant characters etc., recorded. It was found that collection and maintenance of these varieties were useful for future programmes.

Screening of rice varieties suited to Onattukara conditions (Kayamkulam)

Results of screening of rice varieties suited to Onattukara conditions revealed that Blue Bonnet, Pankaj and H4 are suited for the second crop season in Onattukara. For the first crop season, ARC. 11900; Annapurna, Jyothi and Triveni were found to be good.

Evolution of high yielding photosensitive variety suited to different agroclimatic zones (Kayamkulam)

In the studies conducted for the evolution of high yielding photosensitive cultures, a few high yielding, medium tall cultures have been obtained from the cross Jaya x Ptb. 33, Jaya x Ptb. 20, Jaya x Ptb. 4, Ptb. 4 x IR 17, M1-273 x UR-19 and M1-273 x Ptb. 20. The following number of photosensitive cultures having good plant types, medium tall nature and resistance to pests and diseases were selected from each cross.

F5 Studies: Jaya x Ptb.33—28 Nos.

F4 Studies: Jaya x Ptb.20—55 Nos.

Jaya x Ptb.4—31 Nos.

Ptb. 4 x IR.17—52 Nos.

F3 Studies: M.1-273 x UR.19—27 Nos.

M.1-273 x Ptb.20— 8 Nos.

Exploitation of high protein strains from hill paddy varieties and other local strains (Instructional Farm, Vellanikkara)

This project was initiated with the objective of collection and maintenance of rice varieties with high protein content for breeding programmes. Three hundred and eightyfour types were collected so far and maintained.

High protein rice varieties through induced mutations (Instructional Farm, Vellanikkara)

Physical and chemical mutagens were tried in rice to induce high yield and high protein content. Two hundred and sixty five lines were selected based on physical characters and yield attributes. Chemical analysis of samples from these lines for protein was also done.

✓ *Hybridization programme of Annapurna and Sabari with Suvarnamodan (Instructional Farm, Vellanikkara)*

To incorporate the desirable characters like increased straw yield, drought resistance, better head characters etc., from Suvarnamodan. (ARC:11775) to Annapurna and Sabari, this project was undertaken. Suvarnamodan (ARC. 11775) was crossed with Sabari and Annapurna either way. Hybrid seeds were grown in the first crop season. Seeds from these F1 plants were collected, nursery raised and F2 plants transplanted. But no good selections were obtained in F2. Further hybridization will be attempted.

Selection and hybridization in paddy variety Adakkan (Ambalavayal)

This project was taken up to evolve an improved strain from the variety Adakkan by pure line selection. It is found that out of the four cultures of Adakkan, AD.74 gave consistent good performance.

Selection and hybridization in paddy WND. II x Rohini (Ambalavayal)

The objective of this project was to evolve a suitable short duration strain with higher yield and stiff and long straw. Though the line WR.010 out yielded all other lines, there was no statistically significant difference among the lines evaluated.

Preliminary variety trials to evaluate comparative performance of early, medium and late duration rice cultures (Pattambi)

Out of 145 new rice cultures tested in three trials, none was found to be promising compared to the check varieties.

Uniform variety trials to study the performance of early, medium and late duration selections, in comparison with the local checks (Pattambi)

Out of the 74 new rice cultures tested in the five trials, no one could be identified as promising compared to the check varieties.

International rice yield nurseries to test promising materials from the World rice improvement programmes under a wide range of environmental stress (Pattambi)

Out of the 95 new varieties tested under three trials, only four were found to give higher yields than the check varieties.

Performance evaluation of promising medium duration rice cultures under low NPK levels (Pattambi)

No conclusions could be drawn with the results of one season. The trial has since been modified and is being repeated.

Final evaluation of BPH resistant cultures to evaluate the yielding ability and other desirable characters of the hybrid lines selected (Moncompu)

Seven cultures from the cross Triveni x Culture 1539 and one culture from the cross Triveni x IR. 2071 – 625 – 3 were tried in PYT for the two seasons of the year. During the additional crop season, cultures 1537-1 and 1537-2 recorded maximum yield of 5249 kg/ha. and during the

puncha season, culture 1537-2 gave 5473 kg/ha. There were significant differences for the two seasons. During the two seasons of the previous year also there was significant difference in yield between the treatments. On the basis of the pooled analysis of the yield data for four seasons, cultures 1537-2, 1537-1 and 1544-2 were selected for district trials.

Evaluation of the selected cultures from the cross IR-8 x Karivennel to assess yield potential of advanced cultures (Moncompu)

Sixteen cultures selected from the cross IR-8 x Karivennel were tried in a PYT along with two standards for the two seasons of the year. During additional crop season, Jaya recorded maximum yield and Culture M. 23-47-1-1 and M. 23-7-1-1 closely followed. There was significant difference in yield between treatments. The difference in yield between Jaya and Culture M. 23-47-1-1 or M. 23-7-1-1 was not significant. Two cultures viz. M. 23-7-1-1 and M. 23-33-3-1 were finally selected for district trials.

Comparative yield trial on rice (Instr. Farm, Vellanikkara)

To study the field performance of different cultures, two comparative yield trials – one with 12 cultures and Annapurna as check (all having flowering duration of below 94 days) and the other with 13 cultures and IR. 8 as check (all having flowering duration of above 94 days) were conducted. In CYT-1, highest yield was recorded by Culture 10-1-1. This culture was under-trial for many seasons. This culture was sent for district trials for early duration varieties. It showed a slight increase in yield over Annapurna.

Comparative yield trial of short duration cultures (Kayamkulam)

The result obtained from this trial showed that Culture 43-1-6, a derivative from the cross Cul. 16 x Triveni, recorded the maximum yield of 2861 kg/ha. followed by 26-1-1 (Tadukkan x Jaya) with 2760 kg/ha.

Comparative yield trial of promising cultures having intermediate height under broadcast conditions in Onattukara (Kayamkulam)

Under this trial, the maximum yield was recorded by Cul. 1004 followed by Ptb. 23. Cul. 1004 recorded an yield of 4604 kg/ha.

Periodical planting trial with Cul. 31-1 as compared to second crop popular variety Ptb. 20 (Kayamkulam)

The objective of this project was to study the optimum time of planting of Cul. 31-1 to get maximum yield with minimum total duration. Planting on 1st September recorded the highest yield which was on par with 1st August planting and 15th August planting.

Trials with Moncompu cultures (Karamana)

To study the performance of the new cultures 7-1-1 and 33-1-1 in comparison with Jaya, Bharathy and Bhadra, this experiment was started at this Station.

Varietal trial on paddy (Ambalavaya)

The objective of this project was to compare the yield potential of Wynad varieties and their maintenance as germplasm. During the year, 23 varieties were planted after screening. The maximum yield was obtained from Kottathondi followed by Thondi, Chettiveiyyan and Peruvaya. In the previous year, the highest yield was obtained from the variety Chomala.

(ii) Crop management

Monitoring soil fertility and crop production under continuous rice culture at moderate levels of fertilizer application (Pattambi)

The objective is to study the effect of N, P and K alone and in combination, on soil fertility and rice yield. Results indicated that higher grain yield can be obtained by the application of N, P and K in the proportion of 2:1:1.

Nitrogen management trial for increasing the nitrogen use efficiency of rainfed low land rice (Pattambi)

The results indicated that nitrogen use efficiency can be increased by applying nitrogen in the form of sulphur coated urea, urea coated with neem cake and placement of urea super-granules.

Studies on the utility of Azolla and blue green algae for wet land rice culture (Pattambi)

To evaluate the possibility of using azolla and blue green algae for partially substituting the nitrogen requirement of rice and to evaluate the utility in rice culture, this project was conducted. It has been found that about 25% of the nitrogen requirement can be substituted by the application of algal crust at the rate of 10kg/hectare.

Nitrogen management trial for increasing the N-use efficiency of transplanted rice by placement technique (Pattambi)

Nitrogen management trial was carried out to study the efficiency of modified urea materials and their methods of placement for increasing the fertilizer nitrogen use efficiency of transplanted rice. During this year, the trial was vitiated due to heavy incidence of brown plant hopper attack. During the previous year, it was observed that efficiency of nitrogen could be increased by placement techniques.

Phosphate sources for flooded rice (Pattambi)

The objective was to study the efficiency of phosmak as compared to rock phosphate and superphosphate. There was no response to applied phosphorus of any kind. No significant difference in grain yield was obtained between the treatments.

Studies on harvest of rice at its physiological maturity stage (Pattambi)

The project was designed to assess the physiological maturity and correct time of harvesting of short, medium and long duration varieties

under different agro-climatic conditions, in order to get maximum grain yield and milling recovery of rice.

Jyothi and Jaya (short and medium duration rice varieties) recorded higher grain yield when the crop was harvested at 30 days after flowering in the first crop season. In the second crop season, Jyothi recorded highest grain yield when harvested at 20 and Jaya at 25 days after flowering. The long duration rice variety IR-5, recorded highest grain yield at 40 days after flowering during both first and second crop seasons.

Weed control trial in direct sown rice under puddled condition (Pattambi)

The trials indicated that Thiobencarb/2,4-D, Butachlor+ 2,4-D and Piperophos/2,4-D are as effective as hand weeding in controlling weeds in direct seeded rice in puddled soils.

Relay inter cropping in upland rice (Pattambi)

The experiment was aimed at finding out the possibility of growing a short duration rice crop (in the first crop season) in the uplands and an intercrop in relay with rice. Out of the seven intercrops tried, maize gave reasonable yield.

Flow line seeding in upland rice (Pattambi)

The project was to standardise the method of flow line seeding in the uplands by which manual weeding can be made easier, less cumbersome and inexpensive. Among the treatments tried, 30cm flow lines gave the maximum yield. Hand weeding treatments registered significantly higher yield over the herbicide, Propanil. Jyothi produced significantly higher yield over Ptb-28; but it was found susceptible to Propanil.

Water management of rice in relation to ground water table: Lysimetric studies to assess ground water contribution to rice (Chalakudy)

This was undertaken as an observational trial to collect basic information for the conduct of detailed Lysimetric studies under field conditions to assess ground water contribution for rice. During the previous year, the highest yield was recorded by the treatment in which water level was maintained at soil level. The treatment in which water level was maintained at 5cm above the soil level stood next in yield. Lowest yield was recorded by the treatment in which water level was maintained at 55 cm below soil level. There was considerable reduction in the yield of grain, yield of straw, number of productive tillers and height of plant at harvest in the treatment where ground water table was maintained at 60 cm. below ground level. Maximum yield of grain, straw, productive tillers and height at harvest were recorded by the treatment where water table was kept at ground level. Evapotranspiration was substantially low when ground water table was located 60 cm below the surface.

Effect of timing and frequency of N and K application on leaching loss of nutrients and yield response of rice under different water management practices (Chalaky)

The project was aimed at finding out the optimum stage and frequency of application of N and K for medium duration rice in sandy loam soil. The leaching loss of nutrients and fertilizers and water use efficiency were also to be estimated. It was inferred that irrigating paddy at saturation point and fertilizing with N and K in three splits i.e. basal (at transplanting), 15 days after transplanting and 38 days after transplanting are sufficient for medium duration rice crop in rabi season for optimum yield in sandy loam soils.

Nitrogen economy through incorporation of Azolla in rice (Chalaky)

The experiment was undertaken to study the effect of incorporation of Azolla on growth and yield of rice. It was also designed to assess the saving of nitrogen by incorporation of azolla to soil. The work on this project is in progress.

Nitrogen economy in rice through algal fertilisation in different soil types and soil physical conditions (Chalaky)

Multilocational trials to verify the efficiency of the blue green algae for their adoption in various agro-climatic regions of the State and standardisation of the multiplication of blue green algal culture to suit the conditions existing in Kerala were the major objectives of this project.

The grain yield data of variety Jaya for the first crop season for full dose of N, $\frac{2}{3}$ N + 10 kg blue green algae and $\frac{2}{3}$ dose of N showed that there was no response for rice in this soil beyond $\frac{2}{3}$ of the recommended N dose, $\frac{1}{3}$ dose N + 10 kg blue green algae was on par with $\frac{1}{3}$ dose N; but statistically inferior to $\frac{2}{3}$ dose of N. Application of 10 kg blue green algae/ha, along with $\frac{2}{3}$ dose of N tended to give higher grain yield than $\frac{2}{3}$ dose of N alone. The grain yield increased from 2244 kg/ha (for the treatment $\frac{2}{3}$ dose of Nitrogen + PK + amendments) to 2391 kg/ha (for the treatment $\frac{1}{3}$ dose of Nitrogen + P, K + amendments + blue green algae as soil culture 10 kg/ha). During the second crop season, all the treatments were on par. The experiment needs further study to arrive at conclusions.

Nitrogen economy in rice through algal fertilization (Moncompu)

This experiment is aimed to verify the efficiency of blue green algae for their adoption in Kuttanad soils. The experiment conducted during the punja season of 1979-80 indicated that application of the blue green algae @ 10 kg/ha significantly improved the grain yield of paddy when applied along with $\frac{2}{3}$ rd as well as $\frac{1}{3}$ rd of the recommended dose of Nitrogen (i.e. 90 kg N/ha)

Nitrogen economy in rice through algal fertilization (Kayamkulam)

Results showed that there was significant difference in grain yield due to the effect of treatments. Highest grain yield of 3061 kg/ha was recorded by treatments NPK @ 90:45:45 kg/ha, which was on par with NPK @ 60:45:45 kg/ha + blue green algae 10 kg/ha. This study was in progress.

Multilocational trial on blue green algae (Vytttila)

Though the yield differences between the treatments were not significant, the highest yield was recorded in plots treated with blue green algae. The effect was more evident when N dose was lower.

Experiment on method of sowing (Moncompu)

Evaluation of different methods of sowing of rice and selecting a suitable method under the cropping pattern in Kuttanad are the aims of the experiment. The results of the experiment conducted during the punja season of 1979-80 indicated that Dapog method of nursery raising and transplanting was superior to all other methods. This treatment recorded the maximum yield of 5420 kg/ha., closely followed by the normal method which recorded an yield of 4897 kg/ha. Broadcasting the seeds @ 100 kg/ha. recorded the lowest yield of 4297 kg/ha.

Experiment on multiple cropping (Moncompu)

This experiment was laid out to find out suitable cropping pattern for Kuttanad area under the changing conditions subsequent to the construction of Thannirmukkom barrier.

The additional crop of paddy during 1979 showed no significant difference between the treatments. The maximum grain yield of 4318 kg/ha. was obtained from the treatment receiving cowpea as summer crop. However, significant difference in grain yield was obtained during the punja season. Treatment receiving cowpea during summer season out yielded (4419 kg/ha) all other treatments. This was followed by the treatment receiving black gram in the summer season.

Varietal reaction to BPH as influenced by plant density and nitrogen (Moncompu)

This experiment is aimed at fixing up optimum plant density and 'N' levels to minimise the incidence of BPH and also to determine the relative resistance of the paddy variety Jyothy to BPH attack. This experiment was conducted during the punja season of 1979-80. The results showed that spacing had a significant effect on BPH population. The least BPH count was recorded in plots with a spacing of 30 cm x 15 cm. The highest BPH count was observed in the treatment 20x15 cm. 120kg N/ha. recorded higher BPH population over 90 kg/ha and 60 kg N/ha. There was significant difference between the two varieties Jaya and Jyothi so far as BPH population was concerned, Jaya being attacked more than Jyothi.

Only nitrogen had a significant effect on grain yield. Highest grain yield was recorded with 120 kg N/ha., followed by 90 kg N/ha.

Weed control studies to find out the effect of burning stubbles with the use of flame thrower as a method of weed control (Moncompu)

The result of the experiment conducted during the additional crop season of 1979 showed that burning stubbles immediately after punja crop and raising a cowpea crop had the best suppressing effect on weed growth.

Production potential of rice crop (Moncompu)

The objective was to increase the production of rice by raising a summer crop in between the punja and additional crop. The experiment conducted during 1979-80 indicated that growing the variety Bhadra for punja crop, Triveni for summer and Jaya as additional crop outyielded all other combinations.

Technology of manuring of rice in flooded soils (Vyttila)

This project was undertaken to evolve a methodology and manuring schedule for soils under illdrained and flooded conditions with special reference to Pokkali soils. The experiment is a permanent manurial trial. The highest response was obtained for the treatment nitrogen alone, followed by "NPK in mud balls".

Trial to explore the possibility of taking an additional crop of rice in the pokkali lands where only one crop of rice is being taken now (Vyttila)

The seeds of first and second crop varieties mixed in the ratio of 7:3 were sown in the first crop season. As the first crop season was very favourable, the first crop varieties suppressed the growth and development of the second crop varieties. Further, the season was quite unfavourable for the second crop varieties. Due to continuous dry period, no variety survived the salinity after the harvest of the first crop. The experiment was repeated at Edacochin and Vettakkal. No variety could survive the high salinity developed during the season.

Though the yield performance of Cul-25100 during the second crop season was not encouraging, it gave an indication that a successful combination could be achieved in future.

Permanent manurial trial (Kayamkulam)

The objective of this experiment is to find out the effect of continuous application of nitrogen, both as organic and inorganic, together with phosphoric acid and potash on the soil fertility and yield of rice.

During the year, maximum yield of 2038 kg/ha was recorded by the treatment "entire nitrogen 80 kg/ha as cattle manure" followed by the treatment "25% nitrogen as cattle manure and 75% as ammonium sulphate" (1760 kg/ha).

Response of culture 31-1 to graded dose of fertilizers (Kayamkulam)

The treatment with 50:35:35 (NPK) recorded the highest yield of 2996 kg/ha. This was on par with 40:20:20 and 70:35:35 kg/ha of NPK fertilization.

Studies on the optimum level of NPK for rice in sandy tracts (Kayamkulam)

The results showed that the treatment effects were not significant. During the first crop season, maximum grain yield (2558 kg/ha) was recorded by NPK application @ 60:75:75 kg/ha. During second crop season, maximum grain yield (2200 kg/ha) was recorded where NPK was applied @ 90:67.5:67.5 kg/ha. This experiment is in progress.

Economics of crop sequences and their effect on soil productivity over years (Karamana)

The objective was to study the economics of high intensity crop sequences and their effect on soil productivity when grown continuously over years. The experiment has been conducted during kharif, rabi and summer seasons during the year. Since one year data alone are available, no conclusion could be drawn.

Agronomic evaluation of new promising pre-release varieties of cereals (Karamana)

This experiment was to study the response of new promising pre-release varieties of cereals in comparison with locally popular variety, to nitrogen and in relation to date of planting. This experiment was conducted only during the rabi season. Date of planting was found to have significant effect on the grain yield. The normal date of planting was found to give comparatively higher yield over the other two dates of planting tried.

Nitrogen economy through organic manures (Karamana)

This experiment was to study the possibility of economising fertilizer through organic manure in a crop sequence. The application of nitrogen in the form of farm yard manure did not exhibit any additional advantage over fertilizer nitrogen. Farm yard manure form of nitrogen increased the yield of grain. No statistically significant yield difference was noticed by the use of different fertilizer combinations namely 30:60:60. But progressive yield increase was seen by the increased dose of fertilizers.

Effect of slow release and different grades of urea briquettes on rice (Karamana)

The results showed that sulphur coated urea was significantly superior to other sources, namely, urea granules, urea basal and urea splits.

Nutrioperiodism of potash in medium duration rice varieties (Karamana)

The results showed that application of potash as single or in splits and at various growth phases did not exhibit any significant effect in

increasing the grain production. Rabi season results also showed the above trend.

Evaluation of the performance of new short duration rice cultures evolved at the Agricultural college, Vellayani in comparison with locally popular short duration varieties under varying levels of nitrogen (Karamana)

In the summer season of 1979, the culture 24-20 outyielded all other varieties tried, giving an yield of 37.77 quintals per hectare. The response to nitrogen was seen only upto 60 kg/ha. level. Thereafter, a drastic reduction in yield was obtained. In the kharif season, Annapurna and culture 47-41 were on par, producing a grain yield of 48.39 and 46.57 quintals/hectare, respectively. But in contrast to the results of summer season, the varieties responded up to 90 kg. nitrogen per hectare level in kharif season. In the rabi season also Annapurna and Culture 47-41 were on par, producing a grain yield of 28.67 and 24.95 quintals/hectare, respectively. But the response of nitrogen was seen only upto 60 kg./hectare level. From the trends so far, it can be said that Culture 47-41 compares favourably with locally popular variety Annapurna.

Potash nutrioperiodism in rice (Vellayani)

Results showed that in the case of medium duration variety-Jaya, split treatment $1/8 K + 1/4 K$ gave better yield. It has been found that half the dose of K gave same yield as full dose. Thus, it is economical to reduce the quantity of potash. In the case of short duration variety (Triveni), split treatment $1/8 K + 1/4 K + 1/8 K$ gave better yield. From these experiments it is evident that K is required in smaller quantity during the early stages of growth and more during the reproductive period.

(1K=35 kg K_2O for short duration; 1K=45 kg K_2O for medium duration)

Long range effect of continuous cropping (Karamana)

The experiment is in its fourth year. The data available till the end of rabi 1979-80 season showed that nitrogenous fertilizers significantly increased the grain yield upto 80 kg nitrogen/ha. But it was not statistically significant. P and K showed no significant difference.

Studies on the performance of rice variety Aswathi under direct seeding in relation to method of sowing and different methods of weed control (College of Hort. Vellanikkara)

The results from this study indicated that pre-emergence treatment with Machete effectively controlled total weed population and was found to be superior to all other herbicides tested. Number of productive tillers per square metre and length of panicle were influenced by spacing treatments. Hand weeding treatment recorded the highest grain and straw yield.

Agronomic studies in respect of rice grown as an intercrop in coconut garden (Veliyani)

Among five varieties tested to study their performance under partially shaded condition in coconut gardens, Chennellu gave the maximum yield, followed by Ptb-28. The general growth was not satisfactory.

Utilization of Azolla for rice crop (Vellayani)

This project was undertaken with an objective of assessing the savings in nitrogen by incorporation of azolla and to study the effect of azolla incorporation on the physical, chemical and biological properties of soil. This work is in progress.

Study on the effect of blue green algae on the yield of rice (Instructional Farm, Vellanikkara)

The application of blue green algae did not bring about any increase in grain yield under Mannuthy conditions for two years.

AICARP (All India Co-ordinated Agronomic Research Project)

Under AICARP, the experiments are conducted in cultivators field to study the response of crops to different fertilizers and manures and to work out the fertilizer recommendations for different agro-climatic zones within a district or State.

During the year, six experiments in kharif, six experiments in rabi and three experiments in summer were conducted at the Model Agronomic Research Station, Karamana. At Kozhikode district, 87 A type trials and 77 B type trials were laid out. In Kottayam district, the number of A and B type trials were 85 and 87, respectively.

ECF Kozhikode: Data from "A type" experiments during kharif season revealed that the response of nitrogen was upto 80 kg/ha. The response of P and K was upto 60 kg/ha and 30 kg/ha, respectively. Significant response towards lime application was obtained from 600 kg/ha.

In "B type" trials, cul. 1907 which was favoured by the farmers due to its tall nature performed better than Triveni.

ECF Kottayam: Data of "A type" experiments revealed that nitrogen response was upto 80 kg/ha level. The response was seen to phosphorus and potash at 20 kg/ha each.

In "B type" trials, culture 1907 was compared with Triveni. Culture 1907 had a slight edge over Triveni though it was not statistically significant. Taking the added quality of tall character of this strain, cultivators showed much preference to this. It can be concluded that 80:20:20 kg/ha of NPK is the optimum dose of fertilizers for Kottayam district. The variety IR-35 and culture 1907, were found to perform well in this district.

Permanent manurial experiment in dwarf indica series and tall indica series (Pattambi)

The objectives were to study the effect of continuous application of organic and inorganic manures in the form of cattle manure, green leaf and ammonium sulphate alone and in combination with and without P and K on the yield of tall and dwarf indica rice.

The effect of organic and organic + inorganic were on par. Superiority of cattle manure over green leaf was also evident. In view of the shortage of organic manure in rice cultivation, either cattle manure or green leaf can be safely supplemented partially with inorganic fertilizers on equal nutrient basis without reduction in yield. Cattle manure is preferred over green leaf as a source of organic manure.

Crop weather effect on some of the important high yielding varieties of rice with respect to yield and duration (Pattambi)

The performance of some of the popular high yielding (short and medium duration varieties) was studied during different seasons as a transplanted crop under wet nursery with special reference to yield, duration, growth etc.

Under virippu, all four short duration varieties (Rohini, Jyothi, Annapurna and Triveni) gave highest yield when nursery was raised by the middle of June (Makayirām Njattuvela). Chaff percentage was minimum and weight of grain more for the June sowing. During mundakan season, the varieties showed certain critical periods. All the varieties performed very well when raised by the middle of October (Chithira).

As far as the medium duration varieties were concerned, the most popular varieties namely Jaya, Bharathi and IR 8 gave the highest yield when sown very early, during the Bharani Njattuvela, recording the highest grain weight. During mundakan season, very early sowings during July end to August end were very poor. October sowing gave very good yield in the case of medium duration varieties also.

All the four short duration varieties were found ideally suited for the summer punja, for which the best time for sowing was found to be the end of January. Annapurna was found more suited as a punja crop than as virippu and mundakan crop. Rohini and Jyothi gave high yield as a virippu crop, when sown very early during April-May. Bharathi, Jaya, IR-8 and Aswathi performed well as a virippu crop; but as a mundakan crop, the best sowing time was found to be August to September. Delaying reduced the yield. Mashoori yielded best as a virippu crop, when the nursery was raised early in May.

Split application of phosphorus for rice (Chalakudy)

One season experiment showed that there is no response for P_2O_5 application for rice in these soils. The residual effects of application of

P_2O_5 on rice needs more study to arrive at conclusion. The experiment is being continued.

Input requirement of rice based cropping pattern (Chalakudy)

The objectives were to assess the yield response of rice at different levels of NPK, to find out an economic dose for rice under different cropping sequences, to estimate the input reduction possible in each season and to work out the cost benefit ratio for the cropping patterns. Since the experiment is in progress no conclusions were drawn at present.

Studies on the premature drying of paddy leaves during the punja season in Kuttanad (Moncompu)

The punja crop in the experimental plot was harvested. Both major and minor treatments had no significant effect on grain yield. Among the major treatments, highest yield of 4537.5 kg/ha. was recorded by washing with bleaching powder at the rate of 5 kg/ha. Under minor treatments, spraying Agrimycin at the rate of 500 ppm gave the highest yield of 6584.2 kg/ha; the lowest yield recorded was 6427.9 kg/ha for treatments with spraying trace elements 1% solution and spraying Benlate 0.1% solution. Neither the major nor the minor treatments had any effect in reducing the leaf drying.

Studies on the quality of irrigation water in Kuttanad (Moncompu)

The pH of the soil slurry ranged from 4.2 (March 1979) to 6.7 (August 1978). In surface water, it varied from 4.4 (March 1979) to 6.9 (November 1978). With regard to river water, the range of variation of pH was from 6.1 (July 1978) to 6.9 (September 1978). The E. C. of soil slurry ranged from 0.042 m. mhos/cm. to 0.210 m. mhos/cm. The E. C. of surface water varied from 0.055 to 0.1168 m. mhos/cm. As regards the river water, the variation was from 0.0 to 0.15 m. mhos/cm. The quality of irrigation water with respect to pH and EC during the period under study was good.

Response of lime in the acid soils of Kerala (Vellayani)

The main objective was to investigate the comparative response to lime application by the acid soils of Kerala and also to study their calcium status and availability in rice soils with a view to determining the critical levels of calcium in soils below which response to liming can be expected. The result obtained showed that maximum grain yield was obtained with half the lime requirement level in laterites, kayal and kole rice fields, while lime requirement at full level was needed to produce maximum grain yield in kari soils.

Investigations on the possible reasons for lack of response to phosphorus in Kerala (Vellayani)

This project was aimed at studying varietal variations in response under graded doses of applied P in a soil with low available P and low P fixing capacity and to correlate the lack of response to P with varietal

character. Based on yield increase at different P levels, varieties are categorised as poor responders (eg. Ptb.31, Ptb. 8, Jaya, Jyothi), linear responders (eg. Bharathi, Aswathi, Mashoori) and moderate responders (eg. Triveni, Rohini, Annapurna, IR-8, IR-20).

The identification of varieties which are poor responders suggests that in a rice-rice-rice cropping system, alternation of responding and poor responding varieties may enable the skipping of P, in at least alternate seasons.

Phosphorus and potassium fixing capacity of the rice soils of Kerala (Vellayani)

Among the different soils, black soils of Chittur recorded the highest potassium fixing capacity of 4 me. per 100g. soil followed by forest soils with 1.93 me, and Pokkali soils with 1.83 me. per 100 g. soil. Coastal sandy soil was found to have no K fixing capacity, where as laterite soil was found to have 0.12 me./100 g. soil.

Effect of method of application of zinc on the straw and grain yield of rice (Vellayani)

The different methods of application of zinc were tried in a pot culture trial to find out the most efficient and economic one for rice. Application of zinc sulphate at the rates of 20 kg. and 10 kg. to the transplanted crop and 50 kg. to nursery were statistically on par with each other in grain as well as straw yield. Application of zinc to the nursery economises the cost of cultivation.

To study the effect of varying levels of zinc on the growth and yield of rice (Vellayani)

The different growth parameters studied recorded a significant increase by the application of zinc. Significant grain yield increase could be obtained by zinc application. Foliar application of 0.5% zinc sulphate and soil application of 20 kg. zinc sulphate per hectare recorded the maximum yield of grain.

Utility of an indigenous source of magnesium for rice in Kuttanad soils ✓

This project was undertaken to investigate the effect of steatite (magnesium silicate) on the growth and yield characters of rice in Kuttanad soils. The result showed that steatite application increased tillering, plant height, yield of grain and straw, in paddy.

Experiment for the control of sheath blight disease on paddy (Vellayani)

There was significant difference in the nematicide treated plots and untreated plots. Soil application of zinc resulted in significant increase in yield of rice. There was a marked increase in yield of straw by soil application of zinc and neem cake plus Thiride. The combined treatment i.e. micronutrients, nematicides and fungicides showed a significant effect in controlling sheath blight disease of paddy at Adoor Seed Farm.

Zinc and manganese status of paddy soils of Kerala (Vellayani)

The major objective of this experiment was to find out a suitable extraction method for available zinc and manganese in the paddy soils of Kerala. Out of five extractants studied for available zinc and manganese, DTPA, EDTA and 0.1 N HCl gave good results for the soils of Kerala in general. Acid extractions always gave higher values.

Studies on depth and spacing of sub-surface drains: Utilisation of sub-surface water for irrigation through surface drains (Chalakkudy)

This project was to find out the possibility of channelling percolation water through sub-surface tile drains for irrigating low lying tail end plots and also to estimate the yield of water and area commanded. The result showed that by laying out well planned and more extensive system of sub-surface tile drains, substantial area of the farm can be brought under irrigation by tapping the ground water and recycling the water to low lying fields, especially during the lean months.

Crop weather studies on paddy (College of Horticulture, Vellanikkara)

The results indicated that monthly rainfall during June had some influence on the grain yield of paddy varieties Ptb. 5, Ptb. 12 and Ptb. 20. There was significant correlation between number of rainy days during October and the yield of Ptb. 20 during mundakan season. The number of sunshine hours during August also showed significant positive association with yield of paddy in virippu season.

Crop weather correlation studies utilising the available data from the Rice Research Station, Pattambi (College of Horticulture, Vellanikkara)

A crop water correlation study was conducted utilising the data on rainfall, number of rainy days, percentage of relative humidity and number of hours of sunshine for a period of 24 years available at Rice Research Station, Pattambi.

This study revealed that among the various weather parameters included for study, rainfall is the major factor contributing to variations in yield. There was significant positive correlation between number of rainy days during October and the yield of paddy (variety Ptb. 20) in the mundakan season.

iii) Plant Protection

New insecticide trial-granules (Pattambi)

Against gallmidge, Mocap 5 G @ 1.5 kg. ai/ha was found to be the best chemical. For the control of leaf folder also, Mocap was the best. Highest yields were from BPMC, Solvirex and Ficam treated plots. During the second crop also, gallmidge incidence was lower in Mocap treated plots. During the second crop, Mocap recorded highest yield followed by Hibeesh. Previous year's results showed that Furadan, Ficam and

Carlin were effective against stem borer. Furadan was highly effective against leaf roller and recorded the highest yield.

New insecticide trial-sprays (Pattambi)

Ripcord and Sevidol were effective against gall midge at 30 DAT @ 0.75 kg ai/ha and Sumithion and Sevidol at 50 DAT. Highest yield was from Ripcord treated plot; but it was not significant when compared to other treatments during the first crop season. Most of the chemicals were equally effective against stem borer. However, FMC-35001 was the best at 50 DAT.

New insecticide trial-dusts (Pattambi)

The chemicals were more or less equally effective against gall midge. The insecticides tested were in no way better than the untreated control in reducing the percentage incidence of stem borer. Among the chemicals tested, Sumithion 5D @ 25 kg ai/ha gave highest yield.

Insect pest control trial-sprays (Pattambi)

The trial was laid out to evaluate the effectiveness of selected spray formulations at lower doses against specific insect pests and their effect on natural enemies. Previous year's results showed that all the chemicals were equal in their effectiveness against stem borer and gall midge. Sevin, Phendal and Mipion were highly effective in controlling leaf folder.

Economic insect pest control trial (Pattambi)

Root zone application of Cytrolane 5G and Furadan 3G was found to be the best for the control of gall midge. During the first crop, the highest yield was also from Cytrolane root zone applied plots. The application of Furadan granules comparatively increased the yields. Previous year's results showed that seedling root dip in 0.02% Dursban 20 E. C. for 12 hours followed by surface application of Cytrolane 5G and Furadan 3 G was the best treatment in controlling the stem borer incidence during the second crop season. Against gall midge, seedling root dip + Zolone 35 E. C. at the rate of 0.5 kg ai/hectare was the best effective treatment. Leaf folder was least in Furadan 3G applied plots at 4 DAT. Highest grain yield was also in the plots treated with Furadan once at 4 DAT.

Estimation of losses due to insect pests (Pattambi)

Estimation was made of the avoidable loss due to pest complex at different stages of crop growth by adopting suitable protection technique. All the treatments were equally ineffective against gall midge during the first crop season. Stem borer incidence at later stages was least with Furadan 3G (1.25 kg ai/ha) applied at 5 DAT along with Furadan 3 G applied at 30 DAT. White ear head counts at harvest indicated that broadcasting of Furadan at 60 DAT followed by spraying

with Nuvacron 40 EC at the rate of 0.5 kg ai/ha at 80 DAT was most effective. The highest yield was from the plot in which Furadan was broadcast at 30 DAT followed by spraying with Ekalux at 50 DAT followed by Furadan application at 60 DAT followed by Nuvacron spraying at 80 DAT. This showed the importance of controlling pests from the boot leaf stage till harvest.

Pest management trial (Pattambi)

This project was to test the efficacy of different methods of pest management in relation to resistant and susceptible varieties.

All the varieties tested were equally susceptible to gall midge and stem borer. The high incidence of gall midge was in the pre-scheduled management plot. White ear heads were least under pest management based on surveillance except for the variety Jaya which was more susceptible to all pests than the other varieties. Highest yield was from pest management plots during the first crop season.

The results of the second crop indicated that the varieties IR-5 and KPW 6-17 were tolerant to gall midge. The pre-scheduled management was best against incidence of gall midge and stem borer. The variety IET-5238 was found to be tolerant to stem borer attack. Highest yield was obtained from the variety Jaya in the pre-scheduled management plot followed by RPW 6-17, IET-5238 and IR-5 in the same treatments during the second crop.

Stem borer special screening (SBS)

Seventy five entries were planted during the second crop season to evaluate the resistance against stem borer incidence. A few entries were found to be tolerant to the attack of stem borer.

Biotype screening against stem borer

Twenty three test cultures were planted during the second crop season to assess the resistance against stem borer attack. Six cultures were found to yield higher than the others.

Development of rice varieties resistant to brown plant hopper (Moncompu)

A total of 148 cultures were screened in the laboratory for resistance to brown plant hopper. Twenty four lines were found to have good tolerance to the pest.

Effect of levels of pesticides on control of paddy pests and water pollution (Moncompu)

This project was to ascertain the lower dose of pesticides and understand their effect on the eco-system. All the insecticides tested were toxic to fish when applied at the field dose. The experiment is being repeated for confirmatory results.

Bait preference of different species of rats attacking paddy (Moncompu)

This project was aimed at finding out the acceptability of the different locally available bait materials to rats.

Twenty gms. each of different materials as bait (replicated four times) were placed in small earthen pots during night and arranged around the live rat burrows and consumption of materials by rats for 12 hours were determined. This was repeated for two more nights and the average consumption per night was calculated. From this, it was concluded that rats prefer lime shell flesh more. The order of preference in the case of other baits were as shown below: plantain fruit—coconut kernel—dried prawns—tapioca chips—rice—wheat.

Instead of the popular bait base—rice, lime shell flesh can be used for preparing suitable poison baits.

Population dynamics of different species of rats attacking paddy in Kuttanad (Moncompu)

Population of rats was assessed by trapping rats on three consecutive nights every month by setting sixty *Moncompu* traps on fixed trap lines. Collection during 1979-80 indicated that the highest population is on the month of June. Population is very low during March to May. Increasing levels were also seen in January and October.

It was concluded that large scale rodent control measures can be adopted when the population of rat is at the minimum i.e. from March to May.

Operational research project on integrated control of rice pests in Kuttanad (Moncompu)

The project was started with the objective of introduction and practice of integrated control of rice pests with special reference to the brown plant hopper, evaluation of the efficacy of integrated control over insecticidal control, determination and observance of economic thresholds for different pests to minimise insecticidal application and evaluation of the effect on the socio-economic conditions of rice cultivators.

The adaptive trials conducted in farmers' fields have shown the following results:

The pre-release culture M-15-36-2 recorded higher yields and showed good tolerance to rice thrips.

Soil application of 2, 4-D (sodium salt) along with urea gave effective control of weeds and has been observed as the cheapest method without loss in yields.

Mixing neemcake with urea has been found to increase rice yields.

Insecticides Fenitrothion, Dichlorovos and Carbaryl were found to give good control of rice leaf roller. Dichlorovos + Carbaryl

combination and Dimethoate sprays were the best treatments against rice thrips.

Chemical control experiments against rice sheath blight have shown that Bavistin, Benlate and Hinosan are effective in checking the disease.

Area wide demonstrations on integrated control of rice pests revealed that the expenditure on plant protection can be reduced by adopting integrated control measures.

The constraint analysis survey in the project area indicated that in the farmers' perspective, incidence of pests and disease, low cost of paddy, high cost of inputs, lack of availability of inputs and lack of credit facilities were the major constraints in the production of rice. Trials during last year also indicated similar trends.

The following conclusions can be drawn from the results:

Integrated control of rice pests is feasible in the field.

Mixing neemcake with urea can give better yields.

2,4-D can be applied in the soil along with urea for weed control.

New culture M-15-36-2 can be popularised.

Fenitrothion, Dichlorovos and Carbaryl can be recommended for rice leaf roller control.

Bavistin gives best control of sheath blight.

Dimethoate can be recommended against rice thrips.

Selection of insecticides and operation techniques for pesticides application under rice-fish multiple farming programme (Vytila)

The objective was to find out safe chemicals and methods of their application in rice fields without detriment to fish and prawn population in pakkali lands. Sevin, Monocrotophos, Metacid and Lebaycid were tested during the year. None of these chemicals was found toxic to fishes under high or low volume spraying, if spraying was done after one month of spreading of seedling and with a minimum standing water of 15 cm. depth. Out of the chemicals so far tested, only Ekalux was found toxic to fish.

Insect infestation pattern on rice crop in the Onattukara area with special reference to rice stem borer (Kayamkulam)

This project was implemented to work out a precise picture of the different insects involved, their seasonal occurrence and the factors governing their population fluctuations.

During the first crop season, 17 per cent white earheads, upto 14% silver shoots and 6 to 40% leaf roller infestation were noticed. During second crop season, the incidence of leaf roller varied from 4 to 60%, white earheads, 7 to 10 % and gall fly 2%. Whole maggot was found to be an important pest for the first crop season, their infestation being from

4 to 16%. Green leaf hopper, rice hispa and rice bugs were also observed. But their infestation was meagre. During second crop, case worm was observed to be an insect pest of importance other than stem borer, gall fly and leaf roller.

Use of insecticide granules for protection of rice crop against pests (Vellayani)

The objective was to find out an efficient insecticide in granular form with reference to dosage, frequency of application, occasion of application, water management practice and residue in straw and grain. The results indicated that Carbofuran was superior to Phorate and Mephosfolan against sucking pests of paddy. Residues of Carbofuran, Phorate and Mephosfolan when applied at tillering and boot leaf stage were below tolerance limit. It was concluded that Carbofuran can be recommended as a broad spectrum insecticide for a mixed infestation, followed by Phorate. Mephosfolan was effective against gall midge.

Nematicidal trial against H. oryza: Effects of nursery soil treatments and seedling root-dips (Vellayani)

The objective of this project was to find out the efficacy of various popular pesticides in eliminating nematode infection in paddy, by nursery soil treatments and seedling root dips. Results indicated that root infection was considerably reduced in Phenamiphos and Vapam treated plots. Maximum grain yield was obtained in this treatment. It was inferred that nursery treatment with Vapam followed by root dip in 0.2% solution of Phenamiphos for six hours will reduce rice-root nematode infection and increase the yield of paddy.

Effect of micronutrients on the incidence of Helmintho sporiasis of rice (Pattambi)

The object was to study the effect of silica, potash, manganese and magnesium on the incidence of *Helminthosporium* blight of rice. The plot which received silica, manganese and magnesium as soil application showed low disease intensity and increased grain yields during both the seasons. The next best treatment was plots which received manganese alone as soil application. During the previous year, the same result was recorded during the kharif season. Thus it is inferred that silica, manganese and magnesium when supplied through soil will decrease brown spot disease of rice thereby increasing grain yield.

Influence of potash on the incidence of rice blast: Effect of split application and time of application (Pattambi)

Study of the effect of potash application to paddy crop at different times and its split doses in controlling rice blast under protected and unprotected conditions without any change in the recommended N, P, K, dose was the objective of this trial.

A higher leaf blast infection was observed where nitrogen was applied basal. Potash, when applied half at basal and half at panicle initiation stage, recorded lowest neck-infection followed by the plots where full potash was supplied at panicle initiation stage only. During the second crop season, it was found that lowest neck infection was in plots where potash was applied in full at panicle initiation stage than application half at active tillering and half at panicle initiation.

AICRP International Rice Observational Nursery I.R.O.N (Pattambi)

World's elite germplasm was evaluated for their resistance towards different diseases and also to observe their agronomic characters.

Out of 345 entries tried, the following were found to be resistant towards all major diseases and better in their agronomic characters:

IR 7963-30-2-3, IR 7963-87-3-3,
IR 9093-270-2-1-3-1, IR 9411-5-3-3,
IR 9788-36-3, IR 9859-45-2,
IR 13415-46-2, PAU 128-1191, PR-303,
BR 51-46-5, BR 40-39-1-3, IE 76518, OVDN 342-68-2-15,
IR 8192-31-2-1-2, IR 9805-97-1,
IR 9814-14-3, IR 13146-23-3,
IR 17492-17-12-2, CR 1007 and
IR 3483-109-3-2-3.

Chemical control of blast disease of rice (Pattambi)

Evaluation of promising systemic fungicides in controlling blast disease of rice in endemic areas in plains was the objective of this study. The yield data indicated that MBC, Hinosan and Bavistin can be effectively used for blast control.

Chemical control of sheath blight disease of rice (Pattambi)

The results indicated that MBC, Bavistin and Difoltan can be recommended for the control of sheath blight disease.

Disease incidence-weather factors-epidemiological studies on important rice diseases in Kuttanad (Moncompu)

This project was undertaken to study the influence of weather factors on the incidence and severity of different diseases. Fortnightly planting with four rice varieties viz., Jaya, Joythi, T (N) 1, and M-11-57-5-1 revealed that the appearance of bacterial leaf blight in rice fields is closely dependant on meteorological factors (high humidity and scanty rains). The intensity of disease was maximum in T (N) 1 and Jyothi than in Jaya and M-11-57-5-1. Maximum sheath blight and sheath rot were noticed in Jyothi and Jaya, respectively.

During last year it was observed that appearance of bacterial leaf blight starts with continuous light showers. Dry climate or heavy rain tended to reduce the spread of the disease. T(N) 1 and Jyothi were more susceptible to bacterial leaf blight than Jaya or M-11-57-5-1. Maximum sheath blight incidence was noticed in Jyothi, while sheath rot was severe in Jaya.

Control of bacterial leaf blight of paddy (Moncompu)

The major objectives of this project were to find out an effective control measure against the disease, to evolve a variety resistant/tolerant to disease and to formulate suitable agronomic practices to check the development of the disease.

The results indicated that plots sprayed with Agrimycin @ 450 gm/ha. using a high volume spray reduced the incidence of bacterial leaf blight and produced maximum grain and straw yield. Only spacing effects were found to influence BLB incidence and yield of both straw and grain. Minimum disease score was observed in wider spacing of plants. Highest yields were recorded in medium level of spacing (15 x 15 or 20 x 10 cm). It was also found that intensity of BLB reduced slightly with decrease in levels of nitrogen or with widening of spacing.

Multilocal trials: chemical control of sheath rot of rice (Moncompu)

The objective of this study was to evaluate a few promising fungicides in controlling sheath rot of rice. The difference in sheath rot score as well as grain yield between different treatments (including control) was non-significant. However, minimum disease score and maximum grain yield were obtained from the treatments with Bavistin.

The role of soil amendments on the incidence of important rice diseases (Moncompu)

Suitability of organic and inorganic amendments in controlling soil borne diseases of rice was investigated upon. Minimum incidence of sheath blight and sheath rot was noticed in plots treated with marotti cake. Maximum grain and straw yield were recorded for the treatment with rice husk. Regarding the inorganic amendments, none of them were effective in reducing the disease. But maximum grain and straw yields were obtained from the treatments with calcium and molybdenum, respectively.

Multi-local trials on control of sheath blight of rice (Moncompu)

This project was to evaluate a few promising fungicides in controlling sheath blight disease.

Among the different treatments, Bavistin and MBC showed better results in controlling the disease as well as increasing yield. Vitavax was the next one which could reduce the disease and increase the grain yield.

Yellowing disease in rice - soil amendment trial (Kayamkulam)

This project was initiated with the objective of finding out the cause and control of the yellowing disease in the high yielding varieties of rice. During the year 1979-80, the treatment effects were not significant. During first crop season, maximum grain yield of 2539 kg/ha. was recorded by treatment where farm yard manure was given, which was sufficient.

Earhead disease complex of rice (Kayamkulam)

During both 1st crop and 2nd crop seasons, the treatments were not significant for any of the characters studied. During the 1st crop season, maximum grain yield was recorded by the plots treated with Furadan, Ekalux and Bavistin. For the second crop season, plots treated with Ekalux alone recorded maximum grain yield. During the previous year during the 1st crop season, maximum yield was recorded by Furadan-Ekalux followed by Ekalux alone.

Studies on sheath blight of paddy (Vellayani)

This experiment aimed at controlling the severity of the disease by the application of fungicides, nematicides and micronutrients. During this year, soil application of zinc and manganese at 10 kg. each per hectare was found superior to all other treatments. Foliar application of zinc and manganese at 5 kg each/ha, soil application of manganese at 10 kg/ha, and foliar application of zinc at 5 kg/ha were on par.

In the second experiment, no level of a single factor treatment was found as a significantly good treatment but only interaction effect of NK ratios, nematicides and fungicides showed significantly different variations in controlling the disease.

In the third experiment, Vitavax spray was found as a superior treatment along with Thiride and Benthiocarb.

*Strain variation in *Rhizoctonia solani* (Kuhn) in gaining importance as a major pathogen of rice causing sheath blight disease (Vellayani)*

This study was conducted to determine the variation among isolates of *Rhizoctonia solani* from rice and also from its collateral hosts.

Isolates of *Rhizoctonia solani* from cowpea, daincha, betel vine, *Stylosanthus humulis*, carrot, colocasia, *Sporobolus diander* and *Vinca* (all from Vellayani), guinea grass (from Trivandrum), rice (from Adoor, Karamana, Moncompu), leaf isolates (from Vellayani), groundnut web blight (from Kayamkulam) were maintained in pure culture.

*Role of the rice root nematode (*Hirschmaniella oryzae*) in enhancing the incidence of sheath blight disease of rice in Kerala (Vellayani)*

The aim of the study was to assess the incidence of rice root nematode in Kerala and its role in enhancing the severity of the sheath blight disease caused by *Thanaphorus cucumeria*. The effects of fungicides and soil fertilization were found to be significant. There was no significant effect of nematicidal seedling dip on the disease intensity. The

treatment, fungicide+soil fertilization and nematicide was significantly effective. The two factors acted independently of each other. Treatments, Vitavax and Fycap were on par and superior to all other treatments.

Studies on the toxin production by Corticium sasakii: role in the development of the disease (Vellayani)

The different isolates of *Corticium-sasakii* were collected, isolated and purified. It was found that pathogen produced maximum growth on potato dextrose agar medium.

Symptomatology, etiology, and control of sheath rot disease of rice (Vellayani)

The project was to study the disease in detail so as to collect information on the various aspects of the disease and to evolve an economic schedule of operations for the control of the disease. Hinosan was most effective in controlling this disease under field conditions. Vitavax and Dithane, Z-78 were second and third. The morphological and physiological studies on the organism are being carried out.

Bacterial leaf blight of rice—studies on pathogenic variability, screening for disease resistance and chemical control (Vellayani)

A pure culture of the organism was obtained and it was purified periodically and tested for the pathogenicity and maintained. *In vitro* screening of six antibiotics—Agrimycin-100, Streptomycin, Streptocyclin, Penicillin, Terramycin, and Chloramphenicol was done using the standard filter paper disc method. It was found that Terramycin 250 ppm gave maximum *in vivo* sensitivity against the bacterium. Survival of the pathogen in seed and infected plant debris was examined. Isolation studies in seeds from infected plants showed that the pathogen is both internally and externally seed borne. Repeated attempts to isolate bacteriophage of the pathogen were not successful.

Etiology and control of bacterial leaf blight of rice caused by Xanthomonas oryzae (Hyedo Ishiyana) Dowson (Vellayani)

The project was conducted to gather basic information with regard to this disease in our State. The pathogen was isolated from infected paddy leaves. It has been found to be Gram negative. Fifty paddy varieties from Rice Research Station, Pattambi were screened for resistance against the disease. The plants were artificially inoculated and the disease was scored using the score chart developed by IRRI.

Chemical control of udbatta disease of rice (Ambalavayal)

The objective was to study the life cycle, mode of infection, collateral hosts and the control measures of this disease. Results of the study indicated that artificial inoculation was ineffective in bringing about disease symptoms and also that the pathogen is internally seed borne. It was

observed in all the three experimental varieties that the incidence of disease was very negligible and hence the experiment on chemical control as planned could not be laid out.

During the previous year, among the fungicides tried Bavistin (1%) had significantly reduced the disease, followed by Aureofungin sol and Kitazin. The least effective was Benlate. None of the varieties tested showed the symptoms of the disease indicating that the pathogen is internally seed borne.

2 COCONUT, ARECANUT AND OILPALM

COCONUT

CONCLUDED PROJECTS

Plant protection

Project for control of leaf rot disease of coconut (College of Agriculture, Vellayani)

The experiment was laid out on 56 coconut palms mildly infected by leaf rot disease at the Rice Research Station, Kayamkulam. The treatments were FM spray and Bordeaux mixture applied thrice, six times, and 12 times an year. One kilogram of FM spray was diluted in 25 litres of water and sprayed over the foliage. In the case of Bordeaux mixture, one percent formulation was tried at the rate of two litres per tree. The result showed that there was no significant difference between the treatments, over all the months taken together. However, significant difference was observed when the different periods were considered separately. All the treatments except FM spray; thrice an year and the control were effective.

Effect of application of sodium chloride in the leaf axil of coconut palms on the control of Oryctes rhinocerus (Pilicode)

There was no significant reduction in the attack of rhinoceros beetle as a result of application of sodium chloride in the leaf axil of coconut palms. This confirmed previous year's findings.

Rodent control in coconut garden (Pilicode)

Acceptance of 'ratobar' cake and 'ratafin' concentrates mixed with rice grain flour by rats was confirmed.

Studies on the role of bacteria in immature button shedding (Pilicode)

No pathogenic bacteria could be isolated from shed buttons which confirmed the previous year's observations.

Studies to investigate and to identify the causal organisms responsible for immature button shedding in coconut (Pilicode)

In most cases of shed buttons, the presence of *Phytophthora palmivora* was observed, while in a few cases *Colletotrichum* was observed.

ON-GOING PROJECTS

(i) Crop improvement

Pre-potency studies in west coast tall (Pilicode)

The project aimed at identifying prepotent (high yielding) parent palms for seed nut collection and working out the standards for selection of such prepotent parents and their progenies. Parent trees bearing numbers 19, 36,78 and 54 identified as pre-potent palms, produced high yielding progenies during the period.

Study of "off" types of different dwarf varieties (Pilicode)

The objective of this project was to study the performance of the off types of some dwarf varieties-Laccadive Dwarf, Chowghat Dwarf Yellow, Strait Settlement, Niyurgading, Chowghat Dwarf Green and Chowghat Dwarf Orange. Progenies of Strait Settlement and Chowghat Dwarf Green showed maximum vigour of growth.

Second generation selfed and sibmated progenies (Pilicode)

The selfed and sibmated progenies of six grand parents were planted in 1961 and the yield of nuts from each group recorded. The sibmated progenies of all parents except 1/109 B showed increased yield over selfed progenies. In the case of 1/109 B, the selfed progenies gave more yield than the sibmated progenies

Utilisation of existing germplasm and description of varieties (All India Co-ordinated Coconut and Arecanut Improvement Project, Pilicode)

The objectives are the evaluation of exotic and indigenous cultivars available in the Station, and description of the morphological characters of each variety. Replicated trials with promising types also are envisaged. The work is in progress.

Production of new cross combinations AICC & AIP, (Pilicode)

The per unit productivity of coconut is aimed to be increased by isolating the most compatible and productive hybrids. During the year, hybrids involving four parental combinations ie. West coast Tall x Chowghat Dwarf Orange, West Coast Tall x Laccadive Dwarf, West Coast Tall x Gangabondam and West coast Tall x Malayan Dwarf Yellow were produced at the Station.

Trial of promising seed material (AICC & AIP, Pilicode)

The objectives were to conduct field trials to isolate superior types and hybrids, to compare the performance of the promising exotic types and hybrids with West Coast Tall, and to isolate the most promising types and hybrids which ensure the highest net return per unit area of land. The trial is in progress.

Exploitation of hybrid vigour (Evaluation of tall x different dwarfs) (AICC & AIP, Pilicode)

The trial was planted in 1973 with a view to studying the performance of different hybrids involving 15 parental combinations of

tall and dwarf and to compare them with the West Coast Tall to elucidate the extent of heterosis and precocity in different combinations. Almost all palms in the hybrids have flowered. The study is in progress.

Progeny row trial (Balaramapuram)

The trial aims at making comparison in the performance and yield between progenies of T x D and T x GB. T x D seedlings flowered earlier than those of T x GB. The general performance of T x D progeny was better than that of T x GB. The average yield recorded was 86.2 and 73.9 nuts/year/tree for T x D and T x GB, respectively.

Evolving high yielding varieties which are tolerant/resistant to different pests and diseases (KADP, Vellanikkara)

Hybrids from 11 cross combinations were planted on 6.7.1979 at Vellanikkara.

Fixing up selection criteria for hybrid coconut seedlings at nursery stage (KADP, Vellanikkara)

Total number of 389 WCT x CDO and 357 WCT x Gangabondam hybrids in 73 and 72 parental combinations respectively were planted during the previous year. Growth measurements of seedlings were recorded.

Determination of pre-potency of hybrid coconuts to produce high yielding progenies (KADP, Vellanikkara)

The experiment is intended to identify pre-potent T x D palms so as to collect seednuts from such palms for multiplication and propagation. The study is in progress.

Assessment of combining ability of coconuts (KADP, Vellanikkara)

Selection of dwarf coconut palms having high general and specific combining ability is aimed at. Sixteen west coast tall palms have been selected at the Coconut Research Station, Pilicode and each bunch in each palm pollinated with pollen collected from different dwarf palms. The nuts obtained from each combination have been separately collected for further studies.

Effect of chemicals on the setting of nuts in coconut (Vellayani)

This project was designed to study the effect of different nutrients and chemical substances on the setting of female flowers and thus influencing the number of mature nuts harvested. This work is in progress.

Studies on Coconut germplasm (College of Horticulture, Vellanikkara)

This project was started to find out the high yielding cultivars of coconut suitable for large scale cultivation in Kerala. So far 12 extoic varieties and 22 hybrids of various combinations have been planted in the Instructional Farm.

Variability studies in the seedling progenies of T x D coconut hybrids (College of Horticulture, Vellanikkara)

The objective is to conduct studies of the F1 progenies. With the parameters already fixed for correlating seedling characters with adult palm yield, the possibility of utilising the open pollinated seed nuts of Tx D for further multiplication will be explored.

General relative tolerance of hybrid varieties of coconut to diseases (Moncompu)

The project is aimed at studying the relative tolerance of different hybrid varieties of coconut to root wilt, leaf rot and bud rot. Study showed that minimum root wilt incidence was in the crosses T x LD and T x D. High survival percentage was observed in the cross YD x LO.

Performance and disease resistance studies of coconut hybrids (vyttila)

This project was to study the growth, performance and disease resistance of important coconut hybrids and cultures under disease stress conditions at Vyttila. The experiment with nine treatments and 10 replications was started in the year 1978-79. The treatments are coconut varieties- T x D, D x T, LO x G, T x YD, T x NCD, WCT, LO, A O and CC/A G. This work is in progress.

(ii) Crop management

Simple fertilizer trials in cultivators fields (Pilicode)

The object of the trial is to fix an economic level of fertilizer dose for coconut under irrigated and rainfed conditions in different soil types in Kerala so as to ensure a reasonable margin of profit to the cultivators. The trial was started in 1976 in 16 cultivators fields at Pilicode and Nileswar. By the end of 1979, the yield increase was 72.8 percent in the highest level of fertilization (cultivators practice + 500 g. N + 320 g. P + 1200 g. K) over pre-treatment yield at Pilicode. The yield increase in treatment 1 (cultivators practice + 340 g. N + 170 g. P + 680 g. K) were 20.0 and 19.8 percent, respectively. This indicated that higher level of fertilization is necessary for increase in yield in the laterite soils.

Simple fertilizer trial in cultivators field (Balaramapuram)

The experiment was started in 1976. The treatments consisted of T1—cultivators' practice (25 kg. farm yard manure or compost + 10kg. ash/tree/year), T2—cultivators' practice + 340 gm. N + 170 gm. P_2O_5 + 680 gm. K_2O /palm/year and T3—cultivators' practice + 500 gm N + 340 gm. P_2O_5 + 1200 gm. K_2O /palm/year. Continuous application of manure in the same plot for three years increased yield in T1 and T2. T2 plot gave an average increase in yield of 130% after three years, while T1 gave increase of 122%.

Simple fertilizer trial in cultivator's field (Kumarakom)

There was no increase in yield of nuts due to the treatments. The root (wilt) disease intensity increased in all the treatments compared to pretreatment observations. During the year under report, the disease intensity further increased. Drastic reduction in yield of nuts was observed.

Simple fertilizer trial in coconut (Kayamkulam)

There was increase of 24% yield over the cultivators' practices in trees applied with higher dose of fertilizers (NPK @ 0.50: 0.32: 1.20 kg + 25kg. green leaf or compost/tree) Treatment receiving lower dose of fertilizers recorded 10% increase over cultivators' practice.

During the previous year also, higher dose of fertilizers, green leaf or compost recorded significantly higher yield. It can be concluded that 25 kg. cattle manure or compost and higher dose of NPK 0.50: 0.32: 1.20. kg. per tree gave increased yield in sandy loam soils of Onattukkara.

Nutritional studies in coconut-II: Simple fertilizer trials in cultivators field under different soil types in irrigated and rainfed conditions (KADP, Vellanikkara)

The trial has been laid out in two gardens in Calicut District. The experiment is in progress.

Nutritional studies in coconut-I: The effect of micronutrients on the yield, growth and disease resistance in coconut (KADP, Vellanikkara)

The experiment is conducted on four-year old Lacadive Ordinary palms planted at the main campus, Vellanikkara. Experiment is in progress.

Effect of NPK levels and frequency of application on the yield and bearing habit of T x D hybrids (Pillicode)

The object of this experiment is to assess whether the yield potential of T x D can be increased further and the alternate bearing tendency reduced by heavy doses of split application of fertilizers. Confirmatory results have obtained during two consecutive years. The experiment will be concluded.

NPK fertilizer trial in laterite soil types (AICC & AIP, Pillicode)

The object of the trial is to fix an economic optimal dose of NPK for coconut in laterite soils of west coast under rainfed conditions. The seedlings receiving 0.5 kg. N, 0.5 kg. P and 1.25 kg K/year recorded the maximum collar girth, height, number of functional leaves and total leaves. This is in conformity with the previous years' results.

NPK fertilizer trial starting from young palms (Balaramapuram)

The object of the study is to find the response of palms (from seedling stage) to the application of N, P and K at different levels.

The experiment was started in 1964. Application of 680 gm N/tree/year produced the highest yield (6640 nuts/ha/year). This was folio-

wed by 340 gm. N (producing 4570 nuts/ha/year). Application of 225 gm. of P/tree/year resulted in the production of 5386 nuts/ha. Highest dose of P applied (450 gm) had a depressing effect on the production of nuts. The depressing effect of P was observed in previous years also. Hence, it is not advisable to apply more than 225 gm. P_2O_5 /tree/year in typical red loam soils. Application of 900 gm. K_2O gave the highest yield of 6585 nuts/ha. It was on par with applying 450 gm K_2O producing 5256 nuts/ha. All the three major nutrients N, P and K had almost the same effect on the setting percentage of nuts.

Spacing-cum-manurial trial (Balaramapuram)

This experiment was designed to study the effect of different levels of spacing and fertilizer on the growth and productivity of coconut. This was started in 1964. It was found that application of 680 g N + 450 g P + 900 g K tree/year produced 12088 nuts/ha. This was significantly superior to the other treatments. In the spacing treatments, 7.5 x 7.5 m. gave yield of 8497 nuts/ha.

Effect of sodium chloride with and without potassic fertilizers on growth and yield of coconut grown on laterite soils (College of Horticulture, Vellanikkara)

The effect of sodium chloride on growth and yield of coconut palms grown on laterite soils is being investigated. This experiment was started in 1976. The data collected so far indicated that 25 percent replacement of K_2O , closely followed by 50 percent replacement, by sodium chloride (on chemical equivalent basis) had favourable effect on the yield of nuts. This trial is in progress.

Response of D x T hybrids to common salt application from young stage onwards (Pilicode)

The object of this experiment is to find out the effect of applying common salt on the performance of coconut palms and also to find out whether common salt can act as a substitute for potassium in the nutrition of coconut. The experiment was started in 1976 with D x T hybrid seedlings. The seedlings receiving 250 g of Na_2O + 750 g. K_2O per year exhibited maximum vigour and vegetative growth.

Common salt as a substitute for potash in the nutrition of adult coconut palms (Pilicode)

This trial was started utilising bearing coconut palms to find out the effect of common salt on their yield performance. Increase in setting percentage and nut production as a result of common salt application was observed.

Nutrition through leaf axil in diseased and healthy palms (Kumarakom)

Assessment of the relative efficiency of soil Vs leaf axil application of the major nutrients on the performance and yield of adult palms in diseased and healthy conditions was the objective. Leaf axil application

of major nutrients at the dose applied was found to be not congenial for the palms.

Foliar diagnosis in coconut in relation to NP & K (Vellanikkara)

This project is to develop foliar diagnosis techniques in coconut in relation to N,P and K and to study the effect of graded doses of N & K on yield and uptake of nutrients in coconut. Leaf samples collected from the first to the last leaf of coconut palms receiving varying doses of N, P and K are being analysed for standardising the leaf position for foliar diagnosis in relation to N, P and K. A field experiment with three levels each of N, P and K laid out in confounded factorial design at the Coconut Research Station, Balaramapuram is made use of for this study. The yield and pattern of nutrient uptake in relation to the graded doses of N, P and K are also being studied.

Nutritional-cum-water requirement studies on T x D coconuts (Pattambi)

This project was to study the performance of T x D coconuts under different levels of fertilizer and water management. This work is in progress.

Response of irrigation water use efficiency and cost benefit ratio under limited and ample supply of water (K A D P, Vellanikkara)

The experiment is conducted at the RRS, Pattambi to study the nutritional-cum-water requirement of T x D from the seedling stage onwards. The trial garden was planted in 1979. The experiment is in progress.

Management practices for coconut in newly reclaimed sandy soil (Kayamkulam)

The objective of this project was to evolve a suitable package of management practices for coconut in newly reclaimed sandy area.

Application of NPK @ 0.50:0.32:1.20 kg and 25 kg cattle manure per tree per annum applied in addition to the local cultivators practices recorded 28.4% increase in yield over the local practices.

During the previous year also, the same treatment showed maximum yield. The yield was over 30% than in the local practice. The results indicated that higher dose of fertilizers in combination with cattle manure is more effective in maintaining the fertility of newly reclaimed sandy soils for coconut.

Effect of leaf cutting on the productivity of coconut palms (Pilicode)

The experiment was started in 1977 with a view to finding out the effect of removing of certain number of leaves on the productivity of palms. The experiment is in progress.

Effect of tapping on the yield of uneconomic coconut palms under irrigated and rainfed conditions (Pilicode)

The experiment was started in 1976 with the object of finding out

whether tapping will improve the yield of nuts from uneconomic palms. Yield data prior to tapping and after completion of tapping was recorded. The experiment is in progress.

Intercropping coconut gardens with different varieties of banana (Pilicode)

Banana varieties Robusta, Nendran, Njalipoovan, Palayamkodan and Dwarf Cavendish were planted at Pilicode and Nileswar in October 1979. The experiment is in progress.

Intercropping Coconut gardens with various annual crops (Pilicode)

Two successive year's results indicated that out of the six annual crops raised in coconut gardens, tapioca, ginger, turmeric and elephant foot yam were more remunerative than sweet potato and colocasia.

Intercropping trial of tree spices in coconut garden grown under bund systems. (Kumarakom)

The experiment was laid out to study the performance of coconut trees, cocoa and tree spices like nutmeg, clove and cinnamon grown as mixed stand. Cinnamon and cocoa comes up well in the reclaimed soil.

Trial cultivation of fodder suitable for cultivation as intercrop of coconut (Kumarakom)

The object was to find out the variety of fodder suitable for cultivation as intercrop in coconut. Hybrid napier was found suitable in coconut gardens. Work is in progress.

Studies on the suitability of annual crops as intercrops in coconut gardens (Kumarakom)

To study the suitability of annual crops as intercrops in coconut garden in relation to its economics, the experiment was laid out. Out of the various annual crops tried, elephant foot yam gave the maximum yield, followed by turmeric.

Trial cultivation of banana as an intercrop in coconut garden (Kumarakom)

The object was to find out the variety of banana suitable for cultivation as an intercrop in coconut garden. The experiment is in progress.

Performance of pepper varieties in multi-storied cropping

The project aimed at finding out the most suitable pepper variety in multi-storied cropping programme in coconut gardens. Panniyur-1, Karimunda, Balankotta, Kalluvally, Kottanadan and Narayakodi were tried in the experiment. Panniyur-1 registered the highest yield, followed by Karimunda during two consecutive years. Both these varieties seem to be well adapted for growing in coconut gardens.

Effect of raising cocoa as an intercrop in adult coconut plantation (Pilicode)

The object of the experiment is to find out the effect of raising cocoa as an intercrop on yield and bearing habit of coconut and to study the performance of cocoa in different systems of planting. The result of this experiment for two successive years indicated that there was no reduction in coconut yield as a result of interplanting cocoa in coconut gardens. The mean cocoa yield in double row planting was 637.3 pods while it was 461.2 pods in single row planting.

(iii) Plant Protection

Chemical control of cockchafer beetle (Pilicode)

An effective and cheap chemical for the control of cockchafer grubs is being sought for.

Application of chlordane 10% at the rate of 60kg/ha. in two equal doses at an interval of 45 days was found effective.

Corid bugs attacking coconut palms in the southern parts of Kerala-identification, biology and control measures (Balaramapuram)

All the stages of the pests have been collected from the field from alternate hosts (guava) and successfully reared in the laboratory. The pest was identified as *Paradasynus rostratus* at C. P. C. R. I. Kayamkulam. The biology of the pest was worked out in detail. Three egg parasites have been collected and the same sent for identification.

Studies on the sex ratio regulation in B. Brevicornis (KADP, Vellanikkara)

The object of this experiment is to identify the factors regulating the sex ratio of *Bracon brevicornis* and to evaluate their relative importance thereby to standardise laboratory rearing techniques to ensure optimum sex ratio in successive generations. The study revealed that the maximum fecundity of the parasite was registered consistently in all the three TH levels at a host density of 2 larvae/host. The influence of host larval density on the proportion of females were pronounced at TH 3 level and the density of larvae/female was found to be better.

Studies on the temperature/humidity tolerance of the Bethyloid parasite, Perisierola nephantidis

It has been reported that the field recovery of the Bethyloid parasite in the west coast is unsatisfactory.

Studies on the evaluation of the Tachinid parasite (Spoggossia bezziana) in endemic areas (KADP, Vellanikkara)

The study is to ascertain the relative influence of *Spoggossia bezziana* as a biological control agent against *Nephantis serinopa*. The culture is not available in India. Action has been taken to import the same from Sri Lanka.

Biological control of rhinoceros beetle (Oryctes rhinoceros)
(KADP, Vellanikkara)

The experiment is intended to evaluate the biological control agents against rhinoceros beetles and to formulate specific recommendations. The study is in progress.

Survey of microbial pathogens of the red palm weevil (Rhyncophorus ferruginus) in endemic areas of the State (KADP, Vellanikkara)

The experiment is to ascertain whether microbial pathogens associated with grubs and pupae of the weevil and to explore the feasibility of their mass culture and utilisation in pest management. The studies are in progress

Effect of soil insecticides on the pupating grubs of rhinoceros beetle (Vellayani)

Aldrin and BHC were applied in soil under manure pits taken in field up to a depth of 9'. Twenty grubs each were liberated per pit. The net emergence of adults from these pits have shown that the treatment reduces breeding and hence may be adopted as a measure to control the population build up of the pest.

Studies on root (wilt) disease of coconut (Kayamkulam)

The project was initiated to rejuvenate the declining root (wilt) affected palms by inducing fresh root development by providing proper environment. The project has been started during the year.

Studies on the leaf rot disease of coconut (Vellayani)

The effectiveness of insecticides in controlling this disease is being assessed through this project. All organisms associated with the leaf rot disease viz. *Bipolaris* sp. *Gloeosporium* sp. and *Diplodia* sp. are weak parasites. The most important among these, *Bipolaris* sp. could not cause infection on trees in a healthy area. It appears possible that insects may be primarily responsible for causing physical injury to the leaves and the infection by micro-organisms may be secondary.

Studies on stem bleeding disease of coconut (Pilicode)

The pathogenicity was studied. The organisms isolated were species of *Penicillium*, *Aspergillus* and *Trichoderma*. However, inoculation with these fungi did not produce disease symptoms

Symptomatology studies revealed that palms of 13 years age or more are affected by the disease. Under laterite soil conditions, palms of higher yield group are more prone to the disease. Root decay and necrosis, discolouration of leaf petioles and necrosis of bud portion were observed. Disease symptoms appear in October to December in laterite soils and in February—March in sandy soils. Work is in progress.

Microbial deterioration of copra (Vellayani)

Causes of deterioration were investigated to evolve suitable methods for controlling deterioration.

Periodical isolation of micro-organisms, showed that high relative humidity in the atmosphere is the major cause for the deterioration of copra. Microorganisms isolated were *A. niger*, *A. ochraceous*, *A. funigatus*, *P. cetriviride*, *Mucor sp.*, *Fusarium sp.*, and *Botryodiplodia sp.* Study on the estimation of aflatoxin in coconut oil is in progress.

OIL PALM

Nutritional requirement of oil palm (Vellayani)

NPK, calcium and magnesium requirements of oil palm were studied. The effects of these nutrients on the growth characters and yield of oil palm were also investigated. During the year, the field work has been completed. Further work is in progress.

3 SPICES, COCOA AND OTHER BEVERAGE CROPS

PEPPER

CONCLUDED PROJECTS

Symptomatological studies on quick wilt disease of pepper (Pepper Research Scheme, Vellanikkara)

Phytophthora palmivora causing quick wilt of pepper was isolated and studied in culture and host tissues. The sexual reproductive organs were not formed either in culture or in host tissues.

Detailed symptomatology were described on leaves, stems and branches as well as on roots.

Among the seven fungicides tested, four namely Bordeaux mixture, Agallol, Bayer 5372 and Thiride were effective in completely checking the growth of the fungus. All the fungicides when sprayed or drenched two hours before inoculation completely checked the development of the disease.

The results clearly indicated that, in general, fungicides were more effective when they were drenched in the soil compared to when they were sprayed on to the aerial parts.

None of the fungicides were effective in eradicating the established infection when they were sprayed one or two days after inoculation on leaves. But Bayer 5872 checked the growth of the lesion considerably. It is concluded therefore that emphasis should be given in taking prophylactic measures to control the disease.

*Investigation on the interaction of nematodes infesting black pepper vine (*Piper nigrum* L.) and the fungus *Fusarium* sp.*

The studies indicated that two nematodes *M. incognita* and *R. similis* pre-disposed plants to the attack of the fungus. The control of the nematodes will help in controlling the slow wilt disease of pepper.

ON-GOING PROJECTS

(i) Crop improvement

Hybridization and selection in pepper (Panniyur)

Among the hybrid and open pollinated seedlings planted, 188 seedlings flowered and were harvested during 1979-80. Based on the morphological, sexual and yield characters 56 promising cultures were selected for multiplication and for further evaluation. 15 cultures were already planted under P. Y. T. during August, 1979. Cuttings of the remaining seedlings were raised in the nursery for planting during 1980-81 season.

From the hybridization programme during 1979-80, 312 hybrid seeds were obtained from eight parental combinations. The hybrid seeds and the open pollinated seeds collected from different varieties in the germplasm collection were sown in the nursery. A total of 15922 seeds were sown during February-March, 1980.

Germplasm collection and screening of pepper varieties (Panniyur)

The germplasm collection of 105 cultivars and wild types were maintained. Morphological and yield characters were recorded. The yield data of 57 varieties for the last 19 years revealed that the performance of the varieties like cheriyakaniyakandan, Kumbhakodi and Kuthiravaly are better than that of the other varieties. The yield performance after a period of 10 year's regular bearing shows a declining trend in most of the varieties. However, a Malabar variety Kalluvally P. T. B. showed an increasing trend in yield after 10 years.

Collection and maintenance of a germplasm bank of Piper spp. (Pepper Research Scheme, Vellanikkara)

A total of 176 *Piper* types have been collected (102 cultivars and 74 wild types) from four southern districts of Kerala. During the year, 33 wild types were added. One collection (No. 84) Thevarmundi, exhibited good morphological characters and yield for the last two years. This was put in PYT with Panniyur-1 and other popular varieties.

Screening of hybrid and open pollinated seedlings for evolving a disease resistant and high yielding variety (Pepper Research Scheme, Vellanikkara)

One hundred and forty four hybrid and open pollinated seedlings evolved at the Pepper Research Station, Panniyur were planted in 1976. Work on evolving a rapid and efficient technique for screening large number of seedlings has been started.

Morphological studies on pepper varieties (Panniyur)

Detailed studies on the vegetative, sexual and yield characters of the established varieties in the germplasm collection was continued during the year. Studies on 11 varieties were completed.

Comparative yield trial of pepper varieties (Panniyur)

The yield data clearly indicated that Panniyur-1 hybrid gave better yield compared to other varieties. Though Arakulam Munda was second to Panniyur-1 during the last three years, the average number of spikes produced per plant was higher than in Panniyur-1 during 1979-80. Kuthiravally gave higher yield during 1979-80 than Arakulam Munda. After attaining regular bearing stage, Kuthiravally may perform better than Arakulam Munda.

Varietal trial on pepper (Pepper Research Scheme, Vellanikkara)

Panniyur-1 is being compared with Karimunda, Kalluvally, Kottanadan, Narayakodi and Cheriya kaniyakadan, all collected from their respective home tracts. Planting was done in 1977. Narayakodi, Panniyur-1 and Kottanadan, in that order, were the top three during 1979, while Kottanadan, Panniyur-1 and Narayakodi, in that order, topped the list, in 1980.

Varietal trial of pepper in coconut gardens (Panniyur)

Six important varieties of pepper viz., Panniyur-1, Karimunda, Balankotta, Kalluvally, Kottanadan and Narayakodi were grown in a coconut garden at the Coconut Research Station, Nilaswar. From the results obtained so far, variety Karimunda ranked first in the number of plants flowered, total number of spikes produced and yield of pepper, followed by Panniyur-1.

ii) Crop management

Fertiliser trial on local varieties of pepper (Panniyur)

The objective of the experiment is to find out the manurial requirement of two local popular varieties of pepper viz., Karimunda and Arakulam Munda. The levels of nutrients tried were N-50, 100 and 150 g; P_2O_5 -25, 50 and 75 g, and K_2O -100, 150 and 200 g. per plant per year. All the fertilisers were applied in two equal split doses. The experiment was started only in 1978-'79 and results are expected only after continuing it for some more time.

NPK trial on Panniyur-1 variety of pepper (Panniyur)

The experiment was started in 1975-'76. Three levels (50, 100 and 150 g. per plant per-year) each of N, P and K were tried.

The results are not yet conclusive; but the trend of the data so far collected gave an indication that 50 g. nitrogen, 100 g. phosphorus and 150 g. potash per plant per year may turn out to be the best treatment combination. An interesting phenomenon observed was the effect of the nutrients on spike shedding. During normal years, when the mean percentage of spike shedding was less than fifteen, none of the nutrients had any effect on the intensity of spike shedding. But during 1979-'80, when there was an abnormal shedding of spikes from all plants just before maturing, plants which received 150 g. potash per year recorded a

significantly low percentage of spike shedding. This observation requires confirmation by further studies.

Micronutrient trials on pepper (KADP)

A 4³ factorial experiment with 64 treatment combinations and two replications was laid out in September 1979. The micronutrients are zinc, copper, manganese and boron at three levels 0.25, 0.50 and 1.00 per cent as foliar spray. There will be a control also. Spraying will be done twice in a year. Calcium and magnesium will be given as basal dose, in addition to NPK at 100, 40 and 140 g per vine.

Fertilizer-cum-standards trial on pepper (Pepper Res. Scheme, Vellanikkara)

Living standards (*Erythrina indica*) were compared with dead standards (teak poles). Nutritional requirements are also being worked out in relation to standards used. Dead standards were found to be superior to the living ones in terms of vine growth and yield. Split application of fertilizers was better than single application.

Spacing-cum-standard-cum-varietal trial on pepper (KADP)

A field trial in split-plot design having 18 treatments and four replications was laid out in July 1979. There are three types of standards (dead wood posts of teak, *Erythrina indica* and *Garuga pinnata*, three spacings (2m x 2m, 2.5m x 2.5m and 3m x 3m) and two varieties (Panniyur-1 and Karimunda).

Effect of mulching with different materials (Panniyur)

The trial was started in 1977-'78 with the object of finding out the best material for mulching of the basins of pepper plants during summer months. The experiment was started on three-year old plants. Though the results are not conclusive, the data showed that there was a more or less steady increase in the yield of plants receiving saw dust, coconut husk, arecanut husk and dry leaves, whereas in the control plants and those mulched with plastic sheets, this was not the case.

Cultural trial in pepper (Pepper Research Scheme, Vellanikkara)

Preliminary data collected during 1979 gave indications that "digging whole garden twice an year" was better. However during 1980, "digging one metre around the plants and sickle weeding the rest of the area once an year" was better. The experiment is in progress.

Standardisation of pruning technique in bearing pepper vines (KADP)

A field trial in split plot design with 25 treatments was laid out on 19.8.1978. The main plot treatments are pruning at monthly intervals (during the months of January, February, March, April and May). The sub-plot treatments are control (no pruning, pruning 25 per cent of the laterals—removing the old growth retaining a specific length of the lateral), pruning 50 per cent of the laterals, pruning 75 per cent of the laterals and pruning 100 per cent of the laterals.

There were four replications and six plants/plot. During the year, the plants were maintained adopting recommended package of practices. As the plants have not yet attained the bearing stage, the treatments as per the schedule have not yet commenced.

Standardization of training and pruning of young pepper vines (KADP)

A field trial in R. B. D. with five treatments and five replications using Panniyur-1 variety of pepper was planted in September 1978. The treatments are (a) usual training allowing the vine to grow to 6 m. height, (b) lowering the vine during the second year and allowing the development of more number of shoots, (c) as in 'b' + pruning the shoots in second year, (d) removal of terminal shoots six months after planting and thereafter at intervals of six months and (e) pruning as in 'c' + pruning the secondary branches to develop tertiary branches. The treatments will be commenced soon after the establishment of the vines.

Studies on intercropping in pepper gardens (panniyur)

The data indicated that there was a steady decrease in the yield of intercrops except elephant foot yam. During the third year, there was a reduction in the yield of pepper in plots interplanted with banana. In all the other treatments, there was a steady increase in the yield of pepper and yield from these plots were superior than that from control. From these facts, it seems that banana is not a suitable intercrop for pepper, Elephant foot yam, colocasia, ginger and turmeric can be advantageously intercropped in pepper gardens, provided that the same crop is not planted over and again in the same plot. This will increase the yield of pepper and bring an additional income to the farmer.

Studies on the influence of type of planting materials on the growth habit and yield of pepper (Panniyur)

The results are not yet conclusive. But taking all aspects in to consideration, it seemed that the middle 1/3rd portion of the runner shoots was the best planting material followed by the top 1/3rd of runners.

Nutrient uptake and oleoresin content in pepper (Panniyur)

The trial envisages the estimation of the quantities of major nutrients absorbed by the plants when graded dose of fertilizers was applied. The effect of the nutrients on the oleoresin content of the berries is also to be estimated.

Trials with growth regulators (Panniyur)

Previous trials conducted at the Station have shown that application of plant hormones like NAA increases the berry size and weight, resulting in increased weight of mature spikes. During the year under report, the trial was continued with different doses of selected plant hormones to fix up the best chemical and its optimum dose. NAA 100

ppm and 2,4-D 100 ppm were found to be the best treatments. In another trial, dipping the basal portion of the cuttings in 1000 ppm IBA for 45 seconds was found to promote root formation and development.

Studies on spike shedding in pepper (Panniyur)

Under this experiment, percentage of spike shedding was observed and recorded from plants receiving different fertilizer doses, cultural treatments and plant protection measures. One result obtained from these studies was that application of potash @ 150 g/plant per year significantly reduced the percentage of shedding. This effect was observed only during one year (1979-80) and requires confirmation by further studies. Mulching the basins of plants at the onset of the dry period seems to be effective in controlling spike shedding in pepper.

(iii) Plant Protection

Trial on pepper pollu beetle with Ekalux E. C. 25 (Panniyur)

A trial was conducted with different doses of Ekalux E. C. 25. Two applications of the insecticide were given at the berry setting stage. The spray solutions were applied at the rate of one litre/plant. The experiment shows that application of Ekalux E. C. 25 at 0.1% concentration (0.025% Quinalphos) two times an year, one at the time of berry setting (July-August) and the second 30-35 days afterwards (September-October) will effectively control pollu attack on pepper.

Field trial for the control of quick wilt (Foot rot) disease of pepper

Considering all the data together, it can be concluded that one pre-monsoon pasting with 10% Bordeaux mixture coupled with at least one foliar spray (1% B. M.) is the minimum plant protection schedule for controlling the quick wilt disease of pepper. But as the climate, especially the intensity and distribution of rainfall, may vary from place to place and year after year, it will be safe to recommend two foliar applications of the fungicides in May-June and July-August or even a third spraying in September-October along with the pre-monsoon pasting.

Studies on the ecological factors affecting quick wilt disease of pepper

An isolated plot of pepper, where quick wilt disease has been appearing continuously for the past few years, was selected and plants were observed at weekly intervals for the disease incidence. The weather parameters collected will be correlated with the intensity of disease incidence after the observations are continued for a few more years.

Field trial for control of fungal pollu in pepper (Panniyur)

The experiment was started during 1978-79. The main objective of the experiment is to find out the correct time of application of fungicides to control fungal pollu caused by *Colletotrichum gleosporioides*. Ecological studies on the same disease are also being conducted to fix up the correct time for the adoption of control measures. In general, it seems

that spraying of Bordeaux mixture in July-August and September can control the fungal Pollu.

Studies on the etiology and ecology of fungal "pollu" (Panniyur)

The aim of the experiment is to ascertain the time and stage of maturity of pepper spikes at which the infection by the pathogen causing 'pollu' disease occurs. This information will help in determining the correct time of application of fungicides to control the disease. Infection started with the formation of spikes itself; but maximum infection was noticed from August-September. Maximum control of the disease was obtained with Bordeaux mixture when applied at the peak period of infection i. e. in August-September.

Studies on the ecology and etiology of fungal pollu in pepper, (Pepper Research Scheme, Vellanikkara)

The objective of the project is to examine the correlation between climatic parameters and the incidence of 'fungal pollu' in pepper and to find out the critical time of infection for adopting effective control measures.

The imperfect stage of *Glomerella cinguiata* (i. e. *Colletotrichum gloeosporioides*) was identified as the pathogen causing the fungal pollu. The pathogen is perennial and is found in some part of the vine through out the year.

CARDAMOM

CONCLUDED PROJECTS

(I) Crop management

Nursery practices in cardamom (College of Agri. Vellanyani)

The study was conducted to understand the effect of harvesting cardamom capsules in different months on the germination of seeds and vigour of the seedlings. It was also designed to indicate the best method of seed storage and a suitable row spacing in the primary nursery.

September harvested seeds were better. Germination of ripe seeds was higher than that of fully ripe or just ripe seeds. Gibberellic acid, cow dung slurry and scarification + hot water soaking gave higher germination. Storage of seeds in the form of capsules was better. Polythene lined gunny bags were the best containers. Row spacing at 6, 8 and 10 cm at a constant seed rate gave vigorous seedlings.

ii) Plant protection

Investigation on fungal diseases of cardamom (College of Agriculture, Vellayani)

Azhukal, leaf spot and leaf blotch were investigated upon. *Phytophthora* was isolated from decayed seed, rhizome and stem tissue of the infected plants. The incidence of azhukal was severe where rainfall, R.H. and soil moisture were maximum. The toxin produced, caused disintegration of spongy parenchyma cells of the leaf tissue. The vegetative hyphae and sporangia of *Phytophthora* were completely inhibited by drenching with Agallol-3 at 2000 ppm.

Studies on Katte disease-II (Pampadumpara)

A definite reduction in the rate of incidence of the disease was effected by systematic eradication of the affected plants. It was also observed that there was no definite pattern of distribution of the disease during the different months.

Evaluation of granular systemic insecticides against pests, nematodes and vectors of virus diseases of cardamom (Pampadumpara)

Granular insecticides did not have significant effect in controlling the insect pests of cardamom.

Evaluation of insecticide sprays against cardamom thrips (Pampadumpara)

BHC was found to be ineffective; but Fenthion 0.03%, Phenthoate 0.05%, Quinalphos 0.03%, Fenitrothion 0.05% and Methyl parathion 0.03% were found to be effective. These chemicals did not adversely affect the pollination by bees. Out of the eight insecticidal dusts tried, Ekalux 1.5% and Sevin 10% were effective. No granular systemic insecticide was effective against thrips.

Evaluation of insecticide sprays against cardamom shoot and capsule borer (Pampadumpara)

Among the 11 insecticidal sprays tried, only Thiodan at 1% was effective.

ONGOING PROJECTS

(i) Crop improvement

Germplasm bank (Pampadumpara)

This project aims at the collection and description of different varieties/types and wild relatives of cardamom. During the year, a high

yielding type of cardamom variety-Vazhukka was selected. Seeds of large cardamom (*Amomum sabulatum*) were collected from the Assistant Director, Cardamom Board, Sikkim. Twenty six types/varieties/wild relatives were maintained at this Station.

Comparative yield trial of promising types (Pampadumpara)

The project was to compare the performance of six selections available in the Station. It was found that during the period under report type No. 7 recorded the maximum yield (2312 gm of green capsules per plot of six plants).

Hybridisation (Pampadumpara)

Comparison of the performance of progenies of polycross types is the object of this Scheme. The plants have not yet started yielding.

Irradiation trial (Pampadumpara)

Induction of variation through irradiation is the object of the experiment. The plants have not come to yielding stage.

ii) Crop management

Fertilizer trial (Pampadumpara)

The object of this study was to find out the optimum dose of fertilizer for cardamom. Three levels of N, P and K were tried in a confounded factorial experiment. Analysis of the results indicated that none of the treatments were effective and control was found superior to the treatments.

Evaluation of cultural practices (Pampadumpara)

The efficiency of different cultural practices is being evaluated in this trial. The plants started yielding only during 1979-80.

iii) Plant protection

Studies on Katte disease-I (Pampadumpara)

This experiment aims at identifying different insects that are vectors of *Katte* disease and to control them. However, no new vector was identified.

Studies on Azhukkal disease of cardamom (Pampadumpara)

The experiment with 14 treatments was laid out during the year with a view to finding out the etiology of the pathogen, its collateral hosts and methods of control of the disease. Bordeaux mixture was found to be most effective in reducing capsule infection. For shoot and panicle infection, Cuman, Bayer 5072, Difoltan and Bordeaux mixture were found equally effective.

Studies on the role of honey bees in the pollination of cardamom (Pampadumpara)

The object of this trial was to estimate the yield increase due to maintenance of bee colonies in cardamom plantations and to study the effect of insecticide application in bee visit. A 4% increase in fruit set was obtained in the plots where four colonies per hectare were maintained during the flowering season.

Evaluation of granular systemic insecticides against insect pests, nematodes and vectors of Katte disease (Pampadumpara)

The results indicated that the treatments are effective in reducing the population of cardamom thrips on the shoot. Among the five insecticides tried, Disyston has been found to be the most effective one.

Studies on the insects and nematodes associated with cardamom (Pampadumpara)

Studies on biology, binomics and methods of control of insect pests and nematodes infesting cardamom were included in the project.

Observations were made on plants in the Station and in some of the estates. The results indicated that application of Thimet granules (60 gm. per six sq. meter) and spraying 0.1% Quinalphos are effective in reducing infestation.

Field evaluation of newer insecticides against cardamom thrips (Pampadumpara)

Analysis of pooled data obtained during 1977-78 and 78-79 indicated that among the sprays tried, Fenthion, Quinalphos, Phenothoate, Fenitrothion and Methyl parathion were the most effective insecticides. Among the dusts, Quinalphos, Carbaryl, Methyl parathion and Phosalone were found more effective.

NUTMEG AND CLOVE

Studies on growth, flowering, fruit set and fruit development in nutmeg (College of Hort., Vellanikkara)

The shoot growth in nutmeg was observed to be cyclic—a period of growth followed by a period of quiescence. Six flushes were recorded during one year; but all shoots did not exhibit growth. Flowering in female trees was seen for seven months (June to October and January–February) with maximum in July and minimum in February. Flower buds followed six different stages to anthesis. Flowers were generally solitary and of three types—normal male, normal female and abnormal female. Pollination appeared to be through wind. Hand pollination gave 88.75% fruit set, while open pollination gave only 33.10%. Fruit drop, though seen in all the months, was more in second to fourth month after set. Fruits matured 206 to 237 days after pollination, the peak being in April–July.

Studies on leaf blight disease of clove caused by Cylindrocladin sp. (College of Agri., Vellayani)

Leaf blight caused by *Cylindrocladin quinquesepatum* affected the plant at all stages. The seedlings were found to be more susceptible. Injury was a pre-requisite for infection. Bavistin and Thiride were able to control the fungal growth at a minimum concentration tested (Bavistin 250 ppm and Thiride-1000 ppm).

D. GINGER AND TURMERIC

CONCLUDED PROJECTS

(i) Crop improvement

✓ *Varietal trial on ginger to isolate high yielding, disease resistant or tolerant varieties (College of Horticulture, Vellanikkara)*

Twenty nine varieties, both indigenous and exotic were collected and their performance studied. Based on preliminary trial in 1976-77, 25 were selected for further trials. These were put under a 5 x 5 lattice design during 1977-73. The maximum yield of 6453.16 kg. per ha. of dried ginger was recorded by Nadia. The types Bajpai (5074.38 kg), Maran (5042.05 kg) and Narasapattam (4801.44 kg.) closely followed Nadia. Thodupuzha ranked first (25.2%) in dried ginger recovery. Maximum oleoresin content was recorded in Raio-de-Janeiro closely followed by Bajpai. Karachal with an oil content of 2.4% topped the list followed by Rio-de-Janeiro (2.3%) and Maran (1.9%). Fibre content was minimum in China (3.4%) and maximum in Kuruppampady (6.4%).

Variations in yield, driage, oleoresin, oil and fibre were highly significant among the different periods.

The percentage of oleoresin, oil and fibre were maximum at 165 days after planting whereas maximum yield per ha, oleoresin and oil were recorded at 270, 145 and 225 days after planting.

Based on the findings the cultivation of Nadia, Bajpai and Maran are recommended for obtaining high yield of dried ginger, oleoresin and oil.

The type Wynad-Kunnamangalam recorded dry yield of 16927 kg. per ha. followed by Thingpuri (16667 kg. per ha.)

✓ *Varietal trial on turmeric (College of Hort., Vellanikkara)*

Tumeric types collected from different regions of India were evaluated. Significant variation was observed among the types with regard to green yield/plot, curing percentage, oleoresin and curcumin content. The types "Amrithapani-Kothapetta" and "Chayapasupa" topped the list for green yield during 1978-79 and 1979-80 seasons, respectively. "Mannuthy Local" had a curcumin content of 6.55 per cent. The type 'Duggirala' registered an oleoresin content of 21.10%. The per hectare yield of curcumin ranged from 65.4 kg (in Tekurpeta) to 560.6 kg

(in Mannuthy Local). The range for oleoresin was from 249.7 kg (in Tekurpeta) to 1470.3 kg. (in Mannuthy Local).

The yield of green turmeric, dry produce, drying percentage, oleoresin and curcumin were found to be maximum 270 days after planting,

(ii) Plant protection

Studies on the control of soft rot of ginger (Ambalavayal)

A field trial with Aureofungin sol, Difolatan, Thiride, Agallol-3, and Cheshunt compound was laid out with the variety Rio-de-Janeiro. The experimental plants were affected by bacterial wilts as a result of which the trial had to be abandoned.

Studies on the control of soft rot of ginger (College of Hort., Vellankkara) ✓

Six fungicides at three concentrations were used for drenching the soil as well as for treating the rhizomes before planting. Three varieties of ginger (comparatively resistant, susceptible and resistant varieties) were used as experimental material.

Pythium aphanidermatum was found to be responsible for the soft rot of ginger. More than 90% inhibition of the fungus was observed by Agallol, Thiride and Difolatan at 500 ppm concentration *in vitro*. Cheshunt compound, Agallol and Thiride proved very effective *in vitro*. Soil drenching before planting with these fungicides reduced the pre-emergence rotting considerably. In addition to soil drenching, a minimum of two post emergence application of Cheshunt compound or Agallol, one month and three months after planting was necessary to control the disease.

Studies on nematode diseases of ginger (College of Agri. Vellayani)

One hundred and forty seven soil and root samples were collected from ten ginger growing districts of Kerala. *M. incognita*, *Radopholus similis*, *Pratylenchus* and *Helicatylenchus* were found to be associated with the symptoms.

In the screening trials, the twenty varieties tested were found to be susceptible in varying degrees to the attack of *M. incognita*. Histopathological studies revealed that xylem vessels and tracheids were disrupted by the nematodes. Nematicides—Phenamiphos, Aldicarb and Phorate (2.5 kg, 5.0 kg and 7.5 kg ai/ha) gave good control of the nematode, the maximum control being obtained in the case of Phorate.

COCOA

Propagation studies on cocoa (College of Horticulture, Vellankkara) ✓

The study showed that germination percentage was highest in seeds collected in March, followed by those of February, January, December & April. It was concluded that large and medium pods weighing more than 350 g each with not less than 400 cc volume should be selected for raising nursery. Seedlings grown in 30 x 20 cm bags were

superior. A mixture of soil, sand and FYM in the proportion 1:1:2 was found to be better for raising seedlings. Seeds sown on the same day of extraction exhibited maximum germination. The quick dip method for 60 records in 4000/ppm NAA or 6000 ppm IAA was found better for production of rooted cuttings. Green budding in 3 to 4 month-old root stocks carried out during April gave 80-100 per cent success.

Propagational studies in cocoa (KADP)

To fix up the criteria for mother plant selection

The selection of mother plants is in progress in cultivators' fields.

To fix up the criteria for seedling selection

The seeds collected from pedicel end, middle portion and distal end of big, medium, and small pods were studied in detail to fix up the criteria for seed selection for obtaining vigorous seedlings. The mean number of beans per pod varied from 30 to 42 and there was not much difference in the number of seeds among the three classes of pods. In general, the maximum number of seeds per pod was recorded in pods harvested during February and March followed by those harvested in April. Germination studies showed maximum percentage of germination in seeds collected during March, followed by those collected in February.

The pod size or the portion from which seeds were collected did not influence the percentage of germination or the growth of the seedlings. But in general, better seedlings were obtained from seeds collected from large and medium sized pods. Based on this, it is recommended that medium sized pods weighing more than 350 g collected during February and March are better for quality seedling production. It is better to sow the seeds on the same day of fruit harvest as the germination percentage is affected with delay in sowing. The seedlings can be transplanted when they are three months old and have at least 30 cm height and 10 leaves.

To standardise the vegetative propagation methods

An experiment to assess the effect of hormones on rooting of cuttings was conducted. The hormones used were IAA, IBA and NAA individually and in combinations. The duration of treatment varied from 10 to 60 seconds. Higher percentage of rooting and maximum number of roots were obtained by dipping for 60 seconds in 4000 ppm NAA or 6000 ppm IAA. Mist chamber method was successful for production of rooted cuttings.

Four methods of budding namely 'T'-budding, inverted 'T'-budding, patch budding and Forkert budding were tried. Forkert method on stocks 8 to 9 month's old or green budding on 3 to 4 month-old seedlings were successful. The best time for budding was found to be February-March on older root-stocks and April-May on younger root stocks.

Trials on training and pruning of cocoa (KADP)

The trial was laid out last year in the Instructional Farm, Mannuthy. The treatments as per schedule will be given in 1980-81. The seedlings are coming up satisfactorily.

Nutritional studies on cocoa (KADP)

To find out the optimum requirement of N, P, K, Ca and Mg for cocoa

During the period under report, two trials were laid out in the cultivators' fields one each in Trivandrum and Trichur Districts. The first dose of fertilizers was applied in October 1979. During 1980-81 two more trials will be laid out in Calicut District.

To find out the effect of Zn on the growth and production of cocoa

The trial has been laid out last year in the Instructional Farm, Mannuthy. The plants are coming up well. The treatments as per schedule will be given in May 1980.

Standardisation of leaf analysis technique for cocoa

This project is taken up as a P. G. programme. Leaf samples are being collected from cultivator's fields and analysed.

Studies to determine the optimum shade requirement for cocoa (KADP)

The selection of cultivator's fields is in progress.

Control of insect pests of cocoa (KADP)

A survey was conducted during 1976-78 in the State to study the pest complex associated with cocoa. Six major and 14 minor pests were identified. The nature of damage and peak periods of activity of the pests have been studied and management methods against the pests worked out.

Studies on the management of squirrels infesting cocoa pods (KADP)

Most of the studies have been completed and the salient findings are as follows:

Harvesting of pods at shorter intervals just as bronzing is revealed in furrows is suggested to reduce squirrel damage. Covering the pods with punched polybags (150 gauge) or gunny bags smeared with bitumin extended in kerosine afforded absolute protection against the pests; but the pods covered over by gunny bags developed discoloured patches. Polybags (150 gauge) punched and smeared with fish oil insecticidal soap also gave good protection to the maturing pods. Covering the fruits with bare gunny and poly bags was ineffective against the squirrels.

Investigations on the etiology of the fruit drop disease and their control (KADP)

Investigations on the etiology of the pod drop diseases of cocoa revealed that about 10 per cent of the pods were affected by "cherelle wilt" while 6 per cent and 3 per cent of pod infections were attributed

to *Botryodiplodia* pod rot and *Colletotricum* pod rot, respectively.

The pods affected by *Colletotricum gleosporioides* showed small brownish round spots with a yellow halo on the surface of the pods. In advanced stages, the pods were dark in colour and the lesions were slightly depressed from the surface of the pod. Large irregular dark brown areas were also seen on the pods due to the coalescence of numerous lesions.

Mostly immature pods were found to be infected by the pathogen. The internal tissues were also infected and brown in colour. Numerous yellow to pink coloured pustules were seen on the surface of the pod.

In the case of *Botryodiplodia* pod infection, brown lesions develop on the surface of the pod without any halo. The lesions produce masses of black spores and in the advanced stages the pods are covered with sooty powder of black spores.

Studies on the die back disease of cocoa-causes and control (KADP)

From the twigs dried due to dieback, *Botryodiplodia* sp. and *Colletotrichum* sp. were isolated. They caused typical die-back symptoms with withering of leaves. Drying up of twigs was also found in the case of *Cephaleures* sp. attack on the stem.

4 CASHEW AND FRUITS

CONCLUDED PROJECTS

i) Crop improvement

Studies on hybrid vigour in cashew (Cashew Research Station, Anakkayam)

Studies showed that hybrid "Tree-20 x Ponkala (H_2)" recorded the highest mean yield of 7.31 kg. followed by the hybrid "Tree-116 x Tree-34 (H_3)" with 3.9 kg. and hybrid "Tree 20 x K-13-2 (H_1)" with 3.45 kg. Hybrid seedlings were superior to selfed seedlings. Hybrid seedlings and open pollinated seedlings were on par. Selfed seedlings and open pollinated seedling were on par.

Factors affecting yield in cashew (Madakkathara)

The results of the study showed significant positive correlation between yield and percentage of flowered shoots per unit area. Correlation between yield and tree spread was significant. Lack of pollination was found to be one of the reasons for poor fruit set and low yield in cashew.

ii) Crop management

✓ *Studies on fruit set and fruit drop in cashew, (Anacardium Occidentale L, (College of Horticulture, (Vellanikkara)*

The study was carried out in the College of Horticulture with objective of finding out the effect of growth regulators on fruit development in cashew. Blossom biological studies were also conducted.

The results showed that there exists variation between types in respect of size of flowers. Bisexual flowers were larger than the male flowers in all types studied. There was considerable increase in fruit set when the flowers were artificially pollinated. The percentage of hermaphrodite flowers, fruit set and yield were found to increase significantly by the application of 2, 4-D 10 ppm as well as NAA 10 and 20 ppm. Fruit drop was effectively controlled by IAA at 25, 50 and 75 ppm and NAA at 20 ppm.

Fertilizer trial on cashew (Cashew Research Station, Anakkayam)

The results of the experiment with three level of N at 0, 125 and 250 g/tree, two levels of P at 0, and 125 g/tree indicated that treatment effects did not differ significantly between years; but application of N increased the yield.

ONGOING PROJECTS

i) Crop improvement

Collection and maintenance of types of cashew (Anakkayam)

The objective of the study conducted during the past five years at Anakkayam was to maintain the types and varieties to isolate superior ones for further multiplication and breeding works. The clonal types and seedling types like NLR-2-1, K. 10-1, K. 10-2, K. 28-1, K. 25-2 and K. 19-1 recorded mean yield of more than 15 kg. nuts per tree per year and these may be recommended for clonal propagation and large scale distribution.

Germplasm collection and maintenance of germplasm bank (Madakkathara)

The objective of the study at Madakkathara was to survey the cashew growing areas and to collect types for utilisation in crop improvement. So far, 101 types were collected and maintained in the Station. The collection includes types from various cashew growing tracts of the country and also exotic types.

Standardisation of seedling selection in cashew (Madakkathara)

The study was initiated at Madakkathara with an objective of evolving a technique for the selection of seedlings. Positive correlation was obtained between the weight of nuts, height of seedlings and the number of leaves during the years 1978-79 and 1979-80. The study is being continued.

Comparative yield Trial (Anakkayam)

The experiment was started at Anakkayam during 1974 with the objective of studying the performance of the progenies of the 16 promising selections of the Station. The plants have not yet started yielding. Studies are in progress.

✓ *Comparative yield trial with existing high yielders: seedlings (Madakkathara)*

The objective of the study at Madakkathara was to compare the yield performance of promising types from different Cashew Research Centres and to identify types suited to the locality. Sixteen types have been included in the study. The trees are only in the initial stage of yielding and the studies are being continued.

✓ *Comparative yield trial of Anakkayam selections: layers (Madakkathara)*

The objective of the study initiated in 1975 at Madakkathara was to compare the performance of 16 promising types including hybrids at different locations and to identify types suited for different agroclimatic regions of the State. K.22-1 and BLA. 139-1 were the highest yielders during 1978-79 and 1979-80. The trees are only in the initial stages of yielding and the trial is being continued.

Study of promising clonal types (Anakkayam)

The objective of the study at Anakkayam was to assess the performance of the progenies of promising germplasm collections. The first set of hybrids were planted during 1963-64. Among the 12 types planted during 1967, the progenies of Hybrid H. 3-6 recorded the maximum mean yield of 7.765 kg. nuts per tree per year followed by Hybrid H. 3-9 which yielded 7.094 kg. nuts per tree. During 1979-80, the types H. 39 recorded the highest yield followed by H. 3-6. The yields are not stabilised and the experiment is being continued.

Breeding improved varieties by hybridisation (Madakkathara)

✓ The study was initiated at Madakkathara with an objective to evolve high yielding types with medium sized nuts, high shelling recovery and other economic attributes. Out of the 199 hybrids planted in 1973, eight were promising which yielded more than 10 kg. nuts per tree during 1979. During 1979, progenies of 19 crosses were planted in the main field. During January 1979, to March 1980, 17 sets of crosses were made. The study is being continued.

Breeding improved varieties of cashew (Anakkayam)

The objective of the study at Anakkayam was to evolve superior varieties having desirable characters. The results showed that the hybrids H. 3-17 (26.510 kg/tree/year) H. 3-19 (40.890 kg/tree/year) and H. 3-7 (24.660 kg/tree/year) can be recommended for large scale multiplication programme as these are giving higher yields consistently for more than five years.

Studies on F2 progenies and double cross hybrids (Anakkayam)

The experiment was started at Anakkayam to study the extent of variation in the F2 population of the superior hybrids already identified, to select better progenies and to find out how far the F2 progenies are true-to-type in respect of the main economic characters. The selfed

double cross seeds produced during 1978-79 were planted at Vellanikkara under the Kerala Agricultural Development Project.

ii) Crop management

Propagation trials on cashew grafting and budding (Madakkathara)

The objective of the experiment at Madakkathara was to standardise the techniques of side grafting, veneer grafting and budding in cashew. Consistent results obtained in 1978-79 and 1979-80 showed that the best time for these propagation methods was May to October.

Trials on air layering (Madakkathara)

The study was started at Madakkathara in 1979 with the aim of finding out the best medium for the establishment and growth of air layers. The experiment is in the initial stages and conclusive results are not obtained. Another objective of the experiment was to study the correlation, if any, between the initial size and vigour of the layered twigs with the percentage of establishment.

Hormonal trial (Madakkathara)

The objective of the study at Madakkathara was to find out the effect of growth regulators such as IAA, NAA, IBA, 2, 4-D and GA on the post fertilization drop in cashew. Though IBA 60 ppm increased the yield in 1978-79, there was no significant difference in the percentage of post fertilization drop of flowers. The experiment is being continued.

Fertilizer trial on cashew (Madakkathara)

The experiment consisting of 27 treatments was initiated at Madakkathara with the objective of finding out the optimum level of fertilizer for cashew. Wide variability between trees was observed during 1978-79.

Multilocational fertilizer trial on cashew

To gather basic information on the manurial requirement of cashew and to recommend fertilizers suitable to different soil types, studies were undertaken in Malappuram and Cannanore districts since 1976-77. Yield data obtained during 1978-79 showed that application of P increased yield by 35% under laterite soil conditions in Pilicode. But during 1979-80, the yield data showed that the main effects of N, P and K did not differ significantly. The experiment will be continued for two more years to draw up conclusions.

Effects of magnesium, copper and iron on the yield of cashew

In a study on the effects of the application of magnesium, copper and iron on the yield of cashew, the treatment effects were not found to be significant in 1978-79. But the application of the above nutrients along with the recommended doses of N, P and K increased the yield in all the three types of cashew studied in 1979-80.

Cultural trials on Cashew (Anakkayam)

The objective of the experiment at Anakkayam was to study the effect of various cultural practices on growth and yield of cashew. The yield data during the two years of study i.e. in 1978 and 1979 showed no significant differences in treatments. The experiment is being continued.

Observational trial in intercropping in cashew gardens (Anakkayam)

To gather information regarding the feasibility of raising different root crops, fodder grasses and fodder legumes under cashew trees the experiment was initiated at Anakkayam in 1979. Results obtained showed that turmeric under partial shaded conditions gave an yield of 13.26 tons/ha. while under complete shade the yield was 12.32 tons/ha. Among the fodder grasses, guinea grass gave the highest yield under partial shaded conditions ie. 5.4 tons/ha. while under [complete shade, para grass gave the highest yield of 8 tons/ha. followed by fodder cowpea which gave 6.2 tons/ha.

iii) Plant protection

Studies on fungi associated with special reference to immature fruit drop (Anakkayam)

At Anakkayam, 16 high yielding types were screened for leaf blight caused by the fungus *Colletotrichum gloeosporioides*. Types BLA-273-1 and H-3-17 were found to be susceptible. K-22-1 was moderately resistant. *Colletotrichum* infection was found severe during December, January and February at the time of emergence of new flushes. During 1979-80, the pathogenicity of *Pestalotia* sp. and *Colletotrichum gloeosporioides* was established.

Die back disease in cashew: studies on the control of the disease by new fungicides (Anakkayam)

The objective of the study at Anakkayam was to select the most suitable fungicide for the control of the die back disease. The disease was reduced considerably by treatment with Calixin and Bordeaux mixture during 1978-79 and 1979-80.

BANANA

CONCLUDED PROJECTS

(i) Crop management

Desuckering trial on 'Robusta' banana (Banana Research Station, Kannara)

From the results of the study, it was concluded that desuckering exerts great influence on the yield of banana. The study has shown that it is not advisable to retain the suckers in 'Robusta' banana before flowering. Retention of one or two suckers after flowering did not affect the yield of the mother plant.

*Management/control of weeds in banana with the aid of herbicides
(Banana Research Station, Kannara)*

The results of two year's trials indicated that application of Diuron 4 kg/ha at bimonthly interval or Gramaxone 1.5 lit + Diuron 2 kg/ha or Gramaxone 1.5 lit + 2, 4-D Na salt 2kg/ha at six monthly interval post emergence is effective in controlling a broad spectrum of weeds without producing any deliterious effect on the crop. The treatment did not in any way affect the final yield.

ii) Plant protection

*Effect of treating suckers with Furadan for control of rhizome weevil
(Banana Research Station, Kannara)*

The results indicated that the incidence of 'dead heart' caused by rhizome weevil and the population of banana aphid can be reduced considerably by application of Carbofuran granules while planting banana suckers.

*The intensity and extent of damage caused by bunchy top disease
(Kannara)*

A survey was carried out under this project on the incidence of 'bunchy top' disease in various districts of Kerala. Maximum percentage of infection was noticed in the varieties, Nendran, Red banana, Poovan, Palayankodan, and Robusta. Lesser percentage of infection was noticed in the varieties Koombilla Kannan, Peyan, Monthan and Njalipoovan.

Studies on the control of the spread of bunchy top disease by the use of insecticides (Kannara)

The results of the three year trial indicated that both foliar application and soil application of the granular insecticides were significantly superior in controlling banana aphid. While considering the mean number of aphid population, Thimet and Disyston were found to be highly effective in controlling the aphid which is responsible for the spread of the bunchy top disease.

ONGOING PROJECTS

i) Crop Improvement

Varietal collection (Kannara)

The total number of varieties available in the germplasm bank is 180. Biometrical analysis of various morphological and yield attributes and nutrient constituents was done in different varieties. The following banana varieties were found promising and hence can be popularised.

Dessert varieties—Monsmarie, Giant Governor, Robusta, Dwarf Cavendish. Tall—Gross Michel, Chenkadali, Poovan, Palayankodan, Njalipoovan,

Amirtsagar, Karpooravally, Poomkali.

Nendran group—Nedunendran, Zanzibar.

Culinary varieties—Monthan, Batheesa, Kanchikela, Nendrapadathy.

Flower initiation studies (Kannara)

The object of this experiment was to obtain basic information on the flowering characteristics of banana varieties belonging to different maturity groups. Data on the exact date of shooting and the time required for inflorescence emergence was noted in the varieties.

Clonal variation studies (Kannara)

The object of the experiment was to assess the natural genetic variability existing in popular banana variety 'Nendran' and to select promising clones for popularisation. During the year, a detailed survey of areas where 'Nendran' is grown was conducted. The districts surveyed were Trivandrum, Quilon, Kottayam, Calicut, Malapuram and Trichur. Preliminary observations on growth were recorded. Based on yield performance, 12 Nos. were selected and carried forward.

Induced mutagenesis (Kannara)

The object of the experiment was to standardise the size of suckers for irradiation and also to screen out a dwarf short duration and high yielding Nendran type. It was found that suckers weighing 550g to 1250g. were optimum for gamma radiation.

ii) Crop management

Physiological deterioration of planting material in banana variety Nendran (Kannara)

The object of this study was to assess the yield potential of the rhizome of the same mother plant with continuous planting for a period of four years. Suckers of each of the mother plants were planted in separate progeny rows. It was noticed that out of 21 plants obtained from six mother plants, only five plants showed the same productive character. All others were poor yielders. The experiment is continued with suckers of 21 plants to study the rate of deterioration.

Physiological basis of variation in yield between two varieties of banana, Nendran and Zanzibar (Kannara)

The study was meant to assess the various physiological parameters such as NAR, LAR, RGR and LAI that are associated with productivity and to correlate the above parameters with the biomass and economic yield. The results indicated that Nendran had a higher biomass than Zanzibar ie. Nendran was efficient in the dry matter production. This may be due to the higher Leaf Area Index of Nendran.

Nutritional requirements of banana (Palayankodan) under rainfed conditions (Kannara)

Nutritional requirement studies in rainfed banana (cv. Palayankodan) conducted at Kannara revealed that there was significant response to nitrogen with regard to yield and growth characteristics. Graded dose of potash gave significant increase in the number of fingers whereas phosphorus application did not give significant response either in yield or growth characteristics.

Water requirement studies in Nendran (Kannara)

The object of this experiment was to fix the water requirement of banana in relation to physiological stages of crop growth. The treatment differences were not significant in respect of yield or morphological characters. Maximum plant height was recorded in the treatment "40% depletion in vegetative phase and 40% after flowering". Girth was maximum in "60% depletion in vegetative phase and 40% depletion after flowering". Bunch weight was maximum in treatment "60% depletion in the vegetative phase and 40% depletion after flowering".

Effect of crop rotation on growth and yield of var. Nendran (Kannara)

In order to find out the best crop rotation for the economic yield in Nendran, a trial was carried out. The results showed that maximum bunch weight was obtained by the treatment, banana—banana—tapioca, followed by banana—paddy—pulses—tapioca.

Effect of different ratios and levels of NPK on the growth, yield and quality of banana variety Nendran (Kannara)

The object of the experiment was to find out the optimum levels and ratios of fertilizer nutrients for Nendran banana. The results showed that maximum bunch weight was recorded by 200 g N, 150 g P₂O₅ and 400 g K₂O.

Effect of water stress and the critical growth stages of banana variety Nendran (Kannara)

Maximum bunch weight was obtained by irrigating the crop once in 10 days in January, March and May and no irrigation during February and April.

Nitrogen nutrition in rainfed banana cv. palayankodan. (College of Horticulture (Vellanikkara))

The object of the experiment was to study the effect of different levels of nitrogen on growth, yield and quality of fruits and to assess the uptake and distribution of nutrients at different phases of growth and development. The treatments comprised of five levels of nitrogen viz. 0, 100, 200, 300 and 400 g/plant. Among the morphological characters studied, height, girth and petiole length of the plants increased significantly with increasing levels of nitrogen. The treatments did not influence the number of functional leaves and total leaf area at the time of shooting. The yield significantly increased up to a level of 200 g N/plant while a further increase to higher levels decreased the yield. The economic dose of nitrogen required for the crop was worked out as 96 g/plant. The total dry matter production increased with increasing levels of nitrogen at all stages of growth. The uptake pattern of major nutrients was also greatly influenced by nitrogen application. The ratoon crop is maintained in the field without applying any fertilizers so as to study the residual effect of nitrogen on growth, development and quality of

fruits in the ratoon crop. Two suckers per plant was retained for studying the residual effect of nitrogen. Biometrical observations were recorded at the time of shooting. The experiment is in progress.

Effect of pre and post harvest treatments on storage and quality of banana variety Nendran (College of Horticulture, Vellanikkara)

The main objective was to find out the effect of pre harvest application of growth regulators and also different storage methods on the shelf life and quality of banana. The effect of fungicidal treatments in controlling anthracnose disease was also investigated. Studies with growth regulators revealed that application of NAA is effective in increasing the finger size and in improving the quality of fruits. The life of the mature green fruits was found to be extended by 15—20 days when stored in airtight polythene bags of 200 gauge with KMnO_4 as ethylene absorbant. Incidence of anthracnose disease was also studied and the data are being statistically analysed for drawing conclusions.

Efficiency of applied nutrients in banana (cultivar Nendran) under conditions of liming, split application and in presence of nitrification inhibitors (College of Agriculture, Vellayani)

This project was carried out at College of Agriculture, Vellayani. The object of the experiment was to increase the efficiency of N and K to Nendran banana by liming and to find out the uptake pattern of the two major nutrients as well as Ca and Mg with a view to fix the peak periods of utilization. The result indicated that five split application of N and K is superior to the usual two split application. The experiment is in progress.

iii) Plant protection

Population dynamics of banana nematodes (College of Agri., Vellayani)

The object of the trial was to study the build up of nematodes in banana from planting to harvest. The result showed that *Radopholus similis*, *Helocotylenchus* sp. and *Meloidogyne incognita* were present in soil and roots. The population was seen steadily increasing as the plant grew. In summer, the soil population was less.

Studies on the persistence and dissipation of systemic insecticides in banana when used to control banana aphid (Vellayani)

The object of the experiment was to find out the minimum number of application of systemic insecticides needed to give protection to banana from aphid infestation and to find out the residue in the fruit. Phorate, Carbofuran, Disulfotan and Aldicarb were applied and their persistence was assessed in the plants. Application of insecticides were made on the 6th and 10th month of the crop. Disulfotan persisted most, followed by Carbofuran.

Adaptive research for the control of banana aphid (Vellayani)

The object of the experiment was to confirm the experimental results of research in cultivators' field. Two plots of 100 plants each were selected at Muttakad village. Initial observations on vector population were taken. First application of insecticide was given as per the schedule of application. Monthly observations were recorded.

Screening of banana varieties for their resistance to banana rhizome weevil (Kannara)

Valiyakannan and Chirapunchi were found to be tolerant to banana rhizome weevil, *Cosmopolitus sordidus*, a serious pest of banana in Kerala.

Control of rhizome weevil by soil application of insecticides (Kannara)

Soil application of insecticide Thimet was found to be beneficial in reducing the percentage of infestation of banana rhizome weevil.

Control of rhizome weevil by insecticidal treatment of suckers (Kannara)

Pre-treatment of banana suckers with a solution of Dimecron 2 per cent was found to be very effective in controlling banana rhizome weevil.

Studies on Kokkan disease of banana (Kannara)

The object of the experiment was to find out whether there was any reduction in the percentage of infection of Kokkan disease with fungicidal treatment. The experiment is in progress.

Fungal disease of banana and their control (Kannara)

The object of the experiment was to find out suitable control measures using different fungicides against leaf spot disease of banana. The results showed that spraying with Difoltan 0.3 per cent was effective in controlling leaf spot disease caused by *Cercospora musae*.

PINEAPPLE

CONCLUDED PROJECTS

i) Crop management

Effect of shade on growth and fruiting in pineapple (College of Horticulture, Vellanikkara)

The studies were carried out to find out the effects of shading on the growth, flowering and fruiting behaviour of pineapple (variety Kew). There were four treatments viz. 0, 25, 50 and 75% shade, which was provided by spreading coconut leaves on erected pandals over the plants and the intensity adjusted periodically by a Lux meter.

As far as the vegetative characters were concerned, shading increased the leaf area whereas, it had no influence on the no. of leaves produced per plant. Flowering of plants were early, uniform and more under shaded conditions. The maximum flowering percentage (83) was recorded by plants under 50% shade whereas it was minimum in the

open condition (24). Application of 500 ppm Ethrel increased the flowering percentage in open grown plants. However, the same resulted in reduced flowering under 50% shade than that obtained without any growth regulator treatment. Fruit size without crown was affected by shade treatments, the crown size being increased under shade at the expense of the fruit growth. The quality of the fruits was also lowered by shading. The fruits produced under higher intensities of shade were more acidic and the sugar concentration in those fruits was markedly less.

Effect of different growth regulators on flowering (and fruit development in pineapple, Ananas comosus L. (College of Horticulture, Vellanikkara)

This study was conducted with an objective of finding out the effect of growth regulators and certain other chemicals on flowering and fruit development in pineapple. Application of growth regulators and chemicals were done in two seasons and January application resulted in earlier flowering than November application, showing the seasonal variation in the effect of application. Among the different growth regulators tried, Ethrel 250 ppm was found to be the best for maximum induction of flowering. Ethrel at all concentrations was found to reduce the duration of flowering and also the time for fruit set. Ethrel in combination with 2% urea and 0.04% CaCO₃ also showed similar effects. Planofix 20 ppm was found to give the maximum fruit size. None of the growth regulators, chemicals and combinations tried resulted in an overall improvement in quality of fruits. The number of leaves possessed by plants was found to influence the development of fruits. For a satisfactory fruit development, the plant should possess around 40 leaves at the time of growth regulator application. Apart from the leaf number, the leaf nitrogen was also found to influence flowering and fruit development.

ONGOING PROJECTS

(i) Crop improvement

Varietal collection (Vellanikkara)

The 23 varieties of pineapple available in the germplasm bank were maintained for further studies and utilisation in the breeding programmes. 19 varieties were studied in detail. Varieties showed wide variation in all the characters.

(ii) Crop management

Optimum size of suckers for planting (Vellanikkara)

In the experiment on the optimum sucker size (variety Kew) it was found that suckers with 18-22 leaves are the best planting material for obtaining higher yield.

Population density trial in pineapple (Vellanikkara)

In the experiment to find out the most optimum population density for Kew variety of pineapple, the results showed that the average fruit weight was not affected by the increase in the number upto 53,333

plants/ha. However, taking into consideration the crop in the subsequent ratoons, a population of 49,382 suckers per ha, which allows for an inter-space of 105 cm between rows and 20 cm between plants was found to be the optimum.

Standardisation of time of application of growth regulators on plants raised from suckers and crowns (Vellanikkara)

The results indicated that with regard to yield, suckers were the best planting materials. To get maximum yield, plants have to be treated with growth regulator, 18th month after planting the crowns.

Effect of plant growth regulators on fruit size and maturity of 'Kew' pineapple (Vellanikkara)

The object of the experiment was to find out the best concentration of planofix and the stage of application for increasing fruit size and delaying maturity in pineapple. Application of planofix (200 ppm) on the fruits two months after flowering resulted in the formation of superior fruits.

Regulation of fruit size and maturity of pineapple (College of Horticulture Vellanikkara)

The study aimed at finding out the effect of growth regulator, NAA (at different concentrations and at different stages of fruit growth) on fruit size, maturity and quality of fruits. There was an increase in fruit size by the application of 300 ppm NAA, one month after flowering. The data are being statistically analysed to draw further conclusions.

Adaptive trial in pineapple (Vellanikkara)

In an adaptive trial using the improved techniques of pineapple cultivation adopting high population density, chemical weed control and the application of a growth regulator (Ethrel 25 ppm + urea 2% + 0.04% Ca CO₃), flowering could be achieved to the extent of 95-98%. There was no significant difference in fruit weight with and without crowns between the treatments.

JACK

ONGOING PROJECTS

Germplasm collection and description of types (College of Horticulture Vellanikkara)

Making a collection of superior types of jack in the State and maintaining them for further studies are the major objectives of this project. Exhaustive survey was conducted in five districts of the State and 196 types having desirable tree characters like early bearing, off season bearing and high yield were collected. Out of these, 123 types were selected for inclusion in the germplasm. A total number of 131 grafts were made at five locations to secure true-to-type planting material of the selected trees.

Standardisation of propagation technique in jack (College of Horticulture, Vellanikkara)

The objective of this project was to find out a suitable method of vegetative propagation in jack. Air layering was attempted on thirteen selected trees at Mannuthy on one year old growth using different media viz. coconut pith, saw dust and sphagnum moss. Among the media tried, coconut pith was found superior. Inarching gave satisfactory results with 6-9 months old stocks.

MANGO

ONGOING PROJECTS

Quality evaluation of promising mango varieties under Kerala conditions (College of Horticulture, Vellanikkara)

The main objective of this study was to assess the physico-chemical qualities of promising mango varieties and to correlate the quality with rainfall, temperature and humidity conditions prevailed during the season. The flowering time and time for fruit set of varieties were recorded during the last season. The analysis of the fruits will be done during 1981 cropping season.

Nutritional studies in mango (College of Horticulture, Vellanikkara)

The project was implemented with the objective to find out the optimum NPK requirement for mango. Two varieties viz. Neelum and Prior were used for the experiment and as per the technical programme the fertilizer application was done each year. The fourth year application of fertilizers was done in 1979. The biometric observations of the plants such as height, girth and spread of the plants in N-S and E-W directions were recorded and it was seen that with regard to the vegetative characters, the treatments did not show any significant difference in the pre-bearing age. The fruit set and yield characters also will be studied.

Regulation of flowering and fruiting in mango (College of Horticulture, Vellanikkara)

The objective of the experiment was to find out the effect of pruning on flowering and crop production in mango. It was started in the year 1976. The earlier trials conducted on the time of pruning showed that pruning in October was the best for inducing flowering in varieties—Alphonso, Bennet Alphonso, Bangalora, Banganappally, Alampur Baneshan, Pairi and Neelum. The trial was repeated during the year 1979-'80. The pruning in October was found to be the best, while December pruning resulted in vegetative growth. The trials also indicated that effect of pruning was confined to that particular year and in the subsequent years pruning had no effect on cropping. In another set of trial commenced during 1979, old unproductive trees were drastically pruned and the results showed that vegetative growth could be recovered in two years by pruning.

Germplasm collection of mango (College of Horticulture, Vellanikkara)

This was started in 1976 with the objective to establish an exhaustive collection of varieties of mango from different sources for detailed studies of their economic characters. Twenty seven varieties and forty one hybrids collected and planted at the Instructional Farm, Vellanikkara were maintained. In the year 1980, three more table varieties obtained from Alleppy district were added to this collection. The varieties are Vellari, Kapally and Thathachundan. The data on growth and flowering are being collected.

CITRUS

ONGOING PROJECTS

i) Crop management

Standardisation of agro-techniques in Mandarin orange (Ambalavayal)

The aim of this experiment was to evolve suitable cultural practices for mandarin orange. The differential treatments were given during October, 1979 and the cover crop used was *Calapagonium muconoides*. The growth observations of the plants were taken prior to the application of the differential treatments.

Root stock trial in Mandarin orange (Ambalavayal)

The height of the plants was maximum when Mandarin orange was on Carrizo orange root stock, followed by on rough lemon, Carrizo Citrange, Cleopatra Mandarin and Troyer Citrange. With respect to the scion girth, Cleopatra Mandarin ranked first followed by rough lemon, Carrizo Citrange and Raugpur lime in order. The spread of the plants in both directions (East-West and North-South) was more in the case of Carrizo Citrange root stock, followed by in rough lemon and Cleopatra Mandarin. Carrizo Citrange rootstocks also gave the maximum mean number of fruits, followed by rough lemon and Troyer Citrange. From these indications, it can be seen that the Carrizo Citrange rootstock gave better results followed by rough lemon. The trial is being continued to draw conclusive results.

Varietal-cum-root stock trial on Mandarin (Ambalavayal)

The aim of this experiment was to find out the best rootstock scion combination suitable for Wynad conditions. The experiment was laid out in 1979 with 20 treatments in R. B. D.

Adaptability trial on acid lime seedling (College of Horticulture, Vellanikkara)

The project was carried out to find out the suitability of growing acid lime in the plains of Kerala and to study their growth, flowering and yield. Field survival of cross-protected acid lime seedlings was found poor when compared with that of unprotected seedlings. Percentages of mortality of cross protected seedlings was nearly 80%. The

high mortality could be attributed to bacterial canker, and fungal diseases.

Manurial trial in Mandarin orange with N and K (Ambalavayal)

The objective of the experiment was to find out the economic optimum manurial schedule for Mandarin oranges under Wynad conditions. The planting was done in 1976, using Trifoliolate orange as rootstock. As there was considerable variations in the existing experiment, it will be re-laid during 1980 using rough lemon as rootstock, as suggested by the project Co-ordinator.

Micro nutrient trial in Mandarin orange (Ambalavayal)

To find out the optimum dose of micronutrients like Zn, Mo, Mg and B for Mandarin orange under Wynad conitions, this trial has been initiated. A block of 200 budlings planted in 1976 will be utilized for this purpose. The soil samples and leaf samples were collected and sent to IHR, Bangalore for analysis, the results of which will contribute to the pre-experimental data. The treatments will be given when the plants attain the optimum stage.

Weedicidal trial with modern herbicides (Ambalavayal)

This trial was laid out to find out the suitable herbicide to control the weed growth in citrus orchards. The weed flora from the experimental area have been identified during the previous year and the differential treatments were given on 8.1.1980. The dry weight of weeds collected from unit area under different treatments showed that among the pre-emergent applications, Diuron 4 kg/ha gave the minimum (1.99 Kg/sq. ft.). Among the post emergent applications, the minimum dry weight of weeds (2.35 kg/sq. ft.) was obtained by the application of Gramaxone 1.5 lit. or Diuron 2 Kg/ha.

ii). Plant Protection

Chemical control of Powdery mildew (Ambalavayal)

This trial was laid out during 1976 with the objective of finding out suitable control measures for the powdery mildew disease. Since the plants have not attained proper growth conditions, the differential treatments were not given yet.

Chemical control of citrus scab (Ambalavayal)

A trial was laid out with five treatments to evolve suitable control measures for the citrus scab disease. The growth measurements of the plants are being recorded periodically and the differential treatments will be given subsequently when the plants attain proper growth conditions.

Chemical control of leaf fall and fruit rot (Ambalavayal)

The aim of the experiment is to evolve suitable control measures for leaf fall and fruit rot in citrus. The experiment was laid out in R. B. D. with six treatments. Pre-experimental growth data are being recorded

periodically. Differential treatments will be given later when the plants are of optimum size.

Investigations on scale insects, psylla, aphids and leaf miners (Ambalavayal)

The following three separate experiments were included under this project, which have been laid out and the pre-treatment data collected. The differential treatments in these experiments will be given later when the plants attain proper growth conditions.

Chemical control of leaf miner (Ambalavayal)

The objective of the trial was to evolve suitable control measures against leaf miner. The experiment was laid out with eight treatments.

Chemical control of scale insects (Ambalavayal)

The aim of the experiment was to find out suitable measures to control the scale insects. There are nine treatments in this trial.

Trial on the control of aphids, psylla and white flies (Ambalavayal)

The objective of this experiment was to evolve suitable control measures against three insect pests of citrus namely aphids, psylla and white flies. The experiment is in progress.

Investigations on the nematodes associated with citrus (Ambalavayal)

The aim of the trial was to conduct a survey in the citrus growing tracts to find out the nematodes associated with citrus, to assess their population levels, to screen the different citrus root stocks for their resistance and to evolve suitable control measures. The results of the previous year's work showed that there are nematodes belonging to five genera associated with citrus at varying population levels.

5 VEGETABLE & TUBER CROPS

CONCLUDED PROJECTS

i) Crop improvement

Studies on heterosis and combining abilities with respect to important economic traits in chillies, Capsicum annum (College of Agriculture, Vellayani)

Thirty varieties were selected based on yield potential and other economic attributes from among 63 varieties of *Capsicum annum*. Trials with these varieties revealed the presence of heterosis. Two hybrids viz. Purple Round x Vellanotchi and Pant C-1 x Purple Cluster have shown promise. The performance of these two hybrids will be tried on large scale before recommending them to the farmers.

Genetic studies in sweet potato, Ipomoea batatas (L) A biometric approach (College of Agriculture, Vellayani)

Genetic analysis of 40 varieties of sweet potato showed high degree of variability, especially in tuber characteristics which offered scope for

recombining desirable genes from different varieties. Eight varieties selected on the basis of genetic divergence were used for progeny studies. Seven hybrids from the resulting progeny showed significant increase in tuber yield which ranged from 31.25 to 84.63% over the highest parental values.

Genotype-Environment interaction in selected hybrid lines of sweet potato, Ipomoea batatas (L) (College of Agriculture, Vellayani)

Twenty five varieties of Sweet potato were evaluated by experiments done in three different locations, Vellayani, Karamana and Kayamkulam. Results indicated significant variations among genotypes in respect of biometric traits and chemical constituents. Only two genotypes H.2752 and H. 2712 showed general adaptation while the genotypes H. 3032, H. 3115, H. 3803 and Pichivella were poorly adapted to all the environments studied.

ii) Crop management

Cultural trials on colocasia (College of Agriculture, Vellayani)

The different methods of planting did not influence the total tuber yield significantly. However, furrow method of planting gave the maximum yield of 12.40 tonnes/ha. Mulching was also found to increase tuber yields. Size of planting material significantly increased tuber yield. Maximum yield of 12.8 t/ha was produced by medium sized cormels.

Studies on the effect of plant population, density and age at transplanting on the growth, frequency of harvest, and total vegetative yield in amaranthus (College of Agriculture, Vellayani)

The different growth parameters like height, girth, number of branches, number of leaves, spread of the plant and individual leaf area were studied in relation to population density as well as age of seedlings transplanted. In respect of all the growth characters studied; the 25 day old seedlings performed better. The low density plants yielded more leaves per plant and also stem portion. The low density plants gave better leaf/stem ratio and also recorded the highest yield/plant, when the total yield/plant from all possible harvests were considered. On the other hand, the yield/m² for each harvest as well as for all the possible cuts taken together was highest in the case of high density planting. The high density planting gave a total yield of 6.28 kg/m².

Effect of growth regulators on the growth, yield and quality of sweet potato (College of Agriculture, Vellayani)

The study was carried out using Ethrel and CCC at different concentrations. Significant increase in the yield of tubers per plot was observed by the application of Ethrel & CCC. The highest yield of 19.06 kg/plot (23m²) was recorded for Ethrel 300 ppm. In general, the application of Ethrel was found to be more economic than CCC application, in sweet potato.

Effect of supplementary irrigation on yield and duration of tapioca (M.4)
(Rice Research Station, Pattambi)

The experiment conducted for three seasons showed that irrigating tapioca once in 20 days @ 48 lit/plant (5 cm.depth, furrow irrigation) gave an yield increase of 210 percent, over unirrigated control. Harvesting irrigated M4 tapioca at 10 months maturity recorded significantly higher yield than harvesting at 8th or 9th month.

iii) Plant Protection.

Studies on the chemical control of insect pests of brinjal (College of Agriculture, Vellayani)

Cyrotolone 10g at 1 kg. ai/ha as basal dressing followed by need based application and schedule spraying with Quinalphos, Folithion, Zolone, Thiodan and Carbaryl were tried and insecticides ranked according to their efficiency against jassids and beetles. The insecticides tried were effective in controlling the pests of brinjal. Weekly spraying of insecticides was found just as effective as need based spraying along with one application of Cyroione granule at the time of planting.

Studies on the bacterial blight (wilt) of tapioca, incited by Xanthomonas manihotis (College of Agriculture, Vellayani)

By inoculation with the pathogen, all the reported symptoms of the disease like loss of turgidity of leaves followed by shrivelling and wilting, defoliation, discolouration of stem and tubers and gum exudation were observed. The pathogen survived for three weeks in infected material, three months in soil inoculated with culture and 57 days in soil inoculated with diseased plant debris. Severe infection was noticed in plants of one to three months age, while the older plants were not severely affected. A toxic metabolite of the pathogen is suspected to have some role in pathogenesis and symptom expression.

Studies on the bionomics and control of sweet potato weevil (College of Agriculture, Vellayani)

The study was intended mainly to assess the most susceptible stage of sweet potato crop, to infestation by weevil. The crop was sprayed or the soil drenched at 10 days interval, commencing from the different growth stages of plant. Sweet potato was most susceptible to attack of the weevil, 70 days after planting. Two rounds of spraying during tuber formation provided the best possible control. Drenching of soil with insecticidal emulsion was found to be easier and more economic. Studies on different soil types revealed that clayloam soil with adequate plant protection measures yielded the highest returns.

ONGOING PROJETS

i) Crop Improvement

Selection of superior types of Capsicum annum with economic attributes from the segregating generation of intervarietal crosses (College of Agriculture Vellayani)

The experiment was designed to select superior types of chilli with good economic attributes from inter varietal crosses. The F2 generations were raised from the crosses—CAD 1068 x Vellanotchi, G4 x Pusa Jwala, Purple Round x Vellanotchi, Purple Round x Pant C-1, Vellanotchi x Pusa Jwala and Pant C-1 x Purple Cluster. From the segregating generations, the following number of plants were selected to carry forward to F3 generations:

G4 x Pusa Jwala—20

Vellanotchi x Pusa Jwala—4

Pant C-1 x Purple Cluster—30

Collection, evaluation and selection of improved chilli varieties (Capsicum sp)

The experiment was planned to collect and evaluate chilli germplasm with a view to selecting high yielding and locally adaptable types for dry chilli, high capsicin and vegetable purpose. Thirteen *Capsicum* lines used for vegetable purpose were grown. The lines were Bharath F1 hybrid, Express Ball, New Ace, Ace Hybrid, Firework, Scarlet Pinpernel, Little Beauty, Chamelion Lamuoy F1, Large Ball, Giant Bell, Long Sweet Yellow and Picora. The line Picora was found promising.

Breeding for polygenic resistance in chilli against leaf curl and mosaic complex (College of Horticulture, Vellanikkara)

The experiment was planned to evolve chilli varieties resistant to leaf curl and mosaic complexes and to study the inheritance of resistance to the disease, if any. Initially 22 varieties of chilli collected from different centres were grown. The lines included Pant C-1, G-1, G4, 43-2, 43-3, 45-1, 54-1, 59-1, 60-1, 30-2, 30-1, Jwala and 36-1. Selections are being made of lines resistant to leaf curl and mosaic. Experiment is also in progress to evolve clustered, destalked and deep red coloured chilli lines with resistance to leaf curl and mosaic.

Survey, collection and maintenance of germplasm in brinjal, cucurbits and their wild relatives (College of Horticulture, Vellanikkara)

The programme aims at collection and maintenance of available variability in brinjal, cucurbits and their wild relatives. The Department of Olericulture, College of Horticulture maintained 80 collections in *Solanum* sp. and 251 in various cucurbits. Evaluation of these lines for possible use in vegetable improvement is in progress.

Isolation and release of bacterial wilt resistant brinjal varieties

Seventy six lines of brinjal have been collected. Out of 76 lines, 29 lines were grown during May-July 1979. The related species

grown were *Solanum torvum* and *Solanum khasianum*. The screening of germplasm indicated that the varieties SM-6 and Pusa Purple Cluster had resistance/tolerance to bacterial wilt. In the variety SM-6, no plant wilted. Out of 25 plants initially transplanted, only five plants wilted in the variety Pusa Purple Cluster.

Evolving high yielding tomato varieties with resistance to bacterial wilt (College of Horticulture, Vellanikkara)

Thirty six tomato varieties collected from different parts of the Country were screened during March-July 1979 to isolate resistant lines. The variety La Bonita exhibited tolerance to wilt. Thirty six lines were rejected as having no resistance. Nineteen lines obtained from Asian Vegetable Research and Development Centre, Taiwan along with La Bonita were grown during May-September 1979. The line CL 32-D-0-0-1-19 GS which showed tolerance to bacterial wilt and La Bonita were grown along with the germplasm which was not yet screened against bacterial wilt. The lines are *L. pimpinellifolium*, SL-120, Punjab Chuhara, Annauji *L. glandulosum*, *L. peruvianum*, CRA-66-SelectionA, V. 687, EC. 108759, EC-110176 and Gamed. Sowing was done on 12-9-1979. Complete seedling mortality was observed for all the varieties except for CL 32-D-0-0-1-19 GS. The resistance of this line would be further confirmed through multilocation trials.

Selection and breeding in bhindi (I. F. Mannuthy)

Forty eight bhindi varieties were collected. The varieties were grown for an initial evaluation trial. Fourteen varieties were observed to be promising. The selected varieties would further be tested for higher yield and local acceptability.

Exploitation of hybrid vigour in bhindi (College of Agriculture Vellayani)

Twenty eight F1 hybrids were developed through a diallel mating of eight selected varieties. The varieties used are Pusa Sawani, Pusa Red, Ladies Finger Green, Perkin Long Green, Pusa Makhmali, Kilichundan, Local and New White. The 28 F1 hybrids along with their 8 parents were grown in a triple lattice design with 3 replications. Observations were recorded on height, no of branches, days to flower, fruits/plant and weight of fruits. The analysis of data revealed that the genotypes were significantly different only for plant height, branches/plant, and days to flower. The genotypes were not significantly different for fruits/plant and weight of fruits.

Evolving hot weather cauliflower varieties suited for cultivation in Kerala State (College of Horticulture, Vellanikkara)

Five lines obtained from IARI, New Delhi were assessed for their suitability under Kerala conditions. The lines were 328-5-10-5-1, 351-4-1, 395-2, 424-2 and 327-14-8-3.

Genetic variability and correlation studies in pumpkin (College of Horticulture, Vellanikkara)

Eighteen pumpkin lines were grown in a randomised block design with three replications. Spacing given was 1.5 x 8m. The recommended package of practices were followed, observations were recorded on vegetative characters and their components, earliness and its components, flower and fruit characters, and qualitative characters.

The 18 genotypes were significantly different for yield and its component characters. The range in fruit yield/plant recorded varied from 5.45 kg. in CM-18 to 16.10kg. in CM-17. The medium value of genotypic coefficient of variation was observed for male flowers/plant followed by fruits per plant. The highest heritability estimate of 99.14% was observed for male flowers/plant followed by female flowers/plant. The fruit yield/plant had an expected genetic advance of 52.32% in the next generation of selection when the intensity of selection was 5%. Female flowers/plant had no correlation with fruit yield/plant. Length of main vine appeared to have the maximum direct effect on fruit yield/plant followed by average fruit weight. Selection of plants with more average fruit weight and length of main vine was observed not as effective as straight selection of plants based on yield *per se*. The weight of first mature fruits ranged from 1.85kg. in CM-18 to 9.95 kg. in CM-17. The eighteen pumpkin genotypes were significantly different among themselves for protein, phosphorus, potassium, calcium and carotene contents. The protein content ranged from 5.26% on dry weight basis in CM-11 to as high as 9.49% in CM-15.

Selection of suitable cucurbit varieties (College of Horticulture, Vellanikkara)

Twentyfive varieties of bittergourd were grown during 1977-78. Based on yield, the line MC-23 was selected in the green fruited types and MC-10 was selected in the white fruited types. The line MC-23 was put under multilocational trials during 1976 at Vellanikkara and at Instructional Farm, Mannuthy. During March-July, 1979, it was grown in Instructional Farm, Mannuthy, and Banana Research Station, Kannara. The variety performed well in the above stations.

Twenty five varieties of snake gourd were grown during 1978-79. Based on yield, the line TA-19 was selected. This line was put under the multilocational trials since 1978. The line is showing promise.

Collection survey and maintenance of germplasm in winged bean College of Horticulture (Vellanikkara)

Eighteen lines were collected during 1979-80. These lines were grown in a randomized block design with three replications during May-February 1979-80. Observations were recorded on dry pod weight pods/plant, podlength, dry pod weight, weight of seeds/plant, % of wrinkled seeds, 100 seed weight, carbohydrate content in immature pods

and seeds, protein content in seeds, leaves, immature seeds and flower fibre content in seeds and Vit. C in immature pods.

Breeding for 'long podded vegetable types of cowpea (Rice Research Station, Pattambi)

Twelve vegetable types of cowpea were grown in a randomised block design with four replications. The plot size was 6m². The varieties Pusa Barsathi and No. 5269 were found superior yielding 3.02 t/ha. and 3.47 t/ha respectively of vegetable pods.

Varietal trials in brinjal, bhindi, cowpea, amaranthus, dolichos bean, pumpkin, muskmelon, cucumber, water melon, bottle gourd and round gourd (College of Horticulture, Vellanikkara)

In cowpea eight varieties were grown in a randomised block design with three replications. The variety K. 1552 was found superior to other varieties.

Four varieties of musk melon were grown in a randomised block design. The line CS-55 was observed high yielding. The popular varieties Haramadhu hybrid and Punjab selection were found suitable under the agro-climatic conditions of Kerala. Haramadhu yielded on an average, 4.5 fruits/plant, weighing 6.54 kg/plant.

Twenty four cucumber lines consisting of three F1 hybrids and 21 varieties were grown in a randomised block design with two replications. Among hybrids "Progress" yielded 24 fruits/plant, weighing 30.64kg/pit. Among the varieties, Pundex yielded 9.5 fruits/plant weighing 28.45kg/pit.

Varietal trial in water melon was conducted to identify a variety suitable for the locality. 13 varieties including three exotic varieties were tried, in a randomised block design with three replications. Madhu hybrid from IHR (Bangalore) had a T. S. S. value of 10.67° Brix. Sugar Baby closely followed the Madhu hybrid. Sugar Baby out yielded the other 12 varieties and gave earlier fruits, closely followed by Madhu hybrid.

Multilocational trial on Dioscorea alata (Instructional Farm, Mannuthy);

Five varieties (Da 42, Da 60, Da 48, Da 122 and Da 80) were grown in a randomized block design with four replications. The plot size was 5 x 5m². No statistically significant difference was observed among the varieties. Da 60 gave the highest yield of 15.8 tons/ha. while Da 120 yielded 12.7 T/ha.

Evolving high yielding sweet potato through intervarietal hybridisation (College of Agriculture, Vellayani)

Seven superior F1 lines obtained as a result of crossing selected parents on the basis of D² analysis were put under multilocational trial along with local variety at Chungathara and Taliparamba. The trial at Taliparamba indicated the superiority of culture No. V6.

ii) Crop management

Studies on the effect of graded doses of N, P, K on growth and yield of bitter gourd (I. F. Mannuthy)

An experiment was laid out in 3^3 confounded factorial design with 27 treatments to find out the optimum N, P, K requirements of bittergourd var. MC-23. The levels of N, P and K were 0, 25 and 50 kg/ha. The maximum yield was recorded when N, P, K were given at the rate of 50:25:50 kg/ha. This experiment would be repeated to confirm the results.

Studies on the effect of graded doses of N, P and K on growth, yield and quality of bhindi (College of Horticulture, Vellanikkara)

The variety Co.1 was grown in a 3^3 confounded factorial design with two replications to study the effect of graded doses of N, P and K on yield and quality attributes of bhindi. The different treatments tried are all the 27 combinations of N (0,30,60, kg/ha) P (0,25,50kg/ha) and K (0,25,50 kg/ha).

There was increase in plant height with increasing levels of the three nutrients. Higher levels of nutrients resulted in high leaf area index. Application of nitrogen increased NAR upto the intermediate level (30kg/ha.). Nitrogen increased the dry matter yield. There was a significant increase in yield due to increasing levels of N, P, K. In the case of nitrogen, the yield was found to increase upto 60 kg.N/ha. and the economic and optimum levels were worked out to be 61 and 61.23 kg. respectively. Response to P and K application was observed to be linear. The optimum and economic doses of P and K could not be worked out. The treatment had hence been modified with the following levels of N (40,60 and 80 kg/ha) P (30,60 and 90 kg/ha) and K (30,60 and 90 kg/ha). Patterns in uptake of nutrients were studied in different levels of nutrients applied to soil. This has revealed that a bhindi crop yielding 116.39 quintals of pods per hectare removed 87.81 kg. N, 20.572 kg P_2O_5 and 103.90 kg K_2O /ha.

Effect of graded doses of N, P, K on growth, yield and quality of colocasia (Colocasia esculenta L.) Var. Thamarakannan

The experiment was laid out in a 3^3 factorial, randomised block design with two replications. The treatments consisted of applying 40,80 and 120 kg N/ha., 25,50 and 75 kg P_2O_5 /ha. and 90, 120 and 150 kg K_2O ha. over and above 12 tons of FYM/ha. Application of nitrogen @ 120 kg/ha. produced the maximum plant height. Effect of nitrogen in increasing the number of suckers was significant. Application of 40 and 80 kg nitrogen/ha. produced more number of suckers. Maximum number of suckers was obtained at 120th day after planting. Application of 80 kg nitrogen, 75 kg, phosphorus and 120 kg potassium per hectare recorded the maximum leaf area. The maximum number of tubers per plant was produced at 80kg. nitrogen and 50kg. phosphorus per hectare. Application of nitrogen and potassium had no influence in girth of tubers, whereas

increased levels of phosphorus increased the girth of tubers significantly. Maximum tuber volume was recorded in plants supplied with 120 kg nitrogen, 75 kg phosphorus and 150 kg potassium per hectare. Increased levels of nitrogen progressively reduced the percentage of starch. Maximum starch content was obtained by the application of 40 kg. nitrogen, 75 kg. phosphorus and 150 kg. potassium. Higher the quantity of nitrogen applied, higher was the protein content of tubers, whereas increased application of phosphorus reduced the protein content of tubers.

The optimum doses of nitrogen, phosphorus and potassium were found to be 103.92 kg, 74.12 kg and 135.75 kg per hectare and the economic doses were 102.53 kg, 73.16 kg and 135.20 kg per hectare, respectively.

Fertilizer trial on sweet potato (I. F. Mannuthy)

The experiment was laid out to study the response of sweet potato to graded doses (30,60 and 90 kg/ha) of nitrogen and potassium. The treatments consisted of factorial combinations of three levels of nitrogen and potassium, and a control (N_0K_0). The crop was planted during July 1979 and harvested in November. The results showed that the maximum yield of tubers could be obtained when 60 kg nitrogen and 60 kg potassium were applied. The difference between yields at 30 kg level and 60 kg level was not significant. Yield of marketable tubers was increased due to the effect of potassium.

Studies on the stages of harvest of sweet potato (I. F. Mannuthy)

The study was conducted to find out the optimum stage of harvest of sweet potato. Harvesting was done at $2\frac{1}{2}$ months, 3 months, $3\frac{1}{2}$ months and 4 months after planting. The variety 'Kanjhangad Local' was used. Plot size was 3.6 x 3.6m and spacing 60 x 20 cm. Significant differences between stages of harvest were observed. The highest yield was obtained at four month after planting.

Fertilizer trial on tapioca (I. F. Mnnuthy)

The experiment was laid out to find out the response of local and a hybrid variety (H. 2304) of tapioca to combinations of graded doses (60, 120 and 180 kg/ha) of nitrogen and potassium.

The highest yield of 30.25 t/ha was obtained when N and K were applied @ 120 kg/ha. in the case of hybrid. The local variety gave a maximum yield of 20.875 t/ha. when N and K were applied @ 60 kg/ha.

Crop management studies on the optimum stage of harvest in tapioca (I. F. Mannuthy)

The experiment was laid out to identify the optimum stage of harvest of two genotypes of tapioca. One genotype is a variety (Vellayani Local) and the other a hybrid (H. 2304). The treatments consisted of harvesting at 6, 7, 8, 9, 10 and 12 months after planting. The experiment was

laid out in RBD with three replications. Spacing given was 90 cm x 90 cm. The experiment is in progress.

Assessment of N, P, K, requirement of tapioca in Wynad-Ambalavayal (H. R. S., Ambalavayal)

The treatment consisted of four levels of potassium (0, 50, 100 and 150 kg/ha) along with fixed doses of nitrogen and phosphorus (50 kg/ha). The variety was Malavella. The treatment differences were not significant. The experiment is being discontinued.

Propagation methods and cultural practices in sapogenin bearing yam Dioscorea floribunda

The experiment was planned to determine the optimum spacing as well as a suitable fertilizer and manurial schedule for *Dioscorea floribunda* under Kerala conditions. The treatments consisted of three levels of spacing (30 x 30 cm, 30 x 45 cm and 30 x 60cm) and three levels of N (50 kg/ha, 75 kg/ha and 100 kg/ha). For all the treatments, FYM @ 10 t/ha and P_2O_5 and K_2O @ 50 kg/ha. were given. The studies are in progress.

Studies on water use by crops grown in pure and mixed stands

The experiment was designed to find out the most economic and productive crop rotation for the sandy loam soils in command area. The treatments consisted of IW/CPE ratios - R1 (0.25), R2 (0.50), R3 (0.75) and R4 (1.00). Tapioca (9 months) as a pure crop on ridges and with groundnut on both sides of the ridges in two rows made up the two cropping systems. After harvest of groundnut (110 days), amaranthus (70 days) was planted on both the sides of ridges. The research is in progress.

Control of weeds in tapioca with the aid of herbicides

The results indicated that weeds in tapioca, both grasses and broad leaved weeds, can be satisfactorily controlled by spraying one kg. of Dalapon, followed by $\frac{1}{2}$ litre of Gramaxone 10 days after spray of Dalapon.

iii) Plant Protection

Survey for the population of whitefly (Bemisia sp.) and spread of casaava mosaic (College of Agriculture, Vellayani; RRS, Kayamkulam and HRS Ambalavayal)

This is a collaborative project with locations at Kayamkulam, Ambalavayal and Vellayani. At Kayamkulam, monthly observations on the population of whitefly and spread of cassava mosaic were recorded from two locations, one at Kayamkulam and another at Ochira. In each location, there were two plots. The varieties M.4 and H.1687 were planted in Kayamkulam. A local unnamed variety was planted at Ochira. The population build up of white flies started from June to November with a peak in August.

At Ambalavayal, the mean number of white flies/leaf was fairly large, especially during the months of July, August and September. However, the tapioca crop was free from the mosaic disease and there was no source of inoculum. Primary infection was absent in all the plots. During the period of high activity of the vector, there was no secondary spread in the plots under observation.

Studies on the cassava mosaic disease

The experiment consisted of studies on symptomatology, histopathology, electron-microscopy and different methods of transmission (sap seed, grafting, insects other than whiteflies). Detailed studies on vector-virus relationship of *Bemisia tabaci*, pattern of field spread of disease, hostrange of virus, resistance/tolerance of common cultivars of tapioca and estimation of crop losses would be conducted.

6. PULSES & OIL SEEDS

PULSES

CONCLUDED PROJECTS

i) Crop improvement

Estimation of genetic parameters in greengram (Vellayani)

The experiment was laid out using 15 varieties. Significant differences among varieties were observed for all characters studied. Statistical analysis showed that number of pods/plant, 100 seed weight and number of nodes per plant are traits exerting significant positive direct effect on yield. Hence, these characters were to be considered as important attributes in any selection programme.

Selection Index in horsegram (Vellayani)

Fifteen varieties of horsegram were evaluated for morphological and economic characters with a view to formulating a selection index. Path coefficient analysis indicated that the character pod length exhibited maximum direct effect on seed yield and hence was the most important yield contributing character.

ii) Crop management

Nutritional requirements of greengram (Vellayani)

The experiment was laid out using Pusa Baisakhi variety with graded doses of N,P and K. The results revealed that yield was significantly increased with increase in the level of potash. The maximum mean grain yield of 538 kg/ha was obtained with the highest level of potash (20 kg/ha).

Nutritional requirements of blackgram (Vellayani)

The experiment was carried out to study the effect of graded doses of N, P & K on the yield and other agronomic characters of blackgram

variety (K. M-1) under Trivandrum conditions. Yield and other yield attributes showed linear and significant increase with increase in level of potash. The maximum grain yield of 1757 kg/ha was recorded at potash level of 30 kg/ha.

Studies on cowpea rhizobium with special reference to standardisation of mass culture technique using indigenous carriers (Vellayani)

Screening trial with the 20 isolates of *Rhizobium* on cowpea var. 'New era' showed variation in their performance. The best performance was exhibited by the strain isolated from greengram in terms of fresh weight and dry weight of plants as well as number and fresh weight of nodules. The results indicated that inoculation of cowpea seeds with *Rhizobium* significantly increased the fresh and dry weight of plants and nodule characters. It was noticed that inoculation in no-nitrogen condition (non-fertilized plots) performed better, whereas inoculation supplemented with basal dose of ammonium sulphate did not give results similar to inoculation. It was also observed that combination of strains did not give any added advantage over single strain inoculation.

Studies on the performance of two groundnut varieties, TMV-2 & TMV-9 under graded doses of phosphorus and potassium (Vallayani)

TMV-9 was superior to TMV-2 in the number of pegs formed per plant, number and weight of mature pods per plant and yield of pods and haulm/ha. The 100 kernel weight and shelling percentage were higher in TMV-2 than in TMV-9. Protein content of kernel was increased by higher levels of P, while higher levels of K decreased it. Based on the economics worked out it was concluded that application of 90 kg P_2O_5 and 116 kg K_2O /ha. gave the highest net profit.

Studies on the effect of K & Mg on the yield, oil and protein content of sesamum

The results of the pot culture experiment indicated that maximum yield/plant was obtained with the highest level of K (75 kg K_2O /ha) although lower K levels (45 kg K_2O /ha) more favourably influenced the oil and protein synthesis. Mg had no complementary effect with different levels of K on the yield, oil and protein content.

ONGOING PROJECTS

i) Crop improvement

Breeding high yielding cowpea varieties with short flowering phase (Pattambi)

During Kharif 1979, twenty nine lines selected on the basis of seed size and colour from previous year were sown and twenty promising plants were selected for further testing in rabi season.

During rabi season, the twenty lines were sown along with parents. Two lines that showed synchronised flowering and maturity were selected for yield trial. During summer season, the two lines selected were tried with their parents and two other check varieties.

Screening elite cowpea varieties for local adaptability and high grain yield potential (Pattambi)

Twelve varieties were tested during the year, out of which the variety V-38 gave the maximum grain yield (425 kg/ha) followed by Ptb-1 and Pusa-1.

Screening for long podded vegetable type of cowpea (Pattambi)

Among twelve varieties tested Pusa Barsathi and No. 5269 were found to be superior to all other varieties. During the previous year No. 5269, Pusa Barsathi and Calicut-78 were found to be on par and superior to others tested.

Germplasm maintenance (Pattambi)

During the year 149 grain types, 57 vegetable types of cowpea, 48 greengram varieties and 21 blackgram varieties were maintained (kharif crop).

During rabi season, 632 types of cowpea received from Bangalore Centre were also maintained.

Studies on inter-varietal hybrids in cowpea (Vellanikkara)

Hybrids of varying combinations of inter-varietal crosses differed significantly in the extent of expression of heterosis with reference to the 16 economic characters studied.

Co-ordinated varietal trial of blackgram (Pattambi)

Results showed that among the six varieties tested, variety C-5-61-1 recorded the maximum yield of 1221.61 kg/ha. During the previous year, out of 18 varieties tested, H-76-1 recorded the highest yield of 911 kg/ha.

Breeding high yielding short duration drought tolerant blackgram variety suited to second crop: summer rice fallows (Pattambi)

Out of 17 varieties tested, three varieties namely Velloor, T-9 and KMU-3 were found to be better than the others.

During the previous year, M-3, KMU-3 and Edakkad yielded better than others.

Quantitative genetic study of yield and its components in blackgram (Vellayani)

Fiftysix varieties were studied for variability and genetic divergence. Six parents were selected and crossed in all possible combinations using diallel technique. The combining ability and components of genetic variation were estimated.

Varietal trial on blackgram (Kayamkulam)

There was significant differences in grain yield between varieties. Variety No. 31 recorded the maximum grain yield. KM-1 was second in position. During the last two years, maximum grain yield was recorded by variety Co-2.

Evaluation of yield potential of locally adapted varieties of greengram (Pattambi)

Out of 12 varieties tested, the variety Co-2 recorded the highest yield of 589.60 kg/ha. During last year, PS-10 recorded the highest yield of 589.60 kg/ha.

Co-ordinated varietal trial on Greengram (Pattambi)

Out of twenty varieties tested, RIMS-3, ML-5 and RIMS-4 recorded yields of 592, 527 and 519 kg/ha. respectively.

Effect of growth regulators on growth and yield of greengram (Vellayani)

The results showed that gibberellic acid had an effect in increasing the yield of greengram.

Breeding horsegram varieties suited to the locality through single plant selection from the cultivators' field (Pattambi)

Seventy two lines were sown in the field from which 200 single plants were selected for further studies.

Horsegram germplasm maintenance (Pattambi)

Twelve types of horsegram were maintained during the year.

Mutation breeding in horsegram (Vellayani)

M2 generation crop is in the field and further work is in progress.

ii) Crop Management

Study on the effect of foliar spray of urea and diammonium phosphate on cowpea (Pattambi)

Application of half N as basal and two foliar sprays of 2% diammonium phosphate solution on 20th and 30th day after sowing recorded the maximum grain yield of 765 kg/ha. In the previous year, application of N and P (20 and 30 kg/ha) through soil as per package of practices was found to give better yield than applying N and P in the form of urea and DAP at varying proportions.

Study on the effect of different phosphatic fertilizers and efficiency on their method of application on the growth and yield of cowpea (Pattambi)

During the year the crop stand was very poor due to poor germination caused by ill drained condition. In the previous year there was positive response to P_2O_5 application upto 50 kg P/ha. Application of P_2O_5 in the form of Mussorie rock phosphate has given better yield than superphosphate. Placement of phosphatic fertilizer in the form of rock

phosphate at seeding is found to be better than application by broadcasting. In the case of superphosphate, there was no significant difference in yield due to different methods of application.

Methods to increase the efficiency of seed treatments with rhizobium in cowpea (Vellayani)

The objective of the project is to study the methods of increasing the rhizobial population. The results obtained during the year showed that the application of lime @ 600 kg/ha. is to be done for getting maximum benefit from cowpea cultivation. The beneficial effect of rhizobial inoculation was noticed only in the presence of lime.

Nutritional requirement of greengram (Vellayani)

The objective of the project is to find out a combination of NPK for getting maximum crop yield and to study the quality of grains. Results obtained during the year revealed that the crop required 20 kg N, 30 kg P_2O_5 and 30 kg K_2O /ha. for getting higher yields.

Effect of lime, phosphorus and rhizobium inoculation on growth, yield and chemical composition of cowpea. (Vellayani)

This project was undertaken to study the effect of lime, phosphorus and rhizobium inoculation on the growth yield and chemical composition of cowpea. Results obtained during the year indicated that only lime exerted significant influence on the yield of seeds. Yield increased upto 300 kg/ha. Lime increased the nitrogen content of seeds and lime at 300 kg/ha. plus P_2O_5 at 60 kg/ha. increased the 'P' content of plants and seeds.

Scheduling irrigation for pulse: blackgram (Chalakyady)

The objective of this project was to find out the effect of timing and frequency of irrigation on growth and yield of blackgram, and also to identify the critical stages and to fix up the optimum number of irrigations. Two varieties (T-9 and Co-2) of blackgram under four levels of water management at five growth periods were raised in a field experiment.

Results indicated that the yield of grain was significantly influenced by both water management and varieties. Among the varieties tried, T-9 was superior to Co-2 and registered an yield increase of 119.6% over Co. 2. T-9 registered higher water use efficiency than Co. 2. T-9 was found more suitable as a summer crop. This variety could utilise water most economically. Irrigation schedule of 3 cm during the first 25 days and thereafter 4 cm at $IW/CPE=0.75$ (irrigation interval being 10 days) was found to be optimum for blackgram.

Screening of soybean varieties (Vellanikkara)

This experiment was started in 1976 with the objective of screening varieties suitable for Kerala. After screening the global germplasm

collection of soybean varieties maintained at IARI Sub-Centre, Coimbatore, 25 varieties were found to be suitable to Kerala conditions. Varieties B. C.-39821 and Improved Pelicon were found to perform well during S. West and N. East monsoon periods.

Based on the general performance of the varieties during South West and North East monsoons, six varieties were selected for each season. They were put under field trial.

Studies on the nitrogen nutrition and rhizobial inoculation on soybean (Vellanikkara)

The objective is to study the nitrogen requirement of the crop under inoculated and uninoculated conditions and to arrive at the fertilizer equivalent of rhizobial inoculation.

This study revealed that nitrogen fixed symbiotically was adequate for the crop. Application of nitrogen depressed symbiotic nitrogen fixation and with increasing levels of nitrogen. The study also revealed that introduced strain of *Rhizobium japonicum* was less effective in nitrogen fixation (on soybean) than the strains already present in the soil.

Effect of different levels of nitrogen phosphorus and potassium on the growth and yield of cowpea var. P-118 (Vellanikkara)

This project was to find out the effect of different levels of N, P and K on the growth and yield of cowpea var. P-118.

Results indicated that nitrogen at 20 kg/ha level contributed to increased nodulation which in turn favourably increased the grain yield. Phosphorus also had significant positive effect on nodulation. Potassium did not exhibit any significant influence on the yield components and on most of the growth characters.

Effect of phosphorus nutrition, liming and rhizobial inoculation on soybean (Glycine max (L) Merrill) (Vellanikkara)

The objective was to find out the phosphorus requirement of the crop, assessing the response to liming and evaluating the effect of rhizobial inoculation.

Applied phosphorus did not significantly affect any of the growth characters consistently. Grain yield and yield attributes were also unaffected. Liming and rhizobial inoculation did not have any conspicuous effect on the content of nutrients in soil.

Studies on the performance of four varieties of greengram (Phaseolus aureus Roxb) under graded levels of phosphorus (Vellanikkara)

This project is to identify a suitable variety of greengram and to know the response of different varieties to phosphorus application.

The study revealed that the variety Co-2 is superior to the other three varieties viz. Pusa Baisakhi, S-8 and Madira. Highest grain

yield as well as haulm yield were produced by the variety Co-2. Application of phosphorus at the rate of 30 kg P_2O_5 per ha. and 45 kg P_2O_5 per/ha. significantly increased height of plants, number of branches per plant and number of nodules per plant. Neither the varieties nor the levels of phosphorus significantly influenced the nitrogen, phosphorus potassium and protein content of grain.

COMMAND AREA RESEARCH CENTRE

Scheme for intensification of research on pulses and oil seeds

This project started functioning at the Headquarters, Vellanikkara with effect from 3.10.1979. The scheme has been operating at the command areas of Malampuzha, Peechi and Chalakkudy. During the 1979-80 summer season (December-January to April-May), varietal screening trials on pulses like cowpea, blackgram, greengram and oil seeds like sesamum and groundnut were conducted in the summer rice fallows in cultivators' fields. The occurrence of pests and diseases on these crops were also recorded during this season.

In the cowpea varietal trial conducted at Kottekad using 8 cowpea varieties, the variety Ptb-1 produced a grain yield of 400 kg/ha followed by V-16 (358 kg/ha) and V-37 (350 kg/ha). Similar trials with blackgram varieties showed that variety T-9 was the best with a grain yield of 420 kg/ha followed by Co-3 (375 kg/ha.). Among the greengram varieties Co-2 recorded 333 kg/ha and S-8, 336 kg of grain per hectare. The groundnut variety TMV-2 recorded an yield of 1130 kg of pods per hectare. The other varieties viz. TMV-7 and Pollachi-2 were found to yield only 808 kg/ha and 585.5 kg/ha respectively. Among the four sesamum varieties tried Cul-8 was found to be high yielding than the other varieties tested.

Six varieties of cowpea, two each of blackgram and greengram three varieties of groundnut and four of sesamum were tested in Peechi. Among the cowpea varieties tried, S-488 recorded the highest grain yield (274.5 kg/ha.). Greengram variety Co-2 was found to give 274.5 kg/ha. Other varieties tried were S-8 and Madira. Both varieties of blackgram tested were equally good yielding @ 302.5 kg/ha. All the three varieties of groundnut tested recorded yields between 1579 kg/ha and 1743.5 kg/ha.

In the Chalakkudy command area, Ptb-1, popularly known as Kananmani was found to yield 640 kg grain/ha. Variety C-152 was second with a grain yield of 540 kg grain/ha. Blackgram variety Co-2 and Co-3 were superior to all other varieties tested. Out of 4 varieties of greengram tested, variety NP-40 was better yielding than the others. Sesamum, variety K.1 recorded 450kg/ha. and Cul-8, 425 kg/ha. in this command area.

iii) Plant Protection

Control of storage pests of gram seeds (Vellayani)

The objective of this project was to find out the effectiveness of insecticides and other material on the control of the storage pests of gram seeds and on the viability of seeds.

Results obtained during the year indicated that mixing cowpea seeds with coconut oil, rubber seeds oil and neemcake gave good protection. Mechanical protection with polythene lined gunny bags gave complete protection. Mixing with contact insecticides Phoxim and Etriphos each at 10 ppm levels were found superior to the other treatments.

Previous year's results showed that Phoxim and Isofenphos gave protection from attack of pulse beetle, till five months after storage, when they were sprayed on outer surface of gunny bags. Phoximum, Isofenphos, Fanthion and Quinalphos gave protection for three months.

Relative susceptibility of different varieties of pulses to infestation by the pulse beetle (Moncompu)

Out of 25 lines tested, five cultivars K-39, Pusa-3, Kanakamani, C-M. 11 and V-16 suffered less than 5% damage in 30 days of storage. But all these lines suffered more than 25% damage in 60 days.

Studies on Rhizobia isolation and mass production of efficient culture of Rhizobium. (Vellayani)

Twenty one strains of rhizobium belonging to the cross inoculation group *Rhizobium* of cowpea were isolated from the acid soils of college of Agriculture, Vellayani. All these strains, along with five strains of *Rhizobium* obtained from other sources were screened for effective nodulation in cowpea under pot culture conditions. It was concluded that one of the natural strains of *Rhizobium* C-14 (f) out of the 29 culture tested were found to be more efficient in forming nodules in cowpea variety-Kanakamani when compared to all other strains.

Studies of Rhizobium: Selection of suitable strains for blackgram and greengram in Kerala (Vellayani)

The primary objective of the study was to evolve an efficient and most effective rhizobial strain for blackgram and greengram in Kerala.

During the previous year, seventeen *Rhizobium* strains were isolated from different hosts and from different localities in Kerala. These strains were screened for their efficiency in nodulation and N fixation in Kerala. During the year, promising strains identified were used in a pot culture experiment to study the effect of plant protection chemicals on nodulation and N fixation.

Screening of cowpea varieties for resistance against collar rot and web-blight disease ((Vellayani)

During the year, different isolates of collar rot and web-blight organisms of cowpea, and sheath blight organism were prepared. Mass culturing of the organisms was done.

SESAMUM

i) Crop improvement

Varietal improvement of sesamum (Kayamkulam)

Collection and maintenance of varieties of sesamum and evolution of high yielding varieties were the objectives of this project. During the third crop season of 1979-80, fortyseven varieties were grown and they were self fertilized for purifying the collection. Fifteen cultures of the cross Ptb-58-38 x Kayamkulam-1 also was maintained.

Comparative yield trial of promising sesamum varieties (Kayamkulam)

The objective of this project was to study the performance of eight varieties of sesamum as compared to Kayamkulam-1. There was no significant difference between the varieties. However, variety KRR-2 recorded the maximum yield followed by No. 42 and Kayamkulam-1.

During the previous year, GP-III-2 recorded maximum yield, significantly superior to all other varieties.

Multilocational trial with the high yielding multipodded cultures of the cross Ptb-58-38 x Kayamkulam-1 in different locations of the Onattukara tract (Kayamkulam)

The objective of this study was to assess the performance of two high yielding multipodded cultures of sesamum Cul-7-1 and Cul-8 in different locations of Onattukara as compared to Kayamkulam-1. In all the locations Cul-8 was significantly superior to all other cultures.

Cytogenetic studies in sesamum (Vellayani)

This project was to study the genetic basis of the ideal plant type characters and their recombination potential. Forty four varieties were selected for the study. The expression of the different characters were recorded and the varieties showing the maximum expression of the characters were selected as parents. The hybridization work is in progress.

ii) Crop management

Evolve suitable agronomic practices to obtain uniform population in the bulk crop of sesamum so as to enhance the yield per hectare (Kayamkulam)

Sowing seeds and ploughing immediately after the harvest of paddy crop was found to be the best out of 10 methods tried.

Studies on the fertilizer management practices for the multipodded mutant Kayamkulam-1 (Kayamkulam)

Six levels of fertilizers were tried on two varieties, Kayamkulam-1 and multipodded mutant of Kayamkulam-1. It was found that there was significant difference between levels of fertilizers. Both varieties recorded significantly higher yield under NPK @ 15:15:15 and 5 tonnes of cattle manure/ha as basal.

During the previous year, maximum yield and multipodded expression was recorded by treatments with higher fertilizer levels.

Effect of potash on the yield and oil content of sesamum (Kayamkulam)

Maximum yield was obtained from plots receiving NPK 30:15:15 as basal + 15 kg K₂O at interculture time.

During the previous year, NPK @ 30:15:30 kg/ha. as basal and K @ 30 kg/ha. at interculture recorded maximum yield.

Influence of potassium and magnesium on the yield, oil and protein content of sesamum (Vellayani)

The study showed that maximum yield of sesamum could be obtained with the highest levels of 75kg K₂O/ha. Although lower levels more favourably influenced the oil and protein synthesis, magnesium has complementary effect with K only at a lower level of 45 kg K₂O/ha.

iii) Plant protection

Studies on the insect pests of sesamum and their control (Kayamkulam)

During the early stages (3 weeks after planting), aphid attack was observed. But during the later stages, there was not much attack of aphid; but shoot and pod borer attack was observed. The attack was more in adequately fertilized plots. Dusting of BHC 10% and spraying of Dimecron 0.20% was not found to be effective in controlling the shoot and pod borer. During the previous year, aphid and shoot & pod borer attack was severe.

Disease of sesamum (Kayamkulam)

The study revealed that there was not much disease problems to cause considerable reduction in yield. Slight incidence of phyllody and powdery mildew was observed in the later stages of the crop.

GROUNDNUT

i) Crop management

Studies on the optimum seed rate and spacing of groundnut as intercrop in tapioca (Instructional Farm, Vellanikkara)

The experiment conducted during previous year showed that intercropping tapioca with groundnut in single rows at a spacing of 30 cm can be economical.

Varietal trial on groundnut (Kayamkulam)

This project was aimed to study the performance of different groundnut varieties in Onattukara conditions during the third crop season.

TMV-7 and Exotic-1 recorded maximum yield. During the previous year, TMV-2 and Gangapuri recorded the maximum yield. It is concluded that TMV-2 and Gangapuri are suitable for cultivation during third crop season in rice fallows in Onattukara region.

Manurial trial on groundnut (Kayamkulam)

The trial was laid out to study the optimum level of N, P & K for groundnut in sandy tract. During 1979, maximum yield was recorded by NPK application @ of 10:50:50 kg/ha.

Studies on the cultural and management practices of groundnut in the sandy loam tracts of Onattukara (Kayamkulam)

The objective was to evolve an appropriate technology for the effective utilization of the time interval between the two rice crops during the third crop season for profitable cultivation of groundnut as a catch crop in Onattukara rice fallows.

During the previous year, maximum pod yield was obtained from dibbling seeds immediately after second crop harvest without land preparation, after applying 1000 kg lime/ha. and hoeing given after 15th & 30th days of dibbling.

Scheduling irrigation to groundnut (Chalakydy)

The objectives of this project were to find out the effect of timing and frequency of irrigation on the growth and yield of groundnut. Identification of the critical stages of irrigation and fixing up the number of irrigations were also aimed at. Results showed that the differences in the yield of pods either due to water management or due to the interaction between water management and varieties were not significant. But the yield of pods due to varieties was statistically significant. Among the varieties, Gangapuri recorded the highest yield of pods and was superior to the other varieties under irrigated conditions during summer. It was concluded that among the different levels of water management, irrigation at IW/CPE = 0.5 was best without any significant reduction in pod yield.

7 ESSENTIAL OILS AND MEDICINAL PLANTS

ONGOING PROJECTS

Adaptability studies on North Indian vetiver hybrids (Odakkali)

The project aimed at selecting a high yielding variety of vetiver with regard to root and oil yield as well as quality. The crop was harvested in December 1980.

Studies on the methods of extraction of essential oil from vetiver (Vellanikkara)

The objective of this project was to find out a cheaper method of extracting vetiver oil by using solvent extraction techniques.

Performance studies of the M_2 irradiated lemongrass and some superior types of lemongrass in germplasm (Odakkali)

The experiment was to study the performance of the selected mutants and to compare them with OD. 19 and some superior types in the germplasm.

Among the four lines selected, No. 8 gave maximum yield of grass and oil. Multiplication of the line has been started.

Comparative yield trial of promising types of lemongrass collections with OD-19 (Odakkali)

Object was to find out the comparative merits of promising types of lemongrass screened through PYT with OD-19. Among the types, OD-410 gave the maximum oil yield with less citrol content. Herbage yield was maximum in OD-56. OD-19 recorded the maximum citrol percentage.

Effect of time and pressure of steam in the distillation of the essential oil yielding crops (Odakkali)

The aim was to standardise the pressure of steam with time in distilling various essential oils by steam method in different seasons. The study was conducted in lemongrass during the monsoon season. 95% of the oil was extracted in one hr. at 15 lb pressure. 99% of the oil was extracted in one hr. at 25 lb pressure. The experiment will be conducted in other essential oil yielding crops also.

Varietal cum manurial trial on lemongrass: multi-locational trial of ICAR (Odakkali)

The study was to compare the performance of three varieties namely OD-19, SD-68 and RRL-16 developed at Odakkali. CIMPO-Lucknow and R. R. L-Jammu, respectively under graded dose of nitrogen. SD-68 on 100 kg N/ha gave the highest grass and oil yield. OD-19 was the best when no fertilizer was applied. This is in conformity with the previous year's result.

Induction of mutation and polyploidy in lemongrass (Vellayani)

The objective was to induce useful mutations by radiation and chemical mutagens treatment and autotetraoloids by colchicine treatment in the lemongrass variety OD-19.

The data collected indicated variability for productive characters in the mutant clones. Eleven clones gave higher grass yield and seven clones gave higher oil content. Considering grass yield and oil content together, 14 clones were better than the standard.

Studies on the fungal parasites of lemongrass (Vellayani)

Detailed studies on symptomatology, pathogenicity, mode of spread, survival and control of fungal parasites of lemongrass were carried out.

The pathogenicity trial was the main item of work done during the period. No successful results were so far obtained. During the previous year, various fungal pathogens like *Helminthosporium*, *Alternaria*, *Curvularia* and *Colletotrichum* were isolated from barks, flowers and stem of lemongrass.

Performance studies on M_1V_3 generation of the irradiated selection of palmarosa (Odakkali)

The object of this study was to evolve a high yielding variety of palmarosa by mutation breeding. The selected lines, namely, No. 3, No. 4, No. 18 and No. 20 are under multiplication.

Varietal trial on palmarosa (Odakkali)

The study was to find out the best variety with regard to oil yield and geraniol content. Among the two varieties, variety ODP-2 was far superior in oil yield, oil recovery and geraniol content than ODP-1. This is in conformity with previous year's result.

NPK trial on palmarosa: multilocation trial of ICAR (Odakkali)

Application of N 80 kg/ha., P_2O_5 40 kg/ha. and K_2O 40 kg/ha. recorded maximum oil yield. But grass yield was maximum for the treatment O N, O P_2O_5 and 40 kg. K_2O /ha.

Dioscorea floribunda: multilocal trial (Odakkali)

The objectives of this study were to find out the optimum size of the tuber portion as planting material for commercial cultivation, to determine the optimum spacing and to find out the optimum manurial requirement of the crop.

8 POST-HARVEST TECHNOLOGY & NUTRITION

Studies on preservation of neera (College of Agriculture, Vellayani)

The results showed that it is necessary to adopt hygienic methods from the initial stages of tapping, collection, process of treatment and final preservation of *neera* so as to avoid external contamination to the maximum possible extent. It was also observed that *neera* can be preserved for about six months without losing much of its quality by concentration in vacuum and sterilization by steaming. However, it is felt that more elaborate studies are required for recommending the process for adoption on commercial basis.

A study on the current methods of preparation and preservation of tubers by indigenous methods in Kerala (College of Agriculture, Vellayani)

The study was confined to tapioca and a questionnaire covering all aspects of preparation and preservation by indigenous methods was prepared and data collected from 250 rural women of Trivandrum. The results of the survey showed that tapioca used for home consumption by 69% of the respondents were from their own gardens. 90% of the respondents harvested their own crops for home consumption three to four days at a time, while only 10% harvested fresh cassava daily. 30% of the respondents stored cassava in soil, 19% in open places, 14% in baskets, 15% in gunny bags and 17% in wooden boxes.

Processing and acceptability of soybeans (Vellanikkara)

The objective of this project was to popularise soybean recipes to improve the utility of soybean as a cheap protein rich food. Different products like soybean milk, banana milk shake, vadai etc. were prepared using soybean as the main ingredient. To reduce the bitter taste of soybean, it was soaked in (a) gelatin (b) starch (c) gelatin and sodium hydroxide (d) starch and sodium hydroxide, for preparation of soybean milk. It was observed that the milk prepared from the soybean soaked in starch was more acceptable. This work is in progress.

✓ *Studies on the suitability of popular varieties of mango in Kerala for canning (Vellanikkara)*

The object of this study was to find out the suitability of popular varieties of mango in Kerala for canning. Four popular varieties of mango, viz Olour, Suvarnakha, Mundappa and Neelam were canned as slices and their qualities assessed. This work is in progress.

Studies on the variation in the quantity and quality of oil in different parts of palmarosa in different seasons (Vellanikkara)

The project was undertaken to find out the oil yield and geraniol content in oils obtained from different parts of palmarosa as influenced by weather parameters, to determine the physical properties and other chemical properties of the oil obtained from different parts, to compare with ISI specifications and also to work out the cost benefit ratio. Six harvests were made during the year and the estimations of oil carried out.

✓ *Standardisation of techniques for the preparation of candy from fruits (Vellanikkara)*

The objective of this project was to standardise techniques for the preparation of candy from cheaper fruits which may not fetch good price when sold as such. Techniques were standardised for the preparation of candy from unripe papaya and Kelakkai.

Yield and quality of oil from avocado fruits as influenced by variety, flowering season and stage of maturity of fruits (Vellanikkara)

Oil from avocado fruits was extracted and studied to examine the effect of fruit maturity, flowering season and variety on the yield and quality of oil. This work is in progress.

✓ *Studies on post-harvest physiology, pathology and storage of fruits (College of Horticulture, Vellanikkara)*

The object of the study was to find out the effect of pre and post harvest treatments on the quality and storage of fruits. Effect of post-harvest application of growth regulators 2, 4, 5-T, 2, 4-D, IAA and NAA on fruit quality of Palayankodan variety of banana was studied. The growth regulators were used at different concentrations. The study revealed significant variation among the treatments with regard to the

different quality indices like loss of weight on ripening, TSS, acidity, TSS/acid ratio, total sugars and reducing sugar/acid ratio.

No significant variation was noticed with regard to the peel-pulp ratio due to the treatments. Treatments of 100 ppm IAA as well as 40 and 60 ppm 2,4-D were found to increase the loss in weight on ripening, ascorbic acid content and sugar content. Acidity of the fruit was found to be reduced by the treatments with 2, 4, 5-T 60 ppm, NAA 50 ppm, 2, 4-D 20 ppm and IAA 100 ppm. The sugar/acid ratio was increased by IAA 100 ppm and 2, 4, D 60 ppm.

9 SUGARCANE AND OTHER MISCELLANEOUS CROPS LIKE COTTON, JUTE AND MILLETS

SUGARCANE

CONCLUDED PROJECTS

i) Crop improvement

Varietal trial on sugarcane (Thiruvalla)

This experiment was started in the year 1976 with the objective of identifying superior cane varieties to the existing popular varieties of the region. The experiment was concluded during the year 1979, after studying for three seasons. The data gathered are presented in table below:

Variety	No. of millable canes per plot	Yield in kg. per plot (36 m ²)	Sucrose percentage
Co. 997	485.0	261.0	17.23
Co. 62175	457.7	345.7	16.33
Co. 785	394.0	231.2	15.24
Co. 6415	138.7	147.3	17.37
Co. 1254	445.0	225.3	17.59
FA. 64-17	465.7	203.8	16.42
Co. 775	210.7	164.3	15.75
Co. 6602	405.7	231.2	17.57
Co. 7302	466.7	282.0	15.86
Co. 62174	348.7	251.8	16.01
Co. 449	423.0	256.7	16.24
Co. 7106	454.7	289.7	17.21
C. D.	132.3	77.0	—

It can be seen from the table that maximum yield was recorded by Co. 62175 which is 32 per cent over the standard Co. 997. No significant difference was observed between the varieties in respect of sucrose percentage.

ii) Crop Management

Fertilizer trial on sugarcane (Thiruvalla)

The trial was laid out to find out the optimum requirements of nutrients for sugarcane and to formulate fertilizer recommendation for the crop to get maximum yield and sugar recovery. This project was concluded during the 1979-80, after three seasons' studies.

The first season studies showed that effects due to nitrogen and phosphorus were significant; but potash had no effect on the yield of cane. The optimum level of nitrogen was found to be 154 kg. per hectare. The optimum level for phosphorus could not be worked out since the response was linear.

For the first ratoon, treatments could not be given in time, due to circumstances beyond control. With respect to sucrose, no significant difference could be obtained between the levels of nitrogen, phosphorus and potash.

From the results of the three seasons, it can be seen that a higher dose of nitrogen is required for the ratoon sugarcane crop.

Response of promising early and midlate cane varieties to the rate of nitrogen application (Thiruvalla)

This trial was started in January 1977 and concluded in January 1980. The object of the study was to ascertain the response of early and midlate cane varieties to the graded doses of nitrogen over an optimum level of phosphorus and potash. Among the four varieties—Co. 997, Co. 449, Co. 785 and Co. 62175 studied, it was seen that Co. 62175 recorded maximum yield. The optimum level of N for maximising production was 167 kg per hectare. The response to levels of nitrogen was linear in the first ratoon and hence optimum level could not be worked out. Manurial levels and varietal difference had no effect on sugar content.

ONGOING PROJECTS

i) Crop improvement

Evaluation of varieties suitable for the different tracts of Kerala (Thiruvalla)

The objective of this trial was to evolve sugarcane varieties suitable for the different agro-climatic zones of Kerala with special reference to requirements of each tract, through hybridization and seedling selection. The trial is in progress in the Sugarcane Research Station, Thiruvalla.

Utilizing the facilities available in the National Hybridization Garden of the Sugarcane Breeding Institute, Coimbatore, hybrid seeds of 10 inter-varietal combinations were produced during February 1980. The seeds were sown and seedlings planted at S. R. S. Thiruvalla in May 1980.

Seedling selection will be conducted and superior seedlings will be subjected to further screening and evaluation.

Zonal varietal trial (Thiruvalla)

This has been laid out at S. R. S. Thiruvalla with the objective of evolving suitable varieties for the region by making selections from the varieties suggested by the Zonal Leader of ICAR.

From the results of the trial with seven varieties, it could be seen that Co. 62175 recorded the highest yield of 129.77 tonnes/hectare i.e. 40.15 per cent over the standard Co. 997.

Screening of sugarcane varieties for early and midlate groups

The trial was laid out at Thiruvalla, Thakazhi, Idukki, Punalur and Chittur with the available released and pre-release varieties with a view to finding out the most adapted one to the locality. Results of Thiruvalla Station with 22 varieties in the early group and 16 in the midlate group indicated that Co. 658 in the midlate group and Co. 1303 in the early group were superior to the others.

The trial with 21 varieties in the midlate group conducted at Punalur showed that Co. 997 in the early group and Co. 1307 in the midlate group were superior.

Trials at Thakazhi with 21 varieties in the early and 13 in the midlate group revealed that Co. 6806 in the early group and Co. 62175 in the midlate group were the best ones. Results of Idukki with 20 varieties in the early group and 14 in the midlate group indicated the superiority of Co. 997 in the early group and Co. 62175 in the midlate group. Results of the Kanjikode Farm representing the Chittoor Sugar Factory area with 16 varieties of the early group indicated that CoC 77-1 was superior over others.

ii) Crop management

Spacing-cum-manurial trials

The trial has been conducted in three centres viz. Thiruvalla, Punalur and Chittur. In each centre, separate trials for early maturing and midlate varieties were laid out. The objectives of the trial were to determine the optimum spacing of sugarcane for maximum productivity and also to find out the relationship between spacing and nutritional requirements in sugarcane.

At Thiruvalla, the treatment differences for yield for the early variety Co. 997 were not significant. In the case of midlate variety Co. 62175, the treatment differences for yield were significant. The results revealed that 75 cm. spacing was superior to 90 and 105 cm. Maximum yield was recorded at the highest level of fertilizers and minimum at the lowest level.

At Chittur, experiments were laid out with the early variety Co 62174 and midlate variety Co. 419. The trials were laid out only in January 1980 and hence the results were not available during the year.

Analysis of the results of the trials laid out at Punalur was also done.

Ratoon management studies

This trial was laid out during 1979-80 in two centres viz. Thiruvalla and Punalur with the objective of working out the ratoon management practices for sugarcane. The various treatments will be given for the ratoon crop after the harvest of the main crop.

Studies on companion crops in sugarcane fields

This trial was laid out in two centres viz. Thiruvalla and Punalur with a view to identifying suitable companion crops in sugarcane fields and to work out the economics of the system. The data will be available only after the harvest of the standing sugarcane crops.

Effect of altitude on sugarcane seed material

To study the seedling vigour and performance of progenies of seed materials brought from high ranges, four popular varieties of sugarcane viz. Co. 997, Co. 62175, Co. 449 and Co. 785 were raised at Chakkupallom in Idukki District and also Horticultural Research Station, Ambalavayal during 1979-80. Seed materials of these varieties were brought from the above two centres and were compared with the same raised in the plains at S. R. S. Thiruvalla. The data will be available next year.

Introduction of sugarcane to Wynad as a commercial crop

To find out the possibilities of introducing sugarcane cultivation on commercial basis and its processing under Wynad conditions, a project was taken up as an observational trial with four varieties viz. Co. 997, Co. 62175, Co. 785 and Co. 449. The results of the first year indicated that all varieties tried performed well under Wynad conditions.

Experiment to find out the best time of planting of sugarcane

With a view to finding out the best time of planting of sugarcane in different tracts and to examine the feasibility of extending the crushing season by staggering the time of planting, an observational trial with fortnightly planting of sugarcane was taken up at Thiruvalla and Punalur, commencing from November 15th. The results of the trials will be available only after the harvest of the standing crop.

Soil application of silicate slag (Thiruvalla)

In order to ascertain the effect of silicate slag on yield and juice quality of sugarcane, a trial with two varieties viz. Co. 997 and Co. 62175 with five levels of silicate slag was conducted at Thiruvalla. The results indicated the superiority of Co. 62175 over Co. 997 in cane yield. However, the treatments had no effect on the sucrose percentage.

Effect of soil ammendments on yield of plant and ratoon crops of sugarcane in acid soils

Results of the trial conducted at Thiruvalla with two varieties, Co. 997 and Co. 785 revealed that application of lime had no effect on germination. In the case of shoot count, millable cane and yield, Co.997 was superior to Co. 785 in the plant crop.

JUTE AND MESTA

The following three trials were concluded during the year.

Observational trial on the possibilities of raising jute in Onattukara region

The results of the trial conducted in 1979 at R. R. S. Kayamkulam with six varieties of jute revealed the possibility of raising this crop in Onattukara.

Observational trial on variety-cum-date of sowing with Capsularis and Olitorius jute

The trial was laid out to find out the performance of varieties at different dates of sowing. The results indicated the superior performance of *Capsularis* over *Olitorius*.

Exploring the possibility of cultivating mesta as a fibre crop in pineapple growing regions

The results of preliminary trials conducted with two varieties showed the possibility of cultivating mesta as an intercrop in pineapple, tapioca and cashew growing areas.

10 FODDER CROPS

Comparative performance of guinea grass and hybrid napier in coconut gardens and in open, under varying levels of nitrogen and cutting intervals (College of Agriculture, Vellayani)

An experiment was laid out to assess the production potential of guinea grass and hybrid napier as intercrops in coconut gardens and in the open, under graded doses of nitrogen for two cutting intervals. Both as an intercrop and in the open, guinea grass was found to be superior with respect to green matter production. Though progressive increase in yield was noticed with increased level of nitrogen, significant response was noticed only for 200 kg/ha. The longer cutting interval of 45 days was superior to 30 days. It was also observed that the overall fodder yield was lower in partially shaded coconut gardens compared to open field conditions.

Manurial trial on three promising guinea grass types (College of Agriculture, Vellayani)

Three promising guinea grass varieties were studied to assess the fodder production potential and also their nitrogen requirements. The three varieties were FR-600, FR-599 and Mackuenii and the nitrogen levels used were 150, 200 and 250 kg/ha. No significant yield difference

was noticed among the varieties. However, the highest yield was from Mackuenii (30.01 t/ha) followed by FR. 599 and FR. 600. The three strains showed no response to higher doses of nitrogen under rainfed conditions.

Performance of Dinanath grass (Pennisetum pedicellatum Trin) as influenced by nitrogen and lime application (College of Agriculture, Vellayani)

An experiment with three varieties (Pusa-1, PP-15, and JP-12) under three levels of nitrogen (50 kg, 100 kg and 150 kg/ha) and three levels of lime (0,375 and 750 kg/ha.) was laid out as a partially confounded factorial experiment with two replications. The study revealed that variety JP-12 had the maximum height while Pusa-1 produced maximum number of tillers. Both nitrogen and lime favourably influenced these characteristics. An yield of about 35 t/ha. was recorded by varieties PP-15 and JP-12, while Pusa-1 recorded 32 tonnes/ha. Both protein content and protein yield were maximum in JP-12, followed by PP-15. These characters recorded improvement with nitrogen and lime application. The condition of the soil was also observed to have been improved in respect of total N, available N, organic matter and water stable aggregates due to cultivation of this grass.

Fodder production potential of grass-legume mixtures

The project aimed at evolving a suitable grass-legume mixture for Kerala conditions, to assess the beneficial effects of legume intercropping on the yield and quality of fodder and to study the effect of graded doses of phosphorus on fodder production of grass-legume mixtures. The experiment is in progress.

Fodder production potential of sweet potato under varying levels of nitrogen

The object of this study was to evaluate the fodder production potential of sweet potato under varying levels of nitrogen fertilization. There was progressive increase in the length of vines with increase in level of nitrogen. Maximum length of vine (104.24 cm), maximum green fodder yield (11.27 t/ha), dry fodder yield (2.26 t/ha) and tuber yield (7.01 t/ha) were recorded at 90 kgN/ha. This was followed by application of 60 kg N/ha. The experiment will be repeated for one more season before drawing any definite conclusions.

Comparative performance of cowpea varieties

This project aims at the comparison of production potential of 12 fodder cowpea varieties. The result obtained during the year indicated that the varieties did not differ significantly in green and dry fodder yield. However, the maximum green fodder yield 19.73 t/ha. was recorded by the variety UPC-979.

Initial evaluation trial on cowpea

Results obtained revealed that there was no significant difference between the varieties tried in green and dry matter yield. However, variety S-457 registered the maximum green matter yield (9.56 t/ha) and Kanakamani recorded the highest dry matter yield (1.34 t/ha).

Final evaluation trial on cowpea

The results obtained indicated that among the 13 different varieties tested, maximum green fodder yield of 10.48 t/ha. was recorded by the variety HFC 42-1 and lowest yield by C-25. The variety UPC-42 recorded the maximum dry fodder yield of 1.78 t/ha.

Final evaluation trial on bajra

The varieties tested and the yield of green fodder and dry fodder are presented below:

<i>Variety</i>	<i>Green fodder yield (t/ha)</i>	<i>Dry fodder yield (t/ha)</i>
Nagarjuna	8.63	1.87
Visakha	6.17	1.72
Anand Selection	8.02	1.44
Balaji	6.78	1.94
Gujarat Selection	7.40	1.99
CD	N. S	N. S

It was evident that the variety Nagarjuna recorded maximum green fodder yield and Gujarat Selection, maximum dry fodder yield.

Final evaluation trial on Dinanath grass (Pennisetum pedicellatum)

The results obtained during the year revealed that variety PP-15 recorded 18.5 t/ha. of green matter and 5.67 t/ha. of dry matter yield.

Effect of plant population on the yield and quality of Koobabool

This experiment was conducted using nine different spacings. The result showed that there was no significant difference between the treatments in green matter and dry matter yield. However, the maximum green fodder yield (1999.87 kg/ha) and maximum dry matter yield (1266.67 kg/ha) were obtained by adopting the spacing 1.5m x 20 cm.

Evaluation of production potential of grasses and legumes under varying combinations with forage trees

The result obtained during the year indicated that the combination of koobabool + guinea grass + velvet bean registered the highest

green fodder yield (16296.28 kg/ha). This was on par with the combination of *Sesbania grandiflora* + guinea grass + velvet bean.

Effect of row spacing and levels of phosphorus on the growth, yield and quality of Sesbania aegyptica

This experiment was conducted with the objective of finding out the effect of plant population and levels of phosphorus on the fodder production capacity of *Sesbania aegyptica*. This study revealed that the maximum green matter yield (555.55 kg/ha.) was recorded in the treatment "60 P × 30 cm" while the maximum dry matter yield (209.72 kg/ha.) was in the treatment "90 P × 25 cm".

11. PLANT PROTECTION

CONCLUDED PROJECTS

Ecology of Brown Plant Hopper (Moncompu)

The results showed that the BPH is present in fields through out the year with peak population during January to March (punja season), minor peak during Aug-Sept (mudakan season). Rainfall, RH and max. temperature played a decisive role in regulating the population of the insect. Three seasons' results showed that Jyothi was tolerant to BPH attack compared to Jaya. Spacing of 30 × 20 cm recorded least hopper number. Maximum and minimum population of hopper was seen under 120 kgN/ha and 60 kg N/ha, respectively. Higher grain yield was recorded with 20 × 10 cm spacing and 120kg N/ha or 90kgN/ha.

Biology and bionomics of whorl maggot, Hydrellia philippina and inflorescence thrips, Haplothrips ganglbauri (Moncompu)

The whorl maggot and panicle thrips are attacking rice in certain tracts in serious proportions. The objective of this project was to study the biology and bionomics of these insect pests. The life cycle, seasonal occurrence, varietal reaction to pest attack, alternate hosts of the pests, and types of damage caused were studied.

Mating done in day time, lasting few seconds, was followed by the female laying eggs singly (4-6 per individual). Egg incubation period was 6-7 days. The pre-pupal period was three days and pupal period, eight days. Longevity of adult was 5.5 days. *Cyprus rotundus*, *C. iris*, *Echenochia sp.*, *Cynodon sp.* and *Ischaenium sp.* proved to be non-hosts of the insect.

Effect of different oils in reducing population build up of BPH (Moncompu)

The objective of the project was to study the effect of various non-phytotoxic oils in controlling population build up of BPH. Kerosene, berlane, cashew shell oil, fish oil, diesel, lemongrass waste, engine

oil waste were applied 1ml/m². Pot trial showed complete mortality of insects within 48 hrs. by berlane. In a field trial, berlane, diesel and kerosene were effective in bringing down the insect population.

Evaluation of diflubenzuron (Dimilin) for control of rice swarming caterpillar (Vellayani)

The aim was to evaluate the physiological effects of the chemical on the insect pest, with reference to dose effect, stage specificity sterilant effect on protein and lipid metabolism, persistence and its ovicidal action. The chemical has been found effective in controlling various instars of rice swarming caterpillar. It has least mammalian toxicity compared to the insecticides now marketed. It can be recommended against all leaf eating insect pests.

Persistence of Carbofuran in paddy plants when applied at different stages of growth (Vellayani)

The objective were to study its absorption, translocation to stem and leaf parts, its metabolites in such portions; efficacy against BPH and to assess residues in straw and grain when applied at different stages of growth of plants (1,3,7,14 and 21 days after application). The studies showed rapid uptake of the insecticide in plant parts from first day to seven days after application and a decrease thereafter. Correspondingly the mortality of BPH was high during the first few days which decreased subsequently. The leaves had higher residue values than stems depending upon the dosages of 1 kg and 0.54 kg ai/ha. Mortality of BPH was low at the low dosage level. Residues of chemical in straw and grain were present only when applied on 60th day after transplantation.

Effect of application of systemic insecticide granules at the booting stage of paddy on grain setting and residues of the insecticides in grain and straw (Vellayani)

The objectives were to find adverse effect, if any in grain setting and to estimate residues of Carbofuran, Phorate and Mephospholan in grain and straw when applied at boot leaf stage. The results showed that except Carbofuran, @ 0.5 kg ai/ha the chemicals tested significantly reduced grain setting upto 13 per cent, over the check. Carbofuran @ 0.5 kg ai/ha did not leave any residues in grain, residues left in straw was below tolerance limit (0.35-0.47 ppm). Carbofuran, Phorate and Disulfotolp when used @ 1kg, 1.25 kg or 2.5 kg ai/ha left residues above TL of 0.50, 0.1 and 0.75 ppm, both in grain and straw.

Method of application of Furadan against paddy pests (Moncompu)

The aim of the project was to find out suitable methods of placement of chemical in soil encased in mud, cowdung, oilcake and paper balls to ensure maximum absorption by plant and to avoid loss of toxicant, at 40-50 DAT. Jaya was used as test paddy variety. No

significant difference between the methods of placement in pest control or yield of paddy was observed in trials conducted for two years.

Effect of water management on the population build up of BPH (Moncompu)

The object was to find out the influence of water level (upto 5cm height) in fields on population increase of BPH. A pot trial and a field experiment were conducted. Lowest BPH population was recorded when soil moisture was maintained at field capacity. The field experiment results showed that drying field to hair cracking stage and keeping the moisture at field capacity reduced the BPH population to minimum.

Studies on entomogenous fungi associated with lady bird beetle, Heno-sepiledna vigintioctopuncta (Vellayani)

To find out natural entomogenous fungal enemies of the pest. The studies revealed that *Fusarium moniliformae* var, *subglutiuus* caused complete mortality of third and fourth instar grubs as effective pathogen on the insect. The fungus can be mass produced on sorghum and bajra. The fungus can attack several other insects and was compatible with insecticides like Malathion and Ekalux. The fungus is harmless to cotton, tomato, brinjal, bitter gourd and snake gourd. The pathogen caused 96.67 per cent mortality of insects when sprayed @ 7.5×10^5 spores/ml in caged plants.

Studies on disease causing organisms of paddy pests (Moncompu)

One fungus pathogen *Pencillium oxalicum* was observed infecting the earhead cut worm, *Cirphis albistigma*, causing 60-84% mortality in 72 hrs. in laboratory conditions. A further survey in Ayyanad padasekharan revealed that the fungus caused 40-43% mortality of the insect in natural field conditions.

Studies on the nuclear polyhedrosis of rice case worm, Nymphula depunctalis (Vellayani)

The object was to collect basic information of the NPV of rice case worm and its utility in microbial control of the pest. The studies revealed that NPV caused 100 per cent mortality of third and fourth instar larvae. The virus could withstand a thermal point between 80-90°C and weathering upto 48 hrs without loss of virulence infectivity, and it is highly specific to the insect.

Survey of natural enemies of BPH in Kuttanad (Moncompu)

The objectives were to survey and identify the efficiency and effect of insecticides on natural enemies of BPH in Kuttanad. The results showed that a mirid bug, a predatory ant and seven species of spiders are acting as natural enemies of BPH. The spiders were present from tillering phase and mirid bugs in the post flowering phase of rice plants. *Lycosid* spiders could kill nymphs of BPH from 11 to 37/day. Application of DDVP

or Leptophos affected least disturbances of spider population. In case of mirid bug four weeks after Carbofuran treatment, the predator population regained to natural level.

ONGOING PROJECTS

Studies on polyhedrosis and granulosis virus diseases of lepidopterous crop pests of Kerala (Vellayani)

The objective was to survey diseases of lepidopterous crop pests to find out their usefulness in microbial pest control. The survey brought out NPV on *Psara basalıs*, *Phytometra sp.* and *Margaronia indica*. All instars except sixth of *Nymphula depunctajis* were found highly susceptible to the NPV, which had a high thermal inactivation point (85–90°C) with standing weathering upto four days.

Biological activity of different plant extracts with particular reference to their insecticidal, hormonal and antifeedant actions (Vellayani)

Extracts of *Mentha spicata* leaves were toxic to epilachna grubs, inhibiting feeding by them; there was no effect on *Spodoptera litura* caterpillars. Extracts of neem and eupatorium leaves retarded growth of *Drosophilamelanogaster*. Complete inhibition on adult emergence was brought about by neem extract. Leaves of clerodendron and neem @ 0.75–6 kg/60 kg cowdung inhibited development of rhinoceros grubs in pits, preventing natural infection in cowdung pits upto six months. Neem leaf extract @ 100g/litre of water when sprayed on epilachna infection in bitter gourd and brinjal inhibited upto one week, adult emergence of the pest.

Chemical control of nematodes infesting pepper vines

The objective was to know whether the slow wilt affected vines can be recovered by nematicide application. The treated vines showed general improvement and recovery in their stand. The nematode population in roots reduced upto 210 days after application of nematicides. Studies on whether application of nematicides twice a year could make the vines recover rapidly is in progress.

Survey of rice, banana and pepper for incidence of nematode pests (Veliyani)

The study showed that *Hirschmanniella oryzae*, *Heterodera sp.*, *Pratylenchus sp.*, *Tylenchorhynchus sp.* and *Hoplamas* were associated with rice. *Meloidogyne sp.*, *Radopholus*, *Helicotylenchus*, *Pratylenchus*, *Rotylenchulus*, *Haplolaimus* and *Tylenchorhynchus* were associated with banana and pepper.

The incidence of *Heterodera* and *Hirschmanniella* on rice and *Meloidogyne* and *Radopholus* on pepper and *Radopholus* and *Helicotylenchus* on banana needs detailed investigation.

Sex-ratio regulation in Bracon brevicornis (College of Horticulture, Vellanikkara)

Deterioration of cultures by dominance of males is a problem in parasite breeding in Kerala. Techniques were standardised for developing stock cultures of adequate female population of the parasite on the basis of ambient temperature humidity combinations and developmental parameters of parasite and its lab host.

Studies on rats and rat traps (College of Horticulture, Vellanikkara)

The sewer rat, *Rattus norvegicus* has been reported as a field pest of rice for the first time.

Juvenominetic properties of neem leaves (College of Horticulture, Vellanikkara)

The juvenominetic properties of neem leaf extract was established and its use in pest management explored.

Biocontrol of Salvinia molesta (College of Horticulture, Vellanikkara)

The objective was to explore possibilities of control of salvinia by use of a grass hopper feeding on the weed. Nucleus culture of the grass hopper was maintained and total No. of 1300 adults/nymphs were released. The insect is now established in Koratti and Ambalathara. *Ophiocephalus sp.* of fishes were found to be predators of the female insect due to which progeny production, especially in deep ponds and lakes, and the establishment of the insect is adversely affected. Frog and spiders were also found preying the nymphs.

Ecological studies revealed that eggs require 25°—28°C with 90% RH. The shortening of nymphal period (26 days) and maximum adult emergence were at 31°C + 90% RH combination.

Biocontrol of the BPH, Nilaparvata lugens (College of Horticulture, Vellanikkara)

A survey revealed that *Cyrtorhinus lividipennis* and *Harmonia octomaculata* were wide spread in the State as natural enemies of the pest. The adult bugs (*C. lividipennis*) prefer 2nd instar of BPH and also feed on eggs at 5—10/day, their population ranged from 8—51/m² against 0—685/m² of the insect.

The predatory action of the beetle *H. Octonaculata* was studied. It was observed that adults feed on first three instars of the pest. The first instar grubs feed on first and second instars of the insect and other stages feed on all nymphal stages of the pest.

Residual toxicity of fungicides in relation to the control of important plant pathogenic fungi (Vellayani)

Tests conducted with *Botryodiplodia theobromae* spores treated by Difoltan and Rovral caused complete inhibition of germination upto 15 days. Dithane M-45 inhibited germination upto 10 days.

Under rainy conditions Bavistin, Difoltan, Dithane M—45, Mildothane and Rovral were toxic to spore germination till 6th day of treatment. More observations with other fungi are in progress.

Synergistic effects of fungicide-insecticide mixtures against important plant pathogens and insect pests (Vellayani)

The aim of this project was to study the effects of various pesticide combinations on fungi and insect pests. Ekalux and Nuvacron were compatible with Thiram, Fytolan and Dithane M—45. Zolone was compatible with Thiram and Dithane M—45 only.

Role of weeds in the perpetuation of virus diseases of vegetables and ornamental plants (Vellayani)

The objectives were to identify weeds which are infected by viruses and to study symptomatology, transmission method and host range. Thirteen viruses were identified of which six were found to infect crop plants (vegetables and ornamentals). Of the 13 viruses, eight were transmitted by white flies (*B. tabaci*), three by aphids (*A. gossypii* and *A. craccivora*) and two by grafting.

The studies revealed that white flies act as important vectors of virus diseases in Kerala. The mosaic virus of *Amaranthus viridis* and *Stachytarpheta indica* were found to be strains of AMV and CMV, respectively. Several weeds were found as collateral hosts of virus diseases of important vegetables and ornamentals.

Studies on the edible mushrooms of Kerala (Vellayani)

A number of *Termitomyces* collected near termite hills were found to be edible and consumed by local people. Few species of *Pleurotus* were also collected. Among the various substrates tried for spawn production, African payal was found to be suitable. Attack of *Rhizoctonia* on mushroom beds were found to be severe and this reduced the yield.

Utilization of lemongrass waste for mushroom cultivation (Vellayani)

The objectives for undertaking this project were the profitable utilization of the spent lemongrass (after extraction of oil) for the cultivation of paddy straw mushroom, *Volvariella*. Techniques for the large scale production were to be standardised and cultivation of mushroom was to be popularised. This project was started during the year.

Monographic studies on edible species of Pleurotus and standardization of techniques for large scale cultivation (Vellayani)

For artificial cultivation of *Pleurotus*, different methods were tried in trays and also on large scale on specially constructed trenches. During August, very good yield was noticed. When salvinia was used as substrate, it was fully infected by *Rhizoctonia*. The work is in progress.

12 SOILS AND AGRONOMY

CONCLUDED PROJECTS

Studies on the laterite and red soil associations in certain locations in Kerala (Vellayani)

A study was undertaken to identify the genetic factors responsible for the development of laterite and red soils as an association in some locations of Kerala. From the physico-chemical analysis of the soil profiles conducted, it was observed that the laterite-red soil association generally occur in undulating terrain with the laterite in the back slopes and the red soils in the foot slopes, indicating the possibility of the red soils developing from the solum of the laterite in the back slope.

Studies on the response of paddy to lime application in acid soils of Kerala (Vellayani)

A pot culture experiment was laid out with four acid soil samples collected from areas representing laterite, *kayal*, *kari* and *kole* lands of Kerala, for assessing the response of rice variety Annapurna to application of lime. Maximum grain yield was obtained in *kari* and *kole* soils when full lime requirement was met, while in laterite and *kayal* soils, half the lime requirement was found to register maximum yield.

Forms of nitrogen in coconut soils before and after the monsoon, with reference to occurrence of post monsoon yellowing in coconut (Pilicode)

Soil samples collected at various depths and radial distances from base of coconut palms (showing yellowing as also unaffected plants) were analysed to follow their available nitrogen transformations. It was observed that the forms and levels of available nitrogen present around healthy and affected palms during pre-monsoon and post-monsoon were identical. Hence, the possibility of non-availability of nitrogen as a cause of foliar yellowing was ruled out.

Phosphate sources for flooded rice (Pattambi)

A field study was conducted for four seasons using variety Jaya to study the efficiency of Phosmak – a phosphatic fertilizer of marine origin – as compared to rock phosphate and super phosphate. The yield data revealed that there was no significant difference in response of Jaya variety to the various phosphorus sources tried. Phosmak, like other phosphatic fertilizers tried, did not produce any response in rice yield at the Rice Research Station, Pattambi.

Trials with Phosmak for acid soils of Kuttanad (Moncompu)

The response of rice variety Jyothi grown in soils of Kuttanad to the application of Phosmak was studied for five seasons during 1977-78 to 1979-80. The pooled analysis of the data revealed that Phosmak, like other phosphatic sources, had no influence on grain-yield.

Investigations on the possible reasons for the lack of response to phosphorus in Kerala (Vellayani)

The response of ten short duration and ten medium duration rice varieties including high yielding and traditional varieties to phosphorus application was studied in a field trial. It was observed that Ptb 10, Ptb 9, Ptb 23, Ptb 29, Ptb 30 and Jyothi responded poorly to application of phosphorus. Varieties Ptb 31, Triveni, Rohini, Annapurna, Ptb 8, IR 8, IR 20 and IR 5 gave significantly higher grain yield for P applied at 60 kg P_2O_5 /ha, while varieties Mashoori, Bharathi and Aswathy recorded significantly higher yields in all levels of P application (30, 60 and 90 kg/ha) tried. At 30 kg P_2O_5 /ha level, variety Jaya was found to out yield all others.

Soil test-crop response studies for phosphorus in Kerala soils (Vellayani)

To evaluate different soil testing methods for available phosphorus in Kerala soils, a pot culture experiment was conducted with eight typical soils of the State employing four levels of P application (0, 20, 35 and 50 kg P_2O_5 /ha). Available P in soil was extracted using six extractants commonly employed and correlations were worked out with grain yield and crop uptake of P. The double acid extractant was observed to have significant correlation with P uptake, crop growth and yield. The calculation of critical levels of P has shown that response to phosphorus application can be expected in Kerala soils, only if the level of available P as determined by double acid method falls below 5.69 ppm at the time of planting.

Studies on the interaction of carbofuran and urea in soil (Vellayani)

A field trial was conducted at the Instructional Farm, College of Agriculture, Vellayani, using the variety Triveni to find out the effect of adding urea, potash and lime on the residence time of Carbofuran in the soil. The results showed that Carbofuran applied at three and seven days after liming persisted for more than 21 days in the field, while it degraded faster to low levels if applied along with lime or one day after liming. Urea and potash application were found to have no influence on the residence time of Carbofuran in rice soils.

ONGOING PROJECTS

i) Soil fertility management

Phosphorus and potassium fixing capacity of the rice soils of Kerala (Vellayani)

Potassium fixing capacity of twelve typical rice soils were determined. Among the different soils tested, black soil of Chittur recorded the highest K fixing capacity of 4 me per 100 g soil, followed by forest soil with 1.93 me and *Pokkali* soils with 1.83 me per 100 g soil. Coastal sandy soil was found to have no K fixing capacity whereas

laterite soil had fixing capacity of 0.12 me/100 g soil. Further studies are in progress.

Carbon-nitrogen relationship in Kerala soils (Vellanikkara)

The study was undertaken with the main objective of working out a precise C/N ratio for the dry land soils of Kerala so as to predict the total and available nitrogen status of soil based on the organic carbon content of the soil. An experiment to characterise the organic matter present in the various soil types of Kerala was also laid out.

Effect of agro-techniques on soil loss, surface run off and soil moisture storage in hill slopes (Vellanikkara)

A study was undertaken during the period under report for investigating the extent of soil loss and surface run off as a result of the various agro-techniques like planting along and across the slopes, mixed cropping, fallowing etc. The effect of the above treatments on the pattern of moisture storage was also followed. The experiment is in progress.

ii) Plant nutrition

Availability and requirement of phosphate to plants in the laterite soils of Kerala (Vellanikkara)

The main objective of this project was to investigate the reasons for the poor response of crops to application of phosphorus in laterite soils of Kerala. As a first step, a new and more suitable method of estimation of available phosphate reserve from laterite soils was indentified. This method is now being further evaluated for replacing the present method followed in soil testing laboratories employing "Bray No 1" extractant.

Tissue testing with a view to detecting nutrient deficiencies in agricultural and horticultural crops (Vellanikkara)

The objective of this project was to develop suitable tissue testing methods for detecting nutrient deficiencies in crops, by first standardising the tissue for analysis and then establishing critical values of different nutrients and its relationship with plant response. Experiments for the standardisation of tissues for diagnosis and determination of critical values of plant nutrients for crops like coconut, pepper, cocoa, ginger, turmeric etc. have been taken up as post graduate programmes and the work is in progress.

The relationship between soil nutrient status and foliar analysis of cocoa of different age groups in various soil types of Kerala (Vellayani)

The study was undertaken to correlate the nutrient levels obtained from foliar diagnostic tests with the soil test results for N, P and K and to relate these results with the yield data of bearing cocoa plants. It is

also envisaged to locate deficiency or toxicity levels of nutrients based on field observations and analysis. The studies are in progress.

Zinc and manganese status of paddy soils of Kerala (Vellayani)

The zinc and manganese status of rice soils are found to vary much as regards the quantity and forms in which they exist. Agricultural operations like application of manures and fertilizers, liming, flooding, drying etc. are observed to influence the transformation and availability of these minor nutrients. The objects of the present study were to identify the proper extractants for estimation of these nutrients, to follow their transformations under Kerala soil conditions during the crop growth period and to examine their influence on crop yields. Results so far obtained indicated that DTPA, EDTA and 0.1N HCl are suitable extractants for estimation of Zn and Mn in Kerala soils. Analysis of the data is in progress.

iii) Fertilizer management

Combined application of 2, 4-D and urea (Moncompu)

The effect of the combined application of 2,4-D and urea on weed growth was studied. The experiment was carried out both in transplanted and broadcast rice crop. The results indicated that application of 2, 4-D and urea in combination was as effective as separate spraying of 2, 4-D in controlling the weeds. The same trend of results were obtained during the previous year. The trial will be repeated for one more season for confirming the results.

iv) Physical properties of soils

A preliminary study on the variation of soil moisture and moisture retention characteristics in some typical soils of Kerala (Vellanikkara)

Soil samples have been collected from various tracts representing the major soil types of Kerala. The samples drawn from different depths of the various soil profiles will be analysed for the physical properties and correlated with their moisture retention characteristics.

Studies on ground water fluctuations and quality of water of the ARS Chalakudy Farm (Chalakudy)

The water table fluctuations and quality of ground water of the ARS Chalakudy Farm were determined during the last two years. During the current year, in the low land, water table was found to fluctuate from 4.3 cm above ground level to 123 cm below ground level, whereas in upland the level varied between 8.5 cm and 136 cm below ground level. In the case of garden land, the ground water table fluctuated between a minimum of 49 cm to a maximum of 200cm. The quality of irrigation water was observed to be satisfactory with regards to irrigation standards.

v) Problem soil

Studies on the quality of irrigation water in Kuttanad (Moncompu)

The pH of the soil slurry increased from 4.2 (March) to 6.7 (August) during puncha crop period. At the same period, the pH of river water varied from 4.4 to 6.9. The E. C. of the river water also was at desirable limit. Hence, it was observed that quality of irrigation water during the puncha crop season was good.

vi) Soil organic matter--compost making

Studies on the rate of decomposition of salvinia as influenced by chemical agents

The objective of this project was to screen chemical agents suitable for hastening the decomposition of salvinia. Thirteen chemical agents were tried for speeding up the decomposition. The trial is in progress.

Studies on the utilization of eupatorium for compost making

The manurial value of compost made from eupatorium and glyricidia using starters like cattle manure, goat manure and pig manure were determined from the composts already prepared. The analysis of the sample of compost for major nutrients are in progress.

vii) Pollution hazards

Physico-chemical investigation on the crop hazards due to industrial pollution in the sandy soils of Trivandrum

It has been envisaged under this study to conduct detailed investigations on the effect of industrial pollutants on the reported crop hazards in the premises of the Travancore Titanium Products and T. K. Chemicals factories located in the sandy belt of Trivandrum coast. The study also aimed at formulation of ameliorative measures.

13 FARM ECONOMICS AND EXTENSION

CONCLUDED PROJECTS

i) Extension

A study on the impact of Agricultural development programmes among the tribals of Kerala (Vellayani)

The study which was conducted in North and South Wynad taluks of Cannanore and Kozhikode districts of Kerala revealed the following. Kurichiyans, as a tribal group, exhibited higher levels of adoption of improved agricultural practices. The adoption pattern of tribes in more developed areas were superior. Adiyans had favourable attitude towards settled agriculture while Paniyans showed unfavourable attitude. Among the tribes, the use of mass media was very less.

A study on the impact of selected development programmes among the tribals of Kerala (Vellayani)

A study was conducted at the North and South Wynad taluks of Cannanore and Kozhikode districts. It was revealed that the Adiyans as a group showed better adoption of modern living practices, high level of knowledge and showed favourable attitudes to modern living. Adoption behaviour of tribals in developed areas was encouraging.

To study the impact of institutional credit and its influence in the behaviour of farmers in adopting high yielding varieties of paddy cultivation (Vellayani)

The average credit need of the farmers worked out to Rs. 1095/- and the borrowers were found to utilise the credit in full. Among the various agencies engaged in lending, the Intensive Paddy Development Unit was preferred to by the farmers.

A study on the impact of intensive paddy development programme in Kerala (Vellayani)

Farmers in IPD units were found to have gained more knowledge and showed more participation in the agricultural extension programmes. Non-availability of inputs in time, lack of irrigation facilities, lack of credit, high labour use and lack of support price were some of the reasons for low adoption.

To study the effectiveness of farm broadcast through radio in disseminating agricultural information to the farmers of Trivandrum district (Vellayani)

Interview method of farm broadcast was perceived as the best mode of farm broadcast and "Karshikamekhalavarthakal" was the most preferred farm programme. Communication behaviour of farmers was found to be influenced by their listening behaviour, discussion, mass media exposure behaviour etc. and that the adoption behaviour of the listeners were found to be determined by their communication behaviour.

A study on adoption of soil conservation measures by farmers in scheme areas of Trivandrum district (Vellayani)

66.7 percent of the farmers were only partial adopters of soil conservation practices. Lack of credit facilities and inadequate technical assistance were the major reasons for non-adoption of conservation practices. Education, income, size of holding, social participation, knowledge, attitude etc., of the farmers were significantly associated with adoption of soil conservation.

To investigate the extent of adoption of the package of practices recommended by C. T. R. I, Rajamundry by the tobacco growers in East Godawari district (Vellayani)

Only 41.51 per cent of the tobacco growers were found to grow varieties recommended by C. T. R. I. Many farmers were not using farm

yard manure, while fertilizer ash was much above the recommendations deep ploughing was not being practiced.

A study on the farmers functional literacy programme (Vellayani)

Ninety six per cent of the farmer participants of the literacy programme were high or medium adopters. The functional literacy attainments were positively and significantly related to adoption behaviour. It was suggested that while formulating similar programmes, emphasis should be placed on the content and method of transmission of knowledge.

A study of factors affecting the adoption of selected agricultural practices (Veliayani)

Majority of small farmers were found to be low or medium adopters of improved rice technology. The main occupation, education, social participation, economic motivation, risk orientation and the size of holding had significant positive relationship to adoption. The farmers were found to take up individual improved practices at different magnitudes. Among the constraints of adoption of a particular activity, cost considerations weighed more, followed by non-availability of supplies in time and in adequate quantities.

Response of special package programme for agricultural development in Kerala (Vellayani)

Farmers of the package programme areas showed better participation and better programme knowledge. Adoption of improved agricultural practices were more in all package areas. The knowledge of improved practices had maximum direct effect on adoption behaviour.

A study on the gain in knowledge and attitude towards training of supervisors attached to primary land mortgage bank (Vellayani)

The trainees showed a significant gain in knowledge; but supervisors did not show a positive attitude towards inservice training in Agriculture. A negative correlation was recorded between gain in knowledge, age and experience. Educational qualifications showed a positive relation.

A study of the communication behaviour of agricultural extension personnel (Veliayani)

The communication behaviour of 63 percent of Junior Agricultural Officers were of medium level. The maximum feed back to JAO's were found to be received during discussions with the farmers.

A study on the role of leadership in agricultural development in rural areas of Kerala (Vellayani)

While the personal and socio-economic traits of the leaders of all types remained the same, the Panchayath and agricultural leaders perceived agricultural development roles better. The farm size, income, knowledge, mass media -exposure, contact with extension agency and

adoption behaviour explained around 50 percent of the role performance for the leaders.

ONGOING PROJECTS

i) Extension

Relative effectiveness of selected extension methods in imparting knowledge on food and nutrition among rural and urban beneficiaries of nutrition programme (Vellayani)

The objectives were to determine the most effective extension method from among the selected, in imparting knowledge on food and nutrition among the beneficiaries and to assess the association between socio-personal characteristics of the participants.

Study on the training of Agricultural Officers (Vellayani)

The study was to understand the motivation pattern, and the effectiveness of training in increasing knowledge and changing attitude as well as to find out the areas of training as perceived by trainees.

Effectiveness of agricultural articles in "Kalpadhenu" (Vellayani)

The project seeks to understand the readability of articles published in Kalpadhenu, to study the preference offered by JAO's and progressive farmers on the selection of the type of articles and to understand the adaption behaviour exhibited by the readers.

Factors influencing adoption of high yielding varieties of rice by farmers in Kerala as perceived by the agricultural extension personnel (Vellayani)

The objective of the study was to examine the various factors influencing adoption of high yielding varieties of rice by farmers in Kerala and also to determine the relative importance of the various factors influencing the adoption of high yielding varieties of rice by farmers.

A study of the suitability, readability and human interest level of farm news articles published in the "Karshikarangam" in the Malayalam dailies (Vellayani)

The study is to bring out an estimate of the suitability of agricultural news articles published and also to determine the reading ease and human interest of articles.

Developing scales to measure readability of popular publications for farmers in Malayalam (Vellayani)

The project aimed at developing yardstick to measure reading ease, human interest and level of vocabulary used in popular Malayalam publications.

Impact of ANP on beneficiaries (Vellayani)

The studies were undertaken to investigate the extent to which the objectives of the applied Nutrition programme has been achieved and also

to find out the factors that influence the implementation of the programme.

Studies on food habits (Vellayani)

This project aimed at finding out the food consumption patterns of rural people and also to assess the attitude of people towards various foods.

Nutritional profile of tribal groups (Vellayani)

This study tries to reveal the common dietary habits as well as to find out how the food production and procurement influences the nutritional standards. Cooking, storage and preservation habits were also studied.

Study on the shelf life of preserved tapioca and sweet potato by different indigenous method in Kerala state (Vellayani)

The aim of the project was to find out the changes in moisture, colour, smell, taste, texture, presence of weevils and fungal growth in processed foods during storage. The acceptability of preserved foods among farming community were also assessed. Improved methods of preservation and processing of tuber crops were worked out.

ii) Agricultural Economics

Overdues of short and medium term credit of co-operative credit Institutions, Trivandrum district (Vellayani)

The percentage of arrear outstanding in the case of small and big farmers were found to be 41.76 and 47.15, respectively.

Marketing of Agmark products in Trivandrum district (Vellayani)

The commodities marketed under Agmark were coconut oil, gingelly oil, honey and ground spices, namely, turmeric, coriander, and chillies. Lack of information on the quality of agmark products as well as the high prices were found to be responsible for the low demand for graded products.

Income pattern of farm families (Vellayani)

It was found that 37 percent of the income of farm families is from Agriculture and the rest from other sources like labour, services and trade. Of the agricultural income, crop contributed 59 percent. Among the various crops coconut provided 78 percent.

14 SOIL CONSERVATION & MECHANISATION

Development of low cost garden tractor (College of Hort., Vellanikkara)

The design and fabrication of garden tractor chasis with 5 HP Lombardi engine as the prime mover and one tonne trailer to farm a motorised cart has been completed. The trial runs taken on the machine have been encouraging.

Application of jet pump for low lift irrigation (College of Hort., Vellanikkara)

A self propelled floating platform for canal pumping which uses conventional pumpsets and a jet device has been devised and fabricated. Preliminary trials made with this machine have been very encouraging.

Studies on the mechanical control of aquatic weed (College of Hort., Vellanikkara)

Preliminary studies have indicated that the spread density of salvinia is of the order 120 to 150 tonnes/ha. The Department of Agricultural Engineering has successfully developed a fluidisation technique for mechanical collection of African payal. A patent has already been applied for the technique which utilises a conventional pumpset as the prime mover and a jet device which can pump out the weed-water mixture without allowing the weed materials to pass through the primary pumping unit. In the absence of a testing tank for accurate measurements, tests conducted under field conditions indicate that on the average, 10% by wt. of weed materials can be pumped by the system for a given rate of pumping. This result is considered significant in that it indicates the strong possibility for developing of economically viable prototype systems for mechanical collection of African payal in the State.

A prototype canal pumping system consisting of a self propelled platform and two 5 HP pumpsets developed in another project was found to be easily adaptable for salvinia harvesting. The machine was successfully field tested in a local reservoir.

Preliminary studies on equipments and systems for reclamation of Kaya lands (College of Horticulture, Vellanikkara)

The water jet pump system and its applications were investigated in another project. They were found to be easily adaptable for river sand collection. Preliminary studies in a testing tank have shown that the sand can easily be fluidised and pumped out through the system at a much faster rate than is possible under the present manual collection methods. This technique will also eliminate the need for the operators to dive into the water for scooping the sand. The Department of Agrl. Engineering plans to conduct field tests to assess the economic feasibility of such prototype system for river sand collection.

Utilisation of aquatic weeds for biogas production (College of Hort., Vellanikkara)

Salvinia was found to contain only 4.5 percent solid matter. As such, 3.5 kg. of salvinia would be comparable to 1.0 kg. of cowdung, which contains roughly 18 percent solid matter. Studies at both laboratory and pilot plant levels have further shown that biogas production from cowdung and salvinia are comparable, if this proportion is taken into account. It should be possible to develop prototype systems to utilise the African payal once it is mechanically harvested at lower cost.

Adaptive design and development of local innovations in Agricultural Engineering

Under this project, the department has fabricated a small scale drier and the same is being field tested for cocoa and vegetable seeds at the farmers' premises.

15 CROPPING PATTERNS & FARMING SYSTEMS

Studies on mixed cropping (Model Agronomic Res: Station, Karamana)

The experiment was laid out to study the overall production and economics of mixed sowing of rice varieties of the different seasons as practiced locally. The data revealed that the usual practice of raising two separate crops of high yielding varieties is the best method for maximum grain production. It was also observed that the yield from the mixed sowing is slow that it will not be economical in spite of savings in the cost of cultivation during rabi season.

Studies on intercropping (Model Agronomic Res. Station, Karamana)

Screening of short duration crops like groundnut, maize and cow-pea was carried out to assess their suitability as intercrops with tapioca. The results revealed that the yield of main crop tapioca was not affected by growing the intercrops mentioned above, indicating their suitability as intercrops. From the economic point of view, preference may be given to groundnut since it gave highest net profit.

Comprehensive study on multiple cropping in uplands: relay cropping (Rice Research Station, Pattambi)

The project involves growing an early duration rice in the flow lines during the first crop season (April/May-August) and seven intercrops, either in relay with rice or after harvest of rice. The various crops grown were maize, bajra castor, cotton, redgram, gingelly and horsegram. The yield data revealed that maize, bajra and castor can be successfully relay cropped in modan lands.

Production potential experiment (Model Agronomic Research Station, Karamana)

The results of the trial indicated that for maximum profit, "two short duration high yielding varieties of paddy followed by H.165 tapioca" was ideal. "Two medium duration high yielding varieties of paddy followed by bhindi" provided maximum returns. For places where paddy alone can be grown, "three crops of medium duration high yielding variety" was found to be the best cropping pattern.

B. VETERINARY & ANIMAL SCIENCES

1. CATTLE & BUFFALOES

CONCLUDED PROJECTS

Evaluation of coffee husk for milk production in cows (Veterinary College, Mannuthy)

The feeding of coffee husk at 10 and 20% level in concentrate mixture did not affect the physiological status of animals and no significant differences were observed in respect of the quality and quantity of milk produced. The total cost of feed for producing one kg. of milk in animals getting 0, 10 and 20% coffee husk was Rs. 1.42, 1.38 and 1.33 respectively. The cost of production of one kg. of milk was less by nine paise when coffee husk was incorporated at 20% level in concentrate mixture. It was concluded that coffee husk can profitably be incorporated in the ration of dairy cows upto 20% level for economic milk production.

Evaluation of the nutritive value of coconut pith (coir waste) for cattle and feeding value of coconut pith (coir waste) for growth in cross bred calves

Chemical composition of coir waste was determined and seven bullocks and eighteen cross bred calves were fed with coir waste to find out its suitability as a feed ingredient. It was found that coir waste (coconut pith) possesses high percentage of (70%) soluble carbohydrates with a DCP of 0 and a TDN of 63. The average cumulative body weight gain of experimental calves fed with 10% coir waste was 370 g. All the experimental animals maintained positive nitrogen balance and no ill effects were noticed. The overall results indicated that coir waste can be incorporated upto 20% level in the concentrate ration for growing calves. Feed formulations containing coir waste is to be tried extensively.

Evaluation of the nutritive value of spent anatto seeds (Bixa orellana) and effect of feeding spent anatto seeds on growth rate in crossbred calves

Chemical composition, palatability, digestion and balance experiments on bullocks were carried out with spent anatto seeds. Feeding experiments showed that spent anatto seeds were found to be palatable to bullocks and they consumed upto 2 kg/day. The estimated DCP and TDN of spent anatto seeds were found to be 7.9 and 67.2, respectively. The average rate of gain per day for a period of five months registered by calves fed 0 and 20% anatto seeds incorporated rations were 390 and 330 g., respectively, the differences between the groups being statistically not significant. All the animals maintained positive nitrogen balance. No ill effects on the physiological status of the animals were noticed. The overall results indicated that spent anatto seeds can be

profitably incorporated upto 20% level in the concentrate mixture for calves.

Effect of rubber seed cake on growth rate in buffalo calves

Eight buffalo calves were fed with rubber seed cake for four months and it was found that the average daily gain in body wt. of calves fed 20% rubber seed cake in the concentrate ration was 440 g. as against 318 g. for those fed on the control ration (0% RSC). The overall results indicated that rubber seed cake can be profitably incorporated upto 20% level in the ration of growing buffalo calves.

ON GOING PROJECTS

Relationship of blood constituents in heifers to their future milk producing ability

Recognising the limitations of phenotypic selection for improving dairy production, attempts were made to establish a correlation between blood constituents and the future milk producing capacity of heifers for purposes of selection. Blood samples from 27 heifers of the University Livestock Farm, Mannuthy, were subjected to analysis in respect of RBC, Hb, and Haematocrit value. Statistical analysis of the data is in progress.

Studies on some aspects of physiology of lactation'

The role of lactoferrin in the production of milk and diseases associated with milk production has been subjected to study. Work on the standardisation of methods for estimation of immunoglobulin are in progress.

Determination of solid contents of milk by specific gravity lactometer

Better quality milk fetches better price in the market. Since there are inherent difficulties to assess the quality of milk under field conditions (as the tests rely on the estimation of milk solids, excepting butter fat), attempts were made to accurately judge the quality of milk indirectly from the lactometer readings by using a simple formula. This formula is now being tested on large samples of milk.

Composition of milk of crossbred cattle

Commensurate with the advancement in the cross breeding programme in Kerala, data available on the composition of milk of such crossbred cows (Brown Swiss and Jersey) are scanty and hence authentic data on the composition of milk of crossbred cattle reared in the State were collected along with factors that modify the composition.

Utilisation of paddy straw treated with urea and molasses as cattle feed

Nutritionally poor quality straw can be fortified and made more palatable by the addition of 2% urea and 10% molasses. Further work on storage and on economic feasibility is in progress.

Poultry litter as cattle feed

Processed poultry litter containing 10% protein is being tried as an ingredient in cattle feed.

Nutritive value of cheap (all concentrate) ration for cattle: (1) based on coir waste

All concentrate ration with 30% coir waste was tried on bullocks to assess the nutritive value.

Studies on the environmental physiological responses of crossbred animals at the Cattle Breeding Farm, Thumburmuzhi

Data on the environmental physiological responses of crossbred animals under different agroclimatic conditions are being gathered. Preliminary observation on the physiological responses of crossbred cattle reared under confinement as well as on semi-intensive system failed to show any significant differences. The experiment is in progress.

Genetic study of milk production efficiency and fertility score in cross bred dairy cattle

In order to find out whether milk production efficiency of first lactation can be used as an indicator for life time milk production efficiency (which will help in selection of crossbred cattle), the data available in the Livestock Farm were analysed.

Carcass yield and certain meat characteristics of cattle

As a preliminary to the introduction of beef farming and meat trade in the State, data on the carcass yield and other characteristics of cattle were collected.

Studies on the meat potentialities and meat qualities of buffaloes

The results obtained so far revealed that buffaloes exhibited a superior rate of gain than cross bred under the experimental feeding regime.

Studies on sexual behaviour of buffaloes

Data on monthly body gain, rectal temperature, pulse rate and respiration rate were recorded thrice daily on ten female buffalo calves and ten cross bred female calves for comparison. Correlation of the data with the sexual behaviour is being attempted.

2. GOAT IMPROVEMENT

CONCLUDED PROJECTS

Birth weight and growth rate of Malabari and crossbred kids

The birth weight of Malabari and crossbred goats were 1.76 and 2.01 kg. respectively. The rate of growth was also found to be higher in half bred Sannen than Malabari. In Malabari, average increase was from 6.6 kg at four months age to 15.0 kg at 12 months whereas in the Sannen half bred, the range was from 8.6 kg to 19.32 kg.

Production performance of Malabari goats, standardisation of phenotype and studies on factors influencing the same

The data on production performance such as lactation yield, lactation length, milk yield per day per lactation length and kidding interval were analysed. It was found that season of kidding influenced significantly the lactation yield and peak yield, while year of kidding and type of kidding did not exert any influence on production traits. Dry period was not significantly affected by any factors.

Detailed studies on the reproductive performance of Malabari goats

Data on age at first oestrous, age at first kidding, weight at kidding, gestation period, kidding interval of Malabari goats and Sannen half bred kids were analysed. The factors influencing the same were also studied. It was found that the age at first kidding for Malabari goat were 436.5 and 616 days respectively, and in the crossbred animals, the gestation period and kidding were 147 days and 299 days, respectively.

ONGOING PROJECTS

Immunoglobulin level in goats and its association with survivability

Serum samples were collected from Malabari, Alpine x Malabari and Sannen x Malabari. The I. G. values were 0.433 for Malabari, 0.388 for Alpine x Malabari, and 0.410 for Sannen x Malabari. With the limited data, the trend showed 75% Sannen has 0.404 and 75% Alpine have only 0.290, which indicated that Sannen inheritance was better than Alpine inheritance. The work is in progress.

Comparative haematological studies on Malabari, exotic and cross-bred goats of different age groups

Blood samples were collected from Alpine x Malabari crossbred kids aged six months and analysed. It was observed that the erythrocyte sedimentation was 0.5-1 m.m. in males. Total RBC count was 17.08 million per cmm. of blood. Hb level was 10-11 gm percent for male and 8-9 gm percent for females. Further work is in progress.

Certain aspects of reproductive performance in cross-bred goats

A spurt in the growth rate of the gonads was observed in males between 5-6 months age; separation of penis from prepuce commenced at 2½-3 months and was completed by 3½ months. Kids showed sex-libido by mounting females at four months. Vulval slit at 7 months of age measured about 2 cm. Age at first heat was 192 days when the body weight was 16.9 kg. The work is in progress.

Post-natal development of ruminant stomach in goat

Anatomical and Histological aspects of the developing stomach of goat from day-old to five months of age were investigated. The work is in progress.

3 POULTRY AND DUCKS

CONCLUDED PROJECTS

Performance of certain purebreds and crossbreds for broiler traits

Purebreds of ALP, WPR and RIR as well as their reciprocal crosses were reared in day-old to 12 weeks of age and their broiler characters such as body weight, efficiency, dressing percentage and also traits such as combining capacity were studied. In terms of 10th week body weight, pure bred White Plymouth Rock was found to be superior as a broiler bird in comparison to ALP or RIR or crosses containing these breeds. Based on combining capacity information, it was found that further improvement in WPR could be achieved by pure bred selection method.

Economics of raising white Leghorn male chicks for meat

White Leghorn male chicks were raised both on broiler type of diet and layer type of diet. The ideal weight at slaughter and the economics there of was worked out. It was found that male chicks of White Leghorn could be economically raised for meat production. The ideal weight for slaughter was found to be one kg which could be achieved in 12 weeks using broiler type of ration and in 14 weeks using layer type of ration.

Package of practices-improvement to backyard units

Layers were raised in back yard replica pens and were provided with three types of feeding systems, namely, feeding only grains at 100g/bird/day, feeding 100 g of balanced feed per day and feeding of 50 g of balanced feed per bird/day. All the birds were allowed to forage. The birds were reared in a coop measuring 120 x 90 x 60 cm. Their productivity was studied. It was found that a coop of 120 x 90 x 60cm was adequate for 10 birds in back yard as night shelter. High producing White Leghorns were found to be unsuitable for backyard. Feeding 50% of bird's requirement as balanced feed and the balance on house hold waste could maintain fair degree of egg production under back-yard system of rearing.

ONGOING PROJECTS

Establishment of nutrient requirements of ducks (a) energy

The biological experimentation has been completed and chemical analysis is in progress.

Studies on certain economic traits in desi ducks

Preliminary data indicated that desi ducks are capable of producing only around 80 eggs per annum and the age of sexual maturity appears to be around 182 days in the existing methods of rearing.

4. Artificial insemination & animal reproduction

CONCLUDED PROJECTS

Age of semen and conception rate in goats

Six diluents were used for preservation of buck semen. It was found that the buck semen could be stored up to 60hrs. in Tris-skim milk-citrate-fructose-glycine with good motility at 5°C. In coconut milk extender, semen could be stored only upto 24 hrs. The percentage of conception rate was 44, 52, 53.3 with Tris-skim milk-citrate-fructose glycine, milk and citrate-fructose-glycine diluents.

ONGOING PROJECTS

Investigation on incidence, nature and magnitude of prevalence of infertility conditions among crossbred cattle of Kerala

The major problem among cross bred Brown Swiss heifers was observed to be delayed maturity. A low haemoglobin level was observed in the heifers. Cows in anoestrus showed a wide calcium phosphorous ratio. Chloramphenicol citrate was found to be of value in treating cows in anoestrus due to non nutritional causes.

Certain aspects of reproduction in cross bred bulls

Macroscopic and microscopic studies on the testis and epididymis of cross bred bulls in the age group of 0-12 months were conducted. Characteristics of semen including freezability were studied in detail.

Progesterone administration for improving conception rate in dairy cattle

Preliminary studies on a limited number of animals in the University Farm showed slight improvement in the conception rate in cows which were given progesterone in doses of 5-8 mgm immediately after insemination. The trial on a larger number of animals is in progress.

Utero-tubal insufflation test as an aid in the diagnosis and treatment of tubal patency in repeat breeding cows

Suitable equipments for diagnosis and treatment of tubal patency has been fabricated. The equipment has been tried in slaughter house material. Trial of the equipment on live animals is being carried out.

5 ANIMAL DISEASES

ONGOING PROJECTS

Incidence aetiology and pathology of tumours of the ethmoid in domestic animals

The possibility of viral aetiology for this cancer has been indicated. The scope for immunotherapy has been clarified.

Studies on the incidence, pathology and preventive measures of common diseases of goats

The primary cause of winter pneumonia was identified to be a virus. Secondary bacterial complication was responsible for mortality.

There was evidence to indicate that by better management practices the mortality could be reduced. Other important diseases has been identified and detailed studies were in progress on these infections.

Haematological studies on Malabari, exotic and cross bred goats under different physiological and pathological conditions

Clinico-pathological features of pneumonia have been studied and significance of leucocytic profile has been classified. Further studies are in progress,

Studies on the corelation of post-natal development of stomach compartments and the incidence of gastrointestinal disorders in goats

The studies have indicated a tendency for gastrointestinal infections during the first month of the organs.

Investigation on caseous lymphadenitis in goats

The causative agent was identified and preventive/curative measures were worked out.

Investigation on posterior paralysis in goats

Cerebral lesions were identified to be involved in the aetiology of this conditions.

Pathology of endocrine glands in cattle, goats and pigs

Studies have shown that there are changes in the endocrine glands associated with primary lesions elsewhere in the body. There is scope for further studies to understand the effect of endocrine changes on productive capacity of animals. Further studies are in progress.

Pulmonary pathology of animal in industrial areas

Definite indications have been obtained to suggest that environmental pollution in industrial areas has harmful effect on animal health.

Aflatoxicosis in goats

Subclinical effects of toxicity can lower production.

Diseases of ducks in Kerala

Studies on chronological development of lesions in inflammatory response in ducks have indicated that the sequence of development of of reaction varies with the aetiological agent.

Embryo mortality in hatcheries

Significant loss of embryo was noticed during the early periods of incubation. The aetiology is being studied.

Incidence and nature of disease of young stock in Kerala

Common disease conditions associated with mortality in young stock were identified and their causes established. Control measures are being worked out.

Aflotoxicosis in ducks and chicken

Various chemicals were tried to ameliorate the toxic contamination. There is possibility of developing certain chemicals to reduce the toxin levels in contaminated feed. Further studies are in progress.

Mycotoxigenesis in domestic animals

Analysis of feed samples has indicated the presence of different kinds of toxins and there is need for regular screening of feeds.

An assessment of the macrophage lymphoid system in animals bearing tumours of the ethmo-turbinate region

The immunopathological studies have indicated that there is scope for effective immunomodulation in early stages of tumour growth.

Pathobiology of the neoplasms involving the paranasal sinuses in bovine

There is evidence of an involvement of virus in the causation of the tumour.

Cytological studies on exfoliated cells of tumours of the ethmo-turbinate region in domestic animals

The cytological studies on exfoliated cells have indicated that this technique can be made use of for an early diagnosis of the tumour.

Post-natal mortality of kids: A pathoanatomical investigation

The aetiological factors associated with gastroenteric lesions were identified. The observations had shown that improved management practices can minimise the incidence.

Enzymology of tumour in cattle arising from the ethmoid region

Enzyme estimation did not give a positive indication of tumour growth, particularly in initial stages.

The lymphoid system and immune response in the goats

The growth of lymphoid during autogeny appears to be at a lower pace when compared to the thymus and spleen.

Investigations on microbial aetiology of infectious abortions in livestock

Infectious abortion was found to be prevalent and there is need for chalking out control programmes.

Bacterial species associated with pneumonia in goats

Broad spectrum antibiotics are of use in complicated bacterial pneumonia.

Enterobacterial infections in pigs in Kerala

In porcine salmonellosis antibiotic therapy with Gentamycin has been found to be useful.

Reproductive failures in bovines due to infectious vulvo vaginitis virus

Possibility of herpes virus infection in vaginitis has been indicated since the virus could be isolated in a few cases.

The role of free flying birds in the epizootology of New Castle disease

There are indications that free flying birds may act as sources of Raniket disease outbreak.

Susceptibility of ducks to New castle disease and their role in the transmission of disease in chicks

Ducks could harbour pathogenic strains of N. D. V. and act as sources of infection.

Taeniasis of zoonotic importance

Serologic diagnostic test against taeniasis is being attempted.

Spirurids of poultry

Sub clinical infections with *Acuaria* and *Tetrameres* produced marked morbidity with loss of egg production and poor weight gain.

Incidence, pathogenecity and control of parasitic diseases in cross-bred calves in Kerala

Parasitic diseases are common and systematic routine treatment can control the condition to a great extent.

Further studies on corticosteroids as supportive therapeutic measures

There is indication that by therapy, adverse effects due to delay in antivenin treatment can be minimised.

Mastitis and its control in cattle and goats

Teat dipping practice can reduce the incidence on mastitis.

Control of common avian disease with special reference to break down of immunity

Break down of immunity may be associated with concurrent infections.

Practical utility of rumeno-rectal fistula as a relief measure for chronic tympany of the rumen in cattle

Surgical approach could be tried for therapy of tympany.

Studies on necrosis of extremities in cattle and buffaloes

The condition can be cured by therapy and can be prevented by not feeding contaminated straw.

Studies on leukemia in cattle

There was no indication of leukemia in cattle.

Clinical observations on seasons on seasonaly occuring respiratory disease of goats

Climatic factors were found to precipitate the disease and chemotherapy was found to be effective.

C. FISHERIES

CONCLUDED PROJECTS

Studies for the identification of suitable varieties of fishes which can be cultured along with rice in paddy fields (Vytila)

The study is aimed at finding out suitable species of fishes which could be grown along with rice in pokkali fields (which lie adjoining the backwaters) taking into account the various limitations in existence there.

During the report period, five species of fishes viz. the pearl spot (*Etroplus*), *Mugil*, *Tilapia*, the common carp (*Cyprinus carpio*) and the gouramy (*Osphronemus gouramy*) were released in paddy fields along with the pokkali variety of paddy after the spreading operation of paddy. When harvested, it was found that the exotic fish gouramy alone had survived, the survival being 50%. The failure on the part of the other fishes to survive, can be attributed to the thick growth of *Salvinia* which could not be controlled, inspite of the repeated removal from the field, as there was very thick growth in all the neighbouring fields.

From the results of the work done during the last three years, it can be seen that fisheries such as *Etroplus*, *Gouramy*, *Tilapia* and common carp are suitable for culture along with paddy in the pokkali areas, provided there is atleast 30 cm. of water in the fields, the fields are well bunded to prevent the escape of fishes during flooding and the growth of *Salvinia* is controlled.

Adaptive trials on farmers' fields are planned to be conducted with common carp and gouramy to establish the possibility of their culture in paddy fields.

Adaptive trials for introducing fish culture in pokkali fields (Vytila)

This scheme was initiated with a view to taking up fish culture along with paddy in the pokkali fields so as to increase the revenue realised from such fields and to utilize such pokkali fields which are not currently used for prawn filtration practice.

During the report year, this adaptive trial was conducted in the farmers' fields at three places using the fish *Etroplus*, stocking it after the spreading of paddy, at a density of 2000 nos./ha. Survival upto 61% and growth up to 40 gms. per month was obtained.

The results obtained for the last three years had convincingly proved the possibility of utilizing the fish *Etroplus* for culture along with paddy in the pokkali fields which are protected with high bunds and which have at least 30 cm. of water always.

This result is being highlighted in the extension and training programmes of the University. This technology is being popularised under the lab-to-land programme implemented by the University.

ONGOING PROJECTS

Farming of fish as a follow up crop in paddy fields (College of Fisheries, Mannuthy)

The objective of the project was to ascertain the feasibility of raising a crop of fish after the harvest of paddy. In a plot at Karanchira, having an area of 1.2 ha, the fishes *Catla catla* and *Cirrhina mrigala* were stocked at a concentration of 4166/ha. at 1:1 ratio during September 1979. At the time of stocking, catla had an average size of 47.5 mm and 12.5 gm and mrigal 46.7 mm and 11.5 gm. The trial is in progress. It could be seen that there is very good scope for culturing the above major carps along with the flood resistant variety of paddy like Kulappala in fields where water is available throughout or most part of the year.

Adaptive trials for simultaneous farming of fish and prawns along with paddy (College of Fisheries, Mannuthy)

The objective of the study was to find out the feasibility of raising a crop of fish along with paddy. During the report period, a field at Ramankari in Kuttanad was used for the trial. In that field of 2.4 ha. area, 2000 nos. of catla and 5000 nos. of mrigal were stocked on 17.10.1979 and 3000 nos. of common carp on 12.2.1980. An assessment done on 26.1.80, had shown that catla had grown to an average size of 330 mm and 425 gm and mrigal to 190 mm and 110 gm. The growth obtained for both the fishes in the paddy field conditions is quite appreciable.

The survey of seed resources of cultivable species of prawns and fishes in Cochin backwaters (Vytila)

The survey is intended to make a qualitative and quantitative assessment of the availability of seed of cultivable species of prawns and fishes during the different seasons so that the seed resources could be exploited for commercial fish and prawn farming.

The survey done at Puthuvypu using different gears such as midnapore shooting net, hapa net and drag net had shown that the availability of post-larvae of prawns was higher during the pre monsoon period. The maximum of 7655 nos. per net per hour was recorded during April, 1979. By the start of the monsoon, there was a decrease in the availability and it picked up again in March 1980. Hapa net was found to be more convenient and efficient for collection of juveniles. With hapa net upto 1156 juveniles of prawns were collected in Feb.1980, *Penaeus indica* contributed more than 50% during the post and pre monsoon period. The tiger prawn *Penaeus monodon* post larvae were available in appreciable numbers during April-May 1979, when up to 10% of the total catch was contributed by this.

Mullet fry and fingerlings were available throughout, the maximum of 3600 per net per hour was obtained during August 1979, with drag net. *Mugilcephalus* (thirutha) fingerlings were available during July-August and the milk fish (*chanos*) fingerlings in April-May.

Nursery rearing of prawns and fishes (Vytila)

The objective of the project was to find out the best nursery rearing practices suitable to the locally available species of prawns and fishes in order to obtain maximum rate of survival during nursery rearing.

Penaeus monodon post-larva and the fry of *chanos* were reared in plastic pools by feeding them with pelletised feed (made of rice bran and groundnut oil cake at 1:1 ratio) for the prawns and with rice bran alone for the fishes.

The survival obtained for *Penaeus monodon* which works out to about 40% and for *chanos* which works out to more than 90% are appreciable.

Studies on mono and polyculture of fin fish and shell fish with and without artificial feed

The project was meant to find out the best species and the best combination to achieve maximum production from brackishwater ponds and also to find out a cheap nutritive supplementary feed for fishes and prawns.

Mono-culture experiments with the prawn *Penaeus indicus* at concentrations of 50,000/ to 70,000/ha., with the prawn *Penaeus monodon* at a concentration of 25,000/ha. and with the fish *Etrophus* at a lower concentration of 1500/ha. and a higher concentration of 15,000/ha. were conducted during the period. Although the growth obtained for *Penaeus indicus* and *Penaeus monodon* was appreciable, the rate of survival was low. In the case of the experiment with *Penaeus monodon*, it was found that most of them died when the salinity dropped to 0.42‰.

Two experiments of mixed culture of prawns such as *Penaeus indicus*, *Metapenaeus monoceros* and *M. dobsoni* at concentrations of 45,000/ha. and 90,000/ha. were conducted during the period, stocking them at 1:1 ratio. The average monthly growth rate for the latter two species was less than 2.0 gram per month, whereas it was 4.71 gm for *Penaeus indicus*.

In a mixed culture experiment conducted during the period with *Etrophus suratensis*, *Chanos chanos* and *Mugil cephalus* at 5:5:1 ratio and 5500/ha. density, a production of 1353 kg/ha. in 7½ months which works out to 2165 kg/ha. was obtained. This production, obtained without supplementary feeding, is appreciable.

Studies on the ecology of the brackishwater ponds related to productivity

This study is aimed at finding out the optimum dosage of lime, manure, supplementary feed etc. required in each pond with a view to achieve maximum production!

The physico-chemical properties of the water in the ponds was found to show wide seasonal variation, the salinity being the important, recording 18.3‰ in April 1979 and dropping to trace level in June. The pH of the pond water was found to drop upto 4.4 in June 1979 during the first heavy monsoon rains. Studies conducted to elucidate this phenomenon had shown that the leaching of acidic salts from the pond bunds may contribute to the lowering of pH of pond water.

The benthic fauna of the ponds was found to consist of polychaete worms, amphipod crustaceans and gastropod and bivalve molluscs. The quantity of zooplankton available in five litres of water ranged between 0.01 ml to 0.5 ml. The use of 500 kg/ha lime did not help in increasing the level of PH substantially, but was found to help in keeping the level from dropping so low. It was also found that manuring with raw cowdung, urea and rock phosphate did not bring about significant change in the soil nutrient level, but there was increased production of phytoplankton as could be seen from the primary production values.

Prawn culture in Pokkali rice fields after the harvest of paddy

The objective of the scheme was to study the ways and means to improve the prawn filtration practices in Kerala by inducting scientific methods.

During 1979-80 also, the eastern fields of the Rice Research Station having 1.716 ha (control. I) and the southern portion of the western field having 1.936 ha (control. II) were used as controls. The stocking of prawns in both the control fields was done in the traditional way, from the middle of January 1980. In the eastern field, the harvesting was continuous whereas in the western field the prawns entered were allowed to grow for more than two months. From the eastern field 66 kg. of prawns were obtained, whereas from the western field it was 115 kg. showing that the latter method is more profitable in the interior pokkali fields where there is not much scope for the entry of large quantity of seed prawns as well as adults.

In an area of 0.16 ha. on the northern side of the west field, controlled cultivation of *Penaeus indicus* was tried, by stocking juveniles of this prawn having a size of 47 mm and 0.66 gm. at a density of 75,000/ha. When harvested after 68 days of rearing, they had achieved an average size of 115 mm and 10.4 gm. The survival rate obtained was 23%. This study indicated that in interior pokkali fields also, where sufficient salinity will be available only for two months (March-April), controlled cultivation of prawns with *Penaeus indicus* is possible, provided the fields are deep enough to retain 50 cm. of water.

Pig-cum-fish culture (Kumarakom)

This study was meant to find out the extent to which fish production could be increased by utilizing pig dung and urine as manure in fish ponds.

In two ponds (0.1 ha), the fishes such as *Etroplus suratensis*, *Cirrhina mrigala* and *Cyprinus carpio* were stocked at a concentration of 3250 at 5:4:4 ratio. In one pond the dung of pigs at the rate of five kg. was dumped daily whereas in the other pond feed comprising of coconut oil cake and rice bran at 1:1 ratio was given at a daily dose of 2% of the total body weight of the fishes. It was found that the fishes in the pond where pig dung was applied achieved a better rate of growth.

Composite culture of Indian major carps and exotic carps (Kumarakom)

The objective of the study was to find out the best system of culture of fresh water fishes at Kumarakom.

The fingerlings of fishes such as *Catla catla*, *Cirrhina mrigala* and *Cyprinus carpio* were stocked in a pond of 0.1 ha at the rate of 120, 160 and 260 numbers, respectively. Supplementary feeding with a 1:1 combination of rice bran and oil cake was also done. The assessment of growth revealed that the maximum increment of growth was recorded for *Catla catla* and the minimum for *Cyprinus carpio*.

CHAPTER IV

Extension Education

Dr. V. S. S. Potti continued to be the Director of Extension Education during the year under report.

The University aims at providing the technical backstop to the Field Extension functionaries. By imparting scientific principles of farming, the University aims at making the farmers as practising scientists.

The Directorate has only a limited staff (as shown in appendix IV) exclusively for Extension Education work. To augment this limited staff, members of teaching staff from the Colleges/Institute of Agril. Technology and the Research Stations are frequently called upon to impart training programmes, lead discussions in the Seminars, etc. Taking advantage of the high literacy rate and regular newspaper reading habit of the Kerala Farmer, the Extension Education programmes of the University are directed at "Working through mass media". Accordingly, serialised lessons through AIR, correspondence courses on important aspects of crop production etc. are organised.

The activities of the Extension Education wing of the University consist of Training Programmes, Farm Advisory Service and Seminars, Exhibition and Krishi Vignan Melas, Radio programmes, Correspondence Courses and Village Adoption programmes.

The Lab to Land programme, organised by the ICAR in connection with its Golden Jubilee Celebrations, was implemented in 12 villages adopted by the University.

Other activities of the Extension Education wing included the National Demonstration Project, Krishi Vignan Kendra at Pattambi and Extension Education Centre for Pulses and Oil seeds at Kayamkulam.

The activities of the Extension Education wing are summarised in the following pages.

1 Training Programmes

Training programmes were organised by the University for the technical personnel of the Departments of Agriculture, Animal

Husbandry, Dairy Development, as well as for School Teachers, Farmers, Bank officers, etc.

A training unit is functioning at the headquarters with one Training Officer and supporting staff directly under the Extension wing. Another unit with one Training Officer and supporting staff is functioning at the College of Agriculture, Vellayani.

The following training programmes were conducted during 1979-1980.

Inservice training course for Junior Agricultural Officers

The objective of this training was to properly equip the Junior Agricultural Officers with up-to-date knowledge in the different subjects for executing their work efficiently and effectively. The course is for a duration of four weeks and conducted at the College of Agriculture, Vellayani. During 1979-80, 89 Junior Agricultural Officers of the Department of Agriculture were trained in four batches.

Inservice training course for Agricultural Demonstrators

This is a refresher course for the Agricultural Demonstrators working in the Agricultural Department. The training provides them with opportunity to discuss the field problems with experts. Training courses of four weeks duration were offered for four batches of Agricultural demonstrators of the Department of Agriculture.

Inservice training course for Agricultural Demonstrators-Tavanur

The training course was for a period of six months and was offered to 72 Agricultural Demonstrators at the Institute of Agricultural Technology, Tavanur. The object of the training is to make the newly recruited Agricultural Demonstrators technically competent by providing theoretical knowledge as well as practical experience.

Short term training for Assistant Directors and Junior Agricultural Officers

Two batches of 38 Assistant Directors and Junior Agricultural officers were given short term training for 10 days.

Training for the Officers of the State Bank of India

A training programme for a duration of 14 days was organised at the Communication centre, Mannuthy for the Field Officers of the State Bank of India.

Training for the Supervisors attached to the Primary Land Mortgage Bank

A four-week training programme for the supervisors attached to the Primary Land Mortgage Banks was conducted in two batches.

Training for Managerial staff of the Co-operative societies

The objective of the programme was to impart to the managerial personnel of the Co-operative societies, training in the fields of Agricultural Technology, Farm Management and Animal Husbandry practices.

A training for one batch of 25 staff members of Co-operative societies was conducted. Duration of training was six weeks.

Training for School teachers

The work experience training programme in Agriculture for three batches of Upper Primary School Teachers was conducted during the year.

Training in Statistics for Research Workers in Agronomy and Chemistry

A training course was conducted for the research workers of the University for three weeks.

Training on Rice Minikit Trials

State level training on Rice Minikit trials for a duration of four days was conducted with the object of keeping the extension personnel up-to-date with latest techniques of crop production and laying out of the minikit trials.

Training in tree planting and management for the Railway Staff

This programme was taken up to give training of one week's duration for Railway Staff in tree planting and aftercare, garden management etc., for the proper utilization of railway land. Twelve members of Railway staff took part in this training.

Training for skilled workers in vegetative propagation of crop plants

A training programme of five days duration for skilled workers in vegetative propagation was conducted in the College of Agriculture, Veliayani during the year. Nineteen trainees in two batches were given training.

Training in fruit and vegetable preservation

One week training on fruit and vegetable preservation was given to 261 rural women in 8 batches, under the Food Science and Nutrition Section at the Agricultural College, Veliayani.

Training cum discussion seminar on rabi pulses

A training programme lasting for two days on rabi pulses was conducted for 27 Officers of Department of Agriculture.

Training in Cocoa pruning

A three-day training was given to 16 trainees on cocoa pruning.

Training in seed testing and certification

A training programme was organised in seed testing and certification and five Officers of the Department of Agriculture were given training for five days.

Training in household arts

A training programme in house hold arts for rural women was conducted and 55 participants were trained for a period of three months.

Training in microbiological techniques

A training of 10 days was conducted for two trainees in microbiological techniques.

Training for Village social workers

A training programme for a duration of 15 days was organised for a batch of village social workers.

Training in Dairy Husbandry and Management

A training course in Dairy management, fodder production, artificial insemination techniques and other related aspects of successful dairy farming was organised for 25 trainees sponsored by AFPRO for a period of six weeks. The training was conducted at the College of Veterinary and Animal Sciences, Mannuthy.

Refresher training course for senior Officers of the Department of Animal Husbandry

The object of the training was to provide training to senior officers of the Department of Animal Husbandry in the latest advances in Veterinary, Medicine and Animal Husbandry. A nine months training programme was conducted for 10 senior officers of Animal Husbandry Department at the College of Veterinary and Animal Sciences, Mannuthy.

Training in Poultry Management

The programme was organised to give practical training in all aspects of poultry farm management to interested farmers. Two persons were given training in one batch. The duration of the training course was for four weeks.

Training for Dairy Farm Instructors

A training programme of two weeks duration was organised for the Dairy Farm Instructors at the College of Veterinary and Animal Sciences. Three batches of 55 dairy farm instructors were trained.

Training for pre-release Defence Personnel in Dairying

A training for pre-release personnel in Dairying was conducted for a period of one month. Twenty nine persons were trained in two batches.

Training in Poultry Management for pre-release defence personnel,

Fifteen pre-release men were given training in Poultry Management for one month.

Training of Milkmen from Lakshadweep

In this programme, four trainees from Lakshadweep were given training.

Training in Artificial Insemination

A training programme of one month duration was conducted in the College of Veterinary & Animal Sciences, Mannuthy for artificial insemination.

Training in Poultry for Adivasis

A ten days training programme was conducted in poultry and four Adivasis participated.

2 Farm Advisory Service and Seminars

A Farm Advisory Service was started during May 1979 as part of the Directorate of Extension Education with the following objectives.

- (a) to give an opportunity to the farmers to discuss the various technical problems confronting them for raising the agricultural production in their area,
- (b) to have a recorded information from the farmers regarding the intensity and magnitude of the problems and
- (c) to expose the specialists to the various needs of the farmers in the State.

For achieving the above objectives, 34 District Level Agricultural Seminars were conducted, roughly three in each district. After the conduct of the District Level Agricultural Seminar, the experts visited crops dairy and poultry of the participants on their request and gave necessary technical advice. Questions raised by the farmers and answers given by the specialists were cyclostyled and issued to farmers in almost all the seminars during the year.

District Level Agricultural Seminars conducted during 1979-'80.

<i>Date</i>	<i>Place</i>	<i>District</i>
20. 6.79	Eraviperoor (Dist. Level Ag. Seminar)	Alleppy
22. 6.79	Mala	Trichur
5. 7.79	Katoor (Sterility Camp)	Trichur
25. 7.79	Palayad	Cannanore
10. 8.79	Mattanoor	Cannanore
11. 8.79	Kalpatta	Calicut
20. 9.79	Kootoly (Dist. Ag. Seminar)	Calicut
28. 9.79	Vellangalloor	Trichur
29. 9.79	Alakkodu (Sterility camp)	Cannanore
19.11.79	Udayamperur (Dist. Ag. Seminar)	Ernakulam
24.11.79	Kottathara	Malappuram
6.12.79	Angadikadavu	Cannanore
11.12.79	Rajapuram	Cannanore
13.12.79	Cherupuzha	Cannanore
16.12.79	Poyya	Trichur
28.12.79	Vellangalloor	Trichur
13. 1.80	Trichur	Trichur
25. 1.80	Elamkulam	Malappuram
28. 1.80	Irumpliyam	Malappuram
2. 2.80	Kattampak	Kottayam
2. 2.80	Ambalavayal	Calicut

15. 2.80	Kannadi	..	Palghat
19. 2.80	Poyiloor	..	Palghat
21. 2.80	Thaikkattukara	..	Ernakulam
23. 2.80	Vattoli	..	Calicut
23. 2.80	Maradi	..	Ernakulam
28. 2.80	Thazhakkara	..	Alleppy
29. 2.80	Kakkatti	..	Calicut
29. 2.80	Vazhuthanam	..	Alleppy
1.3.80	Karthikulam (Dist. Ag. Seminar)	..	Calicut
1.3.80	Kukruannor	..	Alleppey
21.3.80	Mannanthala	..	Trivandrum
22.3.80	Chempazhanthi	..	Trivandrum
25.3.80	Muttom	..	Idukki

The specialists also participated and took classes in the seminars arranged by other organisations.

Farm Advisory Counter—Velanganor

On all Wednesdays and occasionally on other days as per the request of farmers, the specialists of Farm Advisory Service attended the counter at Velanganor and imparted necessary advice and guidance to the farmers on various agricultural and animal husbandry problems.

Group discussions

The specialists organised group discussions on method and time of fertilizer application, plant protection operations, weedicide application, sterility in cattle, poultry maintaining and calf rearing. They also identified diseased plant specimens brought by the farmers.

The specialists have also participated in the conduct of Cattle shows, and calf rally arranged by the Dairy Development Department and College of Veterinary and Animal Sciences, Mannuthy. They also arranged for the conduct of H. S. vaccination, R.D. vaccination for poultry and castration.

Field visits

The specialists of the Communication Centre and Farm Advisory Service visited the fields of farmers at Nadathara, Ollukkara and other surrounding villages of Trichur and gave advice and suggestions to the farmers on their field problems.

3 Workshop on Package of Practices

Workshop on package of practices for crops was conducted during August 1979. A supplement to the Package of Practices Recommendations was released based on latest research results.

4 Extension Advisory Committee

One meeting of the Extension Advisory Committee was held during the year and plan of work for 1980 was approved.

5 Exhibitions

Two major exhibitions, one at Palghat and another at Trichur (Pooram Exhibition) as well as 11 mini exhibitions at different places in the State were conducted during the year. A three day exhibition was conducted at Horticultural Research Station, Ambalavayal.

6 Setting up of Colour Lab

Preliminary works for setting up of dark-room facilities and colour lab. were started.

7 Graphic services, Preparation of teaching aids

Two hundred and fifty two exposures of colour slides and 180 exposures of black and white negative were prepared. For different publications, 65 copies of photographs were printed and 23 charts and 16 diagrams were prepared. Preparation of colour slides on cardamom, paddy and banana were undertaken during the year.

8 Publications

K.A.U. News letter

K.A.U. News letter is a monthly publication providing information on the activities of the University in various spheres such as resident instruction, training, research, extension education and publications etc. The issues of the Kerala Agricultural University Newsletter were regularly brought out during the period.

Agres-News

This is a quarterly publication, published as a supplement to Kerala Agricultural University Newsletter. Results of research conducted in the University and other Institutions in India and abroad are collected, processed and published for the use of the extension staff of the Department of Agriculture, Animal Husbandry and Dairy Development. Three issues have been published during the year under report.

Kalpadhenu

This is a bi-monthly farm magazine meant for farmers and extension personnel. Six issues were published during the year covering titles on Agriculture, Animal Husbandry, Horticulture, Fisheries, Co-operation etc. Features, research notes and activities of the Research Stations of the University were also documented in these issues of the Magazine.

Research Journals

Two issues each of Kerala Journal of Veterinary Sciences and Agricultural Research Journal of Kerala were published during the period under report.

Abstracts

Abstracts such as 'Agri. Abstract', 'Horti Abstract' 'Anivet Abstract' containing technical information for the use of the technical personnel of

the Kerala Agricultural University and Department of Agriculture and Animal Husbandry etc., were brought out during the year under report.

Publication of books

Two books in Malayalam viz. "Kayekapravardhanam" and "Labh-akaramaya Kozhivalarthal" comprising of the lessons broadcast through the AIR were published.

Publication of technical bulletins in Malayalam

Two technical bulletins viz. "Poshakathottam" and "Kasumavu" were published in Malayalam.

Publication of technical booklets in Malayalam

Four technical booklets, viz. 'Gaveshanopaharam', 'Sudhajala Malsya Krishi', 'Lavanajala Malsya Krishi' and 'Nellu' were published in Malayalam.

Technical booklets on different crops, viz. pulses, groundnut, sesamum, tapioca, colocasia, amorphophallus, dioscorea, pepper, ginger, turmeric, nutmeg, cloves, cinnamon, lemongrass, palmarosa, cocoa, sugarcane, banana, pineapple, coconut, arecanut and bulletins on 'Agro-Industrial By-products' (English), 'small scale fermentation of cocoa', 'Indian dishes with cassava' were under preparation.

9 Information Dissemination

The 'Karshikarangam' columns of the dailies were regularly contributed with scientific articles for publication at the appropriate time to enable the farming community to step up the production by following the timely instructions and details contained therein. One hundred and fifty seven popular articles in Agriculture, Animal Husbandry, Fisheries and, highlights of the Kerala Agricultural University and other similar Institutions, 18 agricultural sciences news items were broadcast through the All India Radio for the benefit of the Extension Workers.

10 RADIO PROGRAMMES

Answering questions of farmers

Questions on scientific/technical points raised by farmers engaged in Agriculture and Animal production were regularly answered to clear their doubts and guide them properly in their venture. Direct detailed replies were sent to farmers who contacted the University directly through letters for getting their doubts cleared. Answers to the questions in 'Malayala Manorama' and 'Deepika' were regularly sent to the concerned dailies for their question answer column. During the year under report 112 contacts through letters and personal enquiries had been attended.

Participation in Farm and Home programme of the All India Radio

The Kerala Agricultural University actively participated in the Farm and Home programme of the All India Radio by regularly broadcasting

talks by the experts, interviews with the experts etc. to the farming community.

Weekly broadcast—Instructions to farmers and Extension Workers

This is a five minutes programme on all Fridays. Forty five timely instructions containing valuable information for farmers and extension workers were broadcast through the All India Radio during the year.

Fortnightly broadcast—Sastravarthakal

This is a 5-8 minute programme on alternating Wednesdays. Based on the research highlights of the Kerala Agricultural University and other similar Institutions, 18 agricultural sciences news items were broadcast through the All India Radio for the benefit of the Extension Workers.

Karshika Sarvakalasala Vartha Pathrika

Varthapathrika containing important events in the University during every month is broadcast from the Trivandrum Station of All India Radio in the Rural Programme.

News release for broadcast

Seven News releases on Lab-to-Land Programmes, Pattambi Research Station and Seminars were broadcast through All India Radio.

Talks and discussions

During the year under report, 39 radio talks, 15 discussions and seven interviews on different subject matters in Agriculture and allied subjects were presented for the benefit of farmers and extension workers through A. I. R.

11 Correspondence Course

A correspondence course was started under the Extension division. Preliminary work like preparation of lessons on coconut and poultry were completed. Applications were invited from the farmers for enrolling in the course.

12 University Press

The University press is undertaking the printing requirements of the University such as the printing of two Research Journals, technical bulletins, correspondence course lessons, College magazines, research reports, leaflets, booklets, forms and registers of many kinds. During the period under report about 50 different jobs were cleared and a total number of 200 major and minor items were completed. The entire binding and ruling work were also done in the University Press.

13 Krishi Vignan Kendra, Pattambi

The Krishi Vignan Kendra was inaugurated at the Rice Research Station, Pattambi on 2nd October, 1979.

During 1979-80, the following training courses were conducted.

Training in homestead farming

Under this programme thirty five farm labourers at Kodallur village were selected and given training in Homestead Farming for 5 days.

Training course for the selected farmers of adopted villages

Under this programme, discussions were held with the Grama Vikasana Samithi of the adopted village to assess the training needs of the farmers of the area. Seven short training courses were organised for the farmers of the adopted villages. The classes were conducted based on the principle 'learning by doing' and major emphasis was given for practicals.

Training in nursery techniques and propagation of fruit and Ornamental plants

Eighteen farmers were trained for 5 days.

Training in Scientific method of coconut cultivation

Ten farmers were trained for 4 days

Training in Scientific method of summer vegetable cultivation.

Thirty persons were trained for 3 days

Training in identification of pests and diseases of paddy, their control measures and handling of plant protection equipments

Twenty farmers were trained for 5 days

Training in raising rooted cuttings of pepper and scientific cultivation methods

Ten farmers were trained for 3 days.

Training in inland fish culture

Four farmers were trained for 3 days

Training in economic use of irrigation water

Ten farmers were trained for 3 days

14 Village Adoption Programmes

Village adaption programme was started by the University with a view to developing closer relations and contacts between the Scientists and farmers, to serve as field laboratories for testing new recommendations and to provide technical assistance to the farmers.

Activities in the following 13 villages adopted by the University adjacent to the different University Campuses and Research Stations were continued.

Main Campus	:	Ollukkara, Pananchery Madakkathara, Nadathara
College of Agriculture, Vellayani	:	Muttakkad, Kalliyur.
Rice Research Station, Pattambi	:	Keezhayur, Trithala.

Horticultural Research Station, Ambalavayal.	:	Ambalavayal.
Lemongrass Research Station, Odakkali	:	Asamannur.
Institute of Agrl. Technology, Tavanur.	:	Tavanur
Rice Research Station Moncompu	:	Nedumudi
Rice Research Station, Kayamkuam.	:	Kayamkulam.

In the adopted villages of Keezhayoor and Trithala an area of about 40 ha. were brought under high yielding variety of paddy under demonstration plots. District trials with improved rice cultures were also conducted. Demonstration plot for groundnut cultivation variety TMV. 2 was laid out at Trithala.

In the adopted village of Moncompu, the specialists of the stations visited the village once a week during the pucha season and spot discussions were carried out with farmers, their problems were identified and remedial measures were suggested with a view for the improvement of paddy cultivation in Kuttanad area.

In the adopted village at Asamannoor, soil samples collected from the farmers were tested in the mobile soil testing laboratory and the results were passed on to the farmers with recommendations and since the pH of the soil was found to be low calcium carbonate and dolomite were distributed for garden and wet lands.

The following planting materials were distributed to the farmers of the adopted villages: Improved paddy seeds, hybrid coconut seedlings, cocoa, pepper, coffee, cardamom, tree spices, fruit plants, ornamental plants, cinnamon seedlings and kolinji seeds. Fish fingerlings were introduced in the adopted village of Nedumudy of Kuttanad area. Female chicks were also distributed in the adopted villages at Vellanikkara. Group discussions were conducted in all these villages. A charcha samithi with 25 members to start with has been organised with its office at the Service Co-operative Society, Moorkkanikkara.

15 Krishi Vignan Mela and Seminars

Krishi Vignan Mela and Seminars were conducted. A Krishi vignan Mela was conducted on 2.2. 1980 on the subject "problems and prospects of cocoa cultivation in Wynad." Eleven Seminars were conducted at the Horticultural Research Station, Ambalavayal on the following topics,

Survival of citrus industry in Wynad.

Control of soft rot and bacterial wilt of ginger.

Control of mealy bug in coffee.

How and when to adopt control measures of quick wilt of pepper.

Vegetable growing for marketing.

Vegetable production for seed purpose.

Processing of cocoa.

Nursery techniques.

Pruning and training in coffee.

A second crop of ginger in paddy field.

Sugarcane cultivation in wet land—problems and prospects.

At the Horticultural Research Station, Ambalavayal, the following three training programmes were also conducted.

Propagation methods.

Coffee planting and after care.

Control of mealy bug in coffee.

Exhibitions were conducted along with Kissan Mela and Seminars at Horticultural Research Station, Ambalavayal.

At the Agricultural College, Vellayani, a Krishi Vignan Mela for 3 days was conducted from 24th – 26th July, 1979.

The following seminars were conducted.

Inter cultivation in coconut garden.

Post-harvest technology on cassava.

A kissan mela and exhibition was arranged at Moorkkanikkara for two days under the Village Adoption Programme of the Main Campus. A one day Agricultural and Animal Husbandry Seminar was arranged at Trichur.

16 LAB TO LAND PROGRAMME

Lab to Land programme organised by the ICAR in connection with its Golden Jubilee Celebration implemented in 12 villages adopted under village adoption programme with a view to transfer of technology for the development of the farm families. Six hundred farm families were selected from the twelve adopted villages and from the nearabouts of Research Stations under the Kerala Agricultural University. Based on bench mark survey and malady remedy analysis, production plans were prepared and these farmers, especially marginal farmers, landless farmers and tribal farmers were given extra inputs worth Rs. 200/- per family. Out of this six hundred families; five hundred were selected for the homestead development programme, where, these farmers are given poultry, improved breeds of goats, planting material, fertilizers and horticultural plants for the development of their homesteads. The farmers as well as the staff were given periodical training for the efficient working of the project.

The Lab to Land programme in Muttakkad village was formally inaugurated on 5.1.1980. A 'kissan mela' was conducted with seminars and exhibition of agricultural crops. A field trip was also organised for the participating farmers to the demonstration plots on multi-tier cultivation in banana garden. Thirty farmers were selected and individual farm production plan for the farms of all the 30 farmers were prepared. Based on this plan planting materials and fertilizers were supplied.

Five demonstration plots on multi-tier cultivation in banana garden were laid out in farmers' fields in this village. One training course on improved method of cultivation of crops was also conducted.

In the Kalliyur village, Lab to Land programme was formally inaugurated on 11.12.1979. A kissan mela, seminar and field day was conducted. Thirty farmers were selected from this village also under Lab to Land programme. Individual farm production plans for the farms of all the 30 farmers were prepared. Based on these plans, planting materials and fertilizers were supplied. Five demonstration plots on improved methods of banana cultivation were laid out in farmers' fields in the village.

In the adopted village at Pattambi, under the Lab to Land programme, crop demonstration plots with pulses were laid out and two field days and seminars were conducted and supply of extra inputs worth Rs. 200/- to each family was arranged.

Lab to Land programme in the main campus was implemented in Ollukkara and Pananchery villages and Kuzhukuiy village. Thirty farmers selected, were contacted frequently and inputs were distributed. Seminars and exhibitions were also conducted. Demonstration plots on rice were laid out in Pananchery Village.

Lab to Land programme in the Asamannoor village was implemented by the Lemongrass Research Station, Odakkali. Thirty homestead farmers were selected and according to the bench mark survey, planting materials were distributed. One training camp, kissan mela and a study tour was conducted.

17 Extension Education Centre (Pulses and Oil seeds) at Rice Research Station, Kayamkulam

The Scheme for establishment of the Extension Education Centre was sanctioned during the latter half of 1979-80.

Improved seed materials of pulses and oil seeds were collected from various Research Stations. The following varieties were collected: cowpea-C-152, Ptb. 1, New Era, blackgram-K. M. 1, redgram-T-15-15, Co.2 and Co.3, castor-SA. 2 and Anna.

A trial cultivation of castor variety SA-2 in the Summer rice fallows at Rice Research Station, Kayamkulam was conducted.

The specialists attended the following seminars and training camps and took classes.

Seminar on betelvine cultivation, conducted by FACT at Kadungalloor.

Cocoa seminar by IPD unit, Thekkekkara.

One day training camp on pulses production technology and nutritive aspects of pulses at Thazhakkara.

18 National Demonstration Project

The objective of the scheme is to convincingly demonstrate to farmers the production potentialities of every unit area of land by using high yielding varieties of crops and adopting multiple cropping programmes and package of practices such as balanced use of fertilizers, effective water management techniques, plant protection measures and other agronomic practices.

Twenty-five demonstrations were laid out during the year under report in the Trichur District. Two paddy crops and a pulse, groundnut and horsegram as companion crops with tapioca, groundnut in rice fallows were the different cropping patterns demonstrated to the farmers. Average yield of paddy was 4256 kg/ha. and groundnut 947 kg/ha. (dry pods)

19 Dry Farming Scheme

The objective of the scheme was to find out suitable cropping patterns for Kozhinjampara, Eruthempathy area in Chittur Block in Palghat District where drought prone cultivation prevailed.

Five experiments having twelve different cropping patterns were tried in farmers' fields at Chittur area. Five economic and profitable cropping patterns were found to be suitable for the drought prone area. Relay cropping of cotton, ten days before the harvest of groundnut, or relay cropping tapioca, one month after the sowing of groundnut, have been found to be highly remunerative even under adverse weather conditions. Raising paddy, especially Suvarnamodan and Annapoorna under delayed monsoon conditions was encouraging. Planting of tapioca alone in April-May was economical.

At Eruthempathy, 25 demonstrations on farmers' fields were conducted. Promising cropping patterns found useful for the drought prone area were tried in these farmers' fields. The results revealed that relay cropping of cotton or tapioca in groundnut fields was highly advantageous for the drought prone areas. Sowing of paddy in May under delayed monsoon conditions proved to be successful. It was also observed that sowing of groundnut under late monsoon conditions will be a complete failure due to the early attack of Tikka disease.

20 National Service Scheme

The Director of Extension Education continued to be the Programme Co-ordinator of the National Service Scheme. The 300 students allotted to the Kerala Agricultural University for regular N. S. S. activities were sub allocated among the constituent colleges.

The N. S. -S. volunteers took active part in the village adoption programmes of the University. They collected the relevant basic data on

crops and their acreage, livestock and poultry management practices, requirements of inputs etc. of the farmers staying in the adopted villages. Another major work of the NSS students of the College of Horticulture was on the improvement of the College Campus. The NSS volunteers conducted free tuition classes to the inmates of MTM Orphanage. They helped to arrange an exhibition organised by the Kerala Agricultural University in connection with the Kissan Mela. They laid out two demonstration plots in paddy in the adopted village and two kitchen gardens in Don Bosco School and Vimala College.

An Agricultural Seminar was organised in the Don Bosco High School on 31.10.1979. Film shows were arranged for the people of the adopted village. The Community Centre of the NSS unit started functioning from October 1979 at the adopted villages.

A ten-day special camping programme under the auspices of the National Service Scheme unit of the College of Horticulture was conducted at the Mar Thimotho's Memorial Orphanage, Kalathode during the inter trimester break from 19th January to 27th January, 1980. Fifty NSS volunteers participated in the programme.

NSS volunteers conducted a survey regarding socio-economic and cultural status of the people of the Harijan Colony at Pattalakkunnu. NSS volunteers designed and laid out a kitchen garden in the Orphanage. All cultivation operations like taking beds, manuring, irrigation etc. were performed by the NSS students. The volunteers constructed a road, leading to the Orphanage from the National Highway.

Another major work of the NSS volunteers was collection of soil samples from the cultivators' fields in the adopted village, Mullakkara. They also arranged a bunchytop eradication campaign, a rodent control campaign and the distribution of seeds and other planting materials in the adopted villages. During the camp period, film show and variety entertainments were conducted. On the final day of the camp, NSS volunteers organised an agricultural exhibition in the orphanage at Mullakkara.

The NSS Unit of the Agricultural College, Vellayani has concentrated their activities in Muttakkad and Kalliyur villages coming under the village adoption programme. The NSS unit of the College is running a community centre at Keezhoor. In the centre, news papers, weeklies, and magazines are made available for reading. The NSS volunteers frequently visit the houses in the adopted villages and render them advice in improved agricultural practices. The International Literacy Day was celebrated on 8th September 1979 at the Community Centre by arranging an exhibition of books. The NSS volunteers participated in the preparation and arrangement and conduct of the exhibition and Farmers' Fair at College of Agriculture, Vellayani from 24th to 26th July 1979.

Gandhi Jayanthi was celebrated on 2nd October 1979 by reconstructing a road of about one km. distance in Palapoor. The NSS unit celebrated Vanamahotsava by planting 200 seedlings in Keezhoor and Palapoor area. Fifty vegetable gardens were raised in the adopted villages. Seeds were distributed free of cost for vegetable gardens.

Blood donation was also done by the NSS volunteers at Sri. Chithra Medical Centre and Medical College, Trivandrum.

A special camping programme of the NSS unit of the College was conducted on 29th September to 3rd October 1979 at Keezhoor in Kalliyur Panchayat. The campers constructed a road and raised vegetable gardens in fifty households. Planting of 250 seedlings was done. A 'Kala Sam-skarika Mela' was organised at L. P. S., Palapoor. Film shows were also arranged. Discussions were arranged on various aspects of 'Youth for Rural Reconstruction'. A calf exhibition and a seminar on scientific production of milk was conducted.

The ten day special camping programme under the NSS unit in the College of Veterinary & Animal Sciences, Mannuthy was conducted from 22.8.1979 to 31.8.1979 at Madakkathara Village. The volunteers visited the Farmers' houses. The NSS volunteers also engaged in the construction of a road. Seminars were conducted on "economic milk production and disease of udder" and "economic fodder cultivation". After the seminar, grass slips were distributed to the farmers and a film show was conducted. Ranikhet vaccination was conducted. A sterility camp and protective vaccination of cattle was also conducted. A random survey was conducted by using a questionnaire to assess the impact of NSS activities and also for its future plans on goat rearing. There was a free egg distribution to 150 children to commemorate the International Year of the Child.

CHAPTER V

Engineering Wing

The Engineering wing of the Kerala Agricultural University consists of the Directorate of Physical Plant with six sub-divisions located, two at Vellanikkara, two at Mannuthy, one at Vyttila and one at Vellayani. Sri. N. Sivathanu Pillai (on deputation) continued as the Director of Physical Plant. Control and maintenance of buildings, procurement of equipment, vehicles and machinery, design and construction of buildings for the University are vested with the Directorate of Physical Plant.

Major works taken up, completed and work in progress during the year 1979-80 are furnished below:

Major works taken up during the year 1979-80

Name of work	Estimate amount in lakhs
1 Improvements to pig sties in Pig Breeding Farm, Mannuthy.	1.20
2 Constructing a brooder house to the Poultry Farm, Mannuthy.	1.50
3 Constructing a new building to house the branch of State Bank of Travancore at Agricultural College Vellayani.	1.13
4 Furnishing the V. I. P. guest house at Agricultural College Vellayani.	0.61
5 Constructing a cattle barn at L. S. Farm, Thiruvazhamkunnu.	1.44
6 Constructing a compound wall for a length of 190 m. in Agricultural College, Vellayani.	0.51
7 Black topping of roads in Mannuthy Campus.	0.83
8 Constructing a new hatchery building at Mannuthy.	1.25
9 "Converting Small Animal Breeding Station, to University Press.	1.23
10 University Poultry Farm, Mannuthy-field pen-special repairs.	0.63

11	Constructing quarters for Professors at Main Campus, Vellanikkara-Type VI 6 nos.	8.52
12	Constructing quarters for Asst. Professors Type-IV (twin type 3 nos) and Associate Professors Type-V-4 nos. at Main Campus, Vellanikkara.	7.56
13	Constructing marginal drains, culvert, wire fencing to Type-II quarters at Main Campus, Vellanikkara.	1.56
14	Constructing Hostel for Ladies at Main Campus, Vellanikkara.	21.00
15	Providing electrification to type-II quarters at Vellanikkara.	0.85
16	Constructing a Radio Isotope Laboratory at K. A. U. Main Campus, Vellanikkara.	8.00
17	Extension to the Hostel-Additional amenities to the Womens' Hostel at I. A. T., Tavanur	1.20

Spill over works in 1979-80

- 1 Constructing a main gate on 'A' road for K. A. U. Main Campus, Vellanikkara and forming 'A' road.
- 2 Formation of 'C' Road in Main Campus, Vellanikkara.
- 3 Constructing a laboratory & library building at Agricultural College, Vellayani.
- 4 Constructing a Farmer's Hostel at Main Campus, Vellanikkara.
- 5 Construction of an inpatient ward to Veterinary Hospital, Mannuthy.
- 6 Constructing Teachers' Hostel at Vellayani
- 7 Constructing compound wall at Agronomic Research Station, Chalakudy.
- 8 Constructing fish ponds at Rice Research Station, Vyttila.
- 9 R. R. S. Vyttila-Construction of Laboratory office building.
- 10 Constructing clinical pathology laboratory in Veterinary Hospital, Kokkalai-construction of additional floor to the store shed.
- 11 Providing fencing around Instructional Farm, Main Campus, Vellanikkara (balance work)
- 12 Construction of laboratory, office-cum-store building at A. R. S., Chalakudy.
- 13 Construction of a building for Dairy Technology at Mannuthy.

- 14 Constructing a net house for Nematology section Agri.-cultural College, Vellayani.
- 15 Digging a tank and constructing a pump house at Pepper Nursery at Instructional Farm, Vellanikkara.
- 16 Constructing pump house and Ground level tank-instructional Farm, Vellanikkara.

Works completed

- 1 Soling and metalling 'A' road in the University Main Campus, Vellanikkara.
- 2 Semigrouting 'A' road, Main Campus, Vellanikkara.
- 3 Constructing dining block near the Hostel Block for Boys at University Main Campus, Vellanikkara.
- 4 Constructing type-IV residential quarters at Mannuthy.
- 5 R. R. S. Vyttila-construction of laboratory office building.
- 6 Constructing Clinical Pathology laboratory in Veterinary Hospital, Kokkalai-construction of additional floor to the store shed.
- 7 Constructing a dining block and connecting corridor to Hostel Block No. I and II.
- 8 Construction of Meat Technology building at Mannuthy.
- 9 Improvements to Glass House at C. R. S. Pampadumpara.
- 10 Constructing staff quarters at K. A. U. Main Campus, Vellanikkara.
- 11 Construction of Laboratory office-cum store building at A. R. S. Chalakudy.
- 12 Construction of Ladies Hostel at Vellayani.

Sanctioned amount for work expenditure during the year 1979-80

Rs. 67,00,000/-

Expenditure incurred on works during the year 1979-80

Rs. 71,74,199.17

(including maintenance and repairs and the funds placed by the other officers out of their allotment)

CHAPTER VI

Finance and Accounts

Shri, P. Rajagopal continued as the Comptroller during the year under report.

The Budget for the year was for an income of Rs. 582.34 lakhs and expenditure of Rs. 611.17 lakhs, disclosing a deficit of Rs. 28.83 lakhs. But the year closed with a balance of Rs. 5.02 lakhs. The main source of income confined to be the grant-in-aid from the State Government and the I. C. A. R.

Four local audits and one special audit were conducted. Twenty seven fresh Audit Notes issued by the Government Auditor were also processed and pursued.

The Accounts Committee constituted from among its non-official members by the General Council at its Annual General Meeting held on 24.3.79 with M/s. O. Lukose, P. Vijayadas & N. Chellappan Pillai considered the Annual Accounts and Audit Report of the University for the year 1973-74 in six sittings, examined the various witnesses found necessary and submitted the Report to the General Council on 21.11.1979. The Comptroller acted as the Convenor of the Accounts Committee as provided for in the rules.

Government Audit Wing

Sri. P. Murugan Kutty in the cadre of Deputy Examiner of Local Fund Accounts was the Government Auditor upto 11.9.79 A. N. Smt. V. Karthiyani Amma, Inspector of Local Fund Accounts was in charge of the Office from 11.9.1979 A. N. to 15.9.1979 F. N. Sri. P. Sekharan Nambiar, Deputy Examiner of Local Fund Accounts took charge as Government Auditor on 15.9.1979 F. N.

Audit of the accounts of the University for the year 1976-77 was completed and Audit Report issued. Audit of the accounts for the year 1977-78 was also taken up during the year and good progress was made. Local verification of records in almost all sub stations under the

University was done. Top priority was also given for the audit of accounts of various schemes functioning in different parts of the State. Audit Certificates in respect of grant received from the Indian Council of Agricultural Research for various schemes for the years 1971-72, 1972-73, 1975-76, 1976-77 (total 44 numbers) covering a total expenditure of Rs. 1,32,87,513.86 was issued during the year under report.

CHAPTER VII

Estate

Sri. T. Ebrahimkutty continued as Estate Officer during the period under report.

An area of 379.5615 hectares have been acquired by the Govt. of Kerala for the Kerala Agril. University and handed over on 1.5.1973. An additional area of 2.7119 hectares was acquired on 8.1.1977. The schemes under Cashew, Pineapple, Pepper, Floriculture and Instructional Farm, of the Horticultural College have already started functioning in the Campus. A total area of 149.3 hectares have been earmarked for the above schemes and farm. An area of 12 hectares have been allotted to the Plant Introduction Scheme of the Indian Council of Agricultural Research and an area of 14 hectares for KADP. Sixty hectares of land have been earmarked for the Botanical garden. where planting will be carried out in a phased programme. An area of about 15.00 hectares have been utilized for buildings and roads. About 150 hectares area covered with tapping rubber trees. This 150 hectares include the area earmarked for Instructional Farm, Pepper Scheme and Botanical Gardens

During the year 1978-79, a quantity of 53367.600 kg. of finished rubber was produced in the factory attached to the Estate. An amount of Rs. 4,86,108.50 has been received being the cost of rubber lace sold. 4,105 trees have been cut and removed fetching an amount of Rs. 2,02,912.53. During the period under report, the expenditure was Rs. 7,28,223.61 against a receipt of Rs. 7,31,391.13. A stock balance of 20,610.2 kg. of finished rubber lace was in hand as on 31.3.1980.

Appendix - I

MEMBERS OF THE STATUTORY AUTHORITIES

I THE GENERAL COUNCIL

Ex-Officio Members

- 1 Her Excellency the Governor of Kerala,
Raj Bhavan, Trivandrum.
- 2 The Hon'ble Minister for Agriculture,
Trivandrum.
- 3 The Vice-Chancellor
Kerala Agricultural University, Vellanikkara.
- 4 The Special Secretary to Government &
Agricultural Production Commissioner,
Government Secretariat, Trivandrum.
- 5 The Secretary (Development),
Government Secretariat, Trivandrum.
- 6 The Special Secretary (Finance)
Government Secretariat, Trivandrum.
- 7 The Director of Agriculture, Trivandrum-1.
- 8 The Director of Animal Husbandry, Trivandrum-4.
- 9 The Director of Dairy Development, Trivandrum-4.
- 10 The Director of Fisheries, Trivandrum-3.
- 11 The Chief Conservator of Forests, Vazhuthacaud, Trivandrum.
- 12 The Registrar of Co-operative-Societies, Trivandrum.
- 13 The Dean,
Faculty of Vety. & Animal Sciences,
College of Vety. & Animal Sciences, Mannuthy.
- 14 The Dean,
Faculty of Agriculture,
College of Agriculture, Vellayani.
- 15 The Dean,
Faculty of Fisheries,
College of Fisheries, Mannuthy.
- 16 The Director of Extension Education,
Kerala Agricultural University, Vellanikkara.
- 17 The Director of Research,
Kerala Agricultural University, Vellanikkara.
- 18 The Director of Students Welfare,
Kerala Agricultural University, Vellanikkara-Vacant

Elected Members

Members of Legislative Assembly

19 Vacant

20 Vacant

21 Vacant

22 Vacant

Representatives of Post-graduate Students

23 Sri. Abdul Azeez, M.,
Post-graduate Student,
College of Vety. & Animal Sciences, Mannuthy.

24 Sri. Markose, V. C.,
Post-graduate Student,
College of Agriculture, Vellayani.

Representatives of Under-graduate Students

25 Sri. Harisankar, S.,
IInd B. Sc. (Ag.),
College of Agriculture, Vellayani.

26 Sri. Mohanan, B.,
IInd B. Sc. (Ag.)
College of Horticulture, Vellanikkara.

Representative of Diploma & Certificate Courses

27 Sri. Krishnakumar, M. S.,
Student, Diploma in Agrl. Sciences,
Institute of Agrl. Technology, Tavanur.

Representatives of Teachers of Faculties

28 Sri. Sivasankara Pillai, K.,
Associate Professor,
Model Agronomic Research Station, Karamana.

29 Dr. M. Krishnan Nair,
Professor of Pathology,
College of Vety. & Animal Sciences, Mannuthy.

30 Dr. D. M. Thampy,
Associate Professor of Fisheries,
Rice Research Station, Vyttila.

Representative of Non-teaching staff

31 Sri. Neelakantan Kartha, K. M.,
Senior Grade Livestock Asst.,
Pig Breeding Farm, Mannuthy.

Representatives of Presidents of Panchayats

32 Sri. Chooriyottil Sethumadhavan,
President, Alanalloor Panchayat,
Edathanattukara, Palghat Dist.

- 33 Sri. Surendran, K. K.,
President,
Madakkathara Panchayat, Trichur Dist.
- 34 Sri. Ramayyashetty, B. M.,
President,
Manjeswar Panchayat, Cannanore Dist.
- 35 Sri. Raveendran, N.,
President,
Kundara Panchayat, Quilon Dist.

**Representative of Mayors of Municipal Corporations and
Chairmen of Municipal Councils**

- 36 Sri. Mohammed Kunju, A.,
Chairman,
Attingal Municipal Council,
Attingal, Trivandrum Dist.

**Members nominated by the Chancellor
Agricultural Scientists**

- 37 Dr. P. N. C. Pillai,
Scientist,
P. P. M. Cell,
Government Secretariat, Trivandrum.
- 38 Dr. Abi. Cheeran,
Associate Professor of Pathology,
College of Horticulture, Vellanikkara, Trichur Dist.

Farmers

- 39 Sri. C. P. Narayanan,
28/1012, Kunnampuram, Trivandrum.
- 40 Sri. E. Gopalakrishna Menon,
C. P. I. District Council Office, Trivandrum.
- 41 Sri. P. Z. Joseph, M. A., B. Ed.,
Kavalam P. O., Alleppey Dist.
- 42 Sri. P. R. Francis,
Porathur House,
Ollur-P. O., Trichur Dist.
- 43 Sri. Kolady Govindankutty,
Advocate,
Ponnani, Malappuram District.

**Non-official representatives of
Co-operation**

- 44 Sri. O. Lukose, M. L. A.,
M. L. A. quarters, Trivandrum.

Fisheries

- 45 Sri. V. V. Saseendran,
Kollam Jilla Malsia Thozhilali Union,
C/o. C. P. I. (M) Office, Polayathodu, Quilon.

Animal Husbandry

- 46 Sri. K. S. Vasudeva Sarma,
Sankaranilayam,
Venmony-P. O., Allepey Dist.

Non-official representatives of plantation Industry

- 47 Sri. George J. Mathew, Ex: M. P.,
Kottickal-P. O., Kottayam.

Woman Social Worker

- 48 Smt. Vijaya S. Nair,
Ayiram Thoppu,
Karikkakom,
Kadakampally, Trivandrum.

Engineer who has specialised in Agrl. Engineering or irrigation

- 49 Sri. K. Bharathan,
Adviser, Irrigation,
Secretariat, Trivandrum.

Educationist

- 50 Prof. V. S. Ouseph,
Mar Ivanios College, Trivandrum.

Representatives of. Agricultural Labour

- 51 Sri. K. P. Joseph,
Kayalparambil veedu,
Ponga - P. O., Moncompu, Alleppey Dist.
52 Sri. R. Narayanan,
Athippotta, Tarur, Palghat District.

Representative of Plantation Labour

- 53 Sri. K. M. Shahul Hameed,
M. P. E. Union Office.
Palianmala - P. O., Idukki District.

Representatives of Universities

Calicut

- 54 Vacant

Cochin

- 55 Vacant

Kerala

- 56 Vacant

Representative of ICAR

- 57 Dr. Silas. E. G.,
Director, Central Marine Fisheries Research Institute,
Gopala Prabhu Road, Eranakulam – Cochin – 18.

II THE EXECUTIVE COMMITTEE

- | | | |
|----|--|----------|
| 1 | Sri. N. Kaleeswaran,
Vice-Chancellor | Chairman |
| 2 | The Secretary to Government & Agricultural
Production Commissioner, Secretariat
Trivandrum | Member |
| 3 | The Secretary to Government,
Finance, Trivandrum | " |
| 4 | The Secretary to Government,
Development Department, Trivandrum | " |
| 5 | Dr. E. G. Silas,
Director, Central Marine Fisheries Research Institute,
Cochin | " |
| 6 | Dr. N. Sadanandan,
Dean,
College of Agriculture, Vellayani | " |
| 7 | Dr. M. Krishnan Nair,
Professor,
Department of Pathology,
College of Vety. & Animal Sciences Mannuthy | " |
| 8 | Sri. E. Gopalakrishna Menon,
Ex. M. L. A.,
Ayyanthole – P. O. Trichur- | " |
| 9 | Prof. V. S. Ouseph,
Mar Ivanios College,
Beth, Nalanchira, Trivandrum – 15 | " |
| 10 | Sri. P. R. Francis, MLA,
Porathur House, Ollur – P. O., Trichur | " |
| 11 | Sri. K. S. Vasudeva Sarma,
President,
Venmony Panchayat, Alleppey | " |
| 12 | The Registrar,
Kerala Agricultural University | Convener |

III THE ACADEMIC COUNCIL

Ex-Officio Members

- | | | |
|---|---------------------|----------|
| 1 | The Vice-Chancellor | Chairman |
|---|---------------------|----------|

2	The Pro Vice-Chancellor,	Member
3	The Dean, Faculty of Agriculture	"
4	The Dean Faculty of Vety. & Animal Sciences	"
5	The Dean, Faculty of Fisheries	"
6	The Director of Research,	"
7	The Director of Extn. Education,	"

Members Nominated by the Chancellor from among the Heads of Departments

8	Prof. A. G. G. Menon, Professor of Agrl. Extension, College of Agriculture Vellayani	"
9	Dr. M. M. Koshy, Professor, (Faculty Research) for Agriculture, College of Agriculture, Vellayani.	"
10	Sri. K. Srinivasan, Professor of Horticulture, College of Agriculture, Vellayani.	"
11	Sri. A. Venugopalan, Professor (Faculty Research) for Veterinary & Animal Sciences, College of Veterinary & Animal Sciences, Mannuthy.	"
12	Shri. K. Radhakrishnan, Professor, Department of Anatomy, College of Vety. & Animal Sciences, Mannuthy.	"
13	Shri. P. K. Abdulla, Professor, Department of Microbiology, College of Veterinary & Animal Sciences, Mannuthy.	"

Members nominated by the Chancellor from among the staff of research stations

14	Vacant	
15	Dr. C. C. Abraham, Professor of Entomology (Entomologist), AICRP on Biological Control of Crop Pests, Vellanikkara.	"
16	Dr. A. Rajan, Professor of Pathology, (Project Officer) ICAR Scheme on Incidence. Etiology & Pathology of Tumours of Ethmoid in Domestic Animals, Mannuthy.	"

**Elected Members from among Post-graduate
& Research Students**

- 17 Sri. Thomas Biju Mathew,
M. Sc. (Ag.) Student,
College of Agriculture, Vellayani. Member
- 18 Shri. P. J. Joseph,
1st Ph. D. Scholar,
Plant Pathology,
College of Agriculture, Vellayani, "

**One member elected by the teachers (other
than Deans of faculties)**

Faculty of Agriculture

- 19 Sri. P. D. Vijayagopal,
Asst. Professor,
Department of Agrl. Botany.
College of Agriculture, Vellayani. "
- Faculty of Veterinary & Animal Sciences**
- 20 Sri. P. A. Ommer,
Assoc. Professor,
College of Vety. & Animal Sciences, Mannuthy. "
- 21 The Registrar,
Kerala Agrl. University Member—Convener.
- 22 The Director of Agriculture,
Govt. of Kerala Trivandrum Member
- 23 The Director of Animal Husbandry
Govt. of Kerala, Trivandrum "

Nominated Members

(From among those connected with service
in Agrl, Animal husbandry, forestry, fisheries,
dairy development, co-operation & community
development departments – not more than 5
members).

- 24 Sri. T. P. Seetharaman,
Aradra Estate,
Ponnoorkara, Trichur Dist. "
- 25 Dr. M. N. Menon, Adviser
Cattle Insurance,
National Dairy Development Board,
Anand, Gujarat State. "
- 26 Dr. T. A. Mammen, Director,
Marine Products Exports Development Authority,
P. B. No. 1708, M. G. Road, Eranakulam,
Cochin-682016. "

- 27 Sri. A. G. Vasavan,
 Managing Director,
 Kerala Fishermen's Welfare Corporation Ltd.,
 Anil Saras, Jawaharnagar, Trivandrum-693003. Member
- 28 Dr. P. M. Ganapathy,
 Director,
 Kerala Forest Research Institute, Peechi, Trichur Dist. "

Representatives of scientists from ICAR/its Institute/from other Universities in India or from among well known scientists in India nominated by the Chancellor.

- 29 Dr. N. M. Nayar,
 Director,
 Central Plantation Crops Research Institute, Kasaragod. "
- 30 Dr. N. Hrishi,
 Director,
 Central Tuber Crops Research Institute, Trivandrum. "
- 31 Dr. A. Appa Rao,
 Director of Research,
 Andhra Pradesh Agrl. University,
 Rajendranagar, Andhrapradesh. "
- 32 Dr. K. J. Joseph,
 Department of Zoology, University of Calicut. "
- 33 Dr. V. Rajagopalan,
 Director of Research,
 Tamil Nadu Agrl. University, Coimbatore. "

IV BOARD OF STUDIES IN THE FACULTY OF AGRICULTURE

Dean, Faculty of Agriculture

— Chairman

Heads of Departments under the Faculty

- 1 Agronomy
- 2 Agril. Botany
- 3 Agrl. Entomology
- 4 Agrl. Economics
- 5 Agrl. Engineering
- 6 Agrl. Extension
- 7 Agrl. Statistics
- 8 Horticulture
- 9 Plant Pathology
- 10 Soil Science & Agrl. Chemistry
- 11 Forestry

Two Specialists

- 1 Sri. K. K. Krishnamoorthy,
Dean, Agrl. College & Research
Institute, Madurai, Tamil Nadu. — Member
- 2 Dr. V. Appa Rao,
Director of Research,
Andhra Pradesh Agrl. University,
Rajendranagar,
Hyderabad " "

Other Members

- 1 Dr. M. Aravindakshan,
Professor,
College of Horticulture, Vellanikkara. " "
- 2 Dr. C. C. Abraham,
Professor,
College of Horticulture, Vellanikkara. " "

Student representatives

- 1 Sri. K. P. Vasudevan Nair,
Ph. D. Scholar,
College of Agriculture, Vellayani. " "
- 2 Shri. Ahammed Foad,
M. Sc. (Ag.) Student,
College of Agriculture, Vellayani. " "

Special Invitees

- 1 Director of Research,
Kerala Agricultural University. " "
- 2 Director of Extension Education,
Kerala Agricultural University " "

V BOARD OF STUDIES IN THE FACULTY OF VETERINARY & ANIMAL SCIENCES

- 1 Dean,
Faculty of Vety. & Animal Sciences, Mannuthy.
- 2 Heads of Departments under the Faculty (19 nos.)
 - 1 Anatomy
 - 2 Animal Breeding & Genetics
 - 3 Animal Management
 - 4 Animal Reproduction
 - 5 Dairy Science
 - 6 Extension
 - 7 Medicine
 - 8 Microbiology
 - 9 Nutrition
 - 10 Parasitology
 - 11 Pathology

- 12 Pharmacology
- 13 Physiology & Biochemistry
- 14 Poultry Science
- 15 Statistics
- 16 Surgery
- 17 Therapeutics
- 18 Veterinary Public Health
- 19 Fisheries

Specialists

- 1 Dr. C. V. Reddy,
Dean,
College of Vety. & Animal Sciences,
Andhra Pradesh Agrl. University,
Rajendranagar, Hyderabad—500030
- 2 Dr. B. S. Kesavamoorthy,
Professor of Vety. Microbiology,
University of Agrl. Sciences,
Hebbal, Bangalore—560024.

Other Members

- 1 Dr. C. R. Ananthasubramaniam,
Associate Professor,
Co-ordinated By-Products Scheme,
College of Vety. & Animal Sciences, Mannuthy.
- 2 Dr. A. Rajan,
Professor,
Dept. of Pathology,
College of Vety. & Animal Sciences, Mannuthy.

Special Invitees

- 1 Director of Research,
Kerala Agricultural University, Vellanikkara.
- 2 Director of Extension Education,
Kerala Agricultural University, Vellanikkara.

VI THE FINANCE COMMITTEE

- | | |
|---|------------|
| 1 The Vice-Chancellor | — Chairman |
| 2 The Secretary to Government (Finance) | — Member |
| 3 The Secretary to Government & Agricultural
Production Commissioner | “ |
| 4 Sri. K. S. Vasudeva Sarma,
President,
Venmony Panchayat, Alleppey | “ |
| 5 The Comptroller,
Kerala Agricultural University, Vellanikkara. | — Convener |

Appendix-II

SUB COMMITTEES OF THE UNIVERSITY

I THE RESEARCH COUNCIL

The Vice-Chancellor, Kerala Agricultural University, Vellanikkara	Chairman
The Director of Research Kerala Agricultural University, Vellanikkara	Secretary
1 Dr. V. S. S. Potti Director of Extension Education, Kerala Agricultural University Vellanikkara	Member
2 Dr. N. Sadanandan, Dean, College of Agriculture, Vellayani	"
3 Dr. P. G. Nair, Dean, College of Veterinary & Animal Sciences, Mannuthy	"
4 Sri. V. S. Ouseph Professor, Mar Ivanios College, Trivandrum	"
5 Prof. T. P. Mohammed Kunhi Manna, Taliparamba	"
6 Dr. M. G. Krishna Pillai Professor, University of Cochin	"
7 Sri. M. Janardhanan Nair Rtd. Director of Agriculture, Lakshmi, Sasthamangalam, Trivandrum	"
8 Sri. Jacob P. John, Rtd. Addl. Director of Agriculture & Private Secretary to the Governor of Andhra Pradesh	"
9 The Director of Research Tamilnadu Agrl. University, Coimbatore	"
10 Dr. S. N. Rao Senior Scientist and Head of Department of Horticulture, Andhra Pradesh Agrl. University Thirupathy	"
11 Dr. K. Krishnamoorthy, Director of Research, University of Agrl. Sciences, Bangalore	"
12 The Agrl. Production Commissioner, Trivandrum	"
13 Dr. M. V. George, Chief, Evaluation State Planning Board, Trivandrum	"

II FACULTY RESEARCH COMMITTEE

a Agriculture

- | | | |
|---|--|-----------------------------------|
| 1 | The Dean,
College of Agriculture, Vellayani | Chairman |
| 2 | The Associate Dean
College of Horticulture, Vellanikkara | Member |
| 3 | Heads of Departments | " |
| 4 | Dr. M. Aravindakshan, Professor,
College of Horticulture, Vellanikkara | " |
| 5 | Sri. N. Gopalan, Assoc. Professor,
Rice Research Station, Pattambi | " |
| 6 | Sri. N. Rajappan Nair, Assoc. Professor,
Rice Research Station, Moncompu | " |
| 7 | Dr. U. P. Bhaskaran,
Director of Research, Kerala Agricultural University, Vellanikkara | " |
| 8 | Dr. M. M. Koshy
Professor of Agrl. Chemistry, College of
Agriculture, Vellayani | Part time Secretary &
Convener |

b Veterinary & Animal Sciences

- | | | |
|---|--|-----------------------------------|
| 1 | The Dean,
College of Veterinary & Animal Sciences, Mannuthy | Chairman |
| 2 | Heads of Departments | Member |
| 3 | Superintendent
University Livestock Farm, Thiruvazhamkunnu | " |
| 4 | Research Officer,
Cattle Breeding Farm, Thumburmuzhi | " |
| 5 | Dr. M. Sthanumalayan Nair
Fodder Research Officer, Mannuthy | " |
| 6 | Dr. K. T. Punnoose,
Associate Professor, Scheme for Studies on Porcine Enterovirus | " |
| 7 | Dr. M. Krishnan Nair
Professor of Pathology, College of Veterinary
& animal Sciences, Mannuthy | Part time Secretary &
Convener |

III RESEARCH ADVISORY COMMITTEE

- | | | |
|---|--|----------|
| 1 | The Vice-Chancellor,
Kerala Agricultural University, Vellanikkara. | Chairman |
| 2 | The Director of Research, Kerala Agrl. University
Vellanikkara | Convener |
| 3 | All non-official members in the
Executive Committee | Member |
| 4 | All Deans in the Kerala
Agricultural University | " |
| 5 | All the members of the Research
Council of the Kerala Agricultural University | " |

- | | | |
|----|---|--------|
| 6 | The Directors or representatives of the ICAR Research Institutes in the state | Member |
| 7 | The Director,
Forest Research institute, Peechi, Kerala | " |
| 8 | The Director of Agriculture Kerala | " |
| 9 | The Director of Animal Husbandary Kerala | " |
| 10 | The Director of Fisheries Kerala | " |
| 11 | The Chief Conservator of Forests Kerala | " |
| 12 | The Director of Dairy Development Kerala | " |
| 13 | All the members of the General Council nominated by the Chancellor under Section 19 (9) KAU Act. 1971 | " |
| 14 | All the MLA's in the General Council of the Kerala Agricultural University | " |
| 15 | The Deputy Director of Agriculture State Planning Board | " |
| 16 | The Farmers Representatives nominated by the Vice-Chancellor | |
| | 1 Sri. Vasudevan Nair,
Punnappuram House, Pirappancode P. O. Trivandrum Dist. ,, | " |
| | 2 Sri E. P. Madhavan Nair,
EPM Industrial & Agrl. Estate Palappuram, Ottappalam,
Palghat District | " |
| | 3 Sri. T. N, Rishikesan Bhattathirippad, Kudamaloor, Kottayam District. | " |
| | 4 Sri. T. V. Varghese Vaidyan, Kalpakavady, Thottappally,
Alleppey District. | " |
| | 5 Sri. Joseph Alappattu Thoppil,
Karanchira, Trichur Dist. | " |
| | 6 Sri. Vasudevan Namboodiripad,
Karuvakundu, Palghat Dist, | " |
| 17 | The Farm Radio Officers,
All India Radio, Trichur & Calicut | " |
| 18 | All the members of the Faculty
Research Committees of the
Kerala Agricultural University | " |
| 19 | All the Project-Co-ordinators
in the Kerala Agricultural University. | " |

IV VARIETY EVALUATION COMMITTEE

- | | | |
|---|---|----------|
| 1 | Director of Research
Kerala Agricultural University, Vellanikkara. | Chairman |
| 2 | The Director,
C. T. C. R. I., Trivandrum or his nominee | Member |
| 3 | Director,
C. P. C. R. I., Kasaragod or his nominee | " |
| 4 | The Director of Agriculture,
Trivandrum or his nominee | " |

5	Director of Extension Education, Kerala Agricultural University, Vellanikkara.	Member
6	Professor of Agronomy, College of Agriculture, Vellayani.	"
7	Professor of Plant Pathology, College of Agriculture, Vellayani.	"
8	Professor of Agrl. Botany, College of Agriculture, Vellayani.	"
9	Professor of Horticulture, College of Agriculture, Vellayani	"
10	Professor of Entomology, College of Agriculture, Vellayani.	"
11	Assoc. Professor i/c, Rice Research Station, Pattambi.	"
12	Assoc. Professor i/c, Coconut Ressarch Station, Pilicode.	"
13	Assoc. Professor, Directorate of Research, Kerala Agricultural University, Vellanikkara.	Convener

V. SELECTION COMMITTEE

1	Sri. E. Gopalakrishna Menon	Chairman
2	Sri. P. R. Francis, MLA.,	Member
3	Professor V. S. Ouseph	"
4	Sri. K. S. Vasudeva Sarma	"
5	Dr. N. Sadanandan	"
6	Dr. M. Krishnan Nair	"
7	Registrar	Member & Secretary

VI STUDENTS WELFARE COMMITTEE

1	Sri. P. R. Francis, MLA.,	Chairman
2	Sri. E. Gopalakrishna Menon	Member
3	Sri, K. S. Vasudeva Sarma	"
4	Professor. V. S. Ouseph	"
5	Dr. M. Krishnan Nair	"

VII COMMITTEE FOR DEPUTATION OF ACADEMIC STAFF

1	The Vice-Chancellor	Chairman
2	The Dean, Faculty of Vety & Animal Sciences, Mannuthy,	Member
3	The Dean, Faculty of Agriculture, Vellayani.	"
4	The Director of Research	"
5	The Director of Extension Education	"
6	The Comptroller	"
7	The Registrar	Convener

VIII POST-GRADUATE COMMITTEE

1	Sri. N. Kaleeswaran, Vice-Chancellor	Chairman
2	Dr. P.,G. Nair, Dean, College of Vety. & Animal Sciences, Mannuthy.	Member
3	Dr. N. Sadanandan, Dean, College of Agriculture, Vellayani.	"
4	Dr. V. S.S. Potti, Director of Extension Education Kerala Agricultural University, Vellanikkara	"
5	Dr. P. C. Sivaraman Nair, Assoc. Dean, College of Horticulture, Vellanikkara.	"
6	Dr. Venugopalan, Professor, Research Co-ordination, (Vety. & A. S.) College of Vety. & Animal Sciences, Mannuthy,	"
7	Dr. M. M. Koshy, Professor, Research Co-ordination (Agri.) College of Agriculture, Vellayani,	"
8	The Director of Research	"
9	The Registrar	convener

IX SELECTION COMMITTEE FOR UNDER-GRADUATE COURSE.

1	Dr. P. G. Nair, Dean, College of Vety. & Animal Sciences, Mannuthy.	Chairman
2	Dr. N. Sadanandan, Dean, Faculty of Agriculture, Vellayani.	Member
3	Dr. P. C. Sivaraman Nair, Assoc. Dean, College of Horticulture, Vellanikkara,	"
4	Dr. P. K. Abdulla, Professor of Microbiology, College of Vety. & Animal Sciences, Mannuthy.	"
5	Sri. K. Srinivasan, Professor of Horticulture, College of Agriculture, Vellayani.	"
6	The Registrar	Member & convener

X SPORTS BOARD OF KERALA AGRICULTURAL UNIVERSITY

- | | | |
|--|--|-----------------------|
| 1 | Sri. N. Kaleeswaran,
Vice-Chancellor | Chairman |
| 2 | All Officers of the University | Member |
| 3 | The Registrar | " |
| 4 | Dr. N. Sadanandan,
Dean,
College of Agriculture, Vellayani | " |
| 5 | Dr. P. G. Nair,
Dean,
College of Vety. & Animal Sciences Mannuthy. | " |
| 6 | Dr. P. C. Sivaraman Nair,
Assoc. Dean,
College of Horticulture, Vellanikkara. | " |
| 7 | Dr. M. Krishnan Nair,
Professor,
Department of Pathology,
College of Vety. & Animal Sciences, Mannuthy. | " |
| One Professor from each College to be nominated
by the Vice-Chancellor. | | |
| 8 | Dr. Radhakrishnan,
College of Vety. & Animal Sciences, Mannuthy. | " |
| 9 | Prof. A. G. G. Menon,
College of Agriculture, Vellayani. | " |
| 10 | Dr. K. M. N. Namboodiri,
College of Horticulture, Vellanikkara. | " |
| 11 | The Athletic Secretary,
College of Vety. & Animal Sciences, Mannuthy. | " |
| 12 | The Athletic Secretary,
College of Agriculture, Vellayani. | " |
| 13 | The Athletic Secretary,
College of Horticulture, Vellanikkara. | " |
| 14 | The Athletic Secretary,
Institute of Agrl. Technology, Tavanur. | " |
| 15 | Student members in the General Council. | " |
| 16 | The Deputy Director of Students
Welfare (S & G) | Member &
convener. |

XI EXTENSION ADVISORY COMMITTEE

- | | | |
|---|---|----------|
| 1 | The Vice-Chancellor,
Kerala Agricultural University, Vellanikkara. | Chairman |
| 2 | The Agricultural Production Commissioner,
Secretariat, Trivandrum. | Member |

3	The Director of Agriculture, Vikas Bhavan, Trivandrum.	Member
4	Director of Animal Husbandry Vikas Bhavan, Trivandrum.	"
5	The Milk Commissioner, Dairy Development Department, Trivandrum.	"
6	The Dean, College of Agriculture, Vellayani.	"
7	Dean, College of Vety, & Animal Sciences, Mannuthy.	"
8	The Associate Dean, College of Horticulture, Vellanikkara.	"
9	The Director of Research Kerala Agricultural University, Vellanikkara.	"
10	Prof. A. G. G. Menon, Dept. of Extension, College of Agriculture, Vellayani.	"
11	Prof. K. Sreenivasan Dept. of Horticulture, College of Agriculture, Vellayani.	"
12	Dr. G. R. Nair, Professor of Extension, College of Vety. & Animal Sciences, Mannuthy.	"
13	Dr. M. Subramaniam, Professor of Dairy Sciences, Mannuthy	"
14	Dr. M. Aravindakshan, Professor, College of Horticulture, Vellanikkara.	"
15	Dr. P. C. Sivaraman Nair, Associate. Dean, College of Horticulture, Vellanikkara.	"
16	Dr. M. S. Nair, Fodder Res. Officer, University Livestock Farm, Mannuthy.	"
17	Sri. V. K. Kunhammed, President, Kayakkodi Panchayat, Calicut Dist.	"
18	Sri. K. S. Vasudeva Sarma, Venmony Panchayat, Alleppey Dist.	"
19	Sri. S. Balakrishnan, Professor (KADP) College of Horticulture, Vellanikkara.	"
20	Sri. K. I. James, Associate Professor, Rice Research Station, Pattambi.	"

21	Mrs. L. Maheswari Amma, Chairman. Block Development Committee, Ambalapuzha	Member
22	Sri. N. N. Ramankutty, Director, Institute of Agrl. Technology, Tavanur.	"
23	The Station Director, All India Radio, Trivandrum.	"
24	The Regional Director, Directorate of Field Publicity, Trivandrum	"
25	The Director, Directorate of Arecanut & Spices Development, Cochin.	"
26	The Director. Directorate of Coconut Development, Cochin.	"
27	Sri. V. Gopalakrishna Kurup, Rashmi, Alleppey—3.	"
28	Joseph Alappat Thoppil, Alappatt House, Karanchira.	"
29	Sri. P. M. Joseph, Addl. Director of Agriculture, Trivandrum.	"
30	Sri. K. Koyamu, Addl. Director of Agriculture, Calicut.	"
31	Dr. V. S. S. Potti, Director of Extension Education, Kerala Agricultural University, Vellanikkara.	Convener

XII PLANNING AND DEVELOPMENT COMMITTEE

1	Vice-Chancellor	Chairman
2	Special Secretary to Government, Agricultural Department and Agricultural Production Commissioner	Member
3	Sri. K. S. Vasudeva Sarma	"
4	Prof. V. S. Ouseph	"
5	Dr. N. Sadanandan, Dean. College of Agriculture, Vellayani.	"

XIII STATUTE SUB COMMITTEE

1	Sri. V. Gopalakrishna Kurup	Chairman
2	Sri. V. S. Ouseph	Member
3	Prof. T. P. Mohamad Kunhi	"
4	Dr. M. Krishnan Nair	"
5	Sri. N. Rajappan Nair	"
6	Registrar	Convener

Appendix-III

LIST OF ADMINISTRATIVE AND OTHER POSTS OF THE KERALA AGRICULTURAL UNIVERSITY HEADQUARTERS

a) University Office:

Vice-Chancellor	1	Rs. 2625
Deans	3	1650—2175
Dean (P. G. Studies)	1	"
Director of Research	1	"
Director of Extension	1	"
Registrar	1	"
Comptroller	1	"
Estate Officer	1	1125—1725
Public Relations Officer	1	"
Assoc. Professor (Agri. Bot).	1	"
Asst. Registrar	3	910—1550
Asst. Comptrollers	3	910—1550
Labour Officer	1	910—1550
Section Officer	21	650—1150
Security Officer	1	"
Transport Supervisor	1	"
Secretary to Vice-Chancellor	1	910—1550 + C. A. 50
Senior Office Supdt.	3	650—1150
Office Supdt. (F C & D)	6	600—1100
Senior Grade Asst.	24	535—950
Translator	1	"
Senior Grade Typist	8	"
Sergeant	1	450—785
Assistant Grade I	40	420—720
Typist Grade I	5	420—720
Assistant Grade II	9	350—580
Typist Grade II	3	"
Driver Grade II (H. V)	1	390—685
Driver Grade II (LV)	7	330—585
		(1 Post with a C. A. of Rs. 75/- 5 posts with C. A. of Rs. 50/-).
Clerical Assistant	1	330—515
Duplicator Operator	2	330—515 C. A. Rs.25/-
Duffadar	1	330—515
Special Grade Peon	2	310—490
Conductor	1	330—515 S. P. Rs.10/-

Cook-Cum-Caretaker	1	330—515 C. A. Rs. 25/-
Peon	15	280—400
Hostel Boy for teachers hostel	1	"
Watcher-cum-Gradener	1	"
Watchmen/Watch and Ward	19	"
Sweeper-cum-Scavenger	3	"
Sweeper	1	"
Sweeper-cum-Scavenger-cum Gardener	1	"
Apprentice clerks	9	Rs. 130/- stipend

**b) Staff position in the Engineering Wing
Directorate of Physical Plant**

1	Director of Physical Plant	1
2	P. A. to D. P. P.	1
3	Financial Assistant	1
4	Assistant Engineers	2
5	Section Officers	2
6	Office Supdt. (F. C. & D.)	1
7	Head Draftsman (Post upgraded as higher grade Asst. Engineer)	1
8	Sr. Gr. Assistant	3
9	Stenographer Gr. I. (Integration of post of Steno with Typist with effect from 7/79)	
10	Sr. Gr. Typist	3
11	Asst. Grade I (two posts upgraded with effect from 11/78)	3
12	Draftsman Grade I	1
13	Typist Grade I	2
14	Asst. Grade II	5
15	Typist Grade II	1
16	Driver Grade II	1
17	Tracers	2
18	Blue Printer-cum-Stereo Operator	1
19	Peon	1

Execution:

1	Architect	1
2	Jr. Architect	1
3	Executive Engineer	1
4	Asst. Executive Engineer	6

5	Asst. Engineers (5 posts upgraded as higher grade Asst. Engineer on Rs 700-1250) (4 posts additionally created)	18
6	Draftsman Gr. I/Overseer Grade I	27
7	Technician (Electrician-cum-Mechanic)	1
8	Senior Grade Assistants (2 posts upgraded)	2
9	Asst. Grade I	5
10	Typist Grade I	4
11	Asst. Grade II	8
12	Typist Grade II	5
13	Bull Dozer Operator	1
14	Road Roller Driver	1
15	Technician Grade I (Fitter Mechanical & Plumber)	1
16	Driver Grade II (LV)	2
17	Pump Operators	7
18	Peons	8
19	Cleaners	2
20	Helper to Electrician	1
21	Watchmen	5

Appendix-IV

LIST OF STAFF IN THE VARIOUS CAMPUSES

a) College of Agriculture Vellayani

Dean Dr. N. Sadanandan

1 Department of Agronomy

Professor-1 Dr. C. Sreedharan

Assoc. Professor-4 1 K. P. Madhavan Nair

2 P. Chandrasekharan

3 U, Mohamed Kunju

4 E. P. Koshy (upto 26.7.79)

G. Raghavan Pillai (from 31.7.79)

Asst. Professor-4 1 G. Raghavan Pillai (upto 12.5.79)

2 M. Oommen

3 M. Abdul Salam (from 16.5.79 to
13.2.80)

4 Vacant

Jr. Asst. Professor-3 1 Abraham Varghese (upto 30.6.79)

2 N. Purushothaman Nair (from 30.7.79)

3 Kamalam Joseph (from 17.4.79)

4 Annamma George (from 23.8.79)

2 Department of Agricultural Botany:

Professor-1 Dr. Mary. K. George

Assoc. Professor-3 1 A. T. Abraham

2 N. Gopinathan Nair

3 Dr. S. T. Mercy

Asst. Professor-3 1 N. Kamalam

2 D. Chandramoni

3 Vacant

Junior Asst: Professor-3 1 J. Sreekumari Amma

2 S. G. Sreekumar

3 N. Ramachandran Nair

3 Department of Agri. Chemistry.

Professor-1 Dr. R. S. Aiyer

Assoc. Professor-4 1 Dr. V. Gopalaswamy

2 P. Ramasubramoniam

3 Dr. P. Padmaja

4 Thomas Varghese

Asst. Professor-5 1 Alice Abraham

2 P. A. Korah

3 Abdul Hameed

4 & 5 Vacant

- Jr. Asst. Professor-3 1 M. Subramania Aiyer
 2 Dr. V. O. Kuruvila
 3 Vacant
- 4 Department of Entomology**
- Professor-1 Dr. N. Mohandas.
- Assoc. Professor-7 1 J. Johnson
 2 S. P. Christudas
 3 Dr. Johnkurian
 4 Dr. Abraham Jacob
 5 Dr. (Mrs) A. Visalakshy
 6 N. J. Narayanan
 7 Dr. D. Dale.
- Asst. Professor-7 1 P. A. Rajan Asari
 2 George Koshy
 3 K. P. Vasudevan Nair
 4 K. Sasidharan Pillai
 5 K. Saradamma
 6 Dr. P. B. Gopinath
 7 K. K Raveendran Nair
- Jr. Asst. Professor 6 1 Babu M. Philip.
 2 S. Naseema Beevi
 3 S. Pathummal Beevi
 4 M. S. Sheela
 5 Job Satyakumar
 6 Suma Kuruvila
- 5 Department of Agrl. Extension**
- Professor-1 Prof. A. G. G. Menon
- Assoc. Professor-4 1 Dr. A. M. Thampi
 2 Dr. G. T. Nair
 3 Dr. L. Prema
 4 Vacant
- Asst. Professor-5 1 Mohammed Hussain
 2 Vimalakumari. N. K.
 3 O. Abdul Rahiman Kunju (upto4.7.79)
 4 & 5 Vacant.
- Jr. Asst. Professor-5 1 Dr. C. Bhaskaran
 2 R. Prakash
 3 Muraleedhara Prasad
 4 Mary Ukkru
 5 V. Usha
- 6 Department of Agrl. Economics**
- Assoc. Professor-1 Sri. K. S. Karayalar
- Asst. Professor-2 1 S. Venugopalan
 2 R. Narayanan Nair

Junior Asst. Professor-2	1	Thomas
	2	N. P. Kumari Sushama
7 Department of Agrl. Statistics		
Professor-1		Sri. E. J. Thomas
Assoc. Professor-2	1	P. V. Prabhakaran (upto 9. 8. 79)
	2	Vacant
Asst. Professor-5	1	M. P. Abdurazak
	2	Indira Devi (upto 30.4.79)
	3, 4 & 5	Vacant
Junior Asst. Professor-1		Vacant
8 Agricultural Engineering		
Professor-1		Dr. Jose Samuel (upto 8.10.79)
Assoc. Professor-2	1	Jacob John
	2	Vacant
Asst. Professor-2	1	M. S. Thomas
	2	Jippu Jacob
Jr Asst. Professor-1.		Vacant
9 Plant Breeding		
Professor-1		Dr. V. Gopinathan Nair
Assoc. Professor-2	1	H. Padmanabhan Thampy
	2	R. Gopimony
Asst. Professor-2	1	P. Manikantan Nair
	2	Vacant
Jr. Asst. Professor-1		Vacant
10 Horticulture		
Professor-1		Sri. K. Srinivasan
Assoc. Professor-1	1	G. Srikantan Nair
Asst. Professor-2	1	B. K. Jayachandran
	2	Vacant
Jr. Asst. Professor-2	1	C. Babu Joseph
	2	M. Abdulvahab
11 Animal Husbandry		
Assoc. Professor-1		Sri. J. B. Rose
Asst. Professor-2	1	Dr. Skariah Oommen.
	2	Dr. E. T. Jacob
12 Plant Pathology		
Professor-1		Vacant
Associate Professor-4	1	Dr. M. C. Nair
	2	Dr. S. Balakrishnan
	3	Dr. James Mathew (from 4.6.79)
	4	Dr. S. K. Nair (from 20.7.79)
Assistant Professor-5	1	Dr. James Mathew (upto 3.6.79)
	2	Dr. L. Rema Devi (upto 3.5.79)
	3	S. Bhavani Devi (from 3.5.79)
	4	Dr. Susamma Philip (upto 9.10.79)
	5	S. N. Shanmugham (from 26.10.79 to 21.3.80).

- Jr. Asst. Professor-7
- 1 P. Santhakumari
 - 2 K. K. Sulochana
 - 3 S. Bhavani Devi (upto 2.5.79)
 - 4 Suharban (from 2.6.79)
 - 5 Rajendran Pillai (from 1.1.80)
 - 6 M. Vijayan (Upto 30.5.79).
 - 7 Koshy Abraham (from 17.4.79)

13 Department of Physical Education

- Jr. Asst. Professor-2
- 1 S. Pazhania Pillai
 - 2 Marykutty

14 Instructional Farm

- Associate Professor-1 K. Pushpangadan
 Assistant Professor-1 K. J. Alice
 Jr. Asst. Professor-4

B. COLLEGE OF HORTICULTURE VELLANIKKARA

- Associate Dean Dr. P. C. Sivaraman Nair

1 Dept of Pomology & Floriculture

- Professor-1 Dr. M. Aravindakshan
 V. K. Damodaran
 Assistant Professor-1 P. K. Rajeevan
 Jr. Asst. Professor-3
- 1 T. Radha
 - 2 N. K. Parameswaran
 - 6 Valsamma Mathew

ICAR adhoc scheme on Survey, Collection & Evaluation of the Germplasm of Jack Fruit

- Associate Professor-1 Dr. K. Kumaran
 Jr. Asst. Professor-2
- 1 S. Prasannakumari
 - 2 R. Gopinathan

2 Dept. of Plantation Crops & Spices

- Professor-1 Dr. N. Mohanakumaran
 Assoc. Professor (NRP)-1 Dr. T. V. Viswanathan
 Assistant Professor-1 Vacant
 Jr. Asst. Professor-3
- 1 P. A. Nazeem
 - 2 R. Kesavachandran
 - 3 Rema Menon
- Jr. Asst. Professor-1 Joseph Philip
 (N.R.P.)

3 Dept. of Olericulture

- Professor-2
- 1 Dr. P. K. Gopalakrishnan
 - 2 Dr. K. V. Peter
- Jr. Asst. Professor-2
- 1 S. M. Akbar
 - 2 K. V. Subramanian

4 Dept. of Proc. Technology

Professor-1	P. Sethumadhavan
Asst. Professor (Nutrition)-1	K. A. Girija
Jr. Assistant Professor-1	Jacob John
Jr. Asst. Professor (Nutrition)-1	V. Indira

5 Kerala Agri. Development project

Professor-4	1 K. Kannan (Coconut)
	2 Dr. N. Mohanakumaran (Cocoa) Dr. N. Krishnan Nair
	3 V. K. Damodaran (Cashew) K. K. Vidhyadharan
	4 S. Balakrishnan (Pepper)
Assoc. Professor-3	1 K. Madhavan Nair (Instrumentation)
	2 P. A. Wahid (Radio tracer)
	3 N. V. Kamalam (Safety Officer)
Assistant Professor-6	1 K. K. Ravindran Nair
	2 Dr. P. J. Joy (Nematology)
	3 K. C. Marykutty/ V. K. Venugopal (Soil Science)
	4 A. Augustin (Biochemistry)
	5 P. K. Rajeevan
	6 M. S. Rajeevan (Hort.)
Jr. Asst. Professor 2	1 Sally Mathew (Plant Pathology)
	2 Ravi (Virology)

6 Department of Agronomy

Associate Professor-1	Dr. R. Vikraman Nair
Assistant Professor-1	M. Abdul Salam

7 Dept. of Agri. Botany

Asst. Professor-3	1 V. K. Mallika
	2 Vacant
	3 Vacant
Asst. Professor (Basic Sciences)-1	Luckins C. Babu

8 Sugarcane Research Scheme

Professor-1	Dr. K. M. Narayanan Namboodiri
Jr. Asst. Professor-2	1 Achamma Ommen
	2 Mathew K. Jacob

- 9 Dept. of Soil Science & Agrl. Chemistry**
 Associate Professor-1 Dr. A. I. Jose
 Asst. Professor-3 1 G. Droupathi Devi
 2 K. C. Marykutty
 3 K. A. Mariam
 Asst. Professor
 (Biochemistry)-1 T. Prabhakaran
- 10 Dept. of Agrl. Entomology**
 Assoc. Professor-1 Dr. K. V. Mammen
 Assoc. Professor
 (Nematology)-1 Dr. T. S. Venkitesan
 Asst. Professor-3 1 G. Madhavan Nair
 2 T. Nalinakumari
 3 Vacant
- 11 All India Co-ordinated Research Project on biological control of crop pests**
 Professor-1 Dr. C. C. Abraham
 Jr. Asst. Professor-2 1 M. K. Sheela
 2 C. M. George
- 12 Dept. of Pl. Pathology**
 Associate Professor-1 Dr. Abi Cheeran
 Assistant Professor-2 1 Dr. C. K. Peethambaran
 2 A. Sukumara Varma
- 13 Pepper Research Scheme**
 Jr. Asst. professor-1 K. M. Thomas
- 14 Dept. of Agrl. Economics**
 Professor-1 Dr. V. Radhakrishnan
 Assistant Professor-2 1 Dr. K. Mukundan
 2 D. V. Rajendran
- 15 Dept. of Agrl. Extension**
 Assistant Professor-1 K. P. Ramachandran Nair
- 16 Dept. of Agrl. Statistics**
 Assoc. Professor-2 1 Dr. K. C. George
 2 P. V. Prabhakaran
 Asst. Professor-1 V. K. Gopinathan Unnithan
- 17 Dept. of Agrl. Engineering**
 Professor-1 Dr. Jose Samuel
 Special Officer-1 T. P. George
 Asst. Professor-1 K. John Thomas
 Asst. Executive Engineer C. P. Mohammed
 (Working arrangement)
 Jr. Asst. Professor-1 Vijayan Raja

18 Dept. of Agri Meteorology

Professor-1 Vacant
 Assoc. Professor-1 Dr. P. Balakrishna Pillai

19 Dept. of Phy. Education

Jr. Asst. Professor-2 1 K. Narayanan Kutty Nair
 2 Susy V. John

20 Rice Research Station & Instructional Farm

Assoc. Professor (IF)-1 Dr. V. K. Sasidhar

Assoc. Professor
 (AICRIP)-1 K. M. George

Asst. Professor (RRS)-1 Vacant

Asst. Professor
 (AICTIP)-1 P. K. Asokan

Jr. Asst. Professor
 (IF)-3 1 K. Aravindakshan
 2 Baby Latha, A. K.
 3 Vacant

Jr. Asst. Professor
 (RRS)-2 1 Rajendran P. C.
 2 Hassan, M. A.

Jr. Professor
 (AICTIP)-1 T. M. Kurian

Administrative and supporting staff other than Class IV employees

Designation.	No of sanctioned posts	No of posts filled up
College establishment		
Administrative Assistant	1	1
Section Officer	3	3
Senior Office Supdt. (FC.& D)	1	1
Processing Tech. Assistant	1	1
Office Supdt. (FC&D)	2	2
Senior Grade Assistant	3	3
I Grade Assistant	1	1
II Grade Assistant	8	7
Senior Grade Typist	2	2
II Grade Typist	2	2
Reference Assistant	3	3
Clerical Assistant	1	1
Duplicator Operator	1	1
Driver, Heavy Vehicle-Gr. I	1	1
Driver, Light Vehicle-Gr. II	3	3
Conductor	1	1
Lab. Assistant Gr. I	2	2
Lab. Assistant Gr. II	1	1

Sr. Gr. Agrl. Demonstrator	3	3
I Gr. Agrl. Demonstrator	1	1
II Gr. Agrl. Demonstrator	4	4
Lab. Attender	9	8
AICRP on the Biological control of crop pests		
Tech. Assistant	1	1
Agrl. Demonstrator	2	2
Pepper Research Scheme		
II Grade Assistant	1	1
II Grade Agrl. Demonstrator	1	1
Instructional Farm & R. R. S. Mannuthy.		
Farm Supervisor	1	1
Sr. Gr. Agrl. Demonstrator	5	5
I Gr. Agrl. Demonstrator	1	1
II Gr. Agrl. Demonstrator	2	2
Field Supervisor	1	1
Admn. Asst. Gr. II	1	1
Senior Grade Assistant	1	1
Gr. I Assistant	1	1
Grade I Typist	1	1
Tractor Driver	1	1
Jeep Driver	1	1
Mechanic	1	1
K. A. D. P.		
I Gr. Stenographer	1	1
II Gr. Assistant	2	1
Gr. II Agrl. Demonstrator	2	2
Laboratory Attender	2	2
Drivers (light vehicles)	7	7

**C. COLLEGE OF VETERINARY AND ANIMAL SCIENCES,
MANNUTHY.**

Dean Dr. P. G. Nair till 4.2.80/
Dr. A. Venugopalan Nambiar held
charge for the remaining period.

1 Department of Anatomy

Professor	Dr. K. Radhakrishnan.
Associate Professor	Dr. P. A. Oommer
Asst. Professor	Dr. Lucy Paily.
Jr. Asst. Professor 3	1 Dr. K. R. Harshan
	2 Dr. C. K. Sreedharan Unni
	3 Dr. Jose John Chungath.

2 Department of Animal Management

Professor 2	1 Dr. T. G. Rajagopalan
	2 Dr. C. K. Thomas
Associate Professor 1	Dr. Kurian Thomas.

Assistant Professor 1	Dr. K. S. Sebastian
Jr. Asst. Professor 5	1 Dr. K. P. Achuthankutty (U. L. F., Mannuthy)
	2 Dr. C. P. Thomas (Since resigned)
	3 Dr. V. L. Somanathan (AICRP-Goat)
	4 Dr. Francis Xavier.
	5 Dr. P. C. Saseendran.
3 Department of Animal Reproduction	
Professor 2	1 Dr. C. K. S. V. Raja (on deputation)
	2 Dr. C. P. Neelakanta Iyer.
Associate Professor 6	1 Dr. K. Prabhakaran Nair.
	2 Dr. E. Mathai.
	3 Dr. V. Sudarsanan (V. H. Mannuthy)
	4 Dr. M. S. Nair.
	5 Dr. K. Ramadas (V. H., Kokkalai)
	6 Dr. E. Madhavan.
Asst. Professor 2	1 Dr. T. Sreekumaran.
	2 Dr. Joseph Mathew (AICRP-Goat)
Jr. Asst. Professor 4	1 Dr. K. V. Athman
	2 Dr. V. Vijayakumaran.
	3 Dr. K. N. Aravinda Ghosh
	4 Dr. P. P. Balakrishnan (at Thiruvazhamkunnu).
4 Department of Animal Breeding & Genetics	
Professor 1	Dr. G. Mukundan.
Associate Professor 3	1 Dr. B. R. Krishnan Nair (AICRP-Goat)
	2 Dr. C. A. Rajagopala Raja.
	3 Dr. Sosamma Iype.
Asst. Professor 3	1 Dr. B. Nandakumaran (AICRP-Goat).
	2 Dr. M. R. Rajan (at Thiruvazhamkunnu)
	3 Dr. P. Nandakumaran.
5 Department of Clinical Medicine.	
Professor 1	Dr. K. M. Alikutty (on deputation)
Associate Professor 1	Dr. N. M. Aleyas
Assistant Professor 1	Dr. V. S. Balakrishnan.
Jr. Asst. Professor 2	1 Dr. K. M. Jayakumar
	2 Vacant.
6 Department of Dairy Science	
Professor 1	Dr. M. Subrahmonyam.
Associate Professor 2	1 Dr. K. Parameswaran Nair (at Thumburmuzhi)
	2 Dr. K. Pavithran
Assistant Professor 2	1 Dr. M. V. Sukumaran
	2 Dr. U. T. Francis.
Jr. Asst. Professor 3	1 Dr. M. Mukundan.
	2 Dr. V. Prasad
	3 Dr. P. I. Geevarghese.

7 Department of Extension

Professor 1		Dr. G. R. Nair.
Associate Professor 2	1	Dr. T. Prabhakaran.
	2	Dr. P. S. Pushkaran (Ext. Adv. Service)
Assistant Professor 1		Dr. V. Raju (Supdt.)
Jr. Asst. Professor 2	1	Dr. C. V. Andrews
	2	Dr. M. R. Subhadra (on leave)

8 Department of Microbiology

Professor 1		Dr. P. K. Abdulla.
Assoc. Professor 2	1	Dr. S. Sulochana (Virologist, ICAR Scheme)
	2	Dr. K. T. Punnose (on deputation)
Asst. Professor 3	1	Dr. P. C. James,
	2	Dr. V. Jayaprakasan.
	3	Dr. R. Madhusoodanan Pillai.
Jr. Asst. Professor 2	1	Dr. M. C. George
	2	Dr. G. Krishnan Nair.

9 Department of Nutrition

Professor 1		Dr. E. Sivaraman.
Associate Professor 8	1	Dr. C. R. Ananthasubramaniam.
	2	Morely Mohan Lal (on leave)
	3	Dr. C. T. Thomas.
	4	Dr. N. Kunjikutty (AICRP - Goat)
	5	Dr. Maggie D. Menacherry
	6	Dr. P. A. Devassia
	7	Dr. P. Ramachandran (U. L. F. Mannuthy)
	8	Dr. C. S. James (at Thiruvazhamkunnu)
Asst. Professor 2	1	Dr. George Mathen
	2	Dr. T. V. Viswanathan
Jr. Asst. Professor 2	1	Dr. Annamma Kurian (AICRP-Goat)
	2	Dr. A. D. Mercy.
Chemist 1		N. Nandakumaran.

10 Department of Parasitology

Professor 1		Dr. R. Kalyanasundaram
Associate Professor 3	1	Dr. K. Rajamohan
	2	Dr. K. Chandrasekharan.
	3	Dr. V. Sathianesan.
Asst. Professor 3	1	Dr. K. Madhavan Pillai
	2	Dr. C. George Varghese
	3	Dr. C. Pythal.
Jr. Asst. Professor 1		Dr. H. Subramaniam.

11 Department of Pathology

Professor 2	1	Dr. M. Krishnan Nair
	2	Dr. A. Rajan (Project Officer, ICAR Scheme)
Associate Professor 2	1	Dr. K. M. Ramachandran
	2	Dr. K. I. Maryamma.
Asst. Professor 3	1	Dr. K. V. Valsala
	2	Dr. T. Sreekumaran (AICRP-Goat)
	3	Dr. G. Mony (AICRP-Poultry)
Jr. Asst. Professor 3	1	Dr. C. R. Lalithakunjamma
	2	Dr. C. B. Manomohan
	3	Dr. N. Vijayan

12 Department of Pharmacology

Professor 2	1	Dr. M. K. Rajagopalan (on duputation)
	2	Dr. Jacob V Cheeran
Associate Professor 2	1	Dr. Zacharias Cherian
	2	Dr. P. Marykutty
Asst. Professor 2	1	Dr. N. Gopakumar
	2	Dr. A. M. Chandrasekharan Nair
Jr. Asst. Professor 4	1	Dr. Santha E. George
	2	Dr. K. Venugopalan
	3	Dr. A. D. Joy (in S. A. B. S.)
	4	Dr. C. M. Aravindakshan (at Tavanur)
Chemist 1		V. R. Reghunandan

13 Department of Physiology

Professor 1		Dr. G. Nirmalan
Associate Professor 3	1	Dr. G. Venugopal
	2	Dr. M. G. Ramakrishnapillai
	3	Dr. K. P. Sadanandan
Asst. Professor 3	1	Dr. K. P. Surendranathan
	2	Dr. E. T. Jacob (at Agri. College)
	3	Dr. P. T. Philomina
Chemist 1		P. K. Ismail

14 Department of Poultry Science

Professor 3	1	Dr. A. Ramakrishnan
	2	Dr. A. K. K. Unni (on deputation)
	3	C. K. Venugopalan (AICRP-Poultry)
Associate Professor 1		Dr. R. Sabarinathan Nair
Asst. Professor 2	1	Dr. Renchi P. George
	2	Dr. G. Raghunathan Nair (U. P. F., Mannuthy)

- | | | | |
|---|---|----|--------------------------------------|
| Jr. Asst. Professor | 7 | 1 | Dr. P. A. Peethambaran |
| | | 2 | Dr. Amrithavaliy Panan |
| | | 3 | Dr. V. K. Elizabeth |
| | | 4 | Dr. Subu Kuruvilla |
| | | 5 | Dr. K. Narayanankutty |
| | | 6 | Dr. Leo Joseph |
| | | 7 | Dr. A. Radhamma Pillai |
| 15 Department of Preventive Medicine | | | |
| Professor | 1 | | Dr. E. P. Paily |
| Assoc. Professor | 1 | | Dr. P. T. Georgekutty |
| Asst. Professor | 2 | 1 | Dr. (Mrs) K. Baby |
| | | 2 | Dr. K. Venugopal |
| 16 Department of Surgery | | | |
| Professor | 1 | | Dr. P. O. George |
| Assoc. Professor | 2 | 1 | Dr. K. N. Muraleedharan Nair |
| | | 2 | Dr. A. M. Jalaluddin |
| Asst. Professor | 2 | 1 | Dr. S. Raveendran Nair |
| | | 2 | Dr. C. Abraham Verkey |
| Jr. Asst. Professor | 2 | 1 | Dr. T. Sarada Amma |
| | | 2 | Dr. K. Rajankutty |
| 17 Department of Veterinary Public Health | | | |
| Professor | | | Dr. R. Padmanabha Iyer |
| Assoc. Professor | 2 | 1 | Dr. M. Soman |
| | | 2 | Dr. P. Prabhakaran |
| Asst. Professor | 2 | 1 | Dr. J. Abraham |
| | | 2 | Dr. E. Nanu |
| Jr. Asst. Professor | | 1 | Dr. M. T. Jose |
| | | 2 | Dr. P. Kuttinarayanan |
| 18 Department of Statistics | | | |
| Professor | 1 | | Dr. P. U. Surendran |
| Assist. Professor | 1 | | R. Balakrishnan Asan |
| Jr. Asst. Professor | | | K. L. Sunny |
| 19 Department of Physical Education | | | |
| Jr. Asst. Professor | 2 | 1. | O. K. Paul |
| | | 2. | Molly John |
| Administrative and other supporting staff including Class-IV employees | | | |
| 1 Anatomy | | | |
| | 1 | | C, Ramakrishnan, Livstock Assistant |
| | 2 | | V. R. Kochu, Driver |
| | 3 | | E. L. Thimoty, Cleaner-cum-Attendant |
| | 4 | | T. J. Thanka, Sweeper |
| 2 Animal Management | | | |
| | 1 | | A. S. Karunakaran, LSA-I |
| | 2 | | K. A. Mathiri, attendant, Spl. Gr. |

- 3 V. L. Devassy, Syce
- 4 V. Moideenkunju, Groom
- 3 Animal Reproduction**
 - 1 E. Sreedhara Marar, L. S. A.
 - 2 K. P. George, L. S. A.
 - 3 V. N. Sankarankutty
 - 4 A. Natesan, Peon
 - 5 M. Divakaran, Class IV
- 4 Breeding & Genetics**
 - 1 P. S. Kumaran, LSA
- 5 Clinical Medicine (Therapeutics)**
 - 1 K. Raman Menon, LSA (Sr)
 - 2 V. Ammini Amma, Attendant (Spl. Gr.)
- 6 Dairy Sciences**
 - 1 C. Georgekutty, Lab. Tech.
 - 2 N. Bhaskara Pillai, Lab. Tech.
 - 3 T. K. Selena, Class IV
 - 4 C. D. Rosy, Class IV
- 7 Extension**
 - 1 Eugene G. Varghese, Audio-visual operator
 - 2 K. O. John Stephen, Driver (till 7-5-80)
 - 3 I. Govindankutty, Class IV
 - 4 M. V. Kunjai, Sweeper-cum-Attendant
- 8 Microbiology**
 - 1 M. Chinnavan, Lab. Tech. Sr
 - 2 V. K. Radha, Lab. Tech. Sr.
 - 3 M. R. Kathru, Attendant
- 9 Nutrition**
 - 1 Vishnu Namboodiri, Analyst
 - 2 Maryamma Kurian, Res. Asst.
 - 3 T. K. Poullose, Lab. Technician
 - 4 I. Kathreena, Attendant
- 10 Parasitology**
 - 1 T. Kalyanikutty L. S. A. (Sr.)
 - 2 C. C. Pandit, Attender
 - 3 P. L. Mariam, Scavenger
 - 4 K. Sarada, Sweeper-cum-Scavenger.
- 11 Pathology**
 - 1 P. C. Lilly, L. S. A. Sr. Gr.
 - 2 P. K. Devassy, Driver
 - 3 K. Ayyappan, Sweeper-cum-attendant
 - 4 K. Ramakrishnan, Sweeper-cum-attendant
 - 5 Rosakutty, Sweeper-cum-attendant

- 12 Pharmacology**
- 1 Lalithamma, L. S. A.
 - 2 Kunjumole, Sweeper-cum-Scavenger
- 13 Physiology & Biochemistry**
- 1 P. M. Joseph, Gasman
 - 2 V. Krishnan, Sweeper-cum-attendant
 - 3 K. V. Mohammed
- 14 Poultry Science**
- 1 P. V. Kunjai
- 15 Preventive Medicine**
- 1 K. J. Varghese, Lab. Tech. (Sr. Gr.)
 - 2 V. C. Ammini Scavenger
- 16 Surgery**
- 1 K. Indira Devi, Radiographer Gr. II
 - 2 M. G. Vasu. L. S. A. Gr. II
 - 3 K. Sosamma, Sweeper-cum-attendant
 - 4 A. O. Thomas, Sweeper-cum-Attendant
- 17 Vety. Public Health**
1. P. Remony, L. S. A. Gr. II.
 - 2 M. Somasekharan (Till Octo. 79) Sweeper-cum-attendant
 - 3 K. V. Mohammed (from Octo. to Nov. 79) "
 - 4 V. V. Vasu (from Nov. 79) "
- 18 Statistics**
- 1 T. K. Indira Bai, Tech. Asst.
 - 2 K. P. Santha Bai Tech. Asst.
 - 3 R. Krishnan Nair, Attendant
- 19 ICAR Scheme (Tumours), Department of Pathology**
- 1 Dr. Enas Augustine, Research Fellow. 1.4.79 to 21. 6.79
 - 2 Dr. A. Jalaluddin, Res. Fellow, 23.8.79 to 26.10.79
 - 3 Dr. Valsala C. Issac, Research Fellow. from 14.1.80
 - 4 P. C. Mary, Lab. Technician
- 20 AICRP (Goat)**
- 1 P. K. Vijayamoni Lab. Technician
 - 2 K. C. Kamalamma "
 - 3 P. C. Mary "
 - 4 N. Narayanikutty, Tech. Asst.
 - 5 K. Krishnankutty, Senior Computer,
 - 6 M. Baby Ist Gr. Assistant
 - 7 P. K. Manikutty "
 - 8 V. S. Skandakumar "
 - 9 S. Rajalekshmy Amma II Gr. Assistant
 - 10 K. Giriya. "
 - 11 C. T. Louis Driver

12	V. R. Parameswaran	Class IV
13	K. Radhakrishnan	"
14	K. Manukuttan	"
15	M. Jabbar	"
16	K. K. Chandran	"
17	A. P. Augusty	"
18	V. Ponnappan	"
19	N. Appu	"
20	K. Sankaran Nair.	"

21 Library

- 1 P. K. Chandrika, Librarian
- 5 Dr. H. Subramaniam, Vety. Surgeon (under Library Development Scheme from 1.4.79 to 20.7.79)
- 3 Dr. K. N. Aravinda Ghosh, -do- from 30.7.79 to 7.11.79
- 4 Dr. C. P. Thomas, -do- from 8.11.79 to 22.2.79 (The post was abolished on 22.2.79)
- 5 K. S. Ambily, Reference Asst.
- 6 C. K. Poulouse, Reference Asst. from 26.4.79.
- 7 M. K. Sarojam, Reference Asst. from 7.6.79 to 25.3.80.
- 8 K. G. Somanathan, Asst. Grade II
- 9 C. K. Karappan, Attender
- 10 K. Gopalan, Attender

22 Vety. Hospital, Mannuthy

- 1 K. L. Jose, Livestock Asst
- 2 T. G. Radhakrishnan, Sweeper-cum-Attendant

23 Clinical Laboratory & Vety. Hospital, Trichur

- 1 M. K. Kumaran, L. S. A. Sr. Grade.
- 2 V. K. Karunakaran, Driver
- 3 K. V. Sukumaran, Attendant Grade I
- 4 P. Sankaran, Sweeper-cum-Scavenger

24 University Livestock Farm, Mannuthy

- 1 C. Rajamma, Administrative Asst. (650-1150)
- 2 M. P. Govinda Pillai, Asst. Grade II
- 3 L. Shyamala Devi.
- 4 P. Saraswathy, Asst. Grade II
- 5 B. Kumary Sathiya Bhama
- 6 C. C. Narayanan, L. S. A. Grade I
- 7 V. Sukumaran Nair, L. S. A. Grade I
- 8 C. Prabhakaran, L. S. A. Grade II
- 9 K. R. Sivaraman, L. S. A. Grade II
- 10 K. V. Kandar. Permanent Servant Grade I
- 11 K. Sankaran, Permanent Servant Grade I

- | | | |
|----|------------------------|------------------------|
| 12 | M. Krishnankutty | Perm. Servant Grade II |
| 13 | C. P. Laya | " |
| 14 | K. P. Jose | " |
| 15 | Govindankutty-Watchman | |

25 University Poultry Farm, Mannuthy

- 1 U. T. Dominic, Poultry Asst. Sr. Grade
- 2 K. P. George, L. S. A. Grade I
- 3 M. K. Vijayakumar, Pl. Demonstrator Grade II
- 4 N. Balakrishnan, Adm. Asst. Grade II
- 5 A. Kousalya, Asst. Grade I
- 6 C. Chandrikakumary, Asst. Grade II
- 7 M. Ayyappan, Peon
- 8 C. Kuttikrishnan Nair, Perm. Servant
- 9 A. Sreedharan, Perm. Servant

D. COLLEGE OF FISHERIES, MANNUTHY

- | | |
|------------------------|---------------------|
| Dean | Dr. M. J. Sebastian |
| Jr. Asst. Professors-3 | 1 C. G. Rajendran |
| | 2 Dr. Ritakumari |
| | 3 Sankara Narayanan |

The following members of staff from Fisheries Unit at Vyttila also took classes:

- | | |
|---------------------|-------------------------|
| Assoc. Professor | Dr. D. M. Thampy |
| Asst. Professor | Dr. E. Susheela Abraham |
| Jr. Asst. Professor | Dr. K. Jayasree |
| | P. S. Mrithunjayan |

In addition, members of staff from the College of Veterinary & Animal Sciences, the College of Horticulture and the Communication Centre also handled classes during 1979-80. The services of a swimming coach from the Kerala Sports Council were also availed of.

E. INSTITUTE OF AGRICULTURAL TECHNOLOGY, TAVANUR

- | | | |
|--------------------------------|----------------|--------------------------------|
| Director Prof. P. N. Pisharody | (till 19-5-79) | /Assoc. Prof. N. N. Ramankutty |
| Asst. Professor | 1 | S. Rajan |
| (Horticulture) | | |
| Asst. Professor | 1 | Dr. P. C. James |
| (Animal Husbandry) | | |
| Asst. Professor | 1 | Philipose Joshua |
| (Agronomy) | | |
| Jr. Asst. Professor | 1 | Jobi V. Paul |
| (Engineering) | | |
| (In the post of | | |
| Asst. Executive | | |
| Engineer (Mech.) | | |

Asst. Professor (Veterinary & Animal Husbandry)	1	Dr. T. V. Viswanathan
Asst. Professor (Agri. Engg.)	1	Vacant
Research Asst.	1	A. P. Gopalakrishnan
Jr. Engineer (Mechanic)	1	Vacant
Jr. Asst. Professor	1	Dr. C. M. Aravindakshan
Jr. Asst. Professor (Farm)	1	J. Arthur Jacob
Jr. Asst. Professor (Plant Pathology)	1	K. Anila Kumar
Jr. Asst. Professor (Physical Education)	1	E. Soman
Jr. Asst. Professor (Agronomy)	1	C. K. Prabhakaran Thambi
Jr. Asst. Professor	1	Syam S. Kurup
Jr. Asst. Professor	1	Vacant
Jr. Asst. Professor	1	P. C. Balakrishnan
Jr. Asst. Professor (Livestock Asst.)	1	Dr. N. Narayanankutty
Jr. Asst. Professor (Livestock Asst.)	1	Vacant
Jr. Asst. Professor (Livestock Asst.)	1	Vacant

Administrative and other supporting staff including class IV employees

	Sanctioned Strength	In position
Office Superintendent	1	1
Section Officer	1	1
Senior Grade Assistants	3	3
I Grade Assistants	3	3
II Grade Assistants	3	3
I Grade Typist (Malayalam)	1	1
II Grade Typist	1	1
Stenographer Grade I	1	1
Agricultural Demonstrator Grade I	2	2
Agricultural Demonstrator Grade II	3	3
Livestock Assistant Grade II	1	1
		(Working in the post of Grade I)

	Sanctioned Strength	In position
Technician Grade II	3	3
Lab. Assistants	3	3
Tractor-cum-Motor Mechanic	1	—
Librarian	1	1
Driver Grade II	1	1
Library Attender	1	1
Driver (Heavy) Grade I	1	1
Pump Operator	1	1
Peon	4	3
Watchman	2	1
Gardner	1	1
Sweeper	1	1
Sweeper-cum-Attender	1	1
Sweeper-cum-Marker	1	1
Scavenger	1	1
Part time sweeper	1	1

F RESEARCH STATIONS/SCHEMES

1 Coconut Research Station, Nileswar/Pilicode	
Associate Professor	3
(Agronomy, Botany & Chemistry)	
Asst. Professor	4
(Agronomy, Botany, Pathology & Entomology)	
Junior Asst. Professor	2
Supporting Staff	46
2 Coconut Research Station, Balaramapuram	
Associate Professor (Agronomy)	1
Asst. Professor	2
(Entomology, Pathology)	
Supporting Staff	10
3 Coconut Research Station, Kumarakom	
Associate Professor (Entomology)	1
Asst. Professor	3
(Entomology, Pathology & Fisheries)	
Junior Asst. Professor	4
Supporting Staff	15
4 Rice Research Station, Pattambi	
Assoc. Professor	8
(Botany-2, Agronomy-2, Pathology, Chemistry, Entomology and Extension)	
Asst. Professor	13
(Pathology, Agronomy, Stat.)	
Junior Asst. Professor	11
Supporting Staff	96

5	Research Station and Instructional Farm, Mannuthy	
	Assoc. Professor	2
	(Agronomy, Botany)	
	Assistant Professor	1
	(Agronomy)	
	Junior Asst. Professor	4
	Supporting Staff	9
6	Rice Research Station, Kayamkulam	
	Assoc. Professor	1
	(Botany)	
	Asst. Professor	2
	(Agronomy, Botany)	
	Junior Asst. Professor	2
	Supporting Staff	13
7	Rice Research Station, Vyttila	
	Assoc. Professor	3
	(Agronomy, Botany, Fisheries)	
	Asst. Professor (Fisheries)	1
	Junior Asst. Professor	4
	Supporting Staff	11
8	Rice Research Station, Moncompu	
	Assoc. Professor	4
	(Botany, Agronomy, Pathology, Entomology)	
	Asst. Professor	6
	(Entomology, Chemistry, Pathology)	
	Junior Asst. Professor	12
	Supporting Staff	24
9	Model Agronomic Research Station, Karamana	
	Assoc. Professor (Agronomy)	1
	Junior Asst. Professor	1
	Supporting Staff	4
10	Horticultural Research Station, Ambalavayal	
	Assoc. Professor (Hort.)	1
	Asst. Professor	4
	(Pathology, Entomology, Botany, Agronomy)	
	Junior Asst. Professor	2
	Supporting Staff	45
11	Pepper Research Station, Panniyur	
	Assoc. Professor	2
	(Chemistry, Breeding)	
	Asst. Professor	3
	(Botany, Agronomy, Pathology)	
	Junior Asst. Professor	3
	Supporting Staff	13

(xii) Pepper Research Scheme, Vellanikkara	
Assoc. Professor (Pathology)	1
Junior Asst Professor	1
Supporting Staff	4
(xiii) Cashew Research Station, Anakayam	
Assoc. Professor (Agronomy)	1
Assistant Professor (Pathology)	1
Junior Asst. Professor	1
Supporting Staff	6
(xiv) Cashew Research Station, Madakkathara	
Associate Professor (Botany)	1
Junior Asst. Professor	1
Supporting Staff	3
(xv) Banana and Pineapple Research Station, Kannara	
Associate Professor	3
(Pathology, Physiology, Botany)	
Asst. Professor	3
(Agronomy, Entomology, Botany)	
Junior Asst. Professor	5
Supporting Staff	21
(xvi) Lemongrass Research Station, Odakkali	
Associate Professor (Agronomy)	1
Asst. Professor (Chemistry)	1
Junior Asst. Professor	2
Supporting Staff	13
(xvii) Cardamom Research Station, Pampadumpara	
Associate Professor (Pathology)	1
Asst. Professor (Botany, Entomology)	3
Junior Asst. Professor	2
Supporting Staff	17
(xviii) Agronomic Research Station, Chalakudy	
Associate Professor	3
(Agronomy, Engineering, Chemistry)	
Junior Asst. Professor	5
Supporting Staff	9
(xix) AICARP (Headquarters Unit)	
Associate Professor (Agronomy)	1
Assistant Professor	2
(Stat, Chemistry)	
Junior Asst. Professor	1
Supporting Staff	3
(xx) AICARP-ECF, Karaparamba	
Assistant Professor	1
Supporting Staff	11

(xxi) AICARP – ECF, Changanassery	
Asst. Professor (Agronomy)	1
Supporting Staff	11
(xxii) AIC Floriculture Improvement Project, Vellanikkara	
Associate Professor (Botany)	1
Junior Assistant Professor	2
Supporting Staff	2
(xxiii) Command Area Research Centre, Vellanikkara	
Associate Professor (Agronomy)	1
Junior Asst. Professor	6
Senior Research Fellows	7
Supporting Staff	9
(xxiv) Sugarcane Research Scheme, Vellanikkara	
Professor (Botany)	1
Asst. Professor (Botany)	1
Junior Asst. Professor	2
Supporting Staff	3
(xxv) Sugarcane Research Station, Thiruvalla	
Associate Professor (Agronomy)	1
Asst. Professor (Botany)	1
Junior Asst. Professor	3
Supporting Staff	5
(xxvi) Sugarcane Research Centre, Kalanjoor	
Asst. Professor (Chemistry, Agronomy)	2
Junior Asst. Professor	1
(xxvii) Sugarcane Research Centre, Menonpara	
Asst. Professor (Chemistry)	1
Junior Asst. Professor	1
(xxviii) AICP on Improvement of Tuber Crops	
Associate Professor (Agronomy)	1
Junior Asst. Professor	1
Supporting Staff	1
(xxix) AICRP on Bio.Control of Crop Pests & weeds	
Professor (Entomology)	1
Junior Asst. Professor	2
Supporting Staff	3
(xxx) ICAR Ad-hoc Scheme for Survey, Collection and Evaluation of Germplasm of Jack Fruit	
Associate Professor (Hort.)	1
Junior Asst. Professor	2
Supporting Staff	2

(xxxvi) Kerala Agri. Development Project	
Professor (Hort.)	4
Associate Professor (Inst., Radio Tracer, Safety Officer)	3
Asst. Professor (Hort., Pathology, Viro. Nem., Bio chemistry, Soil Science)	6
Supporting Staff	6
(xxxvii) SIDA Assisted Project	14
Professor (Agronomy)	1
Supporting Staff	14
(xxxviii) AIC Forage Improvement Project, Veliayani	
Asst. Professor	1
Junior Asst. Professor	1
Supporting Staff	5
(xxxix) Live stock Farm, Mannuthy	
Assoc. Professor (Nut.)	1
Junior Asst. Professor	1
Supporting Staff	18
(xl) Live Stock Research Station, Thiruvazhamkunnu	
Assoc. Professor (Nutr.)	1
Asst. Professor (Gen., AR)	2
Junior Asst. Professor	3
Supporting Staff	42
(xli) Cattle Breeding Farm, Thumburmuzhi	
Associate Professor	1
Supporting Staff	12
(xlii) Poultry and Duck Farm, Mannuthy	
Asst. Professor	1
Junior Asst. Professor	1
Supporting Staff	10
(xliiii) Pig Breeding Farm, Mannuthy	1
Asst. Professor	
Junior Asst. Professor	1
Supporting Staff	9
(xliv) Veterinary Hospital, Trichur	
Associate Professor	1
Supporting Staff	7
(xlv) Fodder Research and Development Scheme, Mannuthy	
Asst. Professor (AR)	1
Junior Asst. Professor	1
Supporting Staff	11
(xlvi) AIP on Agri. byproducts, Mannuthy	
Associate Professor	1
Assistant Professor	2
Junior Asst. Professor	2
Supporting Staff	13

(XLi) AICRP on Goats, Mannuthy		
Associate Professor (Nutr. Gen.)		2
Asst. Professor (Pathology, AR, FM)		3
Junior Asst. Professor		3
Supporting Staff		30

(XLii) AICRP on Poultry, Mannuthy		
Professor		1
Associate Professor		1
Asst. Professor		4
Junior Asst. Professor		3
Supporting Staff		22

G. EXTENSION EDUCATION

Assistant Registrar (Tech.)	1	Dr. T. R. Sankunny
Public Relations Officer	1	Vacant
Associate Professor (Inf.)	1	P. Ramachandran Nair
Associate Professor (Pub.)	1	K. C. Vargheese
Associate Professor (Agro.) (NDP)	1	A. I. Thomas
Associate Professor (Agro.) (FAS)	1	Dr. E. Tajuddin
Associate Professor (Hort.) (FAS)	1	Smt. S. Santha Kumari
Associate Professor (Plant Pro.) (FAS)	1	Vacant
Associate Professor (AH) (FAS)	1	Dr. P. S.-Pushkaran
Assistant Professor (Trg.)	1	Smt. S. Sumangalakutty Amma
Assistant Professor	1	G. Padmakumari (1.4.79 to 30.6.79) Smt. S. Sumangalakutty Amma (1.7.79 onwards) R. R. Nair
Assistant Professor (Agri. Engg.)	1	R. R. Nair
Assistant Professor (Pub.)	2	G. Balakrishna Pillai O. J. George
Assistant Professor (Inf.)	2	P. K. Unnikrishnan Nair Dr. A. Jalaluddin
Press Manager	1	K. Rajappan
Junior Asst. Professor	3	P. Rajendran F. M. H. Khaleel S. Bhaskaran
Language Editor	2	Vacant
Chief Artist	1	G. Gopinathan Nair

Appendix V

LIST OF PUBLICATIONS

A COLLEGE OF AGRICULTURE, VELLAYANI

SCIENTIFIC ARTICLES

- 1 Krishnaraj, P., Sadanandan, N., Nair, K. P. M. and Sasidhar, V. K. 1979. Studies on the yield and quality of guinea grass as affected by different spacing with and without legumes as intercrops. *Agri. Res. J. Kerala*. 1979, 17 (2) 183-185.
- 2 Krishna Raj, P., Sandanandan, N., Nair, K. P. M. and Sasidhar, V. K. 1979. Studies on the crude protein content of guinea grass and component crops under different spacings. *Agri. Res. J. Kerala*. 17 (1) 15-17.
- 3 Krishna Raj, P., Sadanandan, N., Nair, K. P. M. and Sasidhar, V. K. 1979. Economics of intercropping in guinea grass. *Agri. Res. J. Kerala*. 17 (2).
- 4 Oommen, M., Chandrasekharan, P. and Sadanandan, N. 1979. Effect of salt solution spray on the germination of seed in Rice. *Agri. Res. J. Kerala*. 17 (2) 25-28.
- 5 Oommen, M., Chandrasekharan, P. and Sadanandan, N. 1979. Effect of salt solution spray on paddy grain maturity and yield. *Agri. Res. J. Kerala* 17 (2).
- 6 Sreedharan, C. 1979. Fertilization of Rice as influenced by weather conditions. *Inter. Symp. of Tropic. Ecology, Kulalumpur Malayssia* 16.21 April 1979
- 7 Mercy, S. T., Nair, N. G. and Luckins C. Babu 1979. Anthesis in Indian Lemongrass *Cymbopogon flexuosus* Stapf. *Agri. Res. J. Kerala* 7 (2) 200-203.
- 8 Miranda, J. H., Mary K. George and S. T. Mercy. 1979. The effects of colchicine and the induction of polyploidy in sorghum (*Sorghum Vulgare* Pers). *Agri. Res. J. Kerala*, 1979. 17(2) 208-216.
- 9 Mercy, S. T., S. N. Kakar and T. M. Varghese. Studies on pollen tube growth and in vitro storage of pollen grains in *Cicer arietinum* and *C. soongaricum*. *Agri. Res. J. Kerala*. 1979. 17 (1) 27-32.
- 10 Sreekumar, S. G. and A. T. Abraham. Heterosis in green gram. *Agri. Res. J. Kerala*.
- 11 Sreekumar, S. G. and A. T. Abraham. Yield attributes and heritability in green gram. *Agri. Res. J. Kerala*.
- 12 Gopinathan Nair, N., N. Ramachandran, Nair and S. G. Sreekumar. Breaking seed dormancy in pottuvaga. *Agri. Res. J. Kerala*.
- 13 Saraswathy, P., S. G. Sreekumar and E. J. Thomas. Path Analysis in green gram. *Agri. Res. J. Kerala*. 17 (2) 204-207.

- 14 Sreekumar, S. G., Saraswathy, P., E. J. Thomas and Mary K. George. Estimation of leaf area in green gram using linear parameters. Agri. Res. J. Kerala. 16 (2) 269-270.
- 15 Sreekumar, S. G., Ramachandran Nair, N., Jayachandran, B. K. and Mary K. George. Effect of ethrel on growth and yield of Bhindi. Agri. Res. J. Kerala.
- 16 Jayachandran, B. K. and Sethumadhavan, P. Vegetative growth of ginger (*Zingiber officinale* R.) as influenced by Cycocel, Ethrel and Kinetin. Agri. Res. J. Kerala. 1979. 17 (1) 67-70.
- 17 Jayachandran, B. K., Vijayagopal, P. D. and P. Sethumadhavan. Floral biology of ginger (*Zingiber officinale* R.) Agri. Res. J. Kerala. 1977. 17 (1) 93-94.
- 18 Jayachandran, B. K., Vijayagopal, P. D. and P. Sethumadhavan. Attempts on breaking self incompatibility in ginger. Agri. Res. J. Kerala 1979. 17. (2) 256-257.
- 19 Vimalakumari, N.K., V. Usha, Mary Ukkuru and L. Prema. "Standardisation of new recipes with Cassava" presented in the symposium on post-harvest technology of Cassava held in February 1980.
- 20 Menon A. G. G and L. Prema. "Motivational Pattern of women for their participation in training programme. (Communicated to the Indian Journal of Home Science).
- 21 Thomas, E. J. 1979. On a fallacy about genotypic and phenotypic correlation coefficients. Current Science. 48 (16) 728.
- 22 Sivan Pillai, K., Saraswathy, P., Thomas, E. J. and John K. Durong. 1979. A constant for the estimation of leaf area. Food Farming and Agriculture. 10 (10) 316-317.
- 23 Sreekumar, S. G., Ramachandran Nair, N., Saraswathy, P., Mary K. George and Thomas, E. J. 1979. Genetic variability and correlation in cowpea. Agri. Res. J. Kerala. 17 (2) 227-231.
- 24 Susamma Philip and M. R. Menon. 1979. *Fusarium* wilt of nutmeg seedlings. Curr. Sci. 48.
- 25 Wilson, K. I., M. Vijayan and K. K. Sulochana. 1979. Mixed infection of *Cylindrocladium quinquesepatum* and *Colletotrichum capsici*-causing leaf blight of Clove in South India. Plant Disease Reporter 63. (7) 536.
- 26 Lakshmanan P., S. Bhavani Devi and M. C. Nair. 1979. Occurrence of *Thanotephorus cucumeris*, a weed fungus, on mushroom beds. curr. Sci. 48.
- 27 Wilson, K. I., P. S. Sasi and James Mathew. 1979. *Fusarium* caspsule rot of cardamom Curr. Sci. 48 1005.
- 28 James Mathew, K. I. Wilson and Koshy Abraham. 1979. Bacterial leaf spot of pepper in Kerala. Indian Arecanut Spices & Cocoa Journal 11. (4) 112-113.

- 29 James Mathew, Koshy Abraham, G. Indrasenan and Marykutty Samuel. 1979. A new record of bacterial wilt of Ginger incited by *Pseudomonas solanacearum*. E. Smith from India. Curr. Sci. 48 213-214.
- 30 Karunakaran, P. and M. C. Nair. 1980. Leaf spot and die back disease of *Cinnamomum sp.* caused by *Colletotrichum gloeosporioides*. Plant diseases. 64 (2).
- 31 Karunakaran, P. M. C. Nair and C. Gokulapalan. 1980. Survival of the clove pathogen *Coll. gloeosporioides* on the weed clerodendron from India. Plant disease. 64.
- 32 K J. Alice, P. Karunakaran and J. Samraj (1980). A comparative study of the Rhizosphere microflora of coconut palm from diseased and healthy areas with reference to root (wilt) disease. Indian Coconut Journal.
- 33 P. Karunakaran and J. Sam Raj (1980). Role of ascorbic acid on 'Tikka' disease of groundnut. Agri. Res. J. Kerala 18 (1) 116-117.
- 34 P. Karunakaran & M. C. Nair, (1980). Twig blight and flower shedding disease of clove trees. Agri. Res. J. Kerala 18 (1) : 130-131.
- 35 M. Abraham, P. Karunakaran and James Mathew (1980). Leaf spot disease of *Dioscorea alata* Linn. Agri. Res. J. Kerala 18 (1) : 132-133.
- 36 P. Karunakaran and M. C. Nair (1980). Little leaf disease of clove in Kerala. Agri. Res. J. Kerala 18 (1) 134.
- 37 P. Karunakaran & M. C. Nair (1980). Anthracnose disease of Papaya Agri. Res. J. Kerala. 18 (1) 137-138
- 38 M. C. Nair, P. Karunakaran and C. Gokulapalan (1980). Leaf blight of *Dioscorea esculenta* (Lourd). Agri. Res. J. Kerala 18 (1): 141-142
- 39 G. Padmakumari, M. R. Menon and L. Remadevi (1980). Changes in the nitrogen and sugar content of rice infested with *Corticium sasaki* (Shirai) Matsumoto. Agri. Res. J. Kerala 18 (1) : 64-67.
- 40 P. G. Paul, J. Sam Raj, and Susamma Philip (1980). Changes in the quantity and quality of Coconut oil due to microbial infection of copra. Agri. Res. J. Kerala. 18 (1) 68-71.
- 41 L. Remadevi and M. R. Menon (1980). Transmission of *Pseudomonas solanacearum* through tomato seeds. Agri. Res. J. Kerala. 18 (1) : 128-129.
- 42 Susamma Philip, K. I. Wilson and M. Abraham (1980). Cigar end disease of banana. Agri. Res. J. Kerala 18 (1) : 128-129.
- 43 Susamma Philip (1980). Wilt of *Vanilla planifolia* caused by *Fusarium oxysporum*, *F. Vasinfectus* (Atk.) Agri. Res. J. Kerala 18 (1): 139-140.

- 44 Mathew, A. V. and M. C. Nair (1980). Collar rot of soybean a new report from India. *Curr. sci.* 99: 158.
- 45 Charles, J. S. and Kuriyan, K. J. (1979). Nematodes associated with ginger in Kerala. Abstract of papers presented in Second All India Symposium on Nematology. P. 17.
- 46 Charles, J. S. and Kuriyan, K. J. (1979). Evaluation of losses caused by *M. incognita* on ginger. *Ibid.* P. 36
- 47 Charles, J. S. and Kuriyan, K. J. (1979). Screening for resistance on ginger against rootknot nematode, *M. incognita* on ginger *Ibid.* P. 48.
- 48 Charles, J. S. and Kuriyan, K. J. (1979). Control of root knot. nematodes, *M. incognita* in ginger. *Ibid.* P. 72.
- 49 Devanesan, S. Jacob, A., Kuruvilla. and Mathai S. (1979) Infests of *Nphotettix virescens* (Stal) (Cicadellidae; Hemiptera) by *Fusarium equiseti* (Corda) Sacc. *Entomen* 4 (3): 304-305
- 50 Jacob, J. A. and Kuriyan, K. J. (1979). Screening of pepper varieties for resistance against root-knot nematodes *M. incognita* *Agri. Res. J, Kerala* 17 (1): 90.
- 51 Jacob, J. A. and Kuriyan, K. J. (1979) Survey of nematodes associated with pepper in Kerala. *Ibid.* 17 (2): 270-271.
- 52 Jacob, J. A. and Kuriyan, K. J. (1979). Control of root-knot nematodes *M. incognita* on pepper. Papers presented in Second All India Symposium on Nematology. P. 59
- 53 Jacob, J. A. and Kuriyan, K. J. (1979) Screening for resistance to root-knot nematode *M. incognita* in pepper, P. 50.
- 54 Jacob, J. A. and Kuriyan, K. J. (1979). Evaluation of losses caused by *M. incognita* on pepper *Ibid*
- 55 Jacob, J. A. and Kuriyan, K. J. (1979) Nematodes associated with pepper in Kerala. Abstract of papers presented in Second All India Symposium on Nematology P. 11.
- 56 Kuriyan, K. J., Jacob. A. and Charles, J. S. (1979). "Plant parasitic nematodes observed in the rhizosphere of pepper and ginger in Kerala" Second All India symposium of soil Biology and Ecology, April 18-20 U. A. S. Hebbal, Page-3.
- 57 Kuriyan, K. J. (1979). Inter action of root-knot nematode *M. incognita* and nitrogen fixing bacteria, Rhizobium on cowpea. *Papers presented in Second All India Symposium on Nematology.* P. 31.
- 58 Kuriyan, K. J., Jacob. J. A. and Charles, J. S. (1979). Histopathology of pepper and ginger, root infected by *M. incognita*. *Ibid.* P. 31.
- 59 Kuriyan, K. J., and Seshadri, A. R. (1979). Host parasite interaction and factors involved in the infection of tobacco by *M. incognita*. *Ibid.* P. 35.
- 60 Kuriyan, K. J. and Seshadri, A. R. (1979). Evaluation of losses caused by *M. incognita* on tobacco. *Ibid.* P. 36.

- 61 Kuriyan, K. J. and Seshadri, A. R. (1979) Screening for resistance to the root-knot nematodes. *M. incognita* and *M. javanica* in tobacco. *Ibid.* P. 49.
- 62 Kuriyan; K. J. 1979 Effect of organic wastes on the control of root knot nematode, *M. incognita* on Bhindi *Ibid.* P. 57.
- 63 Kuriyan, K. J. 1979 Effect of organic leaves on the control of root knot nematode, *M. incognita* on Bhindi. *Ibid.* P. 58.
- 64 Kuriyan, K. J. 1979 Effect of root-knot nematode. *M. incognita* on nodule bacteria, Rhizobium in cowpea *Abstract of papers Second All India Symposium on Soil Biology and Ecology* P. 17.
- 65 Kuriyan, K. J. and Koshy, P. K. 1979 Lemongrass *Cymbopogon flexuosus* a new host of *Radopholus similis* in Kerala. *Abstract of papers. Second All India Symposium on Nematology* P. 62.
- 66 Kurjyan, K. J. 1979 Effect of granular pesticides in controlling root knot nematode, *M. incognita* on bhindi. *Ibid.* P. 72.
- 67 Kuruvilla. S. and Jacob. A 1979 Host range for the entomogenous fungus *Fusarium oxysporum* schlfot. and its safety to thre crop plants. *Curr. Sci.* 48 (13) p. 603.
- 68 Kurvilla, S, and Jacob, A 1979 Comparative susceptiability of nymphs and adults of *Nilaparvata lugens* stal. to *Fusarium oxysporum* schlect and its use in microbial control *Agri. Res. J. Kerala* 17 (2) 287 288
- 69 Mathai. S., Kuruviila, S. and Jacob. A (1979) *Syncephalastrum recemosum* Cohn Ex Schroeter, an entomogenous fungus of rice leaf hopper *Cicadella spectra* (Dist) *Entomon* 4 (2) 215-216.
- 70 Mathai, G. and Nair, K. P. V. (1979) Effect of residue salt bitters on the yield and foliar yellowing *intensity of coconut palm.* *Agri. Res. J. Kerala* 17 (1) 133-135
- 71 Nair, K. K. R. (1979) Nematode population in relation to soil types. Paper presented in *All India Symposium on soil biology and Ecology* held at *Bangalore* 20
- 72 Nair, K. K. R. (1979) Distribution and association of different plant parasitic nematodes of Kerala. *Abstract of papers presented All India symposium on soil Biology and Ecology* held at *Bangalore*
- 73 Philip, B. M. and Jacob, A (1979) Effect of granulosis of food consumption, growth rate and utilization of feed by caterpillars of *Pericallia ricini* F. (Arctliidae: Lepidoptera) *Entomon* (Accepted).
- 74 Philip, B. M. and Jacob, A. (1970) Histopathology of a granulosis of *Pericallia ricini*. F. (Arctliidae Lepidoptera) *Agri Res. J. Kerala* (Accepted).
- 75 Philip, B. M. and Jacob, A (1979) Studies on the granulosis of *Pericallia ricini* F. (Arctiidae Lepidoptera) *Entomon* 347-350.
- 76 Pillai, K. S. and Saradamma. K. (1979) A new record of the cricket *Euscyrus conscinnus* Hann. (Eucopterina) *IRRN* 4 (2). pp. 15

- 77 Pillai, K. S. and Nair, M. R. G. K (1979) Biology and habits of the rice case worm *Nymphula depunctalis* Guen. In Kerala *Entomon* 4 (1) 13-16.
78. Santha Kumari, K., Nalinkumari, T. and Nair, M. R. G. K (1979) New records of a pest of Brinjal. *Entomon* 4 (2) 215-216
79. Saradamma, K, Pillai, K. S, Das. N. M. and Nair, M. R. G. K (1979) Chemical control of *Polyphagotarsonemus latus* on vegetables with some new insecticides. Abstract of papers presented in the *First All India Symposium in Acarology* held at the U. A. S. Bangalore on April 23-25. 1979
- 80 Venkitesan, T. S. and Charles, J. S (1979) The rice root nematode in low land paddies in Kerala. India. *IRRN*. 4 (1) 21.
- 81 Visalakshy, A., Nair, M. R. G. K. & Aiyer, R. S. (1979) Effect of phorate on the rhizosphere microflora of cowpea. *Indian Journal of Microbiology* 19 (1) 40-42
- 82 Visalakshy, A., Nair M. R. G. K. and Aiyer, R. S. (1979) Effect of phorate on mineralisation of nitrogen in red soil. *Pesticides* 13 (3): 21-23.
- 83 Visalakshy: A. Nair, M.R.G.K. and Aiyer, R. S. (1979) Dissipation of phorate in different types of soils. *Plant and soil* 51 (4): 571-576.
- 84 Visalakshy, A., Ali, A. B. M., Nair, M.R G.K. and Das. N. M. (1979) Horizontal movement of phorate in different types of soil. *Entomon* 4 (2) 125-127.
- 85 Visalakshy, A. Santhakumari K. Nalinakumari T. and Das, N. M. (1979) Residues of systemic insecticides used for rice pests control in rice grain and straw. *Entomon* 4 (4) 383-384.
- 86 A.G G. Menon and L. Prema. Retention of knowledge on human nutrition by rural women as related to their socio-economic status *Indian Journal of Home Science*, 12, 1978, pp. 107-110.
- 87 A.G.G. Menon and L. Prema. The credibility of various sources of information and human nutrition *Agri. Res. Journal of Kerala*: 10 (2) 1978; 217-223.
- 88 A.G,G. Menon, L. Prema and B. Babu. An investigation into the attitude of J. A. Os, towards high yielding varieties of rice. *Agri. Res. Journal of Kerala* : 17 (1). pp. 92-98.
- 89 R. Muraleedhara Prasad, and A.G.G. Menon. Differential characteristics of participants and non-participants of farmers functional literacy programme. *Agri. Res. J. Kerala* 17 (2), 221-226.
- 90 R. Muraleedhara Prasad and A. G. G. Menon. Attitude of farmers towards farmers functional literacy programme *PRASAR*, 6 (2 & 3) pp. 17-24
- 91 L. Prema, A. G. G. Menon. V. Usha, Mary Ukkuru and N. K. Vima-

- lakumari Preservation, preparation and use of cassava in rural households of Kerala. Presented in the symposium on post-harvest technology of cassava held in February 1980.
- 92 Vimalakumari, V. Usha, Mary Ukkuru and L. Prema. Effect of different treatments while cooking on the HCN content of Cassava. Presented in the Symposium on post harvest technology of Cassava held in February 1980
- 93 L. Prema, Mary Ukkuru, V. Usha, Vimalakumari, N.K. Padmakumari and Suma Kuruvilla. Storage of different types of chipped cassava insect infestation and fungal infestation in relation to different storage methods. Presented in the symposium on Post harvest technology of cassava held in February 1980.

Popular articles

- 1 P. Sethumadhavan. Occurrence of polyembryony in certain varieties of Mango. Agri. Res. J. Kerala.
- 2 B. K. Jayachandran & M. Meera Bai, Propagation in bread fruit tree. Kerala Karshakan-1979. 24 (3) : 6
- 3 B. K. Jayachandran & M. Meera Bai, How to grow rose in pots. Kerala Karshakan-1979. 24 (5):16
- 4 B. K. Jayachandran & M. Meera Bai, Scientific manuring for profitable Banana cultivation. Kerala Karshakan 1979. 23 (23):6.
- 5 B. K. Jayachandran & Meera Bai. How to make a mango tree yield. Kerala Karshakan 1980-24 (7):12
- 6 B. K. Jayachandran & M. Meera Bai, Oil palm a plantation crop with prospects. Kerala Karshakan. 1980. 24 (9):3
- 7 G. Sreekandan Nair, All spice. Kerala Karshakan
- 8 G. Sreekandan Nair, Harvesting of ginger. Kerala Karshakan
- 9 G. Sreekandan Nair, Harvesting of cocoa. Kerala Kaumudi daily
- 10 G. Sreekandan Nair, Ginger culture Technical bulletin accepted for publication by the Directorate of Extension Education, Kerala Agricultural University.
- 11 A. G. G. Menon, One Chapter in the "Karshika Vignana Kosam" published by Moral Books, Kottayam
- 12 A. G. G. Menon, Kalpadhenu: 6 (5), 1979, pp. 193-196
- 13 O. A. Rahiman & A. G. G. Menon Long life to tapioca tubers. Intensive Agriculture, 1980, p. 16-17
- 14 A. G. G. Menon and P. Rajendran, Kalpadhenu, 1979, 7 (1). p. 42-43.
- 15 L. Prema, Effect of agricultural practices on the nutritional composition of foods". Kerala Karshakan, 28, 1979: p. 30-32
- 16 L. Prema, Nutrition and Regional habits. Kerala Karshakan, 28, 1979, pp. 18-20.
- 17 L. Prema, Importance of Vegetarianism. Kerala Karshakan, 23. 1979
- 18 P. Padmakumari and N. K. Vimalakumari, Drumstick. Kalpadhenu

B. COLLEGE OF HORTICULTURE, VELLANIKKARA

Scientific Articles

- 1 Nybe, E. V. and Nair, P. C. S. Studies on morphology of ginger types. *Cocoa, Arecanut and Spices Journal*, 1979
- 2 Nybe, E. V. and Nair, P. C. S. Field tolerance of ginger types to important pests and diseases *Cocoa, Arecanut and Spices Journal* 1979.
- 3 Nybe, E. V. and Nair, P. C. S. Assessment of yield and quality components in ginger. *Natl. Seminar on Ginger and Turmeric, Calicut* April. 8-9, 1980
- 4 Joseph Philip, Nair, P. C. S. Nybe, E. V. and Mohankumaran, N. Variation in yield and quality of turmeric types. *Natl. Seminar on Ginger and Turmeric, Calicut.* April 8-9, 1980
- 5 Joseph Philip and Sethumadhavan, P. Curing of turmeric. *Natl. Seminar on Ginger and Turmeric Calicut* April 8-9, 1980
- 6 Ramachandran, C. Peter, K. V. and Gopalakrishnan, P. K. Drumstick, a multipurpose perennial Indian Vegetable. *Econ. Botany*, July Sept, 1980.
- 7 Ramachandran, C. Peter, K. V. and Gopalakrishnan, P. K. Variability on cowpea. *Kerala Agri. Res. J.* 1980
- 8 Joseph, C. B. and Peter K. V. Effect of 2,4-D on yield, leaf area and flower characters in tomato *J. Hort. Sci.* 55 (1) 198, 21-43
- 9 Gopalakrishnan, T. R; Gopalakrishnan, P. K. and Peter, K. V. Variability in a few chemical constituents of pumpkin *South Indian Hort.* 1980
- 10 Gopalakrishnan, T. R; Gopalakrishnan, P. K. and Peter, K. V. Variability, heritability and correlation among certain polygenic characters in pumpkin. *Indian J. Agri. Sci.* (accepted)
- 11 Mehra, C. S. and Peter, K. V. Comparative efficiency of straight selection over selection through discriminant function in chilli *Indian J. Agri. Sci.* May, 1980
- 12 Mehra, C. S. and Peter, K. V. Genetic divergence in chilli. *Indian J. Agri. Sci.* April 1980
- 13 Peter, K. V. and Rai, B. Combining ability analysis of certain quantitative characters of tomato *Indian J. Gen. and PI Breed.* 42, 1980
- 14 Ramachandran, C. and Gopalakrishnan, P. K. Correlation and regression studies in bitter gourd *Indian J. Agri. Sci.* (accepted)
- 15 Ramachandran, C. and Gopalakrishnan, P. K. Studies on the genetic variability in bitter gourd *Kerala Agri. Res. J.* (accepted)
- 16 Ramachandran, C. and Gopalakrishnan, P. K. Assessment of bitter gourd types in relation to preservation. *Seminar Post Harvest Tech* K. A. U., 1979

- 17 Ramachandran, C. and Gopalakrishnan, P. K. Sex expression in *Momordica charantia* Kerala agri. Res. J. (accepted).
- 18 Ramachandran, C. and Gopalakrishnan, P. K. Variability for biochemical traits in bittergourd. Kerala Agri. Res. J. (accepted).
- 19 Ramachandran, C., Gopalakrishnan, P. K. and Peter, K. V. Genetic divergence in bittergourd. Veg. sci. (sent for publication).
- 20 Ramachandran, C. Gopalakrishnan, P. K. and Prabhakaran, P. V. Path analysis in bittergourd. South Indian Hort. (accepted).
- 21 Prabhakaran, T. and Jose, A. I. Standardisation of a technique for the preparation of candy from unripe papaya. Kerala Agri. Res. J. (accepted).
- 22 Prabhakaran, T. and Jose, A. I. Standardisation of a technique for the preparation of candy from Kelakkai. Madras Agri. J. (sent for publication).
- 23 Vijayagopal, P. D. and Droupathi Devi, G. D. Permanent manurial experiment in paddy. Kerala Agri. Res. J. 17 (1), 18-21, 1979.
- 24 Droupathi Devi, G. D., Vijayagopal, P. D. and Sasidhar, V. K. A note on the nitrogen use efficiency and grain yield of rice. Kerala Agri. Res. J. 18 (1).
- 25 Droupathi Devi, G. D. and Vijayagopal, P. D. Studies on the effect of continuous application of organic and inorganic forms of N with and without P and K on the yield of rice. Kerala Agri. Res. J. (accepted).
- 26 Droupathi Devi, G.D. Vijayagopal, P.D. and Sasidhar, V.K. Studies on the fractional application of N on the yield of rice. Kerala Agri. Res. J. (accepted).
- 27 Mariam, K. A. and Koshy, M. M. Effect of zinc with lime on the composition and absorption of nutrients by rice. Kerala Agri. Res. J. 17 (1) 76-84.
- 28 Varma, A. S., Abi Cheeran and Peethambaran, C. K. A new fruit of bitter gourd. Kerala Agri. Res. J. (accepted).
- 29 Peethambaran, C. K. and Singh, K. S. Studies on the comparative survival of *Pythium* spp. in soil. Indian Phytopathology. (accepted).
- 30 Peethambaran, C. K., and Singh, K. S. Effect of susceptible and resistant host in a sequence on population dynamics of *Pythium* in soil and incidence of damping off. Kerala Agri. Res. J. (sent for publication).
- 31 Nair, R. V., Kumar, K. and Peethambaran, C. K. A new disease of cocoa in Kerala. J. of Arecanut, Spices and Cocoa, 1980.
- 32 Premanathan, T., Peethambaran, C. K. and Abi Cheeran. Screening of ginger varieties against *Phyllosticta* leaf spot. Natl. Seminar on Ginger and Turmeric, Calicut, April. 8-9, 1980.
- 33 Peter, K. V. and Peethambaran, C. K. Prospects and problems of breeding for disease resistance in chillies. Hort. Abstract, 1979.

- 34 Abraham, C. C. Nayar, K. M. and Chandrasekhar, P. R. The nature of damage to cocoa pods caused by the striped squirrel *Funambulus tristriatus*. *Placrosym-II*, Nilgiris, 26-30 June, 1979.
- 35 Abraham, C. C. and Remamony, K. S. Pests that damage cocoa plants in Kerala. *Ind. Arecanut, Spices and Cocoa Journal II* (3) 77-81.
- 36 Joy, P. J., Lyla, K. R. and Abraham, C. C. Preliminary studies on the pests of *Eupatorium oderatum*-an important weed in plantations of Kerala. *Placrosym - II*, 3-6, June, 1979.
- 37 Ambika, B., Abraham, C. C. and Vidyadharan, K. K. Relative susceptibility of cashew types to infestation by *Helopeltis antonii* Sign. (*Hem. Miridae*) *Placrosym II*. 3-6, June 1979.
- 38 Sheila, M. K., Abraham, C. C. and Nair, P. C. S. Incidence of shoot borer *Dichrocrocis Punctiferalis* in different types of turmeric *Ind. Arecanut Spices and Cocoa Journal*, Jan. March, 1980—59-61.
- 39 Abraham, C. C. and Ambika, B. Effect of leaf and kernel extracts of neem on moulting and vitellogenesis in *Dysdercus cingulatus*. *Curr. Sci.* 8 (12).
- 40 Ambika, B. and Abraham, C. C. Bio-ecology of *Helopeltis antonii* (Miridae: Hemiptera) infesting Cashew trees—*Entomon*, 4 (4) 335-340.
- 41 Venkitesan, T. S. and Sathy, K. G. Control of the burrowing nematode *Radopholus similis* (Cobb.) on black pepper *Pesticides*. 13. 40-43.
- 42 Venkitesan, T. S. and Charles, J. S. A note on the Chemical control of nematodes infesting pepper vines in Kerala. *Placrosym II*, Nilgiris 26-30, June 1979.
- 43 Madhavan Nair, G. and Abraham, C. C. Relative efficiency of some foliar insecticidal treatments for the control of *Helopeltis antonii* *Kerala Agri. Res. J.* (accepted).
- 44 Madhavan Nair, G. and Abraham, C. C. Relative efficiency of systemic insecticides applied as trunk implantations in controlling infestation of *H. antonii*. *Kerala Agri. Res. J.* (accepted).
- 45 Madhavan Nair, G. and Abraham, C. C. Management of *Helopeltis antonii* with dusting powder formulations of common insecticides. *Kerala Agri. Res. J.* (accepted).
- 46 George, C. M., Joy, P. J. and Abraham, C. C. Distribution, feeding habits and burrowing pattern of *Tatera indica* cuvieri. *J. Bomb. Nat. Hist. Soc.* (accepted).
- 47 George, C. M., Joy, P. J. and Abraham, C. C. The nature of damage and management of *Rattus rattus wroughtonii* H. a serious pest of cocoa pods in Kerala. *Indian J. Rodentology* (1 & 2) 51-52.
- 48 George, C. M., Joy, P. J. and Abraham, C. C. Studies on *Rattus nosvegicus*. *Kerala Agri. Res. J.* (accepted).

- 49 George, C. M. Joy, P. J. and Abraham, C. C. On the occurrence of different species of rats in Kerala. *Kerala Agri. Res. J.* (accepted).
- 50 Ambika, B. and Abraham, C. C. Record of *Helopeltis theivora* as potential pest of cashew *Anacardium occidentale* Linn. *Ind. J. Entomology* (accepted).
- 51 Ramakrishnan, T., Pillai, P. B. and George, C. M. Chemical weed control under semi-dry conditions. *Kerala Agri. Res. J.* 17 (1) 108-110, 1979.
- 52 Pillai, P. B., Sasidhar, V. K. and Nair, R. V. Efficiency of complex fertilizer on rice. *Kerala Agri. Res. J.* 17 (1) 111-112, 1979.
- 53 Nair, G. K., Pillai, P. B. and Nair, K. P. M. Relative efficiency of different herbicides on rice under semi dry conditions. *Kerala Agri. Res. J.* 17 (1) 14-17, 1979.
- 54 Mohankumar, B. and Pillai, P. B. Effects of different levels of N, P, and K on the yield of cowpea variety P. 118. *Kerala Agri. Res. J.* 17 (2) 194-199, 1979.
- 55 Nair, K. P. R. A study of the factors affecting the adoption of hybrid Cotton cultivation. *Kerala Agri. Res. J.* (accepted).
- 56 George, C. M. A new mechanical trap for capturing rice field rats. *Ind. J. Rodentology* 1 (1 & 2) 53-55, 1979.
- 57 Abraham, C. C. George, C. M. and Joy, P. J. The nature of damage and management of *Rattus rattus Wroughtonii*- a serious pest of cocoa pods in Kerala. *Ind. J. Rodentology* 1 (1&2) 51-52, 1979.

Popular articles

- 1 Gopalakrishnan, P. K. and Ramachandran, C. Winged beans. *Deepika* (daily), 4-12-79.
- 2 Gopalakrishnan, P. K. and Ramachandran, C. Model kitchen garden. *Kalpadhenu*, 1979.
- 3 Gopalakrishnan, P. K. and Ramachandran, C. Ginger cultivation in high ranges. *Souvenir of Idukki Agri. Hort. Society*, 1979.
- 4 Gopalakrishnan, P. K. and Ramachandran, C. Clove cultivation and problems. *Kalpadhenu*, 1979.
- 5 Gopalakrishnan, P. K. and Ramachandran, C. Muringa. *Kalpadhenu*, 1979.
- 6 Gopalakrishnan, P. K. and Ramachandran, C. Brinjal. *Kalpadhenu*, 1979.
- 7 Gopalakrishnan, P. K. and Ramachandran, C. Coccinia. *Kalpadhenu*, 1979.
- 8 Gopalakrishnan, P. K. Ramachandran, C. and Peter, K. V. Tinda- a vegetable suited for Kerala. *Mathrubumi* (daily), 13-8-1979.
- 9 Ramachandran, C. Peter, K. V. and Gopalakrishnan, P. K. Checkurmanis- a multiminerall packed leafy vegetables. *Ind. Hort.* 1980.
- 10 Peter, K. V. Unique vegetables of Kerala. *Indian Farmers Digest* 12, 47-51, 1979.

- 11 Rajmohan, K. Peter, K. V. and Gopalakrishnan, P. K. Winged beans. *World crops*. 1980.
- 12 Droupathi Devi, G. D. and Balakrishna Pillai, P. Bacterial fertilizers. *Kalpadhenu*, 1978 (1).
- 13 Droupathi Devi, G. D. and Marykutty, K. C. Major nutrients and plant growth. *Kalpadhenu*, 1979 (6).
- 14 Peethambaran, C. K. Stem bleeding of cashew, *Kalpadhenu* - September—October, 1979.
- 15 Peethambaran, C. K. Stem bleeding of cashew. *Mathrubumi* - September, 1979.
- 16 Peethambaran, C.K. Pesticides - *SADU Demonstrators Training Programme - Hand Book*. 1979.
- 17 Peethambaran, C. K. What to be done with empty pesticide bottles? *Deepika*, Nov. 1979.
- 18 Peethambaran, C. K. Diseases due to pesticides - *Malayala Manorama*, Nov. 1979.
- 19 Abi Cheeran and Peethambaran, C. K. Disease control *KAU leaflet*, 1979.
- 20 Joy, P. J. Coconut can be saved from the black headed caterpillar pest. *Indian Farmers Digest*. XII (11 & 12) 35 - 37, 1979.
- 21 Venkitesan, T. S. Nematodes of pepper. *Yojana* 8 (16), 10-11.
- 22 Venkitesan, T. S. Nematodes - another enemy to rice. *Kalpadhenu*, 6 (4) 161 - 161.
- 23 George, C. M. Types of rats in Kerala. *Kannimannu*, Dec. 1979.
- 24 Abraham, C. C. Protect cocoa from pests. *Kannimannu*, Dec. 1979.
- 25 Sreedevi, P. and Pillai, P. B. Weed control in upland rice *KAU Union, Annual*, 1979.
- 26 Pillai, P. B. Nursery for 2nd crop paddy—*Deepika*, 28-9-1979.
- 27 Pillai, P. B. A meteorological observatory in Kerala Agril. *University, Express*, 18-10-1979.
- 28 Pillai, P. B. The value of weather forecast in Agriculture, *KAU Union Magazine*, 1980.
- 29 Pillai, P. B. Nutmeg cultivation. *TANS Souvenir*, 1980.
- 30 Nair, K. P.R. Role of mass media in education. *KAU Union Magazine* 1980.
- 31 Nair, K. P. R. High yielding varieties in cashew. *Deepika*, 13-3-80.
- 32 Jose, A. I. Nitrogen fixation by legumes. *Hort. College Magazine*, 1979.

Books

- 1 Gopalakrishnan, P. K., Peter, K. V. and Rajmohan, K. *Poshakathottam, DEE, KAU*, 1980.

C. College of Veterinary & Animal Sciences, Mannuthy

Scientific publications

- 1 Chandrasekharan, K., Pythal, C., Radhakrishnan, K. and Sundaram, R. K. (1979). Methyridine as an effective anthelmintic against strongylosis in elephants. *Kerala J. Vet. Sc.*, 10 (1) : 163-166

- 2 Muraleedharan Nayar, K. N., Chandrasekharan, K., Cheeran Jacob, V. and Radhakrishnan, K. (1979). General anaesthesia in an elephant (*Elephas maximum*)—A clinical case report. *Kerala J. Vet. Sci.*, 10 (2) : 197-200.
- 3 Ommer, P. A., Lucy Paily., Harshan, K. R., and Radhakrishnan, K. (1979). A note on certain anatomical peculiarities in a brown-swiss bull. *Kerala J. Vet. Sci.*, 10 (2) : 317-319
- 4 Neelakanta Iyer, C. P., Nair, M. S. and E. Madhavan (1979). Freeze branding—an easy effective and harmless method for identification of animals. *Livestock Adviser* 4 (11) : 31-32
- 5 Neelakanta Iyer, C. P. and Nair, M. S. (1979). The Importance of minerals and trace elements in the reproduction of dairy cows. *Livestock Adviser* 4 (12) : 5-7
- 6 Nair, B. R, K. and Mathai, E. (1979) Effect of certain genetic and non genetic factors on the secondary sex ratio in goats. *Kerala J. Vet. Sci.* 10 (1) : 1-9
- 7 Mathai, E. and Raja, C. K. S. V. (1979) Haematology during different phases of oestrous cycle in crossbred heifers. *Kerala J. Vet. Sci.* 10 (1) : 53-58
- 8 Ramadas, K; Neelakanta Iyer, C. P; and Raja, C. K. S. V. (1979) A preliminary report on the effect of honey as a constituent in extenders. *Kerala J. Vet. Sci.* 10 (1) : 85-89
- 9 Joseph Mathew., and Raja, C. K. S. V. 1979 Incidence of testicular degeneration in goats. *Kerala J. Vet. Sci.* 10 (2) : 206-212
- 10 Joseph Mathew and Raja, C. K. S. V. (1979) Observation on the remnants of the Wolffian and Mullerian duct system in bucks *Kerala J. Vet. Sci.* 10 (2) : 286-292
- 11 Prabhakaran Nair, K; Shobhanan, T. A; Mathai, E. and Ramadas, K. 1979 A note on comparative efficacy of dexamethasone and stilboesterol in the treatment of mummified foetus. *Kerala J. Vet. Sci.* 10 (2) : 297-301
- 12 Neelakanta Iyer, C. P. and Rajan, A. 1979 Testicular degeneration in a buffalo bull. *Kerala J. Vet. Sci.* 10 (2) : 301-306
- 13 Mathai, E. and Krishnan Nair, B. R. 1979 A report on quintuplet birth in goat. *Kerala J. Vet. Sci.* 10 (2) : 324-27
- 14 Bharathan Namboothiripad, T. R. and Prabhakaran Nair, K. 1979 Brucella abortion. A report. *Kerala J. Vet. Sci.* 10 (2) 327
- 15 George, P. O, and Sreekumaran, T. 1979 Cysto-Hysterocele female dog. A case report. *Kerala J. Vet. Sci.* 10 (2) : 328-330
- 16 Prabhakaran Nair, K; Raveendran; Nair, S. and Muraleedharan Nair K-N. 1979 Imperforate hymen in a crossbred heifer *Kerala J. Vet. Sci.* 10 (2) : 330-332
- 17 Madhavan, E; Neelakanta Iyer, C. P. and Francis, U. T. 1979 Influence of cross breeding on gestation length and birth weight of calves. *Kerala J. Vet. Sci.* 10 (2) : 332-335

- 18 Neelakanta Iyer, C. P. 1979 Effect of Scrotal insulation on semen quality of a breeding bull. *Kerala J. Vet. Sci.* 10 (2) : 335-337.
- 19 Prabhakaran Nair, K; Raveendran Nair S. and Muraleedharan Nair, K. N. 1979 Adeno Carcinoma of Vagina in a cow. A case report. *Kerala J. Vet. Sci.* 10 (2) : 342-44
- 20 Nair, M. S. and Raja, C. K. S. V. 1979 Incidence of Hermaphroditism in pigs. *Kerala J. Vet. Sci.* 10 (2) : 349-52
- 21 Prabhakaran Nair, K; Muraleedharan Nair, K. N. and Jalaluddin, A. M. Disappearance of spermatozoa from the ejaculate of bulls following vasectomy/caudectomy. *Indian J. Anim. Sci.* 49 (12) 1009-1014
- 22 Bhat, P. N. and Mukundan, G. 1979 Production potentialities of non-descript desi cow in India. *Dairy Guide-1* 23-26
- 23 D. Souza, C; Bhat, P. N. and Mukundan, G 1979 Genetic studies on some important economic traits in Red Sindhi and its crosses *Indian J. Anim. Sci.* 49 : 247-50
- 24 George, M; Balakrishnan, C. R., Bhargava, R. K. and Rajagopala Raja, C. A. 1979. The effect of gestation length on serum immunoglobulin absorption capacity of post-natal bovine calves *Indian J. Dairy. Sci.*, 32 (4) 472-6
- 25 Nair, T. S; Balakrishnan. C. R. and Rajagopala Raja, C. A. 1979. Effect of parturition on serum immunoglobulin level in goats. *Kerala J. Vet. Sci.* 10 (2) 309-11
- 26 Rajagopala Raja, C. A. and Balakrishnan, C. R. 1979. The effect of serum immunoglobulin level on health and survivability of calves *Kerala J. Vet. Sci.* 10 (1) : 65-70
- 27 Rajagopala Raja, C. A. and Balakrishnan C. R. 1980. Influence of breed age, parity status and stage of lactation on serum immunoglobulin level in cattle, *Froc. Indian Soc. Anim, Br. Genet. Ajmir.*
- 28 Sosamma lype 1979. Inheritance of egg weight in Forsgate strain of White Leghorns, *Kerala J Vet. Sci.* 10 (1) : 71-74
- 29 Sosamma lype and Singh, B. P. 1979. Genetic architecture of a White Leghorn population *Indian Vet. J.* 56 : 102-3
- 30 Joseph, C. R., Aleyas, N. M. & Alikutty, K, M. A. seasonally occurring Respiratory disease in goats in Kerala. (i) Incidence and clinical observations. Accepted for publication in the Kerala Journal of Veterinary Science.
- 31 Joseph, C. R; Aleyas, N. M. and Alikutty, K. M. A seasonally occurring respiratory disease in goats in Kerala. (ii) Etiological aspects. Accepted for publication in the Kerala Journal of Veterinary Science.

- 32 Joseph, C. R; Aleyas, N. M. and Alikutty, K. M. A seasonally occurring respiratory disease in goats in Kerala. (iii) Therapeutic aspects.
Accepted for publication in the Kerala Journal of Veterinary Science.
- 33 Aleyas, N. M. and Vijayan, R. Actur Indigestion Report on clinical cases.
Accepted for publication in the Kerala Journal of Veterinary Science.
- 34 Balakrishnan, V. S; Vijayan, R. and Aleyas, N. M. Intussusception of ileum, Report on clinical case in a calf. Accepted for publication in the Kerala Journal of Veterinary Science.
- 35 Aleyas, N. M. and Vijayan, R. Incidence of a weed toxicity in Kerala. Under publication.
- 36 Chacko, C. T. and Subrahmaniyam, M. 1979. A comparative study on the feed utilisation of sindhi and Sindhi x Jersey Cross-bred cows. *Kerala J. Vet. Sci.* 10 (1) : 21-28
- 37 Joseph, P. M. and Pavithran, K. 1979. Hormonal induction of lactation in cows, *Kerala J. Vet. Sci.* 10 (1) : 47-52
- 38 Sukumaran, M. V. and Subrahmaniyam, M. 1979. Changes in the characteristics of bovine colostrum during natural fermentation at room temperature for ten days. *Kerala J. Vet. Sci.* 10 (2) 177-181
- 39 Mukundan, M; Subramaniyam, M. and Parmeswaran, M. N. Studies on microflora in boiled Milk. *Kerala J. Vet. Sci.* 10 (2) : 234-239
- 40 Joseph, P. M. and Pavithran, K. 1979. Hormonal induction of lactation in cows, *Kerala Vet. J. Sci.* 10 (2) : 240-245
- 41 Francis, U. T. and Subrahmaniyam, M. 1979. A comparative study of two different calf starters on the body measurements and physiological status of calves. *Kerala J. Vet. Sci.* 10 (2) : 268-274
- 42 Francis, U. T. and Subrahmanyam, M, 1979. The calf starter formulation with locally available feed ingredients. *Kerala J. Vet. Sci.* 10 (2) : 275-281
- 43 Madhavan, E; Neelakanta Iyer, C. P, and Francis, U. T. Influences of cross breeding on gestation length and weight of calves. 1979 *Kerala J. Vet. Sci.* 10 : 332-334
- 44 Sulochana, S. and Nair, G. K. 1979 A note on the isolation of new Castle disease virus from a duckling *Kerala J. Vet. Sci.* 10 : 537-538
- 45 Sulochana, S. and Derbyshire, J. B. 1979. Electron microscopic study of the PK 15 cell culture infected with porcine enterovirus strain V 13. *Kerala J. Vet. Sci.* 10 : 123-136

- 46 Sulochana, S. and Derbyshire. J. B. 1979. Ultra structural changes in PK cells infected with porcine enterovirus strain. T. 80 *Kerala J. Vet. Sci.* 10 : 109-122
- 47 Pillai, R. M; Abdulla, P. K. and Punnoose, K. T. 1979. Studies on the bacterial species associated with pneumonia in goats.
- 48 Pillai, R. M; Abdulla, P. K. and Punnoose, K. T. 1979. In vitro-drug sensitivity studies on *Pasteurella multocida*, streptococcus: pneumoniae and *Corynebacterium pyogenes* associated with pneumonia in goats. *Kerala J. Vet. Sci.* 10 : 145-152.
- 49 Sathianesan, V; Chandrasekharan, K; Sundaram, R. K. and Pythal, C. 1979 Anthelmintic efficacy of oxibendazole against the common strongylids in elephants. *Kerala J. Vet. Sci.* 10 (1) 153-156
- 50 Chandrasekharan, K; Rajamohanam, K. and Sundaram, R. K. 1979 A case of cestode infection in an Indian elephant. *Kerala J. Vet. Sci.* 10 (1) : 157-158
- 51 Chandrasekharan, K; Ramadas, K; Jacob, V. Cheeran and Pythal, E. P. 1979, A clinical note on the use of mebendazole against ancylostomiasis and toxocarasis in dogs. *Kerala J. Vet. Sci.* 10 (1) : 159-162
- 52 Chandrasekharan, K. Pythal, C; Radhakrishnan K. and Sundaram, R. K. 1979. Methyridine as an effective anthelmintic against strongylosis in elephants. *Kerala J. Vet. Sci.* 10 (1): 162-166
- 53 Sathianesan, V. and Peter, C. T. 1979 A study on the free living larval stages of *Trichostrongylus Colubriformis* (Giles, 1892) occurring in goats. *Kerala J. Vet. Sci.* 10 (1) : 171-176
- 54 Chandrasekharan, K; Sathianesan, V, Pythal, C. and Sathianesan, V. 1979. Anthelmintic activity of thiophanate (Nemafax) in elephants and Zoo animals. *Kerala J. Vet. Sci.* 10 (1) : 167-170.
- 55 Ramaswamy, K. and Sundaram, R. K. (1979). Porcellio larvis (Isopoda) as a new intermediate host for *Tetrameres mohtedai* Bhaierao and Rav, 1944. *Indian Vet, J.* 56 (5) : 363-366
- 56 Sathianesan, V., Mohan, M. C. and Sundaram, R. K. (1979). Oxibendazole a new and effective anthelmintic against *Ascaridia galli* in experimentally infected poultry. *Kerala J. Vet. Sci.* 10 (2) : 193-196
- 57 Muraleedharan Nair, K. N., Chandrasekharan, K., Jacob, V. Cheeran and Radhakrishnan, K. (1979). General anaesthesia in an elephant (*Elephas maximum*) A clinical case report. *Kerala J. Vet. Sci.* 10 (2) : 197-200
- 58 Sathianesan, V., Rajamohanam, K. and Sundaram, R. K. (1979). Clinical trial with oxibendazole against ancylostomiasis in dogs. *Indian J. Parasitol.*, 3 (2) : 177-178
- 59 Rajan, A., Nair, M. K., George, K. C., Maryamma, K. I. and Valsala, K. V. (1979). Gastric Ulceration in the Pig. A morphohistological study. *Kerala J. Vet. Sci.* 10 (1) : 103-109

- 60 Rajan, A, Nair, M. K., Maryamma, K. I. and K. V. Valsala, (1979). Pathoanatomical changes associated with senility in the endocrine glands of lions (*Panthera leo*). *Kerala J. Vet. Sci.* 10 (2) : 312-317
- 61 Manomohan, C. B., Ramachandran, K. M., Valsala, K. V. and Lalithakunjamma, C. R. (1979).- Incidence of kid mortality in Kerala, *Kerala J. Vet. Sci.* 10 (2) : 312-317
- 62 Neelakanta Iyer, C. P. and Rajan, A. (1979). Testicular degeneration in a buffalo bull. *Kerala J. Vet. Sci.* 10 (2) : 297-301
- 63 Rajan, A., Nair, M. K., Maryamma, K. I. and Valsala, K. V. (1980) Studies on the epidemiology, symptoms and pathoanatomy of duck plague infection (duck viral enteritis). *Indian Vet. J.* 57 : 5-12
- 64 Valsala, K. V. (1979). Avian Immunoglobulin. *COVAS-79* : 47-49
- 65 Rajan, A. (1979) BCG and Cancer Immunotherapy. *COVAS - 79* : 27-28
- 66 Maryamma, K. I. (1979). Immuno complex diseases. *COVAS - 79*: 9-13
- 67 Valsala, K. V. (1979) Pathology of Alcoholism. *KAU Union Annual 1979*
- 68 Maryamma, K. I. (1979). Mycotoxicosis-Hazard to Public Health and national economy. *KAU Union Annual, 1979*
- 69 Chandrasekharan, K., Ramadas, K., Cheeran, J, V. and Paily, E. P. (1979). A clinical note on the use of Mebendazole against Ancylostomiasis and Toxocariasis in dogs. *Kerala J. Vet. Sci.* 10 (1) : 159-162
- 70 Muraleedharan Nair, K. M., Chandrasekharan, K., Cheeran, J. V. and Radhakrishnan, K. (1979). General anaesthesia in an elephant (*Elephas maximus*). A clinical report. *Kerala J. Vet. Sci.* 10 (2) : 197-200
- 71 Philomina, P. T. and Venugopal, G. (1980) Studies on Choline deficiency in the chicken. I: Effect of experimental choline deficiency on growth and feed efficiency in chicken. *Kerala J. Vet. Sci.* 2 : 121-127
- 72 Philomina, P. T. and Venugopal, G. (1980) Studies on choline deficiency in chicken. II. Biochemical studies and muscular efficiency. *Indian Vet. J.*, 57 : 279-282
- 73 Jalaludeen, A., Ramakrishnan, A. and Venugopalan, C. K. (1979). Effect of Restriction of water on certain production characteristics and cage layers. *Indian Vet. J.* 56 : 839-843
- 74 Renchi, P. George, Nair, G. R., Nair, R. S , Nair, B. R. K. and Unni, A. K. K. (1979) Relationship between shank length and body weight in ducks. *Indian Vet. J.* 56 : 937-939
- 75 Balachandran, T. N., Unni, A. K. K. and Venugopalan, C. K. (1979): A note on the production characteristics of White Leghorn in cages and on litter Floor. *Indian Poult. Gaz.* 63 : 83-85

- 76 Nair, G. R., Unni, A. K. K. and Chowdry, M. R. (1979). Production performance of two way and three way strain crosses of White Leghorns. *Indian J. Poult. Sci.* 14 : 114-119
- 77 Venugopal, K., and Paily, E. P. (1979). In vitro antibiotic sensitivity of micro-organisms isolated from Mastitis in goats. *Kerala J. Vet. Sci.*, 10 : (2) : 201-205
- 78 Venugopal, K. and Paily, E. P. (1979). Cell counts in goat milk, *Kerala J. Vet. Sci.*, 10 : (2) : 306-308
- 79 Baby, K., and Paily, E. P. (1979). Sero-epizootology of Brucellosis in buffaloes in Kerala. *Kerala J. Vet. Sc.* 10 (2) : 187-192
- 80 Nayar, K. N. M., Chandrasekharan, K., Jacob, V. Cheeran and Radhakrishnan, K. (1979). General anaesthesia in an elephant - A clinical case report. *Kerala J. Vet. Sci.* 10 (2) : 197-200
- 81 Philip, P. J., Nayar, K. N. M., Sarada Amma, T., Nayar, S. R., Abraham Varkey, C. and George, P. O. (1970). Impaction of ruminant stomach with rubber latex. A report of twelve clinical cases. *Kerala J. Vet. Sci.* 10 (2) : 250-261
- 82 George, P. O. and Srikumaran, T. (1979). Hystercocoele in a female dog - A case report. *Kerala J. Vet. Sci.* 10 (2) : 328-329
- 83 Nair, K. P., Nayar, S. R. and Nayar, K. N. M. (1979). Imperforate hymen in a cross-bred heifer. *Kerala J. Vet. Sci.* 10 (2) : 330-331
- 84 Nair, K. P., Nayar, S. R. and Nayar, K. N. M. (1979). Adenocarcinoma of vagina in a cow. A case report. *Kerala J. Vet. Sci.* 10 (2) : 340-343
- 85 Nayar, K. N. M., Nair, K. P., Sarada Amma, T. and Alikutty, K. M. (1979). *Schistosomus reflexus* in a goat - A case report. *Kerala J. Vet. Sci.* 10 (2) : 346-348
- 86 Nair, K. P., Nayar, K. N. M. and Jalaluddin, A. M. (1979). Disappearance of spermatozoa from the ejaculate of bulls following vasectomy/caudectomy, *Indian J. Anim. Sci.* 49 : (12) : 1009-1014
- 87 C. Abraham, Varkey, Anjelo, S. J. and Das, A. C. (1979). Observations on repair of resected flexor tendons in experimental buffalo calves (*Bubalus bubalus*) *Vet. Res. Bull. Vol. II* (2) : 150-154
- 88 Prabhakaran, P., Padmanabha Iyer, R., Soman, M. and Vikraman Nair N. (1979). Preliminary study on the skin yield of Malabari and cross bred goats. *Kerala J. Vet. Sci.*, 10 (1) : 95-98
- 89 Prabhakaran, P., Padmanabha Iyer, R., Soman, M. and Vikraman Nair, N. (1979). Weight of hide in relation to live weight of Indian Dairy Cattle-a preliminary study. *Kerala J. Vet. Sci.*, 10 (1) : 99-102
- 90 Nanu, E. and Soman, M. (1979). Isolation of Staphylococci from market beef and its public health importance. *Kerala J. Vet. Sci.* 10 (2) : 246-250

- 91 Prabhakaran, P., Soman, M. and Padmanabha Iyer, R. (1979). A note on the carcase characteristics of castrated crossbred goats- *Ind. J. Animal Sc.*, 49 (4) : 325-326
- 92 Indira Devi, A and Surendran, P. U. (1979). Confidence limits to coefficient of variation and relationship between C. V. S. of related variables: *Kerala J. Vct. Sci.*, 10 (1) : 59-64.
- 93 Indira Devi, A and Surendran, P. U. (1979). Estimation of parameters under random determinations on each unit of a random sample. *Ag. Res. J. Kerala.*, 17 (2) : 240-247
- 94 Krishnan Nair, B. R. (1979). "The Malabari goats" Summer Institute on Goat production held at Mathura during July, 1979
- 95 Krishnan Nair, B. R. (1979). "Effects of certain genetic and non-genetic factors on the secondary sex ratio in goats". *Kerala J. Vet. Sci.*, 10 (1), 1979 : 1 to 8
- 96 Kunjikutty, N. (1979) "Studies on the growth rate, feed efficiency and digestibility coefficient of nutrients in Alpine—Malabari crossbred kids".
- 97 Kudjikutty, N. (1979). "Etudies on the protein requirements of Alpine-Malabari crossbred kids".
- 98 Kunjkutty, N. (1979). "Studles on the energy requirement of Alpine-Malabari crossbred kids".
- 99 Kunjikutty, N. (1979). "Studies on the calcium and Phosphorus requirement of the Alpine-Malabari crossbred kids". *Kerala J. Vet. Sci.* 10 (1)
- 100 Joseph Mathew & C. K. S. V. Raja (1979). "Incidence of Testicular Degeneration in Goats". *Kerala J. Vet. Sci.* 10, 206
- 101 Joseph Mathew (1979). "Observation on the remnants of the Wolffian and Mulleran Duct system in Bucks". *Kerala J. Vet. Sci.*, 10 (1)
- 102 Ramachandran, K. M. (1979). "Incidence of kid Mortality in Kerala". *Kerala J. Vet. Sci.* 10 (1)

Popular Articles

Total number published - 44

D. COLLEGE OF FISHERIES

Scientific Publications

- 1 Sebastian, M. J., D. M. Thampy and C. G. Rajendran, 1980. *Preliminary experiments on Tiger Prawn culture and report on seed prospecting Penaeid Prawns in Kerala Backwaters.* Proceedings of First National Symposium on Shrimp Farming held at Bombay August 1978, P. 205-208.

- 2 Thampy, D. M., M. J. Sebastian, E. Susheela Abraham and C. G. Rajendran; 1980.

Relative abundance and distribution of post larvae and juveniles of Penaeus monodon in the Cochin backwaters and the feasibility of their utilization in culture fisheries. In the proceedings of the symposium in coastal Aquaculture held at Cochin during January 1980.

Booklets

Two booklets, one on *Freshwater Fish Culture* and the other on *Brackishwater Fish Culture* in Malayalam prepared by Dr. D. M. Thampy were published during March 1980 by the Director of Extension Education.

E. RESEARCH STATIONS

- 1 Sukumara Dev, V. P. 1979, Carbeudazin controls rice blast. IRR Newsletter 4 (3).
- 2 Ittyaverah, P. J., Nair, S. S., Sivasankara Pillai, K. and Thomas Varghese. "Feasibility of Moderate Nitrogen Technology for Rice in acid sulphate soils of Kuttanad in Kerala. Fertilizer News: April 1979.
- 3 Ittyaverah, P. J., Vasudevan Nair, K. P., and Thomas, M. J. Effect of Potash application on the incidence of Brown Plant Hopper. Agri. Res. Journal, Kerala, 1979, 17 (1) P. 118-119.
- 4 Ittyaverah P. J., Nair, N. R., and Thomas, M. J. *Limuca acuminata Lamarch* (Pulmonata; Limacidal) a pest on *Azolla (Azolla pinnata)*. Agri. Res. Journal Kerala 1979, 17 (2) P. 296.
- 5 Ittyaverah, P. J., Nair, S. S., Sankara Panickar, K., and John, P. S. Phosphate and Potash fertilization of Rice in clay loam soil of Kuttanad. Agri. Res. Journal, Kerala, 1979, 17 (2) 236-239.
- 6 Nair, P. V. and Rajan, K. M. Cultural practices in relation to control of bacterial leaf blight of Rice—Presented in the National Symposium on Microbiology held at Hissar in 1979—abstract published in special issue of Indian Journal of Microbiology.
- 7 Rajan, K. M., and Nair, P. V. Field evaluation of certain proprietary fungicides against Sheath Blight of Paddy. Agri. Res. Journal Kerala, 1979, 17 (2) 253.
- 8 Rajan, K. M. and Nair, P. V. Reaction of certain rice varieties to sheath blight and sheath rot diseases. Agri. Res., Journal Kerala, 1979, 17 (2) 259.
- 9 Rajan, K. M., and Nair, P. V. Control of stack burn disease of rice. Agri. Res. Journal, Kerala. 1979, 17 (2) 261.
- 10 Thomas, M. J., Nair, S. S. and Nair, N. R. Out break of rice thrips in Kuttanad, Kerala, India. I. R. R. N. 1979, 4(1) 7-8.
- 11 Thomas, M. J., Balakrishna Pillai, K., and Nair, N. R. Spiders check plant hopper population. I. R. R. N. 1979, 4 (3) 18.

- 12 Balakrishna Pillai, K., Nair, N. R. and Thomas, M. J. Relative susceptibility of some rice varieties infested by rice leaf roller. Agri. Res. Journal, Kerala. 1979. 17 (2) 298.
- 13 Thomas, M. J., and Rajan, K. M. A new record of Cu entomogenous fungus in rice earhead cut worm. Presented in National Symposium on Microbiology held at Hissar in 1979. Abstract published in special issue of Indian Journal of Microbiology.
- 14 Performance of Cowpea varieties in sandy loam rice fallows—Agri. Res. Journal, Kerala.
- 15 Introduction of improved varieties of groundnut in sandy summer rice fallows. Agri. Res. Journal, Kerala.
- 16 Performance of Blackgram varieties in sandy summer rice fallows
- 17 Catch crops for summer rice fallows—International Rice News Letter
- 18 Effect of depleted nutrition on the incidence and intensity of Blast and Brown spot disease of rice. Agri. Res. Journal, Kerala.
- 19 Incidence of Whorl maggot in Onattukara, Kerala. International Rice News letter.
- 20 Role of Potash in the occurrence of Browning in rice. Indian Potash Journal.
- 21 Sasidhar, V. K. A note on the performance of ginger (*Zingiber officinale*) under graded doses of nitrogen. Agri. Res. Journal, Kerala. 1979. 17 (1) 103-104.
- 22 Sasidhar, V. K. Effect of split doses and time of nitrogen application on growth and yield of direct sown rice in puddled soil.
- 23 Sasidhar, V. K. Response of sesamum variety, Kayamkulam-1 to graded doses of phosphorus and potash in the red loam soils of Vellayani. Agri. Res. Journal, Kerala. 1979. 17 (1) 99-100.
- 24 Sasidhar, V. K. Relative efficiency of different herbicides on rice under semi dry conditions—Agri. Res. Journal, Kerala. 1979. 17 (1) 14-17.
- 25 Sasidhar, V. K. Production potential and economics of seven rice based crop rotations—Agri. Res. Journal, Kerala. 1979. 17 (1) 111-112.
- 26 Sasidhar, V. K. Efficiency of complex fertilizers on rice —Agri. Res. Journal, Kerala. 1979. 17 (1) 111-112.
- 27 Sasidhar, V. K., Studies on the crude protein contents of Guinea grass and component crops under different spacings — Agri. Res. Journal, Kerala. 1979. 17 (1) 85-87.
- 28 Sasidhar, V. K. Root studies in cashew air layers and seedlings. Presented in the international symposium on cashew held at Cochin during 1979.
- 29 Sasidhar, V. K. Studies on the yield and quality of Guinea grass (*Panicum maximum* J) as affected by different spacings with and without legumes as intercrops. Agri. Res. Journal, Kerala. 1979, 17 (2) 183-188.

- 30 Sasidhar, V. K. Economics of intercropping in Guinea grass (*Panicum maximum* J) Agri. Res. Journal, Kerala, 1979, 17 (2) 267-269.
- 31 Sasidhar, V. K. Effect of moderate nitrogen application on high yielding varieties of rice, Indian Journal of Agronomy 1979, 24 (3) 307-309.
- 32 Vijayagopal, P. D. Attempts on breaking self incompatibility in ginger Agri. Res. Journal, Kerala 1979, 17 (2).
- 33 Vijayagopal, P. D. Floral biology of ginger, *Zingiber officinale*.
- 34 Vijayagopal, P. D. Permanent manurial experiment in paddy. Agri. Res. Journal, Kerala, 1979, 17 (1) 18-21.
- 35 Potty, N. N., Radhakrishnan, T. C., Asokan, P. K., A note on the early growth and performance of six varieties of pepper in the multistoreyed cropping programme in coconut gardens-Agri. Res. Journal, Kerala, 1979, 1 (1).
- 36 Potty N. N., Asokan, P. K., Radhakrishnan T. C., Performance of nine Varieties of turmeric, (*Curcuma longa*) in coconut gardens. Agri. Res. Journal, Kerala, 1979, 17 (1).
- 37 Radhakrishnan, T. C. Occurrence of cylindrocladium leaf spot of clove at Pilicode. Macco, Agri. Digest, 1980, 4 (10).
- 38 Radhakrishnan, T. C. 1980-Occurrence of leaf spot disease of Cinnamon at Pilicode. Macco Agri. Digest, 4 (11)
- 39 Kannan, K. and Narayanan Nambiar, P. K. Mother palm and seedling selection in coconut -Agri. Res. Journal, Kerala, 1979, 17 (1).
- 40 Kannan, K. Pepper in Multilevel cropping programme in Coconut gardens-Indian Cocoa, Arecanut & Spices Journal. 1979, 3 (1).
- 41 Mathai, G. Diseases of oil palm and their relations to those of coconut Indian Coconut Journal, Vol. X. No. 2
- 42 Mathai, G. Effect of cultural practices on the yield of coconut palm Indian Coconut Journal Vol. X. No.5
- 43 Mathai, G., Thomas B. A note on the sequence of occurrence and intensity of token symptoms of root (wilt) disease on coconut seedling palm-Indian Coconut Journal, Vol. X No.7
- 44 Sasikumaran, S. Kandaswamy, T. K., and Vidyasekharan, P., Studies on the Physiology of leaf curlvirus infected Tomato Plants. Indian Journal of Phytopathology, 1980.
- 45 Chandy, K. C., Sukumara Pillai, Functional differentiation in the shoot system of pepper vine (*Piper nigrum* Linn) Indian Spices XVI (3) 8-11
- 46 Sukumara Pillai, V., Chandy, K. C., Sasikumaran, S. and Nambiar P. K. V. Response of Panniyur-1 variety of pepper to nitrogen and lime application. Indian Cocoa, Arecanut and Spices Journal III (2) 35-38
- 47 Chandy, K. C., Sukumara Pillai V., Nambiar, P. K. V. Occurrence of abortive spikes in pepper Agri. Res. Journal, Kerala, 17 (1) 148-150

- 48 Sukumara Pillai, V., Chandy, K. C, Grow pepper in flower pots. Indian Horticulture, April-June, 1980.
- 49 Chandy, K, C. Sukumara Pillai, V. and Nambiar P. K. V. Effect of E. M. S. on vegetative buds of pepper. Indian Cocoa, Arecanut and Spices Journal III (4). 93-94.
- 50 Marykutty, K. C. Nambiar I. P. S., Balakrishnan, S., Nayar M. N, C., Effect of storage of Banana suckers Var. Robusta-Agri. Res. Journal Kerala, 17 part (2) 1979.
- 51 Nambiar, I. P. S., Balakrishnan, S. Marykutty K. C. Influence of desuckering and retention of varying number of suckers on Plant growth and yield of banana. Agri. Res. Journal Kerala, 17 Part (2) 1979.
- 52 Krishnan Nair, B. R, The Malabari goats. Summer Institute on Goat production held at Mathura during July 1979.
- 53 Krishnan Nair, B. R. Effects of certain genetic and non-genetic factors on the secondary sex ratio on goats. Kerala Journal of Vety. Science, 10 (1) 1979. 1to8
- 54 Kunjikutty, N, Studies on the growth rate, feed efficiency and digestibility coefficient of nutrients in Alpine-Malabari crossbred Kids.
- 55 Kunjikutty N, Studies on the protein requirement of Alpine-Malabari cross bred kids
- 56 Kunjikutty, N, Studies on the energy requirement of Alipine-Malabari cross bred kids.
- 57 Kunjikutty, N, Studies on the calcium and phosphorus requirement of the Alpine-Malabari crossbred kids - Kerala Journal of Vety. Science.
- 58 Joseph Mathew. Incidence of Testicular Degeneration in Goats.
- 59 Joseph Mathew Observation on the remnants of the Wolffian and Mulleran Duct system In Bucks. Kerala Journal of Vety. Sciences.
- 60 Ramachandran, K. M, Incidence of Kid mortality in Kerala. Kerala Journal of Vety. Sciences.

Research notes

- 1 Tapioca leaf meal as cattle feed.
 - 2 Tapioca starch waste as livestock feed.
 - 3 Silk cotton seed cake as livestock feed.
 - 4 Tea waste as livestock feed.
 - 5 Coffee husk as cattlefeed
- Three popular articles were also published.

Appendix VI

PROJECT CO-ORDINATION GROUPS

A. AGRICULTURE

1 Rice:

Project Co-ordinator—Sri. P. N. Pisharody

Members—Dr. V. Gopinathan Nair, Sri N. Rajappan Nair, Dr. K. Karunakaran, Sri. K. I. James. Sri. T. F. Kuriakose, Sri. P. J. Tomy, Dr. V. K. Sasidhar, Sri. P. K. Gangadhara Menon, Dr. R. S. Aiyer, Sri. N. N. Ramankutty, Dr. C. C. Abraham, Dr. M. J. Thomas. Dr. M. C. Nair.

2 Coconut, Arecanut & Oilpalm

Project Co-ordinator—Sri. K. Kannan

Members—Sri. B. Thomas, Sri. E. P. Koshy, Dr. P. K. Narayanan Nambiar, Dr. C. Sreedharan, Dr. R. Vikraman Nair, Dr. T. V. Viswanathan, Dr. A. I. Jose, Dr. T. S. Venkitesan, Dr. M. C. Nair, Dr. S. K. Nair.

3 Spices, Cocoa and Other beverage crops;

Project Co-ordinator—Dr. N. Mohanakumaran

Members—Dr. L. Rema Devi, Sri. V. Sukumara Pillai, Dr. N. Krishnan Nair, Dr. K. Kumaran, Dr. R. Vikraman Nair, Dr. C. C. Abraham, Dr. T. S. Vankitesan, Sri. S. Balakrishnan, Dr. Abi Cheeran.

4 Cashew and Fruits:

Project Co-ordinator—Sri. V. K. Damodaran

Members—Dr. N. Krishnan Nair, Dr. K. Kumaran, Sri. K. Kannan, Sri. S. Balakrishnan, Dr. N. Mohanakumaran, Sri. M. K. Mammen, Sri. P. Sethumadhavan, Dr. M. N. C. Nair, Sri. G. Sreekantan Nair, Sri. G. Madhavan Nair, Sri. P. C. Jose, Associate Professor Cashew Research Station, Anakkayam, Associate Professor—Cashew Research scheme, Madakkathara.

5 Vegetable and Tuber crops:

Project Co-ordinator—Dr. P. K. Gopalakrishnan

Members—Dr. Mary, K. George, Sri. P. K. Asokan, Dr. K. V. Peter, Sri. P. Sethumadhavan, Sri. S. Balakrishnan, Dr. N. Mohanakumaran, Dr. T. S. Venkitesan, Dr. C. K. Peethambaran.

6 Pulses and oil seeds:

Project Co-ordinator—Dr. V. Gopinathan Nair

Members—Dr. Mary K. George, Dr. T. V. Viswanathan, Smt. Santhakumari, Associate Professor, Pulses Scheme, R.R.S. Pattambi Dr. V. K. Sasidhar, Sri. T. F. Kuriakose, Sri. A. I. Thomas, Sri. M. R. C. Pillai, Dr. R. S. Aiyer, Dr. P. J. Joy, Dr. Abi Cheeran.

- 7 Essential oils and Medicinal Plants:**
 Project Co-ordinator—Dr. Mary, K. George
 Members—Sri. E. V. G. Nair, Dr. A. I. Jose, Sri. T. Prabhakaran, Dr. T. V. Viswanathan, Sri. M. K. Mammen, Professor of Pharmacology Sri. V. Sukumara Dev, Sri. G. Indrasenan.
- 8 Post-harvest Technology & Nutrition:**
 Project Co-ordinator—Sri. K. K. Vidyadharan
 Members—Sri. Luckins C. Babu, Dr. K. V. Mammen, Dr. Jose Samuel, Dr. K. V. Peter, Sri. P. Sethumadhavan, Sri. V. Sukumara Dev, Dr. Susamma Philip, Dr. S. K. Nair, Dr. L. Prema, Associate Professor-Agrl. By Products Scheme, College of Veterinary & Animal Sciences, Mannuthy.
- 9 Sugarcane & Other miscellaneous crops like cotton, jute, millets etc:**
 Project Co-ordinator—Dr. K. M. N. Namboodiri
 Members—Sri. A. I. Thomas, Dr. R. Vikraman Nair, Sri. S. Sukumaran Nair, Sri. K. Ravindran Nair, Sri. P. K. Chellappan Nair, Sri. K. Chandrasekharan Nair, Dr. M. C. Nair.
- 10 Fodder Crops:**
 Project Co-ordinator—Dr. C. Sreedharan
 Members—Dr. V. Gopinathan Nair, Sri. G. Raghavan Pillai, Sri. K. P. Madhavan Nair, Sri. T. F. Kuriakose, Dr. M. C. Nair, Fodder Research officer—Fodder Research Scheme, Mannuthy, Associate Professor—Livestock Research station, Thiruvazhankunnu.
- 11 Plant Protection**
 Project Co-ordinator—Dr. N. Mohandas
 Members - Sri. K. P. Madhavan Nair, Dr. K. P. Rajaram, Dr. C. C. Abraham, Dr. Abraham Jacob, Dr. T. S. Venkitesan, Dr. M. C. Nair, Dr. Abi Cheeran, Dr. K. M. Rajan, Dr. James Mathew, Dr. S. K. Nair.
- 12 Soils and Agronomy:**
 Project Co-ordinator—Dr. K. P. Rajaram
 Members—Dr. C. Sreedharan, Dr. R. Vikraman Nair, Dr. V. K. Sasidhar, Sri. P. J. Tomy, Dr. R. S. Aiyer, Dr. P. Padmaja, Dr. A. I. Jose, Sri. P. K. Gangadhara Menon, Sri. N. N. Ramankutty.
- 13 Farm Economics and Extension:**
 Project Co-ordinator—Sri. A. G. G. Menon
 Members—Sri. E. J. Thomas, Sri. K. S. Karayalar, Sri. E. R. Narayanan, Nair, Dr. V. Radhakrishnan, Dr. K. Mukundan, Dr. T. Prabhakaran Sri. P. Ramachandran Nair, Dr. A. M. Thampy.

14 Soil Conservation & Mechanisation:

Project Co-ordinator-Dr. Jose Samuel

Members-Sri. T. P. George, Sri. P. Jacob John, Sri. A. K. George, Dr. P. Balakrishna Pillai, Sri. John Thomas, Sri.K. P. Madhavan Nair.

15 Cropping Patterns and Farming Systems.

Project Co-ordinator-Dr. V.K. Sasidhar,

Members-Sri. P. N. Pisharody, Dr. K. P. Rajaram, Sri. N. Rajappan Nair, Sri. K. I. James, Sri. K. Kannan, Dr. N. Mohanakumaran, Dr. C. C. Abraham, Dr. Abi Cheeran, Dr. Anantha Subramanyam Dr. K. Karunakaran, Dr. R. Vikraman Nair, Sri. P. J. Tomy.

B. VETERINARY & ANIMAL SCIENCES

1 Cattle and Buffaloes

Project Co-ordinator- Dr. T. R. Bharathan Namboothiripad
(upto 13.2.1980)

Members- Dr. M. Subramanyam, Dr. C. P. Neelakanta Iyer, Dr. R. Kalyana Sundaram, Dr. G. Mukundan, Dr. E. Sivaraman, Dr. M. Krishnan Nair, Dr. D. Nirmalan, Dr. C. K. Thomas, Dr. T. G. Rajagopalan, Dr. K. Pavithran, Dr. A. Rajan, Dr. C. R. Anantha Subramanyam, Dr. C. S. James.

2 Goat Improvement

Project Co-ordinator-Dr. G. Mukundan

Members- Dr. B. R. Krishnan Nair, Dr. K. M. Ramachandran, Dr. E. N. Kunjukutty, Dr. B. Nandakumar, Dr. Joseph Mathew.

3 Poultry and Ducks

Project Co-ordinator-Dr. A. Ramakrishnan

Members- Dr. C. K. Venugopalan, Dr. R. Kalyanasundaram, Dr. Maggie D. Meenachery, Dr. A. Rajan, Dr. G. Nirmalan, Dr. Sosamma Iype.

4 Pig and other Animals

Project Co-ordinator- Dr. T. G. Rajagopalan

Members- Dr. P. K. Abdulla, Dr. C. T. Thomas, Dr. M. Krishnan-Nair, Dr. C. R. Ananthasubramanyam, Dr. G. Nirmalan.

5 Artificial Insemination and Animal Reproduction

Project Co-ordinator- Dr. C. P. Neelakanta Iyer.

Members- Dr. T. R. Bharathan Namboothiripad, Dr. V. Sudersan, Dr. P. K. Abdulla, Dr. A. Rajan, Dr. C. T. Thomas, Dr. M. S. Nair, Dr. E. Madhavan.

6 Animal Diseases

Project Co-ordinator- Dr. A. Rajan

Members- Dr. M. Krishnan Nair, Dr. E. P. Paily, Dr. P. K. Abdulla, Dr. R. Kalyanasundaram, Dr. Jacob V. Cheeran, Dr. N.M. Aliyas, Dr. C. P. Neelakanta Iyer, Dr. P. O. George.

7 Miscellaneous

Project Co-ordinator- Dr R. Padmanabha Iyer

Members- Dr. P. U. Surendran, Dr. G. R. Nair, Dr. T. Prabhakaran, Dr. P. S. Pushkaran, Dr. E. Nanu.

Appendix VII

LIST OF NEW RESEARCH SCHEMES APPROVED DURING 1979-80

A. AGRICULTURE

1 Rice

- 1 The utility of an indigenous source of magnesium silicate for rice in Kuttanad. (PG—Vellayani).
- 2 Etiology and control of bacterial leaf blight of rice incited by *Xanthomonas oryzae* (Oyeda & Ishiyam) Dowson. (PG—Vellayani).
- 3 Evaluation of newer fungicides against diseases of rice, especially rice blast. (PG—Vellanikkara).
- 4 Varietal evaluation of early upland rice cultures. (Vellanikkara).
- 5 Periodical planting trial with Cul. 31-1 as compared to the second crop variety. Ptb-20 (Kayamkulam).
- 6 Evaluation of the selected cultures of the cross M-24 (Kochuvithu x IR8/MOI x IR8 (Moncompu).
- 7 District trial with Cul. 31-1 cross: Kottarakkara— I x Poduvi. (Kayamkulam).
- 8 Varietal-cum-manurial trial for short duration rice (Pattambi).
- 9 Studies on the utility of Azolla and Blue green algae for wet land rice culture. (AICRIP, Pattambi).
- 10 Studies on the efficiency of different formulations of urea treated with N-serve in increasing the nitrogen use efficiency of rice. (AICRIP, Pattambi).
- 11 Increasing the efficiency of applied fertilizer nitrogen in sandy loam soils. (Kayamkulam).
- 12 Response of rice to micronutrients in the irrigated sandy loam soils. (Chalakydy).
- 13 Weed control in direct sown upland rice. (Pattambi).
- 14 Screening rice varieties for sheath blight disease. (Pattambi).
- 15 Chemical control of sheath blight disease of rice. (Pattambi).
- 16 Studies on the control of the sheath blight disease of rice. (Vellayani).
- 17 Chemical control of blast disease of rice. (Pattambi).
- 18 New Insecticides Trial. (NIT-I, Granules) (AICRIP, Pattambi).
- 19 New Insecticides Trial. (NIT-II, Sprays) (AICRIP, Pattambi).
- 20 Insect pest control trial. (IPCT) (AICRIP, Pattambi).
- 21 Pest management trial. (PMT) (AICRIP, Pattambi).
- 22 Economic Insect Pest Control Trial. (EPCT) (AICRIP, Pattambi).
- 23 Brown plant hopper screening and bio-type studies. (AICRIP, Pattambi).
- 24 Gall midge screening (AICRIP, Pattambi).
- 25 Gall midge bio-type study. (GMBS) (AICRIP, Pattambi).
- 26 National Screening nursery. (AICRIP, Pattambi).

- 27 Forecasting of brown plant hopper, stem borer of paddy and their natural enemies in the lower Kuttanad area of Kerala (Moncompu).
- 28 Investigations on seasonal constraints and productivity status in major rice varieties as a transplanted crop (Pattambi).
- 29 Utilization of non-edible oil cakes in increasing the nitrogen use efficiency of rice (PG-Vellayani).
- 30 Nutrient dynamics and residual effects of permanent manurial experiments with rice (PG-Vellayani).
- 2 **Coconut, Arecanut and Oil palm**
 - 1 Mineral nutrition of high yielding coconut genotypes (Vellanikkara).
 - 2 Effect of continued NPK fertilization on the growth and yield behaviour of coconut with special reference to potash nutrition and its inter-relation with other mineral nutrients (PG-Vellayani).
 - 3 Biometric studies on second generation selfed and sibmated progenies of west coast tall coconut (PG-Vellanikkara).
- 3 **Spices, Cocoa and other beverage crops**
 - 1 Bacterial leaf spot of pepper (*Piper nigrum*) incited by *Xanthomonas betlicola* Patel *et al* (PG-Vellayani).
 - 2 Studies on the *Phyllosticta* leaf spot of ginger (PG-Vellanikkara).
 - 3 Studies on the microflora of stored pepper (PG-Vellanikkara).
 - 4 Quick wilt disease of pepper-II. The techniques for screening varieties against quick wilt disease caused by *Phytophthora palmivora* (Butler) (PG-Vellanikkara).
 - 5 Effect of mulching with different materials on the growth and yield of pepper (Panniyur).
 - 6 Intercropping in pepper gardens (Panniyur).
 - 7 Fertilizer trials on local varieties of pepper in cultivators' field (Panniyur).
 - 8 Varietal-cum-fertilizer studies on pepper grown as an intercrop in coconut gardens, using coconut palms as standard (Balaramapuram).
 - 9 Studies on the pollen morphology and pollen viability in three varieties of cardamom (Pampadumpara).
 - 10 Effect of plant growth regulators on flowering and fruit set in cardamom (Pampadumpara).
 - 11 Studies on the symptomatology, etiology and control of the new bacterial disease of ginger in Wynad (Ambalavayal).
 - 12 Storage trial on ginger (Vellanikkara).
 - 13 Small scale fermentation of cocoa beans (Vellanikkara).
 - 14 Studies on processing of cocoa (Vellanikkara).
 - 15 Effect of different mulching materials and soil moisture content on the growth and yield of cocoa interplanted in coconut gardens (Nileshwar).
 - 16 Effect of different planting materials on the yield and quality of turmeric (Vellanikkara).

- 17 Varietal trial and maturity studies on turmeric (Veliyani).
- 18 The relationship between soil nutrient status and foliar analysis of cocoa of different age groups in the various soil types of Kerala (PG-Vellayani).
- 19 Investigations on the nutrition of Black pepper (PG—Vellanikkara)
- 20 Genetic variability and correlation studies in cocoa (PG—Vellanikkara)
- 21 Foliar diagnosis, yield and quality of pepper in relation to NPK (PG—Vellanikkara).
- 22 Foliar diagnosis, yield and quality of pepper in relation to NPK (PGVellanikkara)
- 4 Cashew and fruits:**
 - 1 Relative susceptibility of cashew types to infestation by *Helopeltis antonii* Sign. (Hemiptera, Miridae) (PG—Vellanikkara)
 - 2 Pollination studies, including assisted pollination in cashew (Vellanikkara).
 - 3 Studies on F_2 progenies and double cross hybrids in cashew (Vellanikkara).
 - 4 Varietal testing of superior cashew type in coastal sandy area (Anakkayam)
 - 5 Foliar diagnosis in cashew (Vellanikkara).
 - 6 Performance evaluation of cross protected acid lime (Vellanikkara).
 - 7 Adaptability studies on grape varieties (Vellanikkara).
 - 8 Effect of different plant growth regulators on rooting and subsequent performance of air layers in jack (Vellanikkara)
 - 9 Effect of different ratios and levels of NPK on growth yield and quality of banana (Kannara).
 - 10 Population density trials in banana under rainfed conditions. (Kannara)
 - 11 Potash requirements of pineapple (Kannara)
 - 12 Cyto-taxonomical studies on banana cultivars (PG—Vellanikkara)
 - 13 Intracloonal variation and nutritional studies in banana cv. Palayan-kodan (PG—Vellanikkara),
 - 14 Variability in the F_1 population of cashew (PG—Vellanikkara)
 - 15 Maturity and post harvest studies in Mango (PG—Vellanikkara)
 - 16 Floral biology, pollination and fruit development in pineapple (PG—Vellanikkara)
- 5 Vegetable and Tuber crops:**
 - 1 Germplasm collection and maintenance of tropical tuber crops (Nileswar)
 - 2 Studies on the levels, frequency and stage of fertilization of cassava varieties, M4 and H 2304 (Nileshwar).
 - 3 Response to application of sulphur containing fertilizers in tapioca (Vellayani).

- 4 Crop logging studies in cassava wilt special reference to N, P. and K (Niteshwar).
- 5 Post harvest stage of fresh tapioca tubers at the farm level and for transport to the cities for industrial and domestic consumption (Vellayani).
- 6 Studies on the economization of planting material in elephant foot yam (*Amorphophallus campanulatus*).
- 7 Standardisation of picking maturity in cucurbitaceous vegetables (Vellanikkara).
- 8 Collection, evaluation and selection of improved chilli varieties, *Capsicum* spp. (Vellanikkara).
- 9 Screening chilli cultivars against leaf curl complex and isolation of resistant lines (Vellayani)
- 10 Selection of superior types of *Capsicum annum* with economic attributes from the segregating generation of intervarietal crosses (Vellayani).
- 11 Screening the germplasm collection of amaranthus for yield, quality and adaptability (Vellayani)
- 12 Studies on the levels, frequency and stage of fertilization in cassava (Mannuthy).
- 13 Survey, collection and maintenance of germplasm in brinjal, cucurbits and their wild relatives (Vellanikkara).
- 14 Breeding for polygenic resistance in chilli against leaf curl and mosaic complexes [Vellanikkara]
- 15 Isolation and release of a bacterial with resistant brinjal variety [Vellanikkara]
- 16 Trials with Ethephon, NAA and GA in bitter gourd and sanke gourd to increase production [Vellayani].
- 17 Determination of optimum time of sowing of carrot Var. India Long Red in Kerala [Vellanikkara].
- 18 Use of bio-active water in vegetable production [Vellanikkara].
- 19 Uniformity trial on vegetable crops [Vellanikkara].
- 20 Screening brinjal [*Solanum melongena* L] genotypes for resistance to bacterial wilt disease [PG—Vellayani]
- 21 Inheritance of clusterness, deepred colour and desalkness in chilli [PG—Vellanikkara].
- 22 Relative effectiveness of hybrids and physical mixtures to improve productivity and disease resistance in chilli [PG—Vellanikkara].
- 23 Genetic cataloguing of tomato germplasm towards isolation of lines resistant to wilt [PG—Vellanikkara].
- 24 Phenotypic stability analysis in bhindi [PG—Vellanikkara]
- 6 **Pulses and Oil Seeds:**
 - 1 Screening seasmum varieties for single crop fallows/upland culture/modan land cultivation [Pattambi].
 - 2 Comparative yield trial of promising sesamum varieties [Kayamkulam]

- 3 Evolving suitable agronomic methods to obtain uniform population and maximum yield in the bulk crop of sesamum [Kayamkulam].
- 4 Fertilizer management practices for the multipoded mutant of Kayamkulam-1 [Kayamkulam].
- 5 Effect of graded levels of nitrogen, phosphorus and potassium on the growth and yield of sesamum under upland conditions [Pattambi].
- 6 Chemical weed control in sesamum (Kayamkulam).
- 7 Storage trials in sesamum (Kayamkulam).
- 8 Investigations of diseases occurring on sesamum in the upland areas of Kerala (Pattambi).
- 9 Studies on cultural and management practices on groundnut in the sandy loam soils of Onattukara paddy fields (Kayamkulam).
- 10 Screening cowpea varieties for local adaptability and high grain yield potential [Veliayani].
- 11 Screening cowpea genotype suitable for mixed cropping with tapioca [Pattambi].
- 12 Breeding for long podded vegetable types of cowpea [Pattambi].
- 13 Cowpea co-ordinated varietal trial [Pattambi].
- 14 Response to application of sulphur by cowpea [Veliayani].
- 15 Screening for promising varieties of blackgram suitable for summer rice fallows [Pattambi].
- 16 Blackgram co-ordinated varietal trial [Pattambi].
- 17 Horsegram co-ordinated varietal trial [Pattambi].
- 18 Manurial trial on horsegram [Mannuthy].
- 19 Screening of greengram [*Phaseolus aureus*] Roxb. varieties for local adaptability and grain yield [Vellayani].
- 20 Seed storage studies on pulses—Evaluation of different containers for storing cowpea seeds under Kerala conditions [Pattambi].
- 21 Effect of graded doses of lime and phosphorus on the growth, yield and quality of Blackgram [Vellayani].
- 22 Effect of graded doses of lime and phosphorus on the growth, yield and quality of greengram [Vellayani].
- 23 Methods to increase the efficiency of seed treatment with *Rhizobium* in cowpea [Vellayani].
- 24 Effect of pelleting of cowpea seeds with micronutrients on nodulation, nitrogen fixing capacity and quality [Veliayani].
- 25 Breeding groundnut varieties suited to the different agro-climatic conditions in Kerala [PG—Vellayani].
- 26 Nitrogen management in grain cowpea (*Vigna sinensis*) [PG—Vellayani].
- 27 Studies on the performance of bunch and semi-spreading varieties of groundnut (*Arachis hypogea*) under different levels of foliar and soil application of boron [PG—Vellayani].

- 28 Evaluation of the productivity of the selected sesamum genotypes [PG—Vellayani].
- 29 Effect of lime, phosphorus and *Rhizobium* inoculation on the growth, yield and chemical composition of cowpea [PG—Vellayani].
- 30 Seasonal influence of spacing, nitrogen and potash on grain cowpea under coconut garden conditions [PG—Vellayani].
- 31 Physiological effects of growth regulators and nitrogen in greengram [PG—Vellayani].
- 32 Diallel analysis in greengram, *Phaseolus aureus* Roxb. [PG—Vellayani].
- 33 Effect of levels of K and rhizobial culture inoculation on the growth and yield of soyabean [PG—Vellayani].
- 34 Comparative performance of soyabean varieties [PG—Vellayani].
- 35 Investigations on intra-varietal F₂ hybrids in cowpea [PG-Vellayani].
- 7 Essential Oils and Medicinal Plants**
 - 1 Sprouting efficiency at different portions of the vine, *Dioscorea floribunda* [Odakkali].
 - 2 Identification of some unknown species of essential oil yielding plants [Odakkali].
 - 3 Comparative yield trial of promising types screened from the preliminary yield trials [Odakkali].
 - 4 Adaptability studies of North Indian Vetiver hybrids [Odakkali].
 - 5 Effect of various parts of tuber when used as planting material with regard to yield of tuber and diosgenin content [Odakkali].
 - 6 Studies on the changes taking place in the physical and chemical properties of lemongrass oil during prolonged storage [Odakkali].
 - 7 Effect of antioxidants on the keeping quality of lemongrass oil kept in darkness [Odakkali].
 - 8 Effect of time and pressure of steam in the distillation of the essential oil yielding crops [Odakkali].
 - 9 Introduction and adaptation studies of medicinal plants [Ambalavayal].
 - 10 Influence of applied nutrients and stage of harvest on the yield and physico chemical properties of essential oil of palmarosa (*Cymbopogon martini*) [PG—Vellayani].
 - 11 Evaluation of the production potential of induced lemongrass mutants [PG—Vellayani].
 - 12 Induction of autotetraploids in lemongrass [PG—Vellayani]
 - 13 Morphological and phyto-chemical investigations on species of *Solanum* [PG—Vellanikkara].
 - 14 Yield and quality constituents in *Costus speciosus* under varying levels of N, P & K [PG—Vellanikkara].
- 8 Post harvest Technology & Nutrition**
 - 1 Post harvest studies of cashew apple [Vellanikkara].
 - 2 Studies on the preparation of fermented beverages and pectin from cashew apple [Vellanikkara].

- 3 Nutritional profile of the Chola Naikars tribal community rehabilitated at Nilambur [Vellanikkara].
- 4 Effect of storage at room temperature and at refrigeration temperature on total acidity, total sugar, TSS etc. of jams, jellies, juices and cordials [Vellanikkara].
- 5 Loss of vitamin C in green leafy vegetables in conventional method of food preparation practiced in Kerala State [Vellayani].
- 6 Studies on the suitability of popular mango varieties in Kerala for canning [Vellanikkara].
- 7 Quality evaluation of promising mango varieties under Kerala conditions [Vellanikkara].
- 8 Studies on the optimum maturity and chemical composition of cashew apple for the preparation of different products [Vellanikkara].
- 9 Clarification of Cashew apple juice (Vellanikkara).
- 9 Sugarcane and other miscellaneous crops**
 - 1 Evaluation of varieties suitable for the different sugarcane tracts of Kerala (Vellanikkara, Thiruvalla, Punalur, Idukki, Chittoor).
 - 2 Screening of sugarcane varieties (Chittoor, Punalur, Thiruvalla, Idukki)
 - 3 Spacing-cum-manurial trial (Thiruvalla, Punalur, Chittoor).
 - 4 Fertilizer trial (Punalur and Chittoor).
 - 5 Reducing seed rate by using different planting materials (Chittoor).
 - 6 Ratoon management studies (Punalur, Thiruvalla, Chittoor).
 - 7 The best time of planting sugarcane (Punalur, Thiruvalla, Chittoor).
 - 8 Herbicidal control of weeds in sugarcane (Punalur).
 - 9 Effect of altitude on sugarcane seed material (Idukki, Ambalavayal).
 - 10 Companion crops in sugarcane fields (Punalur, Thiruvalla, Chittoor).
 - 11 Effect of soil amendment on yield of planted and ratoon sugarcane in acid soils (Thiruvalla).
 - 12 Introduction of sugarcane cultivation in Wynad on commercial basis (Ambalavayal).
 - 13 Screening of jute varieties for seed production (Moncompu).
 - 14 Trials on the possibility of cultivating jute for seed production in Onattukara region (Kayamkulam).
 - 15 Exploring the possibility of cultivating Mesta as a fibre crop and as a mixed crop in pineapple and tapioca growing regions (Punalur).
 - 16 Introduction and assessment of rose varieties used for internal market (AICFIP, Vellanikkara).
 - 17 Introduction and assessment of marigold varieties (AICFIP, Vellanikkara)
 - 18 Introduction and assessment of aster varieties (AICFIP, Vellanikkara).
 - 19 Introduction and assessment of hibiscus varieties (AICFIP, Vellanikkara).
 - 20 Collection and maintenance of orchids (Vellayani).
 - 21 Biometrical analysis of yield and yield attributes in para rubber, *Hevea braziliensis* Muell. Arg (PG-Vellayani).

- 22 Standardisation of tissue/meristem culture techniques in important horticultural crops (PG-Vellanikkara).
- 10 Fodder Crops
 - 1 Fodder Production potential of maize/legume mixtures in coconut gardens (PG-Vellayani).
 - 2 Fodder production potential of Sorghum/legume mixtures in coconut gardens (P. G. Vellayani).
 - 3 Induction of mutations in guinea grass *Panicum maximum* Jack (PG-Vellayani).
- 11 Plant Protection
 - 1 Studies on the pests of *Eupatorium oleratum* and *Lantana camera* (PG-Vellanikkara).
 - 2 Studies on the consumption, digestion and utilization of food plants by the caterpillar *Pericallia ricini* (Arctidae: Lepidopeta) (PG-Vellanikkara).
 - 3 Isolation and mass production of efficient cultures of *Rhizobium* (Vellayani).
 - 4 Studies on the residual toxicity of systemic insecticides infected in coconut palms (Vellayani).
 - 5 Survey of microbial pathogens associated with major insect pests of bhindi (Vellayani).
 - 6 Microbial diseases of stored products insects of Kerala and their utilization in pest control (Vellayani).
 - 7 Bacterial disease incidence in *Oryctes rhinoceros* grubs (Vellayani).
 - 8 Studies on the use of *Bacillus cercus* for the management of lepidopterous crop pests (Vellayani).
 - 9 Fungal leaf diseases of plant and leaf hoppers of rice (Vellayani).
 - 10 Nematode infesting rice crop in the Kozhikode district and extent of losses due to nematode infestation (Vellanikkara).
 - 11 Survey and identification of pest complex associated with Sugarcane in Kerala (Vellanikkara).
 - 12 Chemical control of Red palm weevil *Rhynchophorus ferrugineus* using stem injection techniques (Kumarakom).
 - 13 Compatibility of 2, 4-D with insecticides (Kumarakom).
 - 14 Control of pulse beetles (Mannuthy),
 - 15 Evaluation of different attractants for the red palm weevil *Rhynchophorus ferrugineus* (Kumarakom)
 - 16 Evaluation of breeding traps for Rhinoceros beetle, *Oryctes rhinoceros* (Kumarakom).
 - 17 Studies on the biological effects of juvenile hormone analogues on some important crop pests and natural enemy complex (Vellayani).
 - 18 Feeding habits and predator potential of frogs occurring in rice field environment (Moncompu).
 - 19 Management of *Bandicota bengalensis* (Vellanikkara),
 - 20 Controlling rodents infesting coconut gardens (Kumarakom).

- 21 Field and laboratory tests on the acceptability of paraffin-rice mixed baits to rodents in Kerala (Mannuthy).
- 22 Control of the parasitic weed *Striga lutea* in rice fields (Vellayani).
- 23 Screening cowpea varieties for resistance against collar rot and web blight disease (Vellayani).
- 24 Symptomatological and histopathological investigations on cassava mosaic disease (PG-Vellayani).
- 25 Strain variation in *Rhizoctonia solani* kuhn. *Thanateporus cucumeris* (Frank) Donk, causing sheath blight of rice (PG-Vellayani).
- 26 Insect mycosis caused by *Pacilomyces farinosus* (Dickson ex Fries) and the scope for utilising the pathogen in pest control (PG-Vellayani).
- 27 Interaction of nematodes and bacteria infecting Ginger (*Zingiber officinale*) PG-Vellayani).
- 28 Role of metal chelate complexes in inducing resistance to tissue borers of rice (PG-Vellayani).
- 29 Insecticide deposit and residues on paddy with reference to the volume of spray fluid applied at different growth stages of the crop (PG-Vellayani).
- 30 Host varietal specificity for *Rhizobium* for nodulation in groundnut (PG-Vellayani).
- 31 Etiology, survival and control of bacterial wilt of brinjal caused by *Pseudomonas solanacearum* (PG-Vellayani).
- 32 Collar rot and web blight of cowpea (PG-Vellayani).
- 33 Relative efficiency of insecticides in controlling tea mosquito bug infesting cashew (Vellanikkara).
- 34 Critical periods of weed infestation and effect of weed growth on yield and quality of a short duration direct sown rice under semidry conditions (PG-Vellayani).
- 35 Control of shoot and fruit borer of bhindi, *Earias fabia* stal (Noctuidae) with synthetic pyrethroids (PG-Vellayani).
- 36 Studies on the use of aluminum phosphide for the control of storage pests (PG-Vellayani).
- 37 Relative efficiency of certain herbicides for weed control in bhindi (PG-Vellanikkara).
- 38 Seed biology and seedling characteristics of important weeds in Kerala (PG-Vellanikkara).
- 39 Susceptibility of mango varieties to infestation by *Idiocerus* species (PG-Vellanikkara).
- 40 The pest complex infesting cashew inflorescence (PG-Vellanikkara).
- 41 Plant parasitic nematodes associated with pineapple in Kerala (PG-Vellanikkara).
- 12 **Soils and Agronomy:**
 - 1 Aggregate size distribution and its relationship to physical and chemical properties for some typical soils of Kerala (Vellanikkara).
 - 2 A preliminary study on the variation of soil moisture and moisture retention characteristics of some typical soils of Kerala (Vellanikkara).

- 3 Studies on the influence of raising cocoa as an intercrop in coconut gradens on the chemical and microbiological characteristics of laterite soil (Nileswar)
- 4 Utility of Azolla as a partial substitute to inorganic fertilizer for wet land rice culture (Kayamkulam).
- 5 Nitrogen economy in rice through algal fertilization in different soil Physical conditions (Vellayani).
- 6 Combined application of 2, 4-D and Urea (Moncompu).
- 7 Studies on the available sulphur status and different forms of sulphur in the uppland soils of Kerala (Vellayani).
- 8 Evaluation of water productivity in relation to fertilizer use and cropping intensity (PG-Vellayani).
- 9 Efficiency of applied nutrients in banana (cultivar, Nendran) under conditions of liming, split application and in presence of nitrification inhibitors (Vellayani).
- 10 Physico-chemical investigations on the crop hazards due to industrial pollution in the sandy soils of Trivandrum (PG-Vellayani).
- 11 Soil test crop response studies for nitrogen in Kerala soils (PG-Vellayani).
- 12 Shade response of common rainfed intercrops of coconut (PG-Vellanikkara).
- 13 Characterisation of soil organic matter in different soil types of Kerala (PG-Vellanikkara).
- 13 Farm Economics & Extension:**
 - 1 The credibility and utilization pattern of information sources by small farmers (PG-Vellayani).
 - 2 Role of rural youth in the agricultural development of rural areas (PG-Vellayani).
 - 3 An analysis of the role of Junior Agrl. Officers in implementing agricultural development programmes in Kerala (PG-Vellayani).
 - 4 Influence of leaders in the development of rural areas (PG-Vellayani).
 - 5 A study of the differential adoption of recommended agricultural Practices of selected crops (PG-Vellayani).
 - 6 A study of the influence of labour efficiency on the adoption of improved agricultural practices by farmers and the factors related to it (PG-Vellayani).
 - 7 Perception and employment of the principles of co-ordination at Intensive Paddy Development Unit level tn Kerala (PG-Vellayani).
 - 8 Effectiveness of the training programmes for farmers (PG-Vellayani).
 - 9 A study on gain in knowledge and attitude towards training supervisors attached to primary land mortgage banks (Vellayani).
 - 10 A study on gain in knowledge of JAO'S undergoing inservice training in the University (Vellayani).