ANNUAL REPORT

1977-78

KERALA AGRICULTURAL UNIVERSITY

VELLANIKKARA 680651 KERALA

(ENGLISH)
ANNUAL REPORT 1977 - 78
Copies 500
Printed at
KERALA AGRICULTURAL UNIVERSITY
PRESS, MANNUTHY
Proof:
Dr. N. GOPAKUMAR
Dr. P. J. JOY
Published in March 1979
Published by
THE DIRECTORATE OF EXTENSION EDUCATION
Kerala Agricultural University
Vellanikkara 680651 Kerala

CONTENTS

INTRODUCTION

1) The Executive Committee of the Kerala Agricultural University has great pleasure to present to the General Council, the Sixth Annual Report of the University for the period from 1-4-1977 to 31-3-1978.

2) Part I of the report gives general information about the administrative and organisational set up and general activities of the University; and part II relates to the Research work carried out by the University.

3) Sri. N. Kaleeswaran, I. A. S., continued to be the Vice Chancellor during the period under report. Sri. T. J. Paily, Additional Secretary to Government continued to be the Registrar till 31--7--1977. Sri. C. Poulose, Joint Secretary to Government assumed charge of the post of Registrar with effect from 1--8--1977 and continued as Registrar during the period under report. Sri P. Rajagopala Pillai, Deputy Secretary to Government continued as Comptroller. During the year, Dr. V. S. S. Potti continued as Director of Extension Education. Dr. R. Gopalakrishnan, Director of Reasearch relinquished charge of the post on 23-7-1977 and assumed charge of the Special Officer, Ecosystem in Kuttanad. Dr. V. S. S. Potti, Director of Extension Education continued to be in additional charge of the post of the Director of Research from 23-7-1977 to 31-3-1978. In the Faculty of Veterinary and Animal Sciences, Dr. P. G. Nair continued as Dean & Dr. N. Sadanandan continued to be the Dean of the Faculty of Agriculture. Sri. A. T. Devassy continued to be the Director of Physical Plant throughout the year. Sri. V. K. Damodaran, Associate Professor was holding charge of the post of the Associate Dean, College of Horticulture throughout the year.

4) During the period under report, there were a total number of 483 posts of teachers and 839 posts of non-teaching staff, besides 458 posts of class IV employees working under the University.

5) The total expenditure incurred by the University during the year came to Rs. 411.65 lakhs as against a total receipt of Rs. 431.65 lakhs including the grants received from the State Government and the I. C. A. R. The accounts for 1977-78 closed with a balance of Rs. 19.99 lakhs. The I. C. A. R. grant was Rs. 77.96 lakhs and the grant received from the State Government was Rs. 228.58 lakhs (Rs 70 lakhs under Plan and Rs. 158.58 lakhs under non-plan).

6) The Audit of accounts for the years 73-74 and 74-75 were completed and audit reports issued. 30 audit certificates were issued covering a total expenditure of Rs. 52 98 lakhs during the period under report.

7) The administrative set up of the University remained unchanged. But the Executive Committee which is the governing body of the University was re-constituted from 28--2--1978. 10 ordinary meetings and one special meeting were held by the Executive Committee. The General Council held 3 ordinary and one special meetings and the Academic Council held 5 meetings during the year under report. Important policy questions used to be discussed in the meetings of the statutory officers, and 7 such meetings were held during the year.

8) Two first statutes and 12 amendments to the existing statutes were issued during the period under report. A general pay revision based on parity with the Kerala University was effected from 1-1--1976 and orders in this regard were issued by the University in December, 1977.

9) The Headquarters of the University was shifted from Mannuthy to Vellanikkara in March, 1978. The Main campus was inaugurated by Sri. Morarji Desai, Prime Minister on 25-9-1977. The Prime Minister was warmly received by Sri. N. N. Wanchoo, Governor and Chancellor of the University, Sri. A. K. Antony, Chief Minister, Sri. K. Sankaranarayanan, Minister for Agriculture and Pro Chancellor of the University, Sri. C. H. Mohammed Koya, Minister for Education, Sri. K. K. Balakrishnan, Minister for Harijan Welfare and Irrigation and Sri. N. Kaleeswaran, Vice Chancellor of the University.

10) The following teaching institutions were functioning under the University:-

i) College of Agriculture, Vellayani, Trivandrum

ii) College of Horticulture, Vellanikkara, Trichur

iii) College of Veterinary & Animal Sciences, Mannuthy, Trichur, and

iv) Institute of Agricultural Technology, Tavanur, Malapouram District.

11) Courses are offered in the University leading to the award of B Sc. (Ag.), B. Sc. (Hort), B. V. Sc. & A. H., M. Sc. (Ag), M. Sc. (Hort), M. V. Sc., Ph. D. and Diploma in Agricultural Science in the above institutions.

12) The total number of teaching staff in the 3 colleges and I. A. T., Tavanur were 227 persons in position as against 240 sanctioned posts. Of these, 35 persons were Ph. D. holders

13) During the year the following additional posts were created in the teaching institutions.

Professors	: 5
Assoc. Professor	: 1
Asst. Professors	: 3

14) A new department of Fisheries was formed during the year under the Faculty of Verterinary & Animal Sciences. The existing department of Agricultural Chemistry under the Faculty of Agriculture was renamed as Department of Soil Science and Agrl. Chemistry and two new divisions were created under the above department namely Soil Physics and Agricultural Chemicals. Under the Department of Agrl. Entomology a new division was started for Nematology. The Microbiology and Virology divisions were started under the department of Plant Pathology. A new division namely Food Science and Nutrition was also started, under the Department of Agricultural Extension. Under the Faculty of Veterinary and Animal Sciences, the department of Bacteriology and Obstetrics and Gynaecology were renamed as Microbiology and Animal Reproduction.

15) The staff members were provided with facilities to acquire higher qualifications by granting deputation, study leave and study allowance, leave for study purpose etc. Five persons were deputed for Ph. D. and 15 persons were granted study leave and 23 persons were granted leave for study purpose. During the period under report two persons who have completed Ph. D. programme have rejoined. The participation in international and national seminars & conferences was given all encouragements. A total number of 47 persons from teaching institutions participated in such seminars, workshops, etc.

College of Agriculture	: 16
College of Horticulture	: 13
College of Veterinary & Animal Sciences	: 18

16) With a view to imparting wider technical knowledge and skill and also for giving practical field training the syllabii for various undergraduate courses were revised. The system of conducting the the qualifying examination for the Masters Degree. (M. Sc. (Ag), M. Sc. (Hort) and M. V. Sc.) was introduced during the year under report.

17) The following new post-graduate courses were also started during the year

i) M. V. Sc. in Animal Breeding & Genetics

ii) M. V. Sc. in Animal Management

18) During the year under report, 100 students were admitted to B. Sc. (Ag), 40 to B. Sc. (Hort) and 54 to B. V. Sc. & A. H. Courses. For post-graduate courses 37 students were admitted for M Sc. (Ag), 12 for M. Sc. (Hort) and 7 for Ph. D in the Faculty of Agriculture. In the Veterinary College, 24 students were admitted for M. V. Sc. and 2 for Ph. D. Fifty students were admitted to the Diploma Courses in Agriculture Science at the Institute of Agricultural Technology, Tavanur.

19) The total students strength in the Institutions was as follows:-

College of Agriculture, Vellayani	: 418
College of Horticulture, Vellanikkara	: 189
College of Vety. & Animal Sciences, Mannuthy	: 244
I. A. T. Tavanur	: 94

20) Out of 100 students admitted for B. Sc. (Ag) 50 students were admitted in the College of Horticulture, Vellanikkara, considering the facilities available in the College of Horticulture.

21) 28 students belonging to other states were admitted to various courses during the year under report including one from Nigeria. In the College of Agriculture, 260 students were benefited by the various scholarship sponsored by I. C. A. R., K.A.U. and other agencies. The number of students benefitted in the College of Horticulture during the year was 141, that in the College of Veterinary & Animal Sciences was 125 and the number in the Institute of Agricultural Technology, Tavanur was 12.

22) During 1977-78, 77 students of B. Sc. (Ag) 20 students of B. Sc. (Hort) and 20 from B. V. Sc. and A. H. have successfully come out. In the post-grauate programme, 17 M. Sc. (Ag) students and 18 M. V. Sc. students have got their post-graduate

degree. In the Agrl. Faculty, 2 students were awarded the Ph. D Degree.

23) The intake capacity of students in the hostels attached to the teaching institutions are as follows:-

i)	Agricultural College, Vellayani	300
ii)	Horticulture College, Vellanikkara	368
iii)	College of Vety. & Animal Sciences, Mannuthy	216
iv)	I. A, T. Tavanur	94

24) The Valedictory function of the Kerala Agricultural University Union was held on February 13 at the College of Agriculture, Vellayani. Shri. M. K. Hemachandran, Minister for Finance and Law was the Chief Guest.

25) The first youth festival of the University was held at Mannuthy under the auspicious of the University Union from July 21st to 23rd. Shri. N. N. Wanchoo, Governor of Kerala and Chancellor of the University inaugurated the activities of the Union. Shri. K. Sankaranarayanan, Minister for Agriculture and Pro-Chancellor of the University inagurated the festival.

Inter-University Football tournament (South Zone) was organised by Kerala Agricultural University from 16-9-1977 to 7-10-1977. Seventeen Universities participated in the tournaments Annual Inter-College tournaments in track and field, football, shuttle ball badminton, tennis and table tennis were organised. The students of the 3 constituent colleges actively participated in the National Service Scheme activities. A meeting of the University level advisory committee for National Service Scheme was held on march 27 under the Chairmanship of the Vice-Chancellor. The committee reviewed the activities of N. S S. Union of the 3 constituent colleges and also approved the activities proposed for the academic year 1978–1979.

26) The university has enunciated research policy to emphasise the need for research oriented towards solving the problems of farmers and maximising the use of farmers own resources as well as the use of land and labour towards better productivity. On the basis of the above policy, the research activities of the University have been made more comprehensive to cover all economically important crops grown in the State, new crops that could be successfully introduced, Animal Sciences covering cattle, buffaloes, goats, ducks, poultry and pigs. inland fisheries and integrated homestead farming. The total number of resarch projects implemented by the University during the year was 759. Of these, 278 projects under Agriculture and 22 projects under Veterinary and Animal Sciences were newly started. The discipline-wise, crop-wise/ animal wise and the station wise classification of Scheme are as detailed below:-

1. Discipline-wise Classification

	Agriculture:	
1	Plant Pathology	: 77
2	Agronomy	: 190
3	Horticulture	: 24
4	Agricultural Botany	: 143
5	Agricultural Chemistry	: 44
6	Agricultural Entomology	: 90
7	Agricultural Extension	: 19
8	Agricultural Statistics	: 6
9	Agricultural Economics	: 10
10	Agricultural Engineering	: 18
	Veterinary & Animal Sciences.	
11	Anatomy	: 3
12	Animal Management	: 5
13	Microbiology	: 8
14	Breeding and Genetics	: 11
15	Dairy Science	: 12
16	Extension	: 1
17	Fisheries	: 17
18	Preventive Medicine	: 2
19	Nutrition	: 18
20	Animal Reproduction	: 9
21	Parasitology	: 9
22	Patholoy	: 7
23	Pharmacology	: 4
24	Physiology & Biochemistry	: 6
25	Poultry Science	: 12
26	Statistics	: 6
27	Surgery	: 3
28	Therapeutics	: 3
29	Veterinary Public Health	: 6

2. Crop-wise/Animal-wise classification

1	Rice	: 151
2	Coconut	: 39
3	Oil Seeds	: 24
4	Pulses	: 18
5	Spices	:
	(i) Pepper	... 23
	(ii) Cardamom	... 11
6	Cashewnut	... 20
7	Essential Oils	... 17
8	Fruits and Plantation crops:	
	(i) Banana ii) Pineapple	... 45
	iii) Citrus and Other crops	... 17
9	Vegetable	... 11

10.	Sugarcane	... 5
11	Other crops	... 179
12.	Miscellaneous crops	... 61
		621

Animal-wise

1.	Cattle	... 53
2.	Pigs	... 15
3.	Goats	... 33
4.	Poultry	... 19
5.	Fisheries	... 18
		138

3. Station-wise classification

1.	Rice Research Station, Pattambi	... 76
2.	Rice Research Station, Mannuthy	... 8
3	Agronomic Research Station, Chalakudy	20
4.	Rice Research Station, Vyttila	... 10
5	Rice Research Station, Moncompu	... 53
6	Rice Research Station, Kayamkulam	30
7.	Rice Research Sub Station, Karamana	... 2
8.	Coconut Research Station, Pilicode	... 27
9	Coconut Research Station, Kumarakom	... 9
10.	Coconut Research Station, Balaramapuram	3
11	Pepper Research Station, Panniyur	... 23
12	Horticultural Res. Station, Ambalavayal	19
13.	Cashew Res. Station, Anakkayam	... 11
14.	Banana Res. Station, Kannara	... 45
15.	Lemongrass Research Station, Odakkali	... 17
16.	Cardamom Research Station, Pampadumpara	11
17.	Main Campus, Vellanikkara	... 15
18.	College of Agriculture, Vellayani	... 180
19.	College of Horticulture, Vellanikkara	... 56
20	Sugarcane Research Station, Thiruvalla	... 5
21.	Institute of Agri. Technology, Tavanur	... 1
		621

1.	Thiruvazhamkunnu	... 6
2.	Goat Research Porject	... 10
3.	Poultry Research Project	... 6
4.	Fodder Improvement	... 6
5.	Livestock Farm	... 2
6.	Pig Breeding Farm	... 3
7.	Cattle Breeding Farm. Thumbrumuzhi	... 2
8.	Research Project on Tumour	... 2
9	Research Project on Agrl Bye-Products	... 9
10	College of Vety. & Animal Sciences	... 92
		138

27. Research Programmes were taken up in the Research stations and farms under the University. The facilities for research were improved by way of providing adequate staff and infrastructural facilities. The important research work carried out during the year is briefly mentioned below:

28. A tall improved Rice variety "Suvarnamodan" (PTB.42) was released for cultivation in rainfed uplands during the year. This is a selection from the Assam Rice collections. It possesses the most important traits for an upland rice variety, ie., drought tolerance, high initial vigour, good canopy development and nonlodging. This variety has also been found promising under dry sown semidry system of cultivation in wet lands.

29. The Rice culture M-11-57-5-1 of the Moncompu Rice Research Station was recommended for release by the variety evaluation Committee.

30. Research work on cropping systems has been intensified. A new cropping pattern of Rice-Rice-groundnut has been found suitable for the sandy loam tract of Onattukara in Kerala. Fodder varieties suitable to be inter-cropped in Coconut gardens have been identified to develop a coconut based farming system. In the Rice based farming system a Rice-Rice-Fodder cowpea sequence along with maintenance of milch cows has been fo ind to be a useful cropping pattern. The variety "Karnataka local" has been fonud to be a good fodder cowpea in such a sytem.

31. The Research Stations at Pattambi, Mannuthy, Vyttila, Chalakudy, Kayamkulam Moncompu and Karamana had altogether 199 Research Projects under implementation. Of these 12 projects were on pulses under the KAU unit of the All India Co-ordinated Project for the improvement of pulses functioning at Pattambi.

32. Thirty two new Research Projects were started at these stations during the period under report.

33. A dual purpose cowpea variety "Kanakamani" (PTB.1) was released from the Rice Research Station, Pattambi. This is a selection from the varieties collected within the State. Dwarf plant type, long pods and maroon coloured seeds are the characteristics of this new variety. It is the first cowpea variety to be released from Kerala.

34. There were 39 Research projects in operation at the Coconut Research Stations functioning at Pilicode, Kumarakom and Balaramapuram.

35. Over and above these, 12 Research Projects under the Kerala Agricultural University unit of all

India Co-ordinated Research Project on Tuber crops were also going on at the Coconut Research Station, Pilicode.

36. During the period under report a scheme for mixed farming of crop, Livestock and Fish was started at the Kumarakom Research Station.

37. The Pepper Research Stations at Panniyur and Vellanikkara together were handling 27 Research Projects.

38. There were 22 research projects at Cashew Research Stations, Vellanikkara and Anakkayam.

39. At the Cardamom Research Station, Pampadumpara, 11 Research projects were under implementation.

40. All these stations functioned as Centres under the All India Co-ordinated Research project for implementing the scheme taken up on Cashew & Spices

41. The Banana Research Station, Kannara and Pineapple Research Centre at Vellanikkara campus together were dealing with 32 Research projects on Banana 17 projects on Pineapple and one each on Tapioca and Rubber.

42. At the Horticultural Research Station, Ambalavayal, there were a total 19 Research projects in progress out of which six each were on oranges and rice. The other projects were on Tapioca, ginger, turmeric and eucalyptus. One new research project on drip irrigation was started at the Banana Research Station, Kannara during the period.

43. A total of five sugarcane research projects were under implementation at Thiruvalla.

44. Seventeen research projects on various essential oil yielding plants were in progress at the Lemongrass Research Station, Oddakkali. Four new research projects were started during the period.

45. There were twenty Veterinary Research projects under implementation in the following research stations.

1) University Livestock Farm, Mannuthy
2) University Livestock Farm, Thiruvazhamkunnu
3) Cattle Breeding Farm, Thumburmuzhi
4) Poultry and Duck Farm, Mannuthy
5) Pig Breeding Farm, Mannuthy
6) Fodder Research Station, Mannuthy

46. Studies carried out with materials like tapioca leaves, starch waste, cotton seed and cake rubber seed and cake and fruit waste have revealed that tapioca leaf meal can be profitably incorporated in cattle rations and tapioca starch waste can profitably replace such costly ingredients as maize, tapioca chips etc. in the feed for cattle and pigs.

47. The Kerala Agricultural University achieved a major break through in Goat breeding for higher milk yields by crossing the indegenous Malabari breed with the Sannen and Alpine breeds of buck from Switzerland. The breeding programme is sponsored by the ICAR under All India Co-ordinated Research project on Goats for milk production.

48. All India Co-ordinated Project on Brakish water Fish farming was continued at the Rice Research Station, Vyttila. A total of nine new Research Projects on Fisheries were started during the year at the Station and in cultivators field. The availability of pure seed of the Tiger Prawn (Pinaeus Manodan) in appreciable quantities in the Cochin backwaters was established for the first time during the year. The culture of Tiger prawn was found to be promising in low saline areas of the State like Vyttila.

49. The following new research projects were started during the year.

1) AICRIP on Nematode pests and their control	ICAR Scheme
2) AICRIP on biological control of crop pests	
3) KADP Research and Training by K. A. U.	Sponsored by the Cashew Export Promotion Council.
4) Project for studies on the pests of stored cashew and their control	

50. The total strength of teaching staff in the research stations alone, during the year was 243 of which 33 posts were newly created. As against the above, 214 teachers were in position.

51. Two persons were deputed from the Research Stations for undergoing Ph. D. programme. The number of persons who were granted study leave and leave for study purpose were as given below:-

Study leave	-8
Leave for study purpose	-26

52. Four meetings of the Faculty Research Committee for Agriculture were held and 278 projects were cleared. The number of Faculty Research Committee meetings of Veterinary and Animal Sciences held during the period were 2 during which 22 projects were cleared.

53. The Golden Jubilee of the Rice Research Station, Pattambi was celebrated from 21-23rd December

1977 with a Scientific Symposium on Rice on the first two days and a Seminar on the 23rd December, 1977. An Agricultural and Animal Husbandry Fisheries Exhibition was also organised on the occasion.

54. A Roving Seminar with the joint auspices of the Ford Foundation and the ICAR on the current status of Brown Plant Hopper Research in the country was held at the University Rice Research Station, Moncompu in February lst, 1978. Twenty six Scientists representing the I. R. R. I., Ford Foundation, Government of Srilanka, Centre for Overseas Pest Research State Dept. of Agriculture, I. C. A. R. and Kerala Agricultural University participated in the Seminar.

55. The total expenditure incurred by the Research stations, Farms, during the year 1977-78 was Rs.103, 06,229/50 while the income from the stations was Rs. 31,01,804/65.

56. The Extension Advisory Committee met twice during the year to review the extension activities and to approve the plan of action of the extension activities for the year 1977-78.

57. Two posts of Assistant Professor for the Comm. unication Centre and one post of Assistant Professor for Training Scheme were sanctioned during the year

58. The Extension Education activities of the Kerala Agricultural University were considerably expanded during the period. Apart from continuing the ongoing programmes a number of new programmes of training, field trials, national demonstrations, information communication activities etc. were implemented. The Institute of Agricultural Technology continued to function as a separate unit under Extension Education division. The following are the important programmes carried out during the period under report.

		Duration	No. of batches	No. of trainees
1)	Inservice training for Junior Agrl. Officers	4 weeks	5	148
2)	Inservice training for Agrl. demonstrators	4 ,,	4	273
3)	Training to Field Supervisors from Laccadive in Agriculture	4 ,,	1	5
4)	Training of Science Teachers in Soil	5 ,,	1	9
5)	Training in handling meterological instruments and recording of data	6 ,,	1	10
6)	Training in Rice Minikits trials	4 days	2	53
7)	Training for gardeners	12 ,,	1	17
8)	Training in vegetative propagation techniques for Cashew	1 ,,	1	4
9)	Training in tree plantation and management for Railway staff	1 ,,	1	16
10)	Training of FAO fellow	5 ,,	1	1
11)	Training in pregnancy diagaosis and Artificial Insemination technique to Dairy Extensions Officers	3 weeks	5	50
12)	Training in Dairy Husbandry and managament sponsored by AFPRO	4 ,,	1	52
13)	Training in clean milk production and quality control of Milk and Milk Products	2 ,,	1	25
14)	Inservice Training for Dairy Farm Instructors	3 months	1	5
15)	Refresher training course for Senior Officers of Department of Animal Husbandry	9 months	1	10
16)	Training in Poultry Management	4 weeks	2	15
17)	Training for soil chemists of the Department of Agriculture	5 ,,	2	12
18)	Training for Soil Health Care for College teachers	1 month	1	5
19)	Training in course in ginger processing	5 ,,	1	5
20)	Training course in Basic Agricultural skills to tribal Farmers of Pattamavu tribal area	4 days	4	39
21)	Extension Lecture service	2 series Lectures were conducted		

59. Besides, the course material of 7 training programmes has been published in book form.

60. The University has regularly contributed Technical articles on a wide variety of subjects both from Agriculture and Animal Husbandry side which are of interest to the farming community to the Agriculture features of the dailies, ie, Mathrubhoomi, Malayalamanorama, Deepika, Veekshnam, Kerala Times and Kerala Bhooshnam. A total number of 112 articles were published during the period.

61. Questions of farmers to clear their doubts on farming were answered and published regularly through the daily Deepika. Answers were published for enquiries from 148 farmers during the period.

62. Correspondence course for 429 persons on Rice production was completed. Three issues of Agres news containing 92 technical abstracts were brought out and sent to all technical field staff of the Department of Agriculture and Aninal Husbandry and Dairy Development.

63. Agricultural Statistics for 11 years from 1965-66 to 1975-76 were collected, compiled and published.

64. The bi-monthly publication of the Kerala Agricultural University "Kalpadhenu" was also regularly brought out.

65. The bi-mothly publication of KAU news letter containing the important activities of the University was also regularly brought out.

66. The Experts of the Kerala Agricultural University have participated in 36 items of the farm and home programme of A. I. R. by broadasting timely talks of interest to the farming community on subjects of Agriculture and Animal Husbandry.

67. Vartha pathrika were issued for broadcast through A. I. R by Kerala Agricultural University during the period.

68. The Kerala Agricultural University participated in Trichur Pooram Exhibition.

69. Two large scale 'Vignana Mela' were conducted during the period under report.

70. The experts of the Kerala Agricultural University have participated in technical seminars conducted in and outside Kerala during the period.

71. The experts of the University have attended farmers training camps and discussion classes during the period under report

72. Village adoption programme to enable the University scientists to get direct knowledge of farming situation and to serve as field laboratories for the University research and teaching programmes has been implemented in 10 villages. One more village was also selected during the year making the total number of adopted villages to 11.

73. Under the national demonstration scheme, 25 demonstrations were laid out during the period. Groundnut as an inter-crop in tapioca was demonstrated at 7 centres. Pulses demonstration was also taken up in 5 centres.

74. Under the field research activities in the extension education programme, Research in cultivators field was taken up at Kattukampal for finding out suitable locally available ameliorants for the reclamation of high acidic, ill drained and iron toxic kole areas. Experiments were also taken up in Chittur area to find out suitable cropping pattern useful for the dry farming area. A varietal cum time of planting experiment for groundnut as an inter-crop in tapioca was also taken up on cultivators fields.

75. Kerala Agricultural University has one treadle press and one cylinder press. Most of the printing work of the University is being taken up in the press. This includes periodicals, books, leaflets, forms and other job works. Besides a new H. M. T. automatic printing machine was also purchased to cope up with the increasing volume of work.

76. The Agricultural University review committee of the I. C. A. R. visited the University from 4-7th May, 1977. The committee consisting of ten members, held discussion with the University authorities at Mannuthy and Vellayani.

77. An expert team of Swedish scientists of Swedish International Development Agency (SIDA) visited the University to examine the scope and feasibility of implementing the SIDA assisted project on integrated use of ground water surface water, and rainfall for Crop production. The team consisted of Professor Yngve, H. Gustagsson, Mr. Lars Augustinson, Mr. Siquard A. Honmberg and members of the General Ground Water Board.

78. A gold medal was awarded to Dr. T. R. Sankunny, Assistant Registrar (T&R) in appreciation of his work "Vayuvintekatha" which won the award from the Ministry of Education & Social Welfare, Government of India.

79. Dr. K. K. Iya, Retired Deputy Director General, I. C. A. R. team leader of the UNDP/FAO Regional Livestock Development Project, FAO Regional Office, Bangkok addressed the members and students of the Veterinary Faculty under the External Lecture programme on 1st and 2nd April, 1977.

80. Dr. Geert Montsma, Scientfic Officer incharge of the Department of Tropical Animal Production, University of Wagiuingen, Netherlands, visited the University from June 4th to 7th 1977. He also gave a lecture on the subject 'Introduction of improved Dairy Cattle into the tropics and Sub Tropics to the Faculty & students of the Veterinary College on 6th June, 1977.

81. Dr. I. C. Mahapatra and Dr. Virmani, FAD Experts working under the UNDP in West Africa visited Rice Reasearch Station, Vyttila.

82. Two fishery Scientists, Mr. M. T. Kheir & Mr. M. Shefik from the Institute of Oceonography and Fisheries, Cairo, visited the Station on August 12th 1977.

83. Dr. Brucholz, the Agronomist from the Germon Democratic Republic visiting India under a protocol between the Government of India and the Government of GDR visited the Kerala Agricultural University on November, 16th.

84. Dr. G. I. King, Professor of Animal Sciences (Reproduction) University of Guelph, Canada, visited the University under the UNDP.

85. Dr. V. K. Sorokin, Rice Breeder, All Union Rice Research Instistute, Krasnodar, USSR, visited the Rice Research Stations in the University.

86. Dr. G. S. Khush, Plant Breeder and D. T. W. Mew, Associate Plant Pathologist, IRRI, visited Rice Research Station, Vyttila on 17th February 1978.

87. During the year 66800 kg. of finished rubber latex was produced in the factory from an area of about 425 acres (i.e about 52500 yielding trees). An amount of Rs. 5,93,640/-were received being the cost of rubber latex sold. 6629 trees were cut and removed fetching an amount of Rs. 166,578.75.

88. The employees of the University were demanding parity in scales of pay with the Kerala University, and this was sanctioned to the University employees with effect from 1-1-1976.

89. The Rural Institute, Tavanur was renamed as Institute of Agricultural Technology.

90. The major works completed during the period uuder report were construction of 3 Academic Blocks, and Construction of Hostels for Men Block at Vellanikkara. A total expenditure of Rs. 93.77 lakhs were incurred for the above works.

91. The major new works taken up during the year 1977-78 are detailed below

1.	Constructing a building for Meat Technology at Mannuthy	9-00
2.	Constructing Staff quarter (Duplex) 25 blocks	10-88
3.	Constructing a building for Dairy Technology at Mannuthy	6-50
4.	Construciing Hostel B'ock No. II at Main Campus Vellanikkara (Spill over works)	14-28
5.	Constructing Ladies Hostel for 100 Students at Vellayani	8-75

PART I

GENERAL

CHAPTER I

GENERAL ADMINISTRATION

The Kerala Agricultural University was established in the year 1971 under the Kerala Agricultural University Act (Act 33 of 1971)

The Main Campus of the University at Vellanikkara was inaugurated by the Prime Minister on 25-9-1977. The Headquarters of the University was shifted from Mannuthy to the Main Campus in March 1978. The College of Horticulture was also shifted from Mannuthy to the newly constructed Academic Block in the Main Campus in November 1977.

There are two campuses for the University, one at Mannuthy and other at Vellayani with the main campus at Vellanikkara. In addition to these, there are 23 Research Stations for Agriculture and Animal Husbandry. The Total area of the land under the University is 1909 hectares as detailed below:

1.	Mannuthy	...	848 hectares
2.	Vellayani Campus	...	243 hectares
3.	Research Stations	...	818 hectares

A map showing the campuses and Research Stations under the University is appended (Appendix I).

The construction works of the University was taken up with the financial assistance received from the I. C. A. R. The State Government also felt the urgent necessity of providing the required facilities for the development of the University and it extended liberal financial assistance for the rapid progress of the University.

For establishing the remaining facilities and for re-orienting Research for the development of Agriculture as envisaged in the Kerala Agricultural University Act, there is no doubt that the Kerala Agricultural University has to go a long way for which it requires the continued patronage of I. C. A. R. and the State Government.

AUTHORITIES OF THE UNIVERSITY

The General Council, the Executive Committee, the Academic Council, the Faculties, the Board of Studies of faculties and the Finance Committee are the statutory authorities of the University.

The General Council comprising of 17 Ex-Officio members, 20 elected members, and 17 nominated members is the supreme authority of the University. The General Council meets at least once in four months.

The General Council held 3 ordinary meetings and one special meeting during the year under report.

The Executive Committee comprising representatives of the State Government, ICAR and Elected members of the General Council is the Chief Executive Body of the University. Executive Committee held 10 ordinary meetings and one special meeting during the year under report.

The Academic Council and Board of Studies of each Faculty look after the Academic Standards of the University. The Academic Council held 5 meetings during the period under report. The Board of Studies held meetings at periodical intervals.

The Finance Committee met twice during the period under review.

The name of the members of the authorities mentioned above are given in appendix-II.

The following Sub-Committees continued to function during the year under report.

1. Research Council
2. Faculty Research Committee (Agriculture).
3. Faculty Research Committee (Veterinary and Animal Sciences)

4. Research Advisory Committee.
5. Variety Evaluation Committee.
6. Selection Committee.
7. Students Welfare Committee.
8. Committee for deputation of Academic Staff.
9. Selection Committee for post-graduate course.
10. Selection Committee for under-graduate course.
11. Sports Board of Kerala Agricultural University.
12 Extension Advisory Committee.
13. Planning & Development Committee.

The following committees were reconstituted during the year under report.

1. Executive Committee.
2. Finance Committee.
3. Planning and Development Committee.
4. Selection Committee (non-teaching staff).
5. Students Welfare Committee.

A list of members of the various Sub-Comittees is appended (Appendix-III).

UNIVERSITY ADMINISTRATION

The Administrative hirarchy of the University begins with the Governor of Kerala as Chancellor of the University. The Minister for Agriculture is the Pro-Chancellor. The Vice-Chancellor is the principal Executive and Academic Officer of the Univeresity. He is also the Ex-Officio Chairman of the Executive Committee and of the Academic Council. He is also the Chairman of the Research Council, Research Advisory. Committee and Extension Advisory Committee. The Director of Research assists him in Research Administration, the Director of Extension Education in Extension Education activities of the University, the Registrar in the University Administration including Academic Administration, the Comptroller in Financial Administration, the Deans of Faculties regard ing the administration of respective faculties and the Director of Physical Plant in providing Physical Facilities required by the teachers, researchers, staff and students of the University.

A list of Administrative staff is appended (Appendix—IV)

UNIVERSITY ORGANISATION

There are two faculties organised under the University viz.,

1. Faculty of Agriculturel and
2. Faculty of Veterinary & Animal Sciences.

The College of Horticulture is functioning under the Faculty of Agriculture.

Though the Act provides that the University shall have the faculties such as Basic Science and Humanities, Co-operation, Home Science, Fisheries, Forestry, Agricultural Engineering and Technology etc., preliminary steps have been taken to establish the Faculties of Fisheries and Forestry. For the present it has been proposed to constitute a department of Fisheries under the Faculty of Veterinary and Animal Science as a first step. The Professor of Fisheries has been posted and a proposal for starting a Fisheries Research Institute cum-Research Complex has been sent to the I. C. A. R for consideration.

For setting up the Department of Forestry, the project report prepared by Dr. N. Ganapathy, Director, Central Forest Research Institute, Peechi has been approved. The Department of Fisheries & Forestry will be developed as separate Faculties in due course.

For organising a Faculty of Basic Sciences and Humanities, the Dean, College of Veterinary & Animal Sciences prepared a scheme and the same is under active consideration of the University. Amendment to statute for prescribing the qualification of the Dean, has been sent to Government for approval.

The Research programmes are undertaken through the farms and Research stations under the control of the University. In the college departments, Research projects are also undertaken. The Professor of the Departments is primarily responsible for the proper implementation of the projects in each discipline. The schemes have to be approved by the Faculty Research Committee in which all the Professors and the Faculty Deans are members with the Director of Research as Chairman. For tackling the field problems, multi-disciplinary approach is adopted. Schemes screened by the Faculty Research Committee are scrutinised and approved by the Research Council. On getting the approval by the Research Council, the project leaders can implement the schemes subject to budget provision. The membership of other Agricultural Universits in South India would help colloborative work and better technical scrutiny of Research projects.

The Extension Education activities are organised through the Director of Extension Education. The Extension Education programmes are taken up with

close repport with the State Extension Departments. The formal representation of the University in the Research and Extension Co-ordination Board under the Chairmanship of the Minister for Agriculture, the presence of Agrl. Production Commissioner and Heads of State Departments in the University Administrative bodies like General Council, Research Council, Research and Extension Advisory Committee, Academic Council etc. the clear demarcation of responsibilities between the University and the State Departments under the Kerala Agricultural University Act and the close personal relations established at different levels of the University and State Department Officers have all laid the basis for very pleasent and cordial co-ordinated Extension Education activities to mutual benefit.

ADMINISTRATIVE SET UP

According to Section 24 of the K. A U. Act the Officers of the University consists of the Chancellor, the Pro-Chancellor, the Vice-Chancellor, Pro-Vice-Chancellor, the Registrar, the Comptroller, the Director of Physical Plant, the Librarian, Deans of Faculties, the Director of Students Welfare, the Director of Extension Education, the Director of Research and such other persons in service of the University, as may be decided by Statutes. The Chancellor is the Head of the University and the Pro-Chancellor comes next.

The Vice-Chancellor has overall control of the University. The General Administrative power of the University is vested with the Registrar.

The accounts of the University, preparation of budget, statement of accounts and audit are controlled by the Comptroller.

The Research Administration of the University is vested with the Director of Research whereas the Extension activities and public relations work is handled by the Director of Extension Education.

The construction works, maintenance of buildings purchase of vehicles, heavy equipments etc. are dealt with in the office of the Director of Physical Plant.

The resident teaching programme, professional competence evaluation and improvement of curricular and teaching programme, character and quality of leaderships are the responsibility of the Deans of the Colleges.

The posts of Pro-Vice Chancellor, University Librarian, Director of Students Welfare were vacant during the period.

FACULTY IMPROVEMENT

Under the Faculty improvement programme, the staff members were provided with facilities to acquire higher qualifications by granting deputation, study leave and study allowances. Staff were sent for short-term training courses in various areas of specialisations such as irrigation, water management, radiation techniqnes in biological research etc. Participation in International and National seminars on teaching methods are organised during trimester breaks, getting the assistance of the distinguished Agricultural Educationists. As a result of these Seminars, several guidelines covering such matters as preparation of course outlines, practical manuals, question banks, self evaluation of teachers could be finalised. A system of publishing abstracts of important Research articles in different journals has been introduced to bring to the notice of the staff members latest information in all the fields of Agricultural Seience 'Anivet Abstracts', 'Agri Abstracts' and 'Horti Abstracts' were puolished with contribution of staff from all departments.

The Scheme of Emeritus Scientists is being implement to utlise the service of distinguished retired scientists in useful Research Schemes.

The Research policy has been enunciated to emphasise the need for research oriented towards solving the problems of the farmers, increasing total agricultural production in the State as well as net income of farmers thereby enabling them to substantially improve their standard of living The ancillary considerations kept in view are maximisation of the use of farmers own resources, increased labour use in farming and better productivity, better intensity of land use and better land productvity water use efficiency, reduction of drudgery in farm operations, means to improve Livestock and Poultry production and reductian in cost of production. On the basis of the above policy, the Research activities of the Kerala Agricultural University have been made more comprehensive to cover all economically important crops grown in the State, new crops that can be successfully introduced, animal sciences covering cattle, buffaloes, goats, pigs poultry and ducks inland fisheries and integrated homestead farming. The total number of Research Projects implemented by the University is more than 700, multi disciplinary and multilocational projects are being implemented.

GENERAL

Within the short period of its establishment, the Kerala Agricultural University has laid strong foundations for its developments and at present it is one of the good Agricultural Universities in the country both in Academic standards and Research.

New Departments and new Sections in the existing departments have been organised as given below:–

Faculty of Agriculture

Soil Science

New Sections in Existing Departments

Nematology in the Department of Entomology, Food Science and Nutrition in the Department of Agricultural Extension. Microbiology and Virology in the Department of Plant Pathology.

Faculty of Veterinary & Animal Sciences

Fisheries

The construction works in the Main Campus as well as the constituent units were taken up with the financial assistance from the I. C. A. R. The State Government have also extended liberal financial assistance for the rapid progress of the University.

The K. A. U. Sports Board met during the year and chalked out detailed plan of activities for the year

The South Zone Inter University Football tournament conducted from 7th October to 17th October 1977. Seventeen Universities including Kerala Agricultural University participated in the tournament.

The Kerala Agricultural University team participated in the Basket ball (M), Hockey (M), Football (M) and Track and field (M & W).

The University (College and Institute) teams took part in the District/City league tournaments in Football, Basket ball and District Track and Field meets.

A course outline for compulsory physical education programme was prepared for introduction at the under graduate level from the year 1978-79.

CHAPTER II

EDUCATION

Dr. N. Sadanandan continued as the Dean and Head of the Institution during the period under report.

At present the College of Agriculture has the following 11 departments.

1. Agronomy	2. Agricultural Botany
3. Agrl. Chemistry	4. Agrl. Entomology
5. Plant Pathology	6. Agrl. Extension
7. Horticulture	8. Agrl. Statistics
9. Agrl. Economics	10. Agrl. Engineering
11. Animal Husbandry	

In addition to the B. Sc (Ag) course, M.Sc. (Ag) Course was also offered in the first 7 departments and Ph. D. courses in Agronomy, Agricultural Botany, Agricultural Entomology and Plant Pathology.

A list of the Academic staff of the various departments of the College during the year 1977-78 is given in Appendix-V.

Admission of students

B. Sc (Ag)	50/year
M. Sc (Ag)	28/year
Ph. D	10/year

Class Strength

Under graduate course	54
Post graduate course	
M. Sc (Ag)	29
M. Sc (Hort)	4
Ph. D.	7

The yearwise/coursewise strength of students a on 31—3—1978 is as follows:

BSc. (Ag)

I year	54
II year	96
III year	87
IV year	79
Total	316

M. Sc (Ag)

Ist year	29 + 4* (M. Sc. (Hort)
IInd year	35 + 3* (M. Sc. (Hort)

Ph. D.	Part time	Full time
Ist year	—	7
IInd year	3	8
IIIrd year	6	6

STUDENTS ACHIEVEMENT

i) Under-graduate studies

Seventy eight B. Sc. (Ag) students passed out of the College successfully during 1977-78.

Post-graduate studies

Seventeen M. Sc. (Ag) and 2 Ph. D. candidates received their M. Sc. (Ag) and Ph. D. degree during the period under report.

Students aid and Scholarships

The following scholarships/educational concessions were awarded to the students during 1977-78.

Nature of concession/scholarship	No. of awardees
1. Scheduled caste and scheduled tribe students concession	35
2. Concession under Kumara Pillai Commission	53
3. K. A U. Merit Scholarsoip	40
4. National merit scholarships to the Children of School teachers	5
5. National loan scholarships	20
6. National Merit Scholarships	20
7. ICAR Merit cum means scholarships	20
8. ICAR Junior Fellowships	7
9. Educational concession to Nagaland Nominee	1
10. Educational concession to Mehalaya Nominee	1
11. Educational concession to Laccadive students	3
12. Schoiarships from Pyrites and Phosphates	1
13. Scholarships from Indian Potash Limited	1
14. Subbrato Memorial scholarship	1
15. Fee concession to OBC.	4
16. K.A.U Senior Fellowship	1
17. K. A. U Junior Fellowship	33
18. Study allowance from K. A. U	14

In addition to this, Shri J. Thoms, Final M Sc. (Ag) student in Agronomy was awarded the Aspee Gold Medal for the year 1976-77 for securing the highest standards in Agricultural Entomology and Plant Pathology combined together in the undergraduate level.

Practical training programmes.

In addition to the regular practical training in the laboratories and fields, work experience programme had been instituted so that the Agricultural graduate would get thorough practical experience. The work experience programme was distributed over the entire period of 4 years of the B. Sc (Ag) programme. It consisted of growing all the important crops of our State, like paddy, coconut, tapioca, banana, pulses, vegetables and maize.

The first year students cultivated tapioca in an area of two cents/student. In addition to this two coconut trees were also allotted for maintenance to each student. Maintenance of the perennial crop will be continued up to the final year.

The second year B. Sc. (Ag) students raised a crop of banana @ 5 plants/student.

The third year students raised pulses (cowpea), fodder maize and vegetables during the year under their work experience pragramme.

The final B. Sc. (Ag) students had cultivated paddy during punja season. One acre of land was allotted to a group of six students and 13 acres of Kayal land was cultivated by the final year students. Under the field Training Programme, the final B. Sc. (Ag) Students were taken to Intensive Paddy Development Units and Research Station to acquaint with the activities in the I. P. D. Units and Research Station.

Study tours

The second B. Sc (Ag) Students were taken on study tour to various places and institutions of agricultural importance in South India to acquaint with the activities in the agricultural field. With the same object in view the third year students were taken on an All India study tour excepting places they visited during their second year tour.

Extra curricular and co-curricular activities

The College Union functioned properly during the period under report with Shri M. Muraleedhara Prasad as president and Shri Abdul Gaffar as General Secretary. Dr. N. Sadanandan, Dean was the patron of the students Union.

The following members of the staff were nominated to the various offices shown against each.

1.	President, Speakers Club	Dr. A. M. Thambi
2.	President, Athletic Association	Prof. J. B. Rose
3.	President, Planting Forum	Dr. Skariah Oomen
4.	President, Arts Club	Shri. K. P. Madhavan Nair
5.	Programme Officer, N. S. S.	Dr. Skariah Oommen
6.	Staff Editor	Dr. V. Gopinathan Nair
7.	Co-ordinator, Hobby Centre	Prof. A. G. G Menon.

Regular activities of all the above organisations were carried out satisfactorily during the year under report.

Seminars and conferences

Dr. N. Sadanandan,, Dean, Faculty of Agriculture attended the annual meeting of the Agricultural Universities Association held at Anand during January 1978 and presented a paper.

Shri M. S. Thomas, Lecturer in Engineering partici ated in the summer Institute on Energy from sun, wind and biogas held at I. I. T., Kharagpur.

Shri P.Chandrasekharan, Associate Professor attended the summer Institute on Water Management at Water Technology Centre, I A R I, New Delhi.

Shri M.Oommen, Junior Instructor, attended the Summer Institute on "Agronomic advances in grain legume production" conducted by G.B. Pant Agricultural University, Pant Nagar, U. P.

Prof. A.G.G. Menon, and Shri U. Mohammed Kunju participated in the "Karshikamela" held at Amini Island of the Union Territory of Lacadives.

Members of the staff attanded the symposium held at Vellanikkara and Pattambi conducted in connection with the inauguration of the Main Campus and the Golden Jubilee Celebrations of the Rice Research Station, Pattambi respectively. Shri G. Raghavan Pillai, Assistant Professor attended the annual workshop of the All India Co-ordinated Project for Research on Forage Crops held at Jhansi.

Dr. N Mohan Das, Associate Professor attended the training course on crop loss assessment held at the University of Agricultural Sciences, Hebbal and the mini workshop on problems of pesticide residues held at IARI, New Delhi.

Dr. T.S.Venketesan. Associate Professor attended the Mini workshop on Nematology at I. A. R. I, New Delhi under the AICRP on Nematology.

Dr. M. C. Nair, Associate Professor (Plant Pathology) attended the National Seminar on Physiology of parasitism held at Madras. Dr.K.I.Wilson, Associate Professor (PP) attended the All Indian Seminar on Cardamom held at Erakulam

Dr.Mary K.George attended the workshop of Scientists working on chillies, at Marthwada University, Parbhani and presented a papper.

Professor A.G.G Menon attended the National Agricultural Information Communication workshop at New Delhi. He also attended the world Malayalam conference and the Intermedia Publicity Co-ordination Committee meeting of the Government of India.

Dr. A.M. Thampi attended the seminar on educational component in Agricultural Extension service at Tamil Nadu Agricultural University at Coimbatore.

Shri O.Abdul Rehiman, Assistant Professor, attended the training course on Agricultural Business Management at S. I. E. T., Hyderabad.

Dr. L. Prema, Assistant Professor (Nutrition) participated in the Symposium in connection with the Silver Jubilee Celebrations of Home Science Association at Coimbatore.

Publication:

The Agricultural Reseacch Journal of Kerala and Agri-Abstracts were Published regulary from the College of Agriculture. Details of Publications are given in Appendix-VI.

Other activites:

a) **Village adoption programme**

Muttakkad Village and Kalliyoor Village which are in the Neighbourhood of the College of Agriculture were selected under the Village adoption programme Programmes under Village adoption are implemented though Karshika Sarvakalasala Gramavikasana Samithi.

In Muttakkad Village there are two Grama Vikasana Samithis functioning in this Village. Construction of two irrigation tanks were completed during the year. Arrangements are being made for installing pumpsets to errect Sprinkler irrigation system. Five demonstration plots on pulses cultivation were laid out in the farmers field. 30,000 slips of fodder grasses were also distributed during the year. A training-cum-demonstration was held in the farmers field for the prevention of bunchy top disease in Banana using solvirex. Loan for costruction of cattle

shed was made available for 9 farmers through State Bank of Travancore, Vellayani. Medium term loans for purchase of goats were issued to 34 individuals. Arrangements were made for the marketing of the milk produced by the member dairy farmers of Samithis through K. L. D. & M. M. Board.

In Kaliiyoor Village, the Gramavikasana Samithi at Kakkamoola was established in 1976. During the period under report, loans for purchase of cows were made available to 36 farmers though State Bank of Travancore, Vellayani. Arrangements were also made for the marketing of milk produced by the member dairy farmers of the Samithi through K. L. D & M. M. Board. Crop loans were arranged for 12 farmers and one pumpset was issued at subsidised rate through the S. F. D. A., Trivandrum. A reading room was started in the Village. A Mahilasamajam organised during the period started functioning. Twelve Kitchen gardens were also laid out in the Village with the assistance of N. S. S. Uuit of the College of Agriculture Demonstration plots on pulses cultivatien was laid out in the field of 9 farmers.

A second Gramavikasana Samithi was established in this Village at Punkulam during the year under report. Within a short period of two months, 26 crop loans and 32 cow loans were issued to the farmers through State Bank of Travancore, Vellayani. A community dairy was also started to enable the farmers to get reasonable price for the milk. Two tapioca demonstration plots for multiplication of *Sahya* and *Srivisakhom* was also started in the Village The annual camp of N. S. S. Unit of Agricultural College was orgnised at Kakkamoola The N S S. Unit with the active participation of Grama vikasana Samithi and N. C. C. cadets reconstructed the breached bund across Vellayani Kayal connecting Kakkamoola and College Campus.

Special training programme

The Department of Chemistry organised a short course training for six Junior and Senior Scientific Assistants of the soil Testing Laboratories in Kerala for a period of three weeks during March 1978. As part of the traini g programme, they were taken on a study tour to C. P C. R. I, Kayamkulam and the soil testing Laboratory of Cardamom Board and Rubber Marketing Federation at Ernakuiam.

Technical Assistance to Tribal Colony at Pottumavu.

Dr. R. S. Iyer, associate Professor, continued to be in-charge of the technical Assistance programme to tribals at Pottumavu. During this year a number of trials were laid out. These included trials on hill paddy and high yielding varieties of rice, as well as trials on tapioca and groundnut.

d. **Routine analysis**

222 samples were analysed and reported on during the year, the details of which are as follows:-

Fertilizers	139
Soil samples	60
Miscellaneous manures	5
Plant samples	9
Cattle and Poultry feed	2
Other samples	7
Total	222

Out of these, there were 158 paid samples of soil and fertilizer and total amount of Rs.5,475/-was realished as analytical charge.

e. **Training Programmet**

The following training programmes were conducted during the period.

1. Training in Agricultural Technology and Management for the managerial stall of Primary co-operative credit societies.

Forty persons were trained in three batches under this programme.

2. Training for Junior Agricultural Officers of the Department of Agriculture.
one hundred and fifty Junior Agricultural Officers were trained in five batches.

3. Correspondence course for farmers on paddy cultivation. The second course on rice culrivation was completed during the period and 90 farmers participated in the 2nd course.

4. Coaching coursefor A. R. S candidates Coaching was given to 11 candidates appearing for A. R. S examination.

5. Off campus training for fermers and farm women The staff of the Departmant of Extension participated in the off campus training of farm women in 21 A. N. P. camps conducted in Trivandrum District.

f. **Extension lectures:**
The following extension lectures were conducted during 1977-78.

Sl. No.	Name of the Speaker	Topic
1.	Dr. R. P. S. Tyagi, Dean, P. G. Studies, Hariyana Agricultural University.	Post-graduate programme
2.	Dr. Roychoudri, Kalyani University, Calcutta.	Aphids
3.	Dr. K. Gopalakrishna Pillai, Agronomist, A. I. C. R. I. P., Hyderabad.	Recent advances in Rice Agronomy
4.	Dr. S. S. Khanna, Director Project-cum-plan formulation, Hariyana Agrl. University.	Nutrient Mobility concept
5,	Dr. I. C. Mahapatra, Project Manager, UNDP.	Rice Research in Sierra Leon.
6.	Dr. Virmani, Rice Breeder, Libiya	Rice Research in Libiya.
7.	Dr. P. K. Narayanaswami, Chairman & Managing Director, F. A. C. T. Alwaye.	Some aspects of fertilizer production, distribution and consumption in Kerala.
8.	Professor David Hall, Professor of of Biology, University of London.	Solar Energy conservation through biology
9.	Dr. R. Appadurai, Professor of of Agril. Botany, Tamil Namil Nadu Agrl. University.	Biometric approach to problems of genetics and Plant Breeding
10.	Kerala State Co-operative Bank Golden Jubilee Endowment Lecture (3 lectures) Dr. B. Natarajan, Chairman, Institute of Techno-economics, Madras.	1. Co-operation - its past 2. Changes in Co-operative principles. 3. Co-operative for Agricultural production and marketing.

RETEARCH WORK

The details of research work carried out in the various departments of the College are given in part II of this report.

INSTRUCTIONAL FARM — COLLEGE OF AGRICULTURE, VELLAYANI

The Farm provides facilities for the instruction of under graduate and post-graduate students in the College of Agriculture and also for the research work of the staff members and post-graduate students. It has all the physical amenities for imparting practical training to students in almost all the important crops of the State.

Important activities of the farm are:–

1. Production and distribution of quality coconut seedlings.
2. Production and distribution of grafts, layers & other seedlings.
3. Production and distribution of vegetables.
4. Production and distribution of vegetable seeds.
5. Production and distribution of ornamental plants.
6. Production and distribution of important fruits including banana.
7. Puncha cultivation in an area of 300 acres.
8. Participation in the various Agricultural Exhibition.
9. Imparting field training to the Agricultural Demonstratiors of the departments and diploma trainees of the Institute of Agricultural Technology, Tavanur.

The following planting materials have been produced and distributed during the year under report.

1.	Mango graft	3078
2.	Jack graft	2278
3.	Polyalthea	41
4.	Guava layer	850
5.	Rose	442
6.	Malta lemon	430
7.	Jampa	218
8.	Nutmeg	929
9.	Alocassia	77
10.	Palm	42
11.	Hibiscus	40
12.	Crotons	41
13.	Bougainvillas	
	a) Mehrs	114
	b) Ordinary	442
14.	Cinnamon	795
15.	Cocoa seedlings	382
16.	Clove seedlings	222
17.	West Ind. Cherry	615
18.	Curry leaf	506
19.	Litchy	74
20.	Jasmine	93
21.	Star apple	27
22.	Rose apple	224
23.	Pappaya	155
24.	Banana Suckers	1152
25.	Coconut seedlings (WCT)	6031
	Coconut seedlings (Com)	1659
26.	Vegetable seeds	60
27.	Vegetables	6570kg
28.	Banana	11834kg

Production of Jack grafts:

A technique for large scale production of jack graft has been perfected from selected 'Varikka' types of Jack and steps have been initiated to enhance the production of such jack grafts as also to cover more varikka types.

Production of Rubber

An area of 3½ acres is under rubber plantation. Arrangements are in progress for bringing an additional area of 5 acres more under rubber with improved varieties.

Coconut garden:

During the year, 1,56,967 nuts have been received from the general harvest of coconut plams. With the expansion of the stadium attached to the College and also for the construciion of staff quarters and formationof roads, a good number of yielding palms have been clear felled. An area of about 4 acres reclaimed and planted with coconut seedling is being maintained properly. Under planting with coconut seedlings, cocoa seedling cloves cinnamon etc. is being done wherever it is feasible.

Vegetable cum-banana blocks.

The available cultivable area especially of the outer borders of the farm has been divided into 21 blocks of approximately ½ to I hectare each. These blocks are allotted to be under the charge of one male permanent labourer and one woman labourer. In these blocks vegetables banana, tapioca etc. are grown. In addition to the main obsective of bringing these areas under cultivaion with vegetables and banana the allocation of these block will also contribute to the maintenance and upkeep of under planted coconut seedlings and interplanted cocoa, nutmeg, cloves etc. and also vigilant watching of the farm during day time.

Puncha cultivation in the kayal lands.

An area of 300 acres of kayal lands have been cultivated with paddy during the period commencing from December to March 1978.

Exhibitions

The farm particed in the important Agricultural Exhibitions and Melas organised by various departments and institutions in addition to its participation in the Annual Fruit Flower and Vegetable Show and Rose Day 1978, sponsored by Kerala Agri. Horti. Society and Kerala Rose Society Trivandrum. The farm own 31 trophies including 3 rolling trophies in the various competitions held in connection with these exhibitios.

COLLEGE OF HORTICUL TURE

The College was started on October 28th 1972 with the initial intake of 20 students and was temporarily located at Mannuthy till it was shifted to the Main Campus of the University at Vellanikkara during November 1977.

The number of admissions was increassed to 30 from the Academic year 1976-77. B. Sc. (Ag) degree programme was also introduced from 1977-78.

The laboratory, hostel and other facilities available in the Veterinary College and in the Institute of Agricultural Technology, Tavanur were made use of in imparting adequate training for students both theoretical.

Shri V. K. Damodaran, Asaociate Professorof Horticulture was in additional charge of the Dean during the period under report The details of teaching staff is separately appended (Appendix - VII)

Considering the dearth of personnel to man various research and teaching posts in the University M. Sc (Hort) Programme were started during the Academic year 1976—77. M. Sc. (Ag) programmee were also started in the College of Horticulture in disciplines of Agronimy, Agrl. Chemistry, Agrl. Botany, Agri.Entomology and Plant Pathology.

Admission of students:

B. Sc. (Hort)	...	30/year
M.Sc. (Hort)	...	12/year
B. Sc. (Ag)	...	50/year

Class strength

The present strength of under-graduate/ post-graduate classes are as given below:—

Undergrabuates:-	...	
I Year	...	40
II Year	...	29
III Year	...	20
IV Year	...	20
Total	...	109
I Year B. Sc. (Ag)	...	50
Total under-graduate	...	159
M. Sc. (Hort) I Year	...	8
II Year	...	8
M. Sc. (Ag) I Year	...	8
II Year	...	6

Student Achievements

i) Under-graduate studies:

The second batch of B. Sc. (Hort) degree students completed. their degree cours on 13. 8. 1977 and17 of them passed out.

ii) Post-graduate studies:

None completed being the first year after admission.

Student aid and Scholarships

During 1977—78, 141 students enjoyed various scholarships and fellowships. The details of wich are given below:--

SI.No-	Name of Scholarships	No. of receipents
1	National Loan Scholarahips	2
2	Post Metric Scholarship	1
3	National Merit Scholarship	1
4	National Loan Scholarship	18
5	National Foundation for teachers Welfare Scholarship	6
6	Educational concession to SC/ST	17
7	SC/ST Educational concession	1
8	S. T. Scholarship	1
9	Educational concession to X'ian converts from S/C	1
10	Junior Fellowship under 1977-78 programme of I. C. A. R	1
11	Senior Research Fellowship of CSIR	1
12	K. A. U. Fellowship	22
13	K. A. U. Insenive fellowship	I
14	Post Metric Scholarship to S. T. Studenst	1
15	K. A. U. Merit Scholarship	14
16	Educational concession under KPCR	39
	TOTAL	141

Practical training programme

Besides regular practical classes in the Laboratiries and Instructional Farms, the under graduate students were given the following assignments, in order to develop confidence and sufficient technical skill and competence.

1. Plot cultivation

2. Providing 2-3 perennial crops for each student for maintenance, from the second trimester of the first year onwards till the third trimester of the fourth year.

3. Implementation of earn-while-you-learn programme.

Extra curricular and Co-curricular activities

Study Tours

The 1st, 2nd 3rd year students of the College were taken on tour within the State, South India and North India respectively during the period under report.

Students' Union Activities

The Students Union for the year was organised by electing president, Secretary and members for the students union. The students participated in various activities through the students union and its accessory bodies-Social Service League, Planning Forum, Arts Club and the Quiz Club.

The students union for Academic year 1977-78 was inaugurated on 28th January 1978 by Shri K. K. Srinivasan, I. A. S., Managing Director of Seetharam Textiles. Prof. P. Sankara Pillai, President, Kerala Sangeetha Nadaka Academy and Shri N. Kaleeswaren, I. A. S., Vice-Chancellor, Kerala Agricultural University addressed the gathering.

The College Arts team participated in the Kerala Agricultural University Youth Festival and won a large number of prizes.

The planning forum was inaugurated by Prof. O. J. Antony. Two guest lectures were arranged and conducted during the period.

The College Quiz Team participated in a number of inter collegiate Quiz competitions. The Quiz Club was conducting regular quiz competitions in the College for the benefit of students. A Quiz Bulletin was also released every month by the College Quiz Club.

Sports and Games

The students of the college actively participated in the inter collegiate sports and athletic meet of the University and a number of prizes were secured by them.

National Serviee Scheme

Dr. P. Balakrishna Pillai continued to be the programme officer. Fifty students have enrolled during the year. They took active part in various rural development activities. A five day special camping programme was conducted at the Harijan Colony, Mullakkara from 11th January to 15th January 1978. They participated in the flower, fruit and vegetable show organised by Trichur Agri-Horti Society on 4th and 5th February 1978.

Seminars and Conferenees

The following seminars and conferences were attended by the Staff members of the College.

1	Regional workhops for Agrl. Information on officers in Southern States organised by Extension Ministry of Agriculture and Irrigation, New Delhi 15th to 20th April, 1977	Shri K. P. Ramachandran Nair, Asst. Professor, Extension.
2	Summer Institute on breeding and culture of sugarcane at the S. B. I., Coimbatore from 9-5-1977 to 31-5-1977	Dr. K. M. Narayanan Namboodiri, Associate Professor (Botany)
3	Ernakulam District Fertiliser Festival at Perumbavoor on 25-5-1977	Dr. C. C. Abraham.
4	Agri. Seminar at Odakkali 2-6-1978	-do-
5	Cashew Seminar held at Ernakulam on 19th July 1977	Prof. V. K. Damodaran
6	Agri. Seminar, Panangad, Trichur on 20-8-1977	Dr. C. C. Abraham
7	Golden Jubliee Symposium on Rice Research and Development held at the Rice Research Station, Pattambi	Dr. P. Balakrishnan Pillai, Dr. C. C. Abraham Dr. A. I. Jose
8	Seminar on Education component in Agriculture Extension organised by Indian University Association for continuing education, Novembee 30th December 2nd 1977	Shri K. P. Ramachandran Nair, Assistant Professor, Extension
9	National Seminar on Pepper at Calicut, December 1977	Dr. P. C. Sivaraman Nair, Dr. Abi Cheeran
10	International Symposium on Citriculture, held at Bangalore in December 1977	Prof. V. K. Damodaran Dr. M. Aravindakshan
11	IX Annual Convention of Agricultural University Union, held at Anand in January, 1978	Prof. V. K. Damodaran
12	Rose convention held at Bombay on 19th January 1978	Shri S. Ramachandran Nair

13	Oriental entomology workshop on population Ecology held at the University of Agricultural Science, Bangalore on 18 th and 19th January 1978	Dr. C. C. Abraham & Dr. P. J. Joy
14	All India Weed Control Workshop on held at the Tamil Nadu Agricultural University, Coimbatore during February 3rd and 4th 1978	Dr. P. J. Joy
15	The Annual meeting of the Indian Society of Weed Science held on 3rd and 4th February 78	Dr. P. Balakrishna Pillai
16	Agri. Horti. Seminar, Trichur on 5-2-1978	Dr. P. K. Gopalakrishnan
17	State Level Cocoa Symposium held at Kottayam on 12-3-1978	Dr. C. C. Abraham
18	3rd National Seminar on Management at Hyderabad organised by the All India Management Association during March 1978	Dr. P. C. Sivaraman Nair Dr. C. C. Abraham Shri E. R. Narayanan Nair

Publications

A list of articles published by the Staff of the College is given in appendix-VIII.

Village Adoption Programme

Four Villages situated within the four Panchayats around the Mannuthy and Main Campus at Vellanikkara have been selected under the Village Adoption Scheme. One hundred households from each village have been selected for Integrated Agricultural Production Programme. The problems in Agriculture or Animal Husbandry of the selected farmers were studied by the experts of the University and they were given all possible help to solve these problems.

Survey on literacy and education was carried out and International Literacy Day was celebrated. Programmes of general importance like eradication of 'Bunchy Top' disease of Banana, laying out demonstration plots, organisation of field days and seminars and distribution of improved varieties of planting materials were launched.

Training Programme

A short term gardeners training course for a period of 3 months duration was conducted. Shri S. Ramachandran Nair, Assistant Professor was in charge of the training programme. A training progamme for selected school teachers in soil management, soil testing and plant nutrition was conducted for a period of five days by the Department of Soil Science and Agricultural Chemestry Dr. A. I. Jose, Associate Professor was in charge of the programme.

In addition the members of staff of the College participated in the extension education programme of the University and the Department of Agriculture.

Training programmes were conducted during the period under report for the Officers and Agricultural Demonstrators of SADU. Dr. P. C. Sivaraman Nair was in-charge of training programme.

COLLEGE OF VETERINARY & ANIMAL SCIENCES

Dr. P. G. Nair continued as the Dean and Head of the College during the period under report.

The College has 18 Departments either headed by a Professor or Associate Professor. The two Veterinary Hospitals, one at Mannuthy and the other at Trichur along with the Livestock Farm, one Poultry Farm, the Pig Breeding Farm and A. I. Centre in the campus, serve as instructional units.

The details of teaching staff of various departments is separately appended (APPENDIX IX)

Admission of Students

B. VSc.	...	...	...	40/Year
M. VSc.	...	...	...	68/Year
Ph. D.	...	...	...	8/Year

Class Strength

	Men	*Women*	*Total*
B. V. Sc. & A. H.	159	35	194
M. V. Sc.	40	4	44
Ph. D.	6	0	6

Students Aid and Scholarship:

Number of Scholarship/Fellowship awarded to students during 1977-78.

Sl. No.	Name of Scholarship	BVSc	MVSc	Ph. D	Total
1	K. A. U. Merit Scholarship	16	16	1	33
2	Government of India Merit cum-means Scholarships	12	...	...	12
3	National Loan Scholarship	5	...	...	5
4	National Merit Scholarship	4	...	...	4
5	I. C. A. R. Jr. Fellowship				
	Fresh : 2	...	...	...	...
	Renewal : 2	...	4	...	4
6	I. C. A. R. Sr. Fellowship	...	...	1	1
7	Educational concessions of SC/ST Students	13	4	...	17
8	Educational concessions under K. P. C. report	26	...	...	26
9	General Cultural Scholarship of Government of India (Renewal)	1	...	...	1
10	Scholarship under Colombo Plan (Renewal)	1	...	...	1
11	Loan Scholarships to students from J & K sanctioned by their Government	13	...	...	13
12	Loan scholarship to students from Pondicherry sanctioned by the Government	1	...	...	1
13	Scholarship to Bhutanese Students (renewal)	2	...	...	2
14	Travancore temple entry Proclamation memorial Scholarship	1	...	...	1
15	SC/ST Scholarship to J & K students	4	...	...	4
					125

Practicl Training Programme

The students were given practical training in the Livestock, Poultry, Piggery farms attached to the Colllege

Seminars and Conference

Dr. P. A. Ommer, Associate Professor presented a paper entitled 'Present pattern of Education in Kerala Agricultural University and suggestions for improvement' at the validictory function of the University students' Union held on February 13, 1978 at Vellayani Campus.

Dr. K. Radhakrishnan, Professor presented a paper on the Biomechanics of Manuals' at the Department Seminar held at Mannuthy during May 1978

Dr. K. V. Raghunandanen, Instructor attended the Animal Husbandry Seminar held at Sultan's Battery on 19-12-1977 and practicipated in the discussions.

Dr. B. R. Krishnan Nair, Associate Professor attended the Dairy Development Seminar held at Chalakudy on 21-12-1977 and presented a paper on 'Augmented milk production through cross-breeding.

Dr. C. A. Rajagopala Raja, Assistant Professor attended a training course in the 'Handling of Tribolium in Laboratory' held at N. D. R. I. Karnal from 26-9-1977 to 6-10-1977.

Dr. M. Subramaniam attended the Symposium on '25 years of artificial breeding of cattle in Kerala' held on 10-8- 1977 at Trivandrum. Also attended the XIV Dairy Industry Conference held from 18-11-77 to 20-1-1978.

Dr. M. Subramaniam attended the Farm Cattle Buildlng and Equipments Sub Committee and Artifical Insemination Equipments Sub Committee meeting of Indian Standards Institution at New Delhi on 23-1-1978 representing the Kerala Agricultural University.

Dr. P. K. Abdulla, Professor attended a conference organised by Riyath University, Faculty of Agriculture, Saudi Arabia on Agril. Sciences from 19th to 23rd April 1977 and presented a paper on 'Animal Diseases as a limiting factors for Animal Production'.

Dr. K. T. Punnose, Associate Professor presented a Scientific paper on 'Virology Vaccination Treatment and control of Rabies' in a seminar organised by Veterinary Faculty Teachers Association on 31-1-78.

The members of Staff of the Department of Animal Reproduction attended the study classes in Artifical Insemination and in infertility to farmer delegates under the Herd Owner Development Programme organised by Dairy Development at Kottayam in August 1977.

Dr. K. Chandrasekharan participated and led discussions on animal diseases, Zoonotic diseases etc. in 7 seminars.

In the seminar on Degnale Disease at Hissar on 3. 5. 1977, Dr. M. Krishnan Nair presented the Paper on the pathology of Necrosis of extrimities in cattle and buffaloes.

Dr. M. Krishnan Nair, Professor of Pathology presented the paper 'Genital disease of Cattle' in the Scientific Sesson in connection with the Silver Jubilee Celebration of Artificial Insemination in Kerala on 10. 8. 1977. At the FAO International Seminar in Veterinary Pathology held at Izatnagar between November 14th to December 2nd, 1977, he presented the following papers.

1. The inflamatory exudate in granuloma.
2. Problems of perinatal mortality in India
3. Animal disease problems and disease investigatin oprogremme in Kerala. He has also presented a paper on 'Animal Health care-A Perspective and Strategy' in Animal Husbandry Seminar conducted at Vellanikkara in connection with the inaguration of the Main Campus.

Dr. A. Rajan attended the Summer Institute on Methodology of affective communication at IARI, New Delhi between 30th August 1977 and 17th September 1977 and presented paper on the 'Incidence, etiology and Pathology of the tumours of the ethmoid in domestic animals'.

Dr. Jacob V. Cheeran presented a peper on Insecticide poisoning in Animals' in the monthly seminer of the College held on 8.12.1977.

Dr. K. P. Sadanandan attened the National Symposium on Protein metabolism in Ruminants held on 2. 1. 1978 at Ahamadabad and submitted a paper on 'Influence of tannins on rumen metabolism.

Dr. M. G. Ramakrishnan Pillai presented a paper on 'The Influence of still-bestrol dipropionate and testosterone propionate on the enzyme pattern of the reproductive organs and plasma in immature female chicken at the Indian Science Congress, Ahmedabad held during January, 3–7.

Dr. A. K. K. Unni, Professor attended the sixth annual Poultry Science symposium from 15-1-1978 to 17-1-1978 at Jabalpur. A paper on 'Production performance of two-way and three-way crosses in White Leghorns' was presented in the Scientific Session. Dr. C. K. Venugopalan, Senior Scientist, AICRP on Poultry also attended the symposium and present a paper on 'studies on certain economic traits in Desi ducks'.

Dr. A. K. K. Unni attended the meeting of the technical group constituted by the Government of India to go into the problems of Duck-farming in the country held at Hyderobad from 17th to 20th April, 1977.

Dr. A. K. K. Unni professor of Poultry Science and Dr. C. K. Venugopalan, Senior Scientist, AICRP on Poultry attended the 5th workshop on All India Co-ordinated Research on Poultry held at Hyderabad from 6. 9. 1977 to 10. 9. 1977.

Dr. E. P. Paily attended a symposium arranged under the auspices of All India compound Livestock feed manufactures Association of India at Cochin and presented a paper on 'prevalent cattle diseaser and their control'.

Dr. K. N. Muraleedharan Nair, Assistant profesor. attended the short term course in Radiology and orthopaedic surgery from 5. 4. 1977 to 30. 6. 1977 held at IVRI, Izatangar.

Two papers were presented by him during the course viz., (1) use of blood plasma in surgical shock

in animals, and (2) vascular changes followings internal fixation in fractures in animals.

Dr. K. M Alikutty, Associate Professor and Head of the Department of Therapeutics attended the Seminar on Degnala disease at Haryana Agricultural University, Hissar ou 3. 5. 1977.

Publication:

A list of published works of the teaching staff is appended (Appendix–X)

Research work:–

The details of research activities conducted in the various departments of the College are given in part II of this report.

Extension Education Activities

As part of the field extension practical training programme, the undergraduate students were assigned field work in the adopted villages for conducting survey, organising and conducting vaccinations for Livestock and Poultry, organising and conducting cattle sterility campaigns, participation in the village level exhibitions, seminars and Melas and for the conuct of field film shows. A total number of 1000 Raniket Vaccination for Poultry and 315 vaccination against H. S. for cattle and buffaloes were conducted. One hundred and eighty (180) film shows using the ICAR instructional films were conducted.

A large uumber of visitors from various parts of the State and outside consisting of farmers, students and teachers were taken round the College Departments and farms and the various activities conducted were explained to them. A total number of 1018 persons have visited.

Instructional films were also given on loan to the Departments of Dairy Development and Animal Husbandry on request for projection in connection with the various functions organised by the Departments concerned.

The staff of the Extension Department have participated in the Exhibitions and seminars canducted by the Departments in the field.

Village adoption scheme

The Professor of Extension has been incharge of the village adoption scheme of the Kerala Agricultural University for the 4 adopted villages around Mannuthy and Vellanikkara campuses. The Project Leaders and the Joint Project Leaders from the Colleges of Horticulture and Veterinary and Animal Sciences assisted in the implementation of the programmes under the scheme. The main activities undertaken were conduct of Village level seminars, Krishivignan Melas and Campaigns. 'Bunchy top Eradication Campaign' for the eradication of Bunchy top in banana was conducted in each village and new banana suckers were distributed to farmers. Four hundred (400) numbers of improved varieties of of coconut seedlings procured from the University Research Station at Pilicode were distributed to farmers on realisation of actual cost on a no-profit no-loss basis. Two thousand and five hundred (2500) numbers of pepper cuttings of the Panniyur-I variety were also distributed on realisation of cost to the farmers in the adopted villages. Cashew seedlings from all area of $4\frac{1}{2}$ acres were arranged through the Ela Project of the Agricultural Department and distributed to the farmers. Four hundred and fifty (450) numbers of coca seedlings were also distributed in addition to few seedlings of cinnamon, mango, nutmeg and clove distributed on demand from farmers.

Other activities

The Co-operative societies, village libraries and Schools and voluntary social organisations apart from the various official agencies like S F. D. A. and Banks associated with development activities in the Villages were contacted and with their Co-operation village seminars, One-day Dairy seminars, cattle show and calf show were conducted in addition to sterility campaign organised and conducted in each village.

An enrolling campaign for enlisting subscribers from among the farmers for the University Extension Publication 'Kalpadhenu' was carried out. Over 100 subscribers have been enlisted as members.

Under the Applied Nutrition Programme nutrition classes and film shows were held with the co-operation of Balavadies and Mahilasamajams in the villages.

The pulses crop demonstrations and intercrop demonstrations with tapioca and groundnut as well as demonstrations on Pineapple cultivation were conducted in each village under the guidance of the Project co-ordination in charge of demonstration trials. Five demonstration plots in each of the 4 villages, viz, Kurichikkara, Nathara, Panancherry and Ollukkara were laid. The intercropping of tapioca with groundnut has been great success and farmers have come forward to take up the programme by themselves.

Sannan—Malabari cross-bred bucks have been arranged to be distributed to selected farmers and

Panchayat for grading up of the local stock of goats. Accordingly one cross-bred-buck has been supplied to a farmer on payment of Rs. 420/- One cross bred buck for the Nadathara Panchayat and another to a progressive farmer in Ollukkara Panchayat have been arranged to be supplied.

A total number of 15 abstracts on Extenston have been contributed to publication in the 'ANIVET ABSTRACTS' in the 6 issues published during the period from April 1977 to March 1978. Dr. G. R. Nair, Professor of Extension has contributed 2 abstrcts, Dr. T. Prabhakaran, Associate Professor has contributed to 6 abstracts and Dr. P. S Pushkaran, Asst. Professor has contributed 7 abstracts.

Serialised lessons on selected topics of topical importance to farmers, were got prepared by the Poultry Department and Dairy Science Department and have been given for publication in vernacular dailies through the Directorate of Extension Education

Topics on Veterinary and Animal Husbandary subjects having a direct bearing on field problems were selected and list of experts from the various disciplines of the College have been fixed and furnished to the All India Radio, Trichur for radio broadcast talks in addition to the Krishipadam series contributed to the A. I. R. on Economic/Milk Production.

Extension consultancy service was rendered to the individuals of the organisations who were interested in starting Poultry farming, Dairy farming etc. Several copies of 'Package of Practices Recommendations for Livestock and Poultry' were distributed to persons within the State and outside on request in addition to copies distributed to the Officers of the Department of Animal Husbandry and Dairy Development.

A fisheries Development Programme in adopted villages in collaboration with the Department of Fisheries of the University has also been initiated. Organisation of Poultry clubs in selected high schools has also been taken up in the adopted villages.

During the year under report in the Department of Microbiology, 220 clinical specimens sent from various parts of Kerala were examined for bacterial, fungal and viral agents and the results were communicated for appropriate treatment and prophylatic measures

Biological products manufactured at the State Veterinary Biological institute were tested and certified for their safety and potency before release for the field use.

During November-December, 1500 doses of antivaccin for pneunomia in goats (CCPP) were manufactured and released to Chalakudy and Koraty areas as a prophylatic measures The results of vaccination were were very encouraging.

Tuberculin and Johnin tests were conducted in Elephants Stationed at Kodanadu Elephant camp.

A detailed investigation was conducted at Kurisumala Ashram, Vangamon based on a report of 'storm of Abortion' in cross-bred animals. On preliminary examination, leptospiral antibiodies were detected in a few animals and the results were confirmed by IVRI. More samples collected from the herd were sent to WHO Reference.

Dr. C. T. Thomas, Associate Professor, Department of Nutrition attended to the problems of feeding of animals in the Livestock farm, Mannuthy. He also attended to the analysis of feed samples received from the Agricultural Research Station, Chalakudy.

In the Department of Animal reproduction, a new project entitled 'Mobile sexual health control programme was launched. Shri P. G. Muraleedharan Agricultural Production Commissioner inaugurated the Project in the presence of the Vice-Chancellor Shri N. Kaleeswaran. The Project is drawn out to provide primarily the expert service required in the breeding of cattle at the door of the farmer at a reasonable cost. Apart from the benefits extended to the farmer this project ambodia the entire concept of Agricultural University viz., integration of teaching, research and extension. For the implementation of the Project a van with all modern scientific fittings have been procured and commissioned. A total number of 1475 animals were examined under this project and expert advice given.

The Department has under its control 2 artificial insemination centres, one at Mannuthy and the other at Trichur to cater to the needs of the public for artificial breeding of their animals. A herd of breeding bulls belonging to Holstein, Brown Swiss and Jersey crossbreds is maintained at the Mannuthy centre. This centre continued the work of semen processing, artificial insemination and extension of clinical expertise on reproductive problems of animals of local public. The centre at Kokkalai continued services on artificial insemination and diagnosis and treatment of infertility cases.

A total revenue of Rs. 20,735/- was collected by way of Artificial Insemination charge and sale of fresh processed semen.

The members of the staff of the department in collaboration with the Project leaders of the various adopted villages of the University regularly visited the villages and extended all expertise on the various problems of the villagers as far as reproductive problems of their cattle were concerned.

Dr. V. Sathianasan participated and did screening work (Parasitological) of animals brought for the Animal Husbandry Fair in Irinjalakuda and in Chelakkara.

In addition to teaching and research, the department of Pathology offers diagnostic service to field Veterinary staff, farms and to hospitals. During the year thirty one visits to the field were made for diagnosing diseases in connection with various out breake This Department is the Chief reference laboratory for the disagnosis of Rabies.

There was an outbreak of pneumonia in different parts of our State. The condition was diagnosed as a viral pneumonitis. Control measzures were suggested.

Incidence of aflatoxicosis was reported in buffaloes. goats and ducks, In buffaloes hepatie necrosis. erosions and ulcers in the abomasum and catarrhal gastro enteritis were noticed.

In goats hepatic necrosis and cirrhosis were the chief lesions The content of aflatoxin in the feed ranged from 10-25 ppm in the suspected feed.

Investigations on the mortality of animals in the Indoswiss project at Kolahalamedu revealed a toxic etiology due to ingestion of a fern.

Regular diagnostic service was given to farmers and to Government Poultry farms for diagnosing Poultry diseases. Marek's disease, Bangkok haemorrhagic disease, coccidiosis, Ranikhet disease and Ascaridiasis were found to be the major diseases causing mortality.

In the Department of Therapeutic, Laboratory investigation of 396 clinical samples collected from selected cases admitted at Veterinary College Hospitals were carried out during the period under report.

INSTITUTE OF AGRICULURAL TECHNOLOGY, TAVANUR

The Institute is now under the direct Administrative and technical control of the Director of Extension Education. The Head of the Institution is designated as 'Special Officer' in the cadre of Associate Professor.

Shri P. K. G. Menon continued as the Special Officer through out the period under report. The detailed staff position is separately appended (Appendix-XI)

Academic courses & Training Programmes:

1. Diploma in Agricultural Sciences:

This course hitherto continued as a certificate course covering a period of 6 trimesters was converted into a Diploma course extending the period by one trimester. During the extended period they are sent out on Field training to various research stations, District farm, seed farms IPD Units etc. for acquiring practical knowledge.

The third batch of the Diploma course comprising of fifty students was commenced from 1.8. 1977.

2. Short term training course in repairs and maintenance of Tractor and other Agricultural implements.

The course commenced on 11. 10. 76 was continued during the period with 19 trainees. This course started as a 6 months course was subsequently converted into a 1 year course, so as to make the trainees eligible for apprentice. The minimum qualification for admission to this course was also changed to VIIIth standard to improve the scope of the trainees and make them more eligible for absorption as apprentices as per the apprentice act.

The syllabus of this training course was subsequently re-oriented under the trimester pattern as a regular one year Academic course and the name of the course changed to 'Agricultural Mechanic course'.

3. Inservice training for Agricultural Demonstrators.

An inservice training course was started from 16. 1. 1978 for the Agricultural demonstrators working in the Department of Agriculture. The period of the training course is 6 months of which the first 3 months period will be devoted to Institutional training. The trainees are taught the basic Agricultural sciences in Agronomy. Plant Protection, Soil Science Horticulture, Agrl. Extension and Economics Co-operation and Farm Management, and Agrl Engineering. They are taken to co-operative societies, soil testing laboratories, Meterological observatories etc. as a part of the practical classes.

The first batch of trainees numbering 60 completed their Institutional training here and proceeded for the practical training.

4. Livestock Assistants Training Course

The 2nd batch of training course for candidates selected for apppointment as Livestock Assistants commenced from 16-1-1978, with 69 trainees on the roll. This is a 11 months training course out of which 9 months training will be in the Institute in different branches of Veterinary Sciences and the remaining 2 monthes will be practical training in Veterinary Hospitals, Artificial Insemination Centres, Cattle and Poultry Farms of the Departmant of Veterinary Science and Kerala Agricultural University. The training is in progress.

INSTRUCTIONAL FARM

The farm extending over an area of 26 hectares also provided facilities for the practical classes of the students and trainees basides being a source of income to the Institute.

Paddy

Out of 11.2 hectares of paddy land, 10.44 hactares were raised under bulk paddy during the virippu season. An area of 0.06 hectares were put under trial with different rice cultures received from Pattambi making the total area under paddy during Virippu to 10.50 hectares. The remaining area (0.70) was reserved for Mundakan Nursery.

Trial of New Rice Cultures

A yield trial with different Rice Cultures of intermediate height, obtained from the Rice Research Station, Pattambi was conducted during the Virippu Season to study their perfo mance under dry sown conditions in wetlands. 13 Cultures including an Assam Rice collection, ARC 11775 which has been reported to be highly promising under upland (Modan) conditions were tested with Jaya and PTB 26 as local checks. The performance of ARC 11775 as a low land dry sown crop was below normal from the point of yield but it was found to be comparatively earlier in flowering. Cultures 1016, 1017, 1015 and 1029 were the promising cultures with an yield ranging from 4.7 to 5.9 ton/hectare while the check varieties recorded 4.5 tons.

Tapioca

Tapioca was raised in an area of 2.10 hectares under the following varities.

M4	1.10 hect.
Local	0 80
Hybrids	0 20
	2.10

(H.1687
H.1249
H.2059)

Banana

A total of 1110 numbers of Nendran suckers, 50 suckers of Robusta and 57 in different varieties like Monsmarie, Pedda Pacha, Dwarf Cavendish, Zansibar, Rasthali, Poovan and Bontha Batcheesa were planted during the period.

Vegetables

Vegetables were cultivated in an area of 0.50 hectares, 0.30 as rainfed crop and 0.20 as summer vegetables. Yam and Colocasia were raised as intercrops in Banana. A total of 31.8 kg. vegetable seeds produced in the farm were sold at the Golden Jubilee Exhibition, Pattambi

Coconuts

A total of 5 Hybrids (TxD) and 50 Laccadive ordinary seedlings were planted during the period. 625 seed nuts collected from good bearing trees were sown in Nursery during July for local distribution. A germination of 95.8% has been recorded so far A total of of 1050 bearing Coconut Palms exist in the farm including 10 Hybrids, one Spikata and two Dwarf Orange. A total of 28584 nuts were obtained during the year.

Production of Coconut Seedlings

A total of 625 seed nuts have been sown in the Nursery during July 1977. The final germination count 6 months after sowing recorded 95.7% germination. The seedlings are for distribution to the public.

A total of 355 seednuts have been collected for raising the nursery for distribution next year. The nuts have been preserved prior to sowing. Sowing will be done in June – July.

Cashew

A total of 270 cashew trees about 3–3½ year old (237 local and 33 hybrids) exist in the farm area. They have not started bearing. 12 improved selections obtained from Mannuthy were planted during 8/77 but only 3 of them namely K-27-1, B1A-273-1 and NDR-2-1 established.

Pepper

A total of 83 bearing vines of local variety, 37 Panniyoor—1 (about 10 year old) exist in the farm. 30 cuttings of Panniyoor—1 were rooted and planted during the year. A total quantity of 57.750 kg. dry pepper were obtained during the year.

Nutmeg

A total of 66 nutmeg plants ranging from 3–8 years in age exist in the farm. 8 plants have started flowerings. 200 gm mace has been collected so far during the year from the bearing trees. 218 seeds were collected and 70 established seedlings have also been obtained from the good viable seeds collected.

Other crops

The following crops also exist

Cocoa	50 (8 year)
Sapota	25 (3 year-6) 10 year–19)
Mango grafts	105 (1 year–55 10–15 year–50)
Arecanuts	870 (ranging from 10 to as old of 40 years)

Dairy and Poultry

The following is the present stock of Livestock animals and poultry birds as on 1-4-78.

Livestock	Stock as on 1-4-1978
Cows	20
Bullocks	2
Heifers	3
Bulls	2
Total	27
Poultry Birds	99

The entire old stock of poultry birds were disposed off and 200 numbers of one day old chicks (white leghorn variety-Mychix) were brought from Mannuthy. A total of 5815.25 litres of cow milk, 1293.25 litres of buffalos milk and 24895 poultry eggs were produced in the unit during the period.

Veterinary Hospital-cum-Inseminaton Centre

The Unit started functioning during February 1977. The Instructor (Animal Husbandry) and one Livestock Assistant (II) are attending to the hospital work besides the classes and their duty in the poultry and dairy units.

A total of 955 cases brought by the public have been treated in the Hospital during the period.

Bovine cases	691
Caprine	174
Canine	16
Avian	74
Total	955

Besides the above a total of 111 insemination cases (91 cows and 20 buffaloes) were also attended to.

Extension activities

A training camp on the control of Bunchy top disease of Banana was organised for the benefit of the farmers under the Village adoption programme 33 farmers took part and they were taken to the Banana Research Station, Kannara.

Four classes were taken for the benefits of the farmers at 'Changerakulam' and 'Pothanur' under the programme sponsored by the FACT. Important aspects of soils, their characteristics, Manures organic and inorganic and fertilizer application were dealt with in detail in these classes. The importance of soil testing was also stressed.

Sixtynine farmers were enrolled as subscribers of 'Kalpadhenu' during the period. Educational films were brought from the field publicity office, Trichur and exhibited both in and out side the campus for the benefits of the students as well as farmers. 6 such film shows were conducted.

Special Lectures

Six special lectures were conducted during the period for the benefit of the Agricultural Students on the following topics by Officers of the Department of Agriculture and soil conservation.

4 4.77	Shri P. S. D. Nair, Dy Director of Agriculture, Trichur
6.5.74	Shri V. K. Karthikeyan, Dy Director of Agriculture.
10.5.77	Shri K. S. Thankappan. Dist. Soil Conservation Officer.
10.6.77	Shri P. G. Mathew, Joint Director of Agriculture.
29.10.77	Dr. P. N. C. Pillai addl. Director of Agriculture.

1. Ela programme of the Department
2. Development schemes of the Agriculture Department
3. Soil conservation progrmmes
4. Seed production & certification
5. Plant Production Programmes of the Department of Agriculture

LIBRARY

Library facilities are adequate for the present for the courses now in progress. The staff consists of one librarian and one library attender. There is also a small reading room for the benefit of staff and students. The Institute is subscribing to 27 journals both scientific and popular, besides the Kerala Gazette.

GENERAL

Gandhi Jayanthi was celebrated on October 2nd by conducting a meeting under the Literary club of the students Union. Shri. V. T. Bhattathiripad a noted writer was the chief guest on the occasion. The entire week was celebrated as 'Sevena Varam' and the students took part in cleaning of the premises. The 20th anniversary of Human rights day was celebrated on 10-12-77 by organising a meeting under the students club. Shri K. C. V. Raja, member of the Institute Governing Body was the invitee for the function. Both students and staff took part in the celiberations.

Election to I. A. T. students union was conducted during the year under report and the following were elected to the various posts.

President,	IAT	Students	Union	B. Mohanan (II batch)
Vice President		,,	,,	C. A. Mathew (III batch)
General Secretary		,,	,,	T. R. Radhakrishnan (II batch)
Associate ,,		,,	,,	Jones charles (II batch)
Art Club Secretary			,,	P. P. Gangadharan (III batch)
Student Editor		,,	,,	Radhakrishnan (II batch)

CHAPTER III

RESEARCH

Twenty three Research Stations are engaged in conducting Research on Rice, Coconut, Pepper, Cardamom, Cashew, Pineapple and Sugarcane under the Kerala Agricultural University in addition to the Research work carried out in the College of Agriculture, Horticulture and Veterinary and Animal Sciences.

Dr. R. Gopalakrishnan held the post of Director of Research till 22-7-1977 and there after Dr. V. S. S Potti, Director of Extension Education put in additional charge of the post of Director of Research.

The Research work undertaken in the field of Agriculture, Veterinary and Animal Sciences are given in Part II (Technical) of the Annual Report.

A brief account of the administrative aspects of Research Stations/Farms under the University where major schemes are implemented is detailed below. A list of Research Stations and staff working in the Statsons/Farms is given Appendix-XII.

A list of publications by the Research staff also given as Appendix-XIII.

1. RICE RESEARCH STATION, PATTAMBI

This is major Research Station engaged in various research studies on different aspects of rice varieties. Besides, research on pulses is also undertaken at this station. Though the main obtective of the station is to evolve high yielding rice varieties suited to the different agro-climatic conditions prevailing in the State, the station is actively participating in intensive research with multi disciplinary approach on production and protection technology in rice cultivation. The State Seed Testing Laboratory and Crop weather scheme are also functioning in the station.

The Golden ubilee of the Rice Research Station, Pattambi was celebrated from the 21st to 23rd December 1977 with a Scientific Symposium on Rice on the first two days and a Seminar on the 23rd. An Agricultural Animal Husbandry and Fisheries exhibition was also organised for the occasion.

During the year a rice culture which has been named 'Suvarna modan' (Ptb.42) with a duration of

110-120 days was released for cultivation in the modan lands of Palghat and Trichur districts. This variety could be grown as a rainfed crop in the viripps season and is tolerant to lodging.

From the trials under the International Rice Yield Nursery, one variety, Br 51-46-1-C1 with a duration of 110 to 120 days, which has consistantly given higher yields than the local checks has been identified.

One culture, Cul. 1907 a derivative of a cross between Bhavani and Triveni maturing in 105 to 110 days and resistant to lodging under moderate fertilizer levels has been obtained. Twenty rice cultures with multiple resistance to different pests and diseases have also been located

Muliple cropping trials have indicated that crops like maize, bajara and castor could be successfully grown as a relay crop in uplands after modan rice.

Experiments with weedicides have revealed that pre-emergence herbicides, Penoxalin and Benthiocarb are efficient in controlling weeds in direct sown rice grown under semi-dry conditions. In rice grown under puddled conditions a combination of Piperophos and 2,4—D, Benthiocarb and 2,4—D, Butachlor and 2,4—D, Durstun and 2,4—D as well as C—288 were found efficient in controlling weeds.

Studies on the role of non-cash inputs proved that the ill-effects of planting overaged seedlings could be mitigated by either shallow planting of two seedlings or deep bunch planting.

Trials with different sources of phosphates have shown that there is no significant difference in yield due to different forms of phosphates.

Nitrogen management trials have indicated that considerable reduction in nitrogen could be achieved by using slow release sources like sulphur coated urea and Isobutylidene diurea or by placement of urea in mud balls, the rate of response to unit nitrogen dose being 18 9 and 17.2 Kg of grain per Kg. of nitrogen as Isobutylidene diurea and sulphur coated urea respectively.

Results of the permanent manurial trial have shown that a combination of organic manures and inorganic fertilizers was superior to either of them alone irrespective of the variety being tall or dwarf.

Studies to find out the real requirement of P 205 in rice soils have indicated that P 205 applied in the first incremental doses up to 40 ppm. get fixed and very little is made available when incubated for five days. The grain yield data showed that during the viripPu and mundakan seasons the highest yields were obtained with 7.5 Kg. P_2O_5 per ha.

Micronutrient studies at Pattambi have shown that 50 Kg. Copper sulphate and 25 Kg. Zinc sulphate along with NPK fertilizers gave the highest yields during the first crop while in the second crop the highest yield was obtained with 25 Kg. Copper sulphate alone with NPK.

In a pot culture study with soils from Eruthempathi, Chitoor and Pattambi, it was observed that application of Zinc in Pattambi soil and Copper in Chittoor and Eruthampathy soils recorded higher yields than control during the first crop season. While Zinc and Copper in Chittoor soil and Zinc alone in Eruthampathi soil gave the maximum yield during the second crop season. Pattambi soil did not respond to either of the nutrients during the second crop.

Fortnightly planting studies with different varieties have indicated that time of planting influences remarkably the growth and yield of even photo—insensitive varieties.

In controlling the pests of rice, trials with new insecticides have revealed that Furadan (encapsulated) at 1.5 Kg. ai, per ha. among the granular formulations proved to be the most effective in controlling in stem borer and gallmidge.

Among the spray formulations Sumicidin at 0.75 Kg. ai./ha was found to be better than the others especially in controlling gall midge and leaf roller. Nuvacron and counter were found effective against stem borer, gallmidge and leaf roller and knockbal against leaf roller.

Out of 253 entries tested for resistance to gall midge 55 were found to be resistant. It was also observed that progenies of crosses involving. Warangal cultures and RPW 6-13 showed more resistant to gallmidge. Among 261 entries tested for resistance to brown plant hopper 46 entries showed a resistant reaction.

The biotype of brown plant hopper prevalent in Kerala seemed to be different from those in the Philipines.

Frequent application of insecticides reduced the natural enemies both predators and parasites of the pests.

It was observed from the fungicidal trial to control sheath blight disease that soil application of

thiram followed by a foliar spray of Hinosan and soil application of PCNB followed by a spray application of Hinosan could decrease the intensity of the disease by 41. I% and 26.9% respectively over the control.

In the blast control trial with chemical, a systemic fungicide Bavistin was found to reduce neck infection by 47. 5% and increase the yield by 42% over the control. Hinosan and Kitazin were the other chemicals of note.

While assessing varieties for resistance to diseases one of the entries IET. 6058 was found to possess a high degree of resistance to blast, sheath blight and bacterial leaf blight.

Under the project for intensification of research on pulses, an improved variety of cowpea which has been named as 'Kanakamani' (PTB. I) was released during the year.

Varietal trials with blackgram and greengram have shown that NP I4 in the former and NP.40 in the latter are varieties with high yield potential under our conditions.

Fertilizer trials in cowpea have indicated that the optimum dose of nitrogen and phosphorus are 32 Kg. and 38 Kg/hectare respectively.

The station is under the charge of an Associate Professor. Sri. N. Gopalan was in-charge of the station during the period under report.

The total expenditure incurred during the year under report was Rs. 14, 19,071/04 aganist an income of Ri. 2, 78, 644/55.

2. RICE RESEARCH STATION, MONCOMPU

A paddy breeding station at Moncompu was started in 1940 with the object of evolving high yielding paddy strains suited to Kuttanad tract and also to tackle problems allied to paddy cultivation. In 1976, the Rice Research Station, Moncompu was upgraded to the status of a full fledged Research Station and the strength of the technical staff was increased. At present the station is in its take off stage and measures are being taken to equip it with facilities and personnel for bringing it to the level of a good rice research institute.

A remarkable achievement of the station is the evolution of the rice culture viz., M-11-57-5-1 which is found to be a high yielding strain(average yield 5,500 Kg/ha) suited to Kuttanad soils especially Karapadams and is comparatively tolerant to brown plant hopper attack.

Sri. N. Rajappan Nair, Associate Professor was in-charge of the station during the period under report.

An amount of Rs. 2. 18, 533/96 has been incurred towards an income of Rs. 52, 655/21 during the year under report.

3. RICE RESEARCH STATION, KAYAMKULAM

The aim of the Station is to evolve suitable Rice and Sesamum varieties suited to the sandy tract and formulate improved cultivation practices in Onattukara region Thus the overall improvement of rice and sesamum crop in Onattukara region is the objective of the Station.

The Research activities of this station is mainly concentrated on Botanical, Agronomical and Plant Protection aspects of Rice and Sesamum.

An improved variety UR-19 giving about 30% increased yield over the local variety Chempavu was evolved by pureline selection. This variety is most popular in Onattukara region.

From the varietal trials conducted it is found that Ptb-23 for the Ist crop and Ptb 20 and Ptb-4 for the 2nd crop are best suited to the tract.

Among the high yielding varieties, it is found Jaya, Jyothy and Triveni are the most suited for the first crop season. For the 2nd crop season the present high yielding varieties are not coming up well and hence UR-19, Ptb-20 and Ptb-4 are recommended.

Four promising short duration cultures viz., Cul-1,2,4 (Annapoorna x IR-8) and Cul. 16 (Kochuvithu x TN-1) were evolved by hybridisation and they are gaining popularity in the region.

Application of cattle manure to supply 25% of the total nitrogen together with the balance nitrogen, full P_2O_5 and K_2O as fertilizers recorded maximum yield for the Ist crop.

During the 2nd crop season entire dose of nitrogen applied as cattle manure recorded the maximum yield.

Among the nitrogenous fertilizers tried Urea and Ammonium Sulphate were found equally good

Application of P_2O_5 and K_2O is found essential for higher yields in sandy tracts.

Continuous application of nitrogen in the form of inorganic fertilizers without P_2O_5 and K_2O is having a deleterious effect.

Application of Zinc Sulphate and Manganese Sulphate as micronutrients has given increased yield

Split application of Potash @ 50% as basal, 25% at tillering and 25% at PI stage was found to be more beneficial.

It is conclusively proved that fields must be maintained free from weeds upto 45 days of seedling/planting for higher yields

Dibbling seed behind the country plough and planking is the best method of seedling compared to broadcasting or drilling for the first crop.

Optimum number of seedlings per hill for maximum yield was found to be two for local varieties. No increase in yield could be obtained by increasing the number of seedlings per hill.

Soil application of B. H. C. 50% dust before dibbling, ie., during last ploughing @ 28 Kg ha. considerably reduced the attack of Mole Cricket during the first crop.

Since iron toxicity is one of the major causes of yellowing in Onattukara tract management practices may be adjusted so as to improve the soil conditions against excess, accumulation and absorption of iron. Use of higher dose of Potash (67.5 Kg. K_2O/ha) has given encouraging results against yellowing.

The first dose of nitrogen whether applied at the time of dibbling or planting or 15 days after dibbling or planting did not effect the grain yield significantly.

A high yielding Sesamum variety Kayamkulam-1 was released during the year by pureline selection. It has an increased yield of 21.1% and 2.8% oil content over the local variety. This superior variety has gained popularity throughout the State.

A multipoded mutant of Kayamkulam-1 is also isolated and is in the pre-release stage.

Fifteen high yielding cultures having multipoded nature derived from the cross Pt. 58-35 x Kayamkulam-1 are under yield trial at the Rice Research Station, Kayamkulam.

A total number of 86 Sesamum varieties are being maintained under germ plasm collection. Screening studies for higher yield and other desirable characters are being conducted.

Intervarietal trial conducted from 1962 onwards proved that besides Kayamkulam-1 and Multipoded mutant of Kayamkulam-1, TMV-2, KRR-1 and Selection-14 are suitable for cultivation during 3rd crop season in paddy fields.

Seed rate of Sesamum was recommended as 5Kg/ha and the optimum spacing for Sesamum was recommended at 15 cm x 15 cm.

Manurial requirement of the crop was studied and was found to be 30:15:30 Kg of NPK per hectare.

Inter culturing on 15th and 25th day after sowing was found to be better for the crop.

Among the nitrogenous fertilizers, Urea was found to be more effective in sandy soils supplying of N @ 30 Kg per hectare.

Foliar application of Urea (2% solution) 29 days after sowing combined with basal application @ 15 Kg/ha. will increase the yield of Sesamum.

Effect of irrigation on the yield of Sesamum was studied and it was found that yield can be increased by irrigation, twice at vegetative phase and once at reproductive phase.

It has been proved that during 3rd crop season in Onattukara, ie., January-April months, besides Sesamum, Groundnut, Blackgram, Cowpea (New Era and Kunnamkulam local) can be successfully cultivated in paddy fields.

Sri A. E. Sreedhara Kurup, Associate Professor was in-charge of the station during the period under report.

An amount of Rs. 2,11,797/98 was spent during the year against an income of Rs. 36,286/39.

3. RICE RESEARCH STATION, VYTTILA

Rice Research Station, Vyttila is situated in the Corporation area of Cochin and thereby accessible by all means of conveyance. The station is 7 and 15 Kilometers east of Ernakulam Junction and Cochin Air Port respectively.

A fishery unit also started functioning in the station from February 1976, under the direct supervision of an Associate Professor.

Nine projects under rice and seven projects under fisheries were conducted during the year under report.

Post larvae of tiger prawn brought from West Bengal and stocked in ponds at Vyttila have given a a record growth of over 38 gms. within a period of 130 days.

Tiger prawn seed resource was located for the first time in Kerala backwaters under the seed resource survey conducted by the fisheries unit of the station.

In the district trials conducted during 1977-78, the two promising cultures of the pure line selection from Cheruviruppu (Cul. No. 74 and 174) out yielded the bulk by 15 and 30% respectively.

A germ plasm of 22 local varieties which are tolerant to salinity were collected from different saline areas in the country and maintained during the year under report.

Screening of 144 entries (varieties and cultures) were conducted during 1977-78 for salinity tolerance None of the entries showed better tolerance than pokkali.

A total expenditure of Rs. 1,13,619/01 and Rs. 1,31,748/69 was incurred during the year as against a receipt of Rs. 11,352/20 and Rs. 2,363/12 for the Rice Unit and Fisheries Unit respectively.

Sri. P. J. Tomy, Associate Professor continued as the Head of the Office.

5. MODEL AGRONOMIC RESEARCH STATION, KARAMANA

This Station was established during the year 1955 with an object to conduct complex manurial cultural and rotational experiments in Paddy crop under the All India Co-ordinated Research Project of the ICAR This station also undertakes the Research projects suggested by the Rice Committee and also undertakes the quality seed production and distribution.

In the mixed sowing experiment it was found that high yielding varieties in both the seasons was found to be far superior to local strains during both the seasons or high yielding variety in one season and a local variety in another.

It was also proved that high yielding variety of paddy is highly unsuitable for use in the mixed sown cropping system.

The planting of Jaya and Culture 1065 should not be delayed beyond the last week of June whereas for the variety Culture 23548, there is no harm even if the planting is delayed by a month.

Among the varieties tried Culture 1065 was superior to Jaya and Culture 23548.

Combined application of NPK and farm yard manure are not beneficial.

$N_{60}P_{30}K_{30}$ dose of fertilizer can be substituted by the application of 12 tonnes of farm yard manure.

Beyond 90 kg. Nitrogen per hectare, the response is insignificant.

No difference between super phosphate and Mussoorie rock phosphate is noted.

There is no residual effect for phosphatic manures.

Jaya variety yields more when the planting date is advanced by a month during Kharif season Where as Jyothy variety performs well when it is planted at the normal date. Advancing the date of planting in Rabi season is also found to be advantageous for getting greater yields in high yielding varieties.

In both Kharif and Rabi seasons, Jaya variety is found to be superior to Jyothy and Bharathy.

Sri. V. Ramachandran Nair, Associate Professor was in-charge of the station during the year under report.

A total expenditure of Rs. 1,37,863/46 was incurred against an income of Rs. 29,918/47 during the year.

6. AGRONOMIC RESEARCH STATION, CHALAKUDY

The main objective of the station is to conduct research on water management and soil salinity and to develop cropping pattern suitable for varying water management and fertility situation in command areas. Testing of new crops and varieties for the adaptability and performance under different moisutre constraints, to estimate the water requirements of Rice and various forms of water losses, to evolve sutiable practices to increase water use efficiency in field crops etc. are also under taken at the station.

During summer, 'Phasic stress irrigation' can be practised to the advantage of irrigating 20 to 30 percent more area with the same resources of water, if rice is grown as third crop.

Two irrigations of 3 cm. depth each given in the vegetative phase and in the generative phase was the best, registering maximum yield and water use efficiency in the case of gingelly grown in rice follows in summer.

The Rabi tapicoa can be harvested 2 months earlier if the crop is irrigated during summer, once in 2 or 3 weeks.

The following rice based cropping pattern can be successfully adopted in the project area.

Khariff	Rabi	Summer
Rice (SM)	Rice (M)	Groundnut-Daincha
Rice (S)	Rice (S)	Tapioca
Rice (M)	Rice (SM)	Vegetables
Rice (M)	Rice (M)	Sesamum-Daincha

The Station is under the Administrative control of Sri. N. N. Ramankutty, Associate Professor upto 9-1-78 and Dr. U. P. Bhaskaran, Associate Professor continued as the Officer-in-charge of the station during the remaining period under report.

An expenditure of Rs. 3,13,589/83 was incurred against an income of 36,384/19 during the year.

7. RICE RESEARCH STATION-CUM-INSTRUCTIONAL FARM, MANNUTHY

The Rice Research Station has been converted as an Instructional Farm and functioning as a part of the College of Horticulture. It was developed with the object of providing practical training and to provide planting materials for the Research Station and staff of the College of Horticulture.

Several manurial experiments were conducted at this station to find out the optimum manurial schedule for the Paddy Crop and it was found that there is increase in yield with increase in the dosage of the Nitrogen. There is no effect due to the application of P and K alone but interaction between NP and NK is effective to increase the yield. It was also found that better yield is obtained when Nitrogen is applied in 3 more split doses From the experiments conducted in this station, it was found that stam F34 is very effective in controlling weeds in Rice Fields. It was also found that Thimet and Furadan (Granular insecticides) are most effective to control the various pests of Rice Crop and Hinosan is a good fungicide to control the blast disease in Rice.

The station is under the administrative control of Sri. P. Balakrishna Pillai, Associate Professor upto 12-7-77 and thereafter, Sri. V. K. Sasidhar, Associate Professor continued as the Officer in-charge of the station during the period under report.

A total expenditure of Rs. 8,52,783/99 was incurred against an income of Rs. 1,25,447/23 during the period under report.

8. COCONUT RESEARCH STATION, PILICODE, NILESWAR

The main objective of the station is to study the cultural, manurial and other Agronomic practices of Coconut Cultivation and to formulate best Agronomic practices of red sandy loam and gravely laterite soils. The study of crop behaviour and adaptability of exotic varieties to ensure their economic characters based on their performance are also undertaken at this station. The station is producing high yielding hybrid varieties of Coconut for distribution among the cultivators. The research activities of the station were mainly made on project based under five disciplines viz., Botany, Agronomy, Chemistry, Entomology and Plant Pathology.

Two All India Co-ordinated Projects ie., All India Co-ordinated Coconut and Arecanut Improvement Project and All India Co-ordinated Tuber Crop Improvement Project are also under operation at the station.

One more cultivar, ie., Ayramkachi a dwarf variety obtained from Veppamkulam, Tamil Nadu was added on the germ plasm collection bringing the total number of cultivars to 29 exotic and 25 indigenous. Description of plant and nut characters of 50 cultivars have been completed so far.

In the trial on exploitation of hybrid vigour 20 plants in 12 hybrid combinations have flowered so far, ie., 4 years after planting. The maximum of 4 out of 5 plants flowered in West Coast Tall x Laccadive Dwarf followed by West Coast Tall x Chowghat Dwarf Green in which 3 out of 5 plants flowered.

Among the six varieties of pepper planted in; Multistoreyed cropping trial in Coconut Garden Panniyur-1 has established well and made good vegetative growth. The next best is Karimunda.

In the trial to study the response of D $\times$ T hybrid coconut to common salt application from seedling stage on-wards vegetative growth was found to be more during the first year in the seedling getting one third the adult dose of 250 gm. sodium and 750 gm. potash per Palm per year. The seedlings which received no potassium and sodium were stunted in growth.

Leaf axil application of fertilizers in coconut resulted in premature dropping and shedding of leaves as a result of scortching and decay of leaf base.

Sri. K. Kannan, Associate Professor continued to be in-charge of the station during the period under report.

A total expenditure of Rs. 5, 6I, 261/41 incurred during the year against an income of Rs. 4, 23, 061/26.

9. COCONUT RESEARCH, KUMARAKOM

The station is mainly engaged to conduct varietal, cultural, manurial and plant protection trials in coconut crops under the Agro-climatic conditions prevailing in the back water area of Kuttanad tracts with special reference to root wilt disease.

Ten research projects were continued during the year and two new projects were also started. The research projects are at different stages of implementation and it is too early to obtain any conclusive results on those project,

In addition to the above, a new project entitled 'Integrated Research Project on mixed farming of coconut, livestock and fish' which underline the prinicipie of organic recycling to maximise agricnltural production was started during the year under report. The scheme will cover crop farming, cattle farming, fodder cultivation, pisciculture and frog rearing. Under this project about 2. 4 hectares of coconut garden were brought under fodder cultivation, one hectare under spice cultivation and 0.5 hectare under vegetable cultivation. Trial cultivation of fresh water fishes like Catla, Comman Carp, Gourami etc. were undertaken during the year. The initial observation on the growth and performance of these fishes were not satisfactory. Their performance is closely watched further.

Sri. P. K. Sathiarajan, Associate Professor was in-charge of the station during the period under report.

A total expenditure of Rs. 1,99, 712/50 was incurred during the year against an income of Rs, 1, 23, 962/10.

10. COCONUT RESEARCH STATION, BALARAMAPURM

This station undertakes varietal, manurial cultural and agronomic trials to find out suitable cultivation practices for coconut in red loamy soils in Kerala.

Four research projects are also in operation at this station,

The long term NPK factorial experiment to study the response of coconut palms grown on the typical red soil, on the soil applied NPK fertilizers started during 1964 has yielded results which are of much practical importance in the nutrition of young palms. The combined analysis of 6 years' yield data (1972–77) showed that, (1) the young bearing palms responds remarkably to NPK fertilizers, the yield enhaning progressively with the increasing doses of fertilzers tried in the experiment; (2) the optium level of P_2O_5 was found to be 225 gm/Palm/year, doses higher than this tended to reduce nut production to some extent: (3) with the application of the highest dose of nitrogen viz., 680 gm/palm per year there was a five fold increase in the yield compared to those in the no N plot. Phosphoric acid at 225 gm. P_2O_5/palm/year broght about a four fold enhancement of the yield. Potash at the highest level viz., 900 gm K_2O/palm/year increased the nut yield by 55 times with those of the no potash plants. The economic optimum for the three nutrients has also been worked out. The notable feature of the results of this experiment is that the fertilizer responses are far higher than those reported in literature; this wide difference may be due to the fact that the young bearing palms, particularly those adequately fertilized from the seedling stage would probably manifest larger fertilizer responses than the adult palms which are the experimental material in older experiments.

The station is under the administrative control of Shr K. Pushpangadan, Associate Professor till 27-11-77 and from 2-12-77, Dr. K. M. Sukumaran was the Officer incharge.

A total expenditure of Rs. 1,77,166'54 was incurred during the year under report against an income of Rs. 1,27,114'60.

11. CARDAMOM RESEARCH STATION, PAMPADUMPARA

The main objective of the station is to undertake research on Agronomical, Botanical, Entomological and Plant Pathological problems of cardamom cultivation. The station is also one of the Co-ordinating centres for Research on Cardamom under the All India Co-ordinated Spices and Cashewnut improvement project of the ICAR.

Seventeen research projects are in operation in the station.

A total quantity of 701 kg. of dried cardamom was sold during the year. During the year 7,500 cardamom seedlings were planted. Out of this 600 seedlings were used for fresh planting and the remaining for gap filling. Two thousand rhizomes were also planted for gap filling. An area of 3 hectares of land hither to left uncultivated was planted with pepper. A multilocational varietal trial using

five varieties of pepper viz., Panniyur-1, Narayakodi, Karimunda, Aimpiriyan and Vellanampan was started during the year. Primary nursery for 35,000 c rdamom seedlings has been raised during the year. Nursery for five thousand seedlings of a new variety (S. L. N. 7) of coffee has also been raised during the year.

Six insecticides sprays have been found effective in controlling thrips infestation on cardamom capsules. Among dust formulation tried, six have been found very effective in controlling thrips infestation on cardamom capsules. An experiment using bactericides, fungicides, insecticides etc. proved that none of the treatments is effective in reducing the incidence of 'Chenthal' disease of cardamom. It has been observed that 'Chenthal' occurs only on plants which are exposed to direct sunlight and wind. Studies on the role of honey bees in the pollination of cardamom proved that the cardamom pollination is mainly through the agency of honey bees.

The station is under the administrative control of Dr. K Wilson, Associate Professor upto 3-7-77 and Dr. S. Balakrishnan, Associate Professor for the remaining period under report. A total expenditure of Rs. 3,12,323/74 was incurred against an income of Rs. 91,626/99 during period

12 HORTICULTURAL RESEARCH STATION, AMBALAVAYAL

The station is located at Ambalavayal in South Wynad Taluk of Kozhikode district 100 Km. away from the Kozhikode town on the eastern side. The elevation of the station is 974 meters above MSL The station was started in the year 1946 and has an area of 87.03 ha

The main objectives of the station are:—

i) To carry out research on different crops cultivated in Wynad and for the improvement of Agriculture in Wynad in general and for the colonization area in particular.

ii) To make available to the farmers quality seeds and seedlings of various crops suitable to Wynad.

iii) To render technical advice to cultivators on various aspects of improved Agricultural practices.

The station has become one of the main centres for the conduct of research on hill paddy, fruits, spices, essential oils etc. in addition to the production and distribution of quality seed and seedlings, rooted cuttings and grafts of various crops suitable for cultivation in the sub-tropical area of the State.

The station is under the administrative control of an Associate Professor. Sri. A. Padmanabhan Thampi was in-charge of the Station during the year under report.

A total expenditure of Rs. 8,49,871/40 was incurred as against an income of Rs. 4,34,874/28 during the period under report.

13. LEMONGRASS RESEARCH STATION, ODAKKALI

The main objective of the station is to conduct investigation on botanical, agronomical and biochemical aspects of various essential oil yielding plants of Kerala with special reference to Lemongrass.

A total of 16 experiments have been conducted on various essential oil yielding crops during the year. Out of the 16 experiments, 2 experiments on Lemongrass and one experiment on Palmarose have been concluded. The Pooled data for four years (analytical result yet to be received) of the fertilizer trial of lemongrass showed that application of nitrogen at the rate of 150 kg/ha. in one single basal application gave maximum oil yield. Stage of harvest trial of Lemongrass grown in lower areas conducted for four years showed that an interval of 45–50 days between successive harvest was the best for obtaining maximum oil yield. While highest citral content in oil was obtained for the treatment 55–60 days. For Palmarosa maximum oil yield was obtained when fertilizers are applied at the rate of 40:30:30 kg/ha.

The station is under the administrative control of Sri. E. V. G. Nair, Associate Professor during the period under report.

An extenditure of Rs. 2,02,838/17 was incurred during the year under report against Rs.40,372/56 as receipt.

14. PEPPER RESEARCH STATION, TALIPARAMBA

This is a station doing research work on the evolution of high yielding varieties of pepper, control of insects pests and diseases, the manurial requirements of the crop and optimum methods of cultivation under the Kerala Agricultural University.

During the year under report, nineteen different research projects were in progress at the station. About 3,000 hybrid open pollinated seeds were sown in the nursery. Among hybrid and open pollinated seedlings planted during the previous years, 17 seedlings flowered during the year. Among these four

seedlings which exhibited desirable growth and spike characters, have been multiplied by taking cuttings and put in a preliminary yield trial along with popular high yielding pepper varieties viz., Panniyur–1 and Karimunda. In an experiment to find out the effect of graded doses of Nitrogen with and without lime on the yield of Panniyur–1 variety of pepper, it is observed that higher doses of Nitrogen has not a proportionate effect on the yield, though application of Nitrogen at all levels increases the yield, the rate of increase is poor at higher levels of Nitrogen. In the experiment 60 grams of nitrogen per plant per year seems to be the optimum dose.

A total expenditure of Rs. 2,23,080/56 was incurred during the year under report as against a receipt of Rs. 60,695/34.

Sri P. K. Venugopalan Nambiar, Deputy Director of Agriculture was in-charge of the station during the year under report.

15. BANANA RESEARCH STATION, KANNARA.

The objective of the station is to undertake research on various aspects of Banana and Pineapple cultivation in Kerala. Selection ofsuperior varieties of Banana and Pineapple, standardisation of cultural and manurial practices, time and method of planting, pest disease control measures, dose and method of application of hormones and growth regulators etc. are the major items of work carried out in the station.

Banana

The varietal collection consisted of 157 varieties of banana. Based on the studies the following varieties were found promising.

DESSERT TYPES

1. Dwarf	i) Monsmari
	ii) Giant Governor
	iii) Robusta
	iv) Dwarf Cavendish
2. Tall	i) Grosmichel
	ii) Chenkadali
	iii) Poovan
	iv) Palayankodan
	v) Njalipoovan
	vi) Amritsagar
	vii) Karpooravalli
	viii) Poomkalli
3. Nendran group	i) Nedunendran
	ii) Zanzibar

CULINARY VARIETIES

i) Monthan
ii) Batheesa
iii) Kanchikela
iv) Nendrapadathy.

Among the various available mutants of cavendish banana at this station, the variety Monsmari produced bunches of better weight. Its fruits were of largest size and contained higher sugar and lesser acidity.

The survey of weed flora of banana plantation indicated the presence of 36 types of weeds of which 13 were of major importance. Weedicide application was found to be very effective in controlling a broad spectrum of weeds. Among the various herbicides tried, post emergence application of a combination of Gramaxone 1.5 lit. and Diuron 3 Kg ha. at six monthly intervals was found to be the best, next best treatment being the combinationtreatment of Gramaxone 1.5 lit. + 2.4 DNa salt one kg per ha. Among the above two treatments application of gramaxone 1.5 lit. + 2 4 DNa salt 3 Kg/ha was found to be more economic. The herbicide application did not adversely affect either the growth of plant or productivity.

The studies undertaken on the incidence of diseases in banana and their control have yielded the following results:-

On banana three diseases viz., Bunchy top, leaf spot and Kokkan are most important in Kerala. The survey on the incidence of bunchy top disease in various district of Kerala revealed that the maximum percentage of infection was in Nendran, Red banana Poovan, Palayankodan and Robusta.

The screening of varieties of banana so far conducted against bunchy top disease by artificial inoculations showed that the varieties Bodless Alta Fort, Pisang awak' Boodithabontha batcheesa, Karpooravally, Kanchikela, Vadakkan Kadali, Senna chenkadali and Vennettukunnan were comparatively tolerant to bunchy top disease when compared to other varieties tried.

Both soil and foliar applications of insecticides were effective in controlling the insect vector (*Pentalonia nigronervosa*) of bunchy top disease thereby bringing reduction in the disease incidence. Among the insecticides tried Thimet and Disyston were very hightly effective.

The leaf spot disease of banana was found associated with two fungi viz., *Cercospra musae*. and *Cordona musae*. Spraying with bordeaux mixture 1%.

was found to be very effective. This treatment contributed for higher mean bunch weight. The analysis of the ripe fruits for various qualities indicated that the percentage of total sugar was more in all the treatments compared to control, the best treatment being spraying with Bordeaux mixture.

The survey on the incidence of parasitic nematodes in banana indicated the presence of the following five species of parasitic nematodes.

1) *Radopholus sp.*
2) *Paratylenchus sp.*
3) *Helicotylenchus sp.*
4) *Griconemoids sp.*
5) *Meloidogyne sp.*

Pot culture experiments conducted to assess the pathogenic effects using different levels of plant population of *Radopholus similis* indicated that the growth got retarded when the population of nematode exceeded the level of 100 numbers in 10 gm. of roots.

The evaluation of different nematicides for the control of parasitic nematodes of banana indicated that there was reduction in the number of parasites due to application of nematicides, significant difference in population being noticed between treated and control plots. In control plot the population exceeded the normal pathogenic level. Maximum bunch weight was obtained from the plots treated with Nemacur, Thimet and Themik.

The trial conducted to determine the optimum time and frequency of application of nitrogen and potash to nendran banana under irrigated conditions indicated that in respect to mean bunch weight, Tr. 4 (N and K) in two equal split doses at 30 and 150 days after planting was the superior.

The screening of varieties against the attack of banana rhizome weevil revealed that none of the varieties tested was resistant to pest attack. The varieties Nendran, Zanzibar, Robusta, Dwarf cavendish and Grosmichel were more susceptible than Kanchikela, Njalipoovan, Palayankodan, Poovan and Pachabontha batcheesa. Insecticidal treatments of suckers and application of insecticides around the rhizomes helped to reduce the infestation of the weevil and increased the bunch weight.

The population density trial in banana variety Robusta indicated based on cost benefit analysis that a population of 4,900 suckers/ha. was acceptable, but further trials comparing the local practice of accomodating 2,310 suckers/ha. with the above, however, appears necessary.

The work on screening of 143 varieties of banana against leaf spot disease showed that Red banana, Chenkadali, Senna chenkadali, Pisang lilin, Pakka, Tomgate, Adakkakunnan and Thiruvananthapuram were more tolerant than other varieties.

Pineapple

Planting of higher population of suckers in unit are a helped to increase yield of pineapple considerably Of the various treatments P1S5 (61666 suckers/ha), P1S4 (59259 suckers/ha) and P1S2 (53333 suckers/ha) were found superior for yield. On an overall analysis it appeared that the treatment P1S4 (59259 suckers/ha was most advantageous. But in this treatment the spacing between trenches being 75 cms, difficulty arose in the maintenance of the crop in the subsequent ratoon seasons. Therefore, the treatment P1S2 52,333 suckers/ha) allowing interspaces of 90 cms. between trenches, 60 cms. between rows and 25 cms. between plants was found to be more beneficial as against the coventional cultivation practice of planting suckers adopting a spacing of 45 cm x 60 cm x 180cm (15000 suckers/ha).

Soil application of nitrogen fertilizer was found to be better than foliar + soil application for pineapple. Nitrogen levels and method of N application did not influence TSS and acidity of fruits. The lowermost dosage of 8 g N/plant/year contributed for higher reducing sugars in fruits. In respect of other qualities of fruits viz , non-reducing sugars, total sugars and sugar acid ratio, Nitrogen level of 12 gm/plant per year was superior. Soil application of N was significantly superior for all the characters studied.

Survey of weed flora of pineapple plantation indicated the presence of 41 types and varieties of weeds of which 20 types were of major importance. Application of herbicides was found to be very effective in controlling a broad spectrum of weeds in pineapple plantation. Among the treatments tried, Diuron 3 kg per hectare applied as pre-emergence and repeated at half dose five months after first application was found to be not only superiormost, but also was more economical than hand weeding under the prevailing wage rates. This treatment helped in increased production of fruits by 15% thereby ensuring higher profit. The herbicide treatment was not detrimental to the plants or to the quality of fruits.

A mild incidence of leaf blight disease was noticed in pineapple and the causative fungus was idientified as *Drechslera hawaiiensis*.

The first series of observational trial conducted in 1974-76 season indicated that Ethrel at 500 ppm. concentrations were most effective in inducing maximum flowering in pineapple suckers of age 14–1/2 to 16 months in plant crop season. The second series of observational trial conducted in 1976–77 season during the month from November to May using different growth regulators at different concentrations of the plant crop of 16 months old and ratoon crop on 11-12 months old indicated that besides ethrel alone at 1000ppm and 500ppm dosages, combination treatments of ethrel at 100 ppm and 25 ppm with 2% urea and 0.04% of calcium carbonate were very effective, combination treatments being exceptionally good for both plant crop and ratoon crop. The treatment 25 ppm ethrel + 2% urea + 0.04% calcium carbonate was the cheapest involving a cost of 1.2 paise/plant. The third series of observational trial to evaluate the efficacy of different growth regulators in inducing flowering during the different months of the year commencing from May 1976 to January 1977 indicated that maximum per centage of flowering was observable in the applications made in the months of October, November and December, just prior to anticipated natural flowering period of pineapple. Among the various treatments, combination treatment of ethrel, urea and calcium carbonate was found to be reasonably good in the off season of June-July provided rains did not advance or precede application atleast a day.

The adaptive trial laid out to compare the results of resrarch so far obtained with local practices proved the advantages of adopting high density planting, herbicide application and growth regulator application While the improved practices ensured profit within two years of planting based on computed figures for yield, the local practice ended in less showing the imperative necessity for adhering to ratooning under local practice of cultivation.

The station is under administrative control of an Associate Professor. Shri. S. Balakrishnan was in-charge of the staiion during the year under report.

The total expenditure incurred during the year was Rs. 3,93,623/65 against an income of Rs. 1,19,641/49.

16. CASHEW RESEARCH STATION, ANAKKAYAAM

The main objective of the station is to find out ways and means for augmenting cashew production in the Kerala State by improved cultural practices. It includes breeding new varieties, evolving suitable plant protection measures, cultural and manurial schedules.

Nine research projects were in progress at this station.

The station is under the charge of an Associate Professor. Sri. P. G. Veeraraghavan was in-charge of the station.

A total expenditure of Rs. 1,02,254/86 incurred during the year under report against an income of Rs. 29,592/67.

SCHEMES

i) **All India Co-ordinated Spices & Cashew Improvement Project, Mannuthy**

A unit of All India Co-ordinated Spices and Cashew Improvement project is functioning at the main campus in an area of 24.7 hectares. The scheme is functioning under the control of Shri. K. K. Vidayadharan, Associate professor.

A germplasm collection for cashew types is being built up at this centre. During the year 23 new types were added thus bringing the total collection to 92.

A total expenditure of Rs. 91,809/35 was incurred during the year under report against Rs. 21574/48 as income.

ii) **Sugarcane Research Scheme, Thiruvalla**

The main objective of the station is to conduct fertilizer, varietal and zonal trials as approved by the ICAR, with a view to formulating fertilizer recommendations for the crop in the State and releasing promising cane varieties.

The station is under the administrative control of an Associate Professor. Sri. P. K. Chellappan Nair was in-charge of the station.

A total expenditure of Rs. 64,576/33 was incurred during the year against a receipt of Rs. 29, 030/79.

Veterinary Research

1. UNIVERSITY LIVESTOCK FARM, MANNUTHY

The station provides facilities for research work both at graduate and under-graduate level. It serves the needs of the farmers for their requirements of meat, draught and milch animals.

Sri. M. Stanumalayan Nair, Fodder Research Officer was in full additional charge of the station. The stock position is as shown below:

Details	Begining of the year	End of the year
Milking cows	92	99
Dry cows	27	37
Young stock-Male	41	48
Female	41	30
Bullocks	6	6
	207	220

The lactation average of the herd during the year was 1652. 10 kg in 305 days as compared with 1204 50 kg. in 305 days in the previous year.

The maxiumum amont of milk in the history o- the farm was produced during the year, ie., 2,I0,873.3kg. Programmes for rearing male cross-bred calves for breeding purposes has been initiated during the year under report. These animals are intended for supply to different stations under the University and to Department of Animal Husbandry.

The requirement of dairy cows of the different University stations like University Livestock Farm, Thiruvazhamkunnu and I. A. T-, Travanur have been met to a considerable exten during the year.

During the year under report, an amount of Rs 5, 43, 386/99 was incurred against an income of Rs. 2,77, 240/09.

2. UNIVERSITY LIVESTOCK FARM, THIRUVAZHAMKUNNU

The main objective of the station is the breeding of buffaloes and cattle. The farm was established in the year 1950 and is situated in the Mannarghat Taluk in Plaghat district.

Many of the animals in the farm were unsuitable for any research project to be taken up during the period, due to reasons of lower production and prevalence of such major diseasons like Nasal Schistosomiasi , John's disease ete. Hence activities during the period under report were concentrated mainly towards the improvement of the herd by way of disease control, culling and purchase of new animals etc. as per the development plan.

Herd Strength

a) Cross-bred Brown Swiss/ Jersey calves born- 45

b) Buffaloe colves (Surti/Murrah) calves born- 20

c) No. of heifers/cows purchased- 49

The following quantity of fodder produced during the year under report.

i)	Perennial Grass	-726. 35 tonnes
ii)	pennisetum Pedicellatum	-687. 75 ,,
iii)	Teosinte	- 57. 00 ,,
iv)	Maize	- 26. 00 ,,
v)	Silage	- 87. 35 ,,
vi)	Hay	- 97. 75 ,,

A total quantity of 50, 099 2 kg. of milk was produced during the period. 300 coconut seedlings were planted during the year.

The herd average and the lactation average was as follows:

Herd average	- Cattle	- 2.41 kg.
	- Buffaloe	- 1.51 kg.
Lactation average	- Cattle	- 1181.56 kg.
	- Buffaloe	- 975.37 kg.

Sri. P. A. Devasia, Associate Professor was in-charge of the station during the period.

An amount of Rs. 5,95,444/46 has been incurred as against an income of Rs. 1.16,021/99.

3 CATTLE BREEDING FARM, THUMBURMUZHI

This farm is situated in Pariyaram Village, Mukundapuram Taluk, Trichur dist. on the road side 15 Km. east of Chalakudy on the Chalakudy Sholayar route.

This station served as a unit to supply pregnant heifers to other farms under the Kerala Agricultural University. Young female calves are brought from other farms, fed and reared profitably under existing farm conditions. At maturity they are bred by Artificial Insemination and detained until eight month pregnant. Herd strength at the beginning of the year was 128. During the year 56 calves arrived from other farms. 70 pregnant heifers were supplied to Livestock farm, Mannuthy. At the close of the year, the strength of the herd was 118.

Different varieties of grasses were grown to meet the bulk roughage requirement of calves maintained during the year and also to supplement the concentrate feed. 20 hectares of land were brought under different varieties of fodder cultivation. The most promising varieties found to be ideal for the locality are guinea and Hybrid Napier. A quantity of 743.820 metric tonnes of green grass was harvested and fed to calves and heifers stationed at the farm during the year. Steps taken during 1974-75 to increase farm receipts by utilising fallow lands that are not used for fodder cultivation, have been augmented.

Coconut saplings planted in 1975 have attained sufficient growth and will bear flowers and bunches in next year.

Dr. E. T. Jacob was in-charge of the farm upto 16-6-77. Sri. K. Parameswaran, Associate Professor was incharge of the farm during the remaining period.

The total expenditure during the period was Rs. 3,52,854/69 as against an income of Rs. 7,007/26.

4. UNIVERSITY POULTRY FARM, MANNUTHY

This farm was established by the Government of Travancore-Cochin in 1952 as a District Poultry Farm and it was transferred to the Kerala Agricultural University in 1972.

The stock position as on 31-3-78 was 4024 birds. A total number of 2,94,966 eggs were produced during the year under report. The percentage of egg production was 59.2% for 1977-78.

The total expenditure during the year was Rs. 3,02,807/22 and the total receipt was Rs. 2,36,039/13.

The station is under the administrative charge of an Instructor.

Dr. P. T. Philomina was in-charge of the farm upto 11-7-1977 and Dr. A. Jalaludeen continued as the Officer-in-charge of the farm for the remaining period.

As a part of the Poultry farm, a Duck farm was also established during the year 1976-77, with the objective of imparting training to students, to evolve a suitable germ plasm by crossing desiducks with exotic ones and to find out the nutritional and managemental requirements of ducks.

5. UNIVERSITY PIG BREEDING FARM, MANNUTHY

The farm is located within the main campus of the Kerala Agricultural University abont 5 kms. outside Trichur Town on National High way 47. The farm has a neatly enclosed area of 4 hectares of well drained land.

Maintained and multiplied pure and cross-bred exotic pigs, recorded their performance, conducted research and supplied quality seed stock to pig breeders for multiplication. During the year, the farm produced 313 piglings, sold 343 for research.

Provided practical farm training facilities for under-graduate and post-graduate students.

An Earn While You Learn Pork Project for B. V. Sc. students was implemented successfully for the first time. Six students reared 8 pigs on hostel waste alone, each participant earning Rs. 245/80 per head during a period of 74 days.

Six adult boars of Large White Yorkshire breed were purchased from Hassaragatta, Karnataka State. Eleven young pigs (3 Large White Yorkshire and 8 Landrace) costing Rs. 35,128/69 were purchased from U. K. through State Trading Corporation of India to improve the herd.

Five more open sties were repaired and remodelled for research work.

The farm is under the administrative control of the Dean, Faculty of Veterinary and Animal Sciences and supervisory control of the Associate Professor (Animal Management). Dr. P. Ramachandran, Asst. Professor is in direct charge of the farm.

An expenditure of Rs. 3,45,684/63 was incurred as against an income of Rs. 38,525/21.

UNIVERSITY VETERINARY HOSPITAL, KOKKALAI, TRICHUR

The main objective of the institution is to give all kinds of veterinary aid to the animals in and around Trichur and to give them protective vaccination against infectious diseases. As far as possible the most modern trends in the fields of diagnosis and treatment are practical here. Specialists from different clinical and para clinical departments of Veterinary College are attending this institution regularly for this purpose. The fact that cases from different districts in Kerala are referred to this Hospital is only a proof of expertise available here.

A total No. of 29,209 cases were treated during the year under report.

During the year under report, the institution was under the administrative and technical control of the Dean, College of Veterinary and Animal Science, Mannuthy. The Officer in-charge of the Hospital was Dr. K. Ramdas. An expenditure of Rs. 83 943/79 was incurred against an income of Rs. 290/68.

VETERINARY COLLEGE HOSPITAL, MANNUTHY

The main objective of the hospital is to impart

clinical training to both under-graduate and post-graduate students of Veterinary College

Regular weekly vaccination programmes against Ranikhet disease were conducted on all Saturdays. During the period under report, 7,415 birds were vaccinated. One hundred and twenty animals were vaccinated against Haemmorrhagic Septicaemia in the hospital. Prophylatic antirabic vaccination were given to 76 dogs. Post exposure treatment against Rabies was conducted for 3 bovines, 2 goats and 11 dogs.

Dr. K. M. Alikutty, Associate Professor was in-charge of the Hospital during the period under report.

FODDER RESEARCH & DEVELOPMENT CENTRE, Mannuthy

The centre is located in the Mannuthy campus of the University.

The scheme could meet the fodder requirements of all the Livestock stations in the Mannuthy campus in full during the year under report. 2791.252 tonnes of fodder was produced during the period of which 850 tonnes were ensiled. Considering the contingent expenditure alone the cost of production of fodder was Rs. 89/85 per tonne. At Rs. 150/ per tonne of fodder produced, the scheme has made a net profit of Rs. 1,18,548/94 even when the establishment charges also are accounted.

Five research projects have been undertaken by the scheme of which one was completed during the year. Four projects are being continued.

Successful establishment of hey in 4 hectares of land with 68.5 grass fraction and 31.5 legume fraction has marked the possibilities of providing better quality fooder to the animals at a comparitively cheaper rate.

An expenditure of Rs. 3,43,185/14 was incurred as against an income of Rs. 94,045/82.

Sri. M. Sthanumalayan Nair, Associate Professor was in-charge of the scheme during the year under report.

CHAPTER IV

EXTENSION EDUCATION

Dr. V. S. S. Potti continued as the Director of Extension Education for the period under report.

The extension activities of the Directorate of Extension Education were expanded considerably during the year adding 24 new projects to the existing projects These projects had the desired effect on the adoption of new technology by the farmers at large Publication of periodicals and bulletins and communication of farm information through press and radio and on campus training of farmers and extension workers were the other important avenues of work of the extension personnel.

The detail of the Extension personnel is given in Appendix—XIV.

Training programmes

Twenty-three training programmes were organised by the Directorate for the technical personnel of the Departments of Agriculture, Animal Husbandry, Dairy Development, Cardamom Board as well as for school teachers and farmers.

A training service was constituted during 1975-76 with one unit comprising of one Training Officer and supporting staff directly under the Extension Wing and another unit with one Training Officer and supporting staff at the College of Agriculture, Vellayani.

The following training programmes were conducted during 1977-78.

1. INSERVICE TRAINING COURSE FOR JUNIOR AGRICULTURAL OFFICERS

The object of this training was to update the technical competence of Junior Agricultural Officers. The course was for a duration of four weeks and was conducted at the College of Agriculture, Vellayani. During 1977-78, 148 Junior Agricultural Officers were trained in five batches.

2. INSERVICE TRAINING COURSE FOR AGRICULTURAL DEMONSTRATORS.

This training course was organised to provide the Agricultural Demonstrators of the Agricultural Department with adequate knowledge in various subject matter fields so as to improve their technical competence in all aspects of agriculture. The training course was for a duration of four weeks and 273 Agricultural Demonstrators were trained during 1977-78 in six batches.

3. TRAINING ON PEST AND DISEASE SURVEILLANCE

A six day training programme on pest and disease surveillance was conducted at the Rice Research Station, Moncompu. Eighteen Junior Agricultural Officers of the Department of Agriculture participated in the programme.

4. TRAINING ON RICE MINIKIT TRIALS.

A State level training course on Rice Minikit trials for four days duration was conducted ni 2 batches at the Mannuthy Campus during 1977-78 with the object of keeping the extension personnel uptodate with the latest techniques of crop productino and laying out proper Minikit demonstrations. The number of technical personnel of the Department of Agriculture who attended the courses in two batches was 47.

5. TRAINING FOR FIELD SUPERVISORS OF LAKSHADWEEP

The training was organised to impart training in crop-husbandry with special reference to cereals, vegetables, pulses and fruit crops to field supervisors from Lakshadweep. The duration of the training was four weeks and was conducted at the Mannuthy Campus from 2..7..77 to 4..8.. 1977. Five Field Supervisors participated in the training programme.

6. TRAINING FOR SCIENCE TEACHERS IN SOIL TESTING

A short term training on soil testing and soil management was organised for scienee teachers for a duration of five days at the College of Horticulture from 20-6-1977 to 24-6-1977. Nine teachers attended the course.

7. TRAINING IN HANDLING METERIOLOGICAL INSTRUMENTS AND RECORDING OF DATA FOR AGRICULTURAL DEMOSTRATORS

A six day training programme on the handling of meteorological inst uments and recording of data for the Demonstrators of the Department of Agriculture was organised at the Instructional Farm, Mannuthy. from 20-6-1977 to 25-6-1777. Ten Agricultural Demonstrators attended the course.

8. TRAINING FOR GARDENERS

The training for gardeners was organised to create opportunities for self employment. The course provided practical training in budding, grafting, plant propogation methods, nursery practices, lay out and maintenance of graden, cultivation of vegetables and fruits etc. Seventeen trainees participated in this twelve weeks course from 3-10-1977 to 31-12 1977 at the Instructional Farm, Mannuthy.

9. TRAINING IN VEGETAEIVE PROPAGATION TECHNIQUES OF CASHEW

Four technical personnel working in the progeny orchards of the Department of Agriculture attended the five day course on the vegetative propagation of cashew. This training was conducted at the Cashew Research Centre, Vellanikkara from 4-7-1977 to 8-7-1977.

10. TRAINING IN TREE PLANTATION AND MANAGEMENT FOR RAILWAY STAFF

This programme was taken up in order to give training to the staff deputed by the Southern Railway in tree plantation, garden management and aftercare for the proper utilization of waste railway lands. The training was conducted at the College of Horticulture from 18-4-1977 to 25-4-1977. Sixteen trainees participated.

11. INSERVICE TRAININC FOR AGRICULTURAL DEMONSTRATORS

The object of the training was to make the newly recruited Agricultural Demonstrators technically competent by providing them theoretical knowledge and practical evperience. The duration of the course was six months – three months for institutional training and three months for field training. The training was conducted from 16.1.78 at the Institute of Agricultural Technology, Tavanur.

12. TRAINING OF F. A. O. FELLOW

To provide training in the cultivation and proceeding of aromatic oil crops such as Lemongrass, Citronella, etc. this training was organised from 5 8. 77 to 17. 9. 1977 for Shri. Hemachandra Samaratunga FAO Fellow at the Lemongrass Research Station, Odakkali.

13. DIPLOMA COURSE IN AGRICULTURE

The course was started at the Institute of Agricultural Technology, Tavanur with the object of meeting the trained man power requirement of field staff of the Kerala Agricultural University and the Department of Agriculture. The first batch of forty-four students was admitted during 1975-76, second batch of fifty students in 1976-77, and the third batch of forty-nine students in 1977-78. The first batch would be completing the course in April 1978.

14. CERTIFICATE COURSE IN AGRICULTURAL MACHINERY

A training course for the operation, repair and maintenance of tractors, power tillers, pumpsets and plant protection equipments was conducted at the Institute of Agricultural Technology, Tavanur. Originally the duration of the course was six months, but later extended to one year. Twenty trainees completed the course as on 14. 11. 1977.

15. TRAINING OF FARMERS

Training classes for farmers were conducted throughout the State with a view to improve the skills of the practicing farmers. The University provided expert resources personnel for the training camps organised by the Department of Agriculture. Forty-seven camps were conducted during the period under report. Apart from providing training for farmers, this programme also gave opportunlty to the teachers and research workers to get acquainted with varied farming situations and problems of farmers and also forged an effective link between the University and farmers.

16. TRAINING FOR THE MANAGERIAL STAFF OF THE CO-OPERATIVE INSTITUTIONS.

The objective of this programme was to impart to the managerial personnel of the Co-operative Societies practical training in the field of Agricultural Technology, Farm Management and Animal Husbandry

Two training courses of two weeks duration each were conducted at the College of Horticulture Vellayani during 1977-78. A total of 20 trainees participated in the programme.

17. TRAINING IN PREGNANCY DIAGNOSIS AND ARTIFICIAL INSEMINATIO

The training in pregnancy diagnosis and artificial insemination for the fourth and fifth batch of the personnel of the Dairy Development was conducted Twenty persons were trained during 1977-78 in two batches. The training course was conducted by the Department of Animal Reproduction, College of Vety. & Animal Sciences, Mannuthy.

18. TRAINING IN DAIRY HUSBANDRY AND MANAGEMENT SPONSORED BY APPRO

A training course in dairy management, fodder production, artificial insemination and other related aspects of successful dairy farming was organised for twenty five candidates sponsored by 'Action for Food Production' from 9. 5. 1977 to 8. 6. 1977. The training was conducted at the College of Vety. and Animal Sciences, Mannuthy.

19. INSERVICE TRAINING TO DAIRY FARM INSTRUCTORS

The purpose of the training was to equip the Dairy Farm Instructors of the Dairy Development Department working at Block levels with up to date knowledge on, feeds and feeding of cattle, fodder crops, cattle management, common diseases of cattle and dairy extension techniques. The duration of the training was three months. Five trainees participated in the training course conducted at the College of Vety. & Animal Sciences.

20. TRAINING IN CLEAN MILK PRODUCTION, QUALITY CONTROL OF MILK AND MILK PRODUCTS

Training was imported to 25 trinees sponsored by Milk Co-operative Societies in clean milk production and quality control of milk and milk products. The training was organised at the College of Vety. & Animal Science, Mannuthy.

21. 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 latest advances in Veterinary Medicine and Animal Husbandry. The duration of the training was nine months. The training was conducted at the College of Vety. & Animal Sciences Mannuthy. The course for the first batch of trainees was completed on 31. 8 1977. The second batch of eight Senior Officers commenced their training course from 16. 1. 1978.

22. TRAINING IN POULTRY MANAGEMENT

The programme was envisaged to give practical training in all aspects of poultry farm management to interested farmers and to equip them with necessary

skills for efficient operation of poultry farming. The training was conducted at the University Poultry Farm, Mannuthy. Fifteen persons were given training in two batches. The duration of the training course was four weeks.

23. LIVESTOCK ASSISTANT'S TRAINING

The Livestock Assistants' Training course was started at the Institute of Agricultural Technology, Tavanur. Of the sixty four candidates admitted for the course, 54 were deputed by the Department of Animal Husbandry, Kerala, four by the Union Territory of Lakshadweep and six by the Kerala Agricultural University. The training included nine months course work and two months' intensive field training at Veterinary Hospitals and Artificial Insemination Centres.

Extension Lecture series

The Extension Lectures have been instituted under the Kerala State Co-operative Bank Diamond Jubilee Endowment Lectures were delivered on the 26th 27th and 28th October, 1977, by Dr. B. Natarajan, Chairman, Institute of Techno-Economic Studies, Madras at the College of Agriculture, Vellayani on the role of Co-operative Sector in Agricultural Progress and Development.

Information and Public Relations

All the activities of the University under Research, Extension and Education were covered by the Public Relations Officer during the year under report. These were given wide publicity through press and radio. A total of 373 press releases were issued during the year covering these activities.

Eleven issues of the Kerala Agricultural University Newsletter were brought out collecting materials from various research stations and institutions under the University. The KAU Newsletter is a compendium of all activities during each month. Eleven news broadcasts entitled "Karshika Sarvakalasala Varthapatrika" were also prepared for broadcast by All India Radio, Trivandrum in its Rural programme.

Adequate publicity was given to the inauguration of the Main Campus of the University by Prime Minister in September and the celebration of the Golden Jubilee of the Rice Research Station Pattambi.

The feature articles on the functions held in connection with inauguration of the Main Campus were prepared and published in the Mathrubhoomi and the Kalpadhenu.

On the Rice Research Station two feature articles were prepared and published in the Mathrubhoomi. A talk was also broadcast from All India Radio, Trichur. The films division authorities were contacted and the function held in the Main Campus was filmed by them.

The workshop held at Mannuthy on the All India Co-ordinated Research Project on Goats for Milk Production was duly covered and published in local dailies.

A feature article was prepared on the workshop on package of Practices held in February 1978.

The Independence Day Silver Jubilee Trophy debating competition has organised inviting all the colleges in the Trichur district besides the constituent colleges of the University.

Publications

The following publications were brought out by the University.

1. KALPADHENU

This is a bi-monthly farm magazine meant for extension personnel and pogressive farmers. Vol. IV and two issues of Volume V were published during the year, covering titles on Agriculture, Horticulture, Fisheries and Co-operation. Feature research notes and activities of the research stations of the University were also documented in these issues of the magazine.

2. KAU NEWS LETTER

It is a monthly publication providing information on the activities of the University in various spheres such as resident instruction, research and extension education. Eleven issues of the KAU News letter were brought out during the period.

3. RESEARCH JOURNALS

Two issues each of the Kerala Journal of Veterinary Science and the Agricultural Research Journal of Kerala were published during the year.

4. ABSTRACTS

Abstracts such as Agri. Abstracts Hort. Abstracts and Anivet Abstracts containing technical information for the use of the technical personnel of the Kerala Agricultural University and staff of the Department of Agriculture and Animal Husbandry were published.

5. AGRES NEWS

This is a quarterly journal published as a supplement to KAU News letter. 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.

9. SERIALISED LESSONS

Serialised lessons, a new venture in the field of information communication were started during the year.

The first series of lessons selected for publication were on 'poultry production' which were published in the daily "Deepika" starting from February 1977. The series was completed in 1977-78.

The selected topic was divided into a number of small lessons and published serially every week in the news paper, in an understandable manner, so that all those connected with the topic were able to follow and utilize technical know-how imparted through such lessons in their field of activity.

The second series under this project is on "Dairy farming" having 13 lessons.

7. PUBLICATION OF ARTICLES IN KARSHIKARANGAM

The Karshikarangam columns of the daily news paper were regularly supplied with scientific articles for publication. The articles dealt with a wide variety of subjects A total of 112 such articleswere published.

Name of daily	No. of articles Published
Mathrubhoomi	35
Malayala Monorama	48
Deepika	10
Veekshanan	14
Kerala Bhooshanam	2
Kerala Times	3
	112

Answering Questions of Famers

Questions received from farmers were regularly answered. Detailed replies were sent to those farmers who had contacted directly through letters. The question-answer column of the daily Deepika was also handled during this period. Under this project the questions of farmers received by Deepika were answered and published regularly in the 'Karshikarangam' column of the daily.

Correspondence course

Correspondence course, designed primarily to educate literate farmers in different branches of Agriculture and Animal Sciences, with special emphasis on the principles involved in production technology to enable the participant farmers to apply such knowledge gainfully in their fields for better production was conducted during this period. The syllabus of the course was prepared in such a way as to give comprehensive knowledge on the topic. The lessons prepared on the basis of the syllabus were sent one after another along with the response card of evaluation to the participant.

The first topic selected in this series was 'Rice Production'. Five hundred persons participated in this course. The next topic selected is 'Coconut production'. The course material for this has been collected and the course will be commenced shortly.

Participation in Farm & Home programme of A. I. R,

The Kerala Agricultural University actively participated in the Farm and Home programmes of All India Radio by regularly broadcasting talks of the experts, interviews with experts etc., to the farming community. During the period under report 68 such programmes were attended to.

Exhibitions

During 1977–78, six mini exhibitions and three large scale exhibitions were conducted. Mini exhibitions were conducted at Trithala, Tirur, Chalakudy, Sultan's Battery, Chelakkara and Tirunavaya. Large scale exhibitions were organised in connection with Trichur Pooram Exhibition, Golden Jubilee Celebrations of Rice Research Station, Pattambi and inauguration of the KAU Main Campus at Vellanikkara.

Vigyan Mela

One Krishi Vigyan Mela was organised in connection with the inauguration of the main campus of Kerala Agricultural University at Vellanikkara in September 1977. Five hundred selected cultivators from all parts of the State participated in the Mela.

Another Krishi Vigyan Mela along with a large scale exhibition was conducted at the Rice Resarch Station, Pattambi in connection with the Golden Jubilee Celebrations of the Station in December 1977.

Technical Assistance Project for Tribals

The University has started a project to give technical support for the development programme of the tribal areas in the State. The following four tribal settlement in the State were selected to

implement the project in consultation with the Director of Tribal Welfare.

1) Vallat 2) Ambalavayal
3) Nalayani 4) Pottanmmavu

The guidelines for the project work in these areas are:-

i) Identifying the reasons for low production and productivity.

ii) Suggesting suitable cropping programmes

iii) Planning detailed management practices for the area

iv) Extension education programmes to educate the tribals on scientific methods of crop production,

Trials on paddy, tapioca, pepper etc. were laid out in these tribal settlements to assess their adaptability. Technical advice and assistance to the developmental agencies involved in the programme were given as and when required. Soil conservation work was taken up at Nellayani tribal area. Apart from giving training for better agriculture, the tribal development programmes were mainly centred in the distribution of livestock and poultry, improvement of homestead etc.

Technical Assistance programme to Tribal Development

Kerala Agricultural University gave technical assistance in the planting of 26,400 plants at Poomal in Poomala.

The tribal development activities at Pootanmmavu, Trivandrum district was intensified.

Root Zone application of Carbofuran and Urea with liquid injector

A gravity fed liquid injector was fabricated at the Institute of Agricultural Technology, Tavanur based on IRRI Prototype. The experiments conducted with this injector indicated that the level of carbofuran at 400 g/ha and urea at 52.7Kg/N/ha could be reduced under root zone application techniques without appreciable reduction in grain field. By adopting this new method, gall midge, stem borer and whorl maggot could be controlled advantageously.

Village Adoption Programme

Village Adoption Programme was started by the University with a view to develop closer relations and contacts with the farmers and to provide technical assistance to farmer for agricultural development.

Under this programme, eleven villages adjacent to the University campuses and research stations were selected, the details of which are given below:-

1.	Main Campus	1) Ollukkara
		2) Panancherry
		3) Kuriahikkara
		4) Nadathara
2.	College of Agriculture, Vellayani	5) Muttakkad
		6) Kalliyur
3.	Rice Research Station, Pattambi	7) Kizhayur
4.	Horticultural Research Station, Ambalavayal	8) Ambalavayal
5.	Lemongrass Research Station, Odakkali	9) Asmannur
6.	Institute of Agricultural Technology Tavanur	10) Tavanur
7.	Rice Research Station, Moncompu	11) Nedumudi

Students participation in Extension programmes

The main objective of the project are to give opportunities to the students to participate in simple Agricultural production programmes so that the developed interest in Agriculture.

The groundnut tapioca demonstration at Nadathara was carried out with the participation of the students of St. Mary's College, Trichur, College of Horticulture and College of Veterinary and Animal Sciences The yield recorded in that demonstration was 860 kg. pods and 1,200 kg. haulms per hectare and 12 86 tonnes of tapioca per hectare.

Pulse trials

During 1977-78 fifteen pulse (grain) trial and twelve groundnut trials were conducted in the adopted villages.

The average yield was 1,062 kg green pod of cowpea and 148 kg. of dry cowpea seeds per hectare from the pulse plots. From the twelve groundnut trial plots an average of 881 kg. groundnut pods and 1,346 kg. of haulms were harvested per hectare from the rice fallows.

The pulse cultivation in the adopted village during third crop season saved the way for extensive cultivation of pulses in rice fallows in adopted villages.

Operational Research Programmes

The object of the study was to find out whether the Chakarichor could be utilised for the ameleoration of iron rich acid soils.

The study was conducted at 16 locations at Kattukambal Kole area in Trichur District.

The chakarichor at the rate of 1,000 kg (50 bags) per hectare gave on an average 538 kg. of grain per hectare more than the untreated control. This waste product of coir industry thus proved to be a good soil ameliorant. The trial will be repeated during 1978-79 and 1979-80 for obtaining confirmatory results.

Grama Vikasana Samithies

Two Grama Vikasana Samathies were formed in Kalliyoor village, one at Kakkamula and another at Poonkulam in order to facilitate the activities.

The Grama Vikasana Samithi at Kakkamula situated at the eastern part of Kalliyoor village was started functioning from 1976 onwards. During the year 1977-78 crop loans were issued to 22 farmers for raising Paddy, Tapioca, Banana, Vegetables and Betelvines through the State Bank of Travancore, Vellayani branch. Five farmers were given loans for the purchase of pump sets with the subsidy of SFDA Loan were also issued to 36 farmers for the purchase of cows. The formation and proper running of a community dairy by the Grama Vikasana Samithi is an important acheivement. During this year they made a profit of Rs. 4,050/-by which they have arranged to purchase a plot in order to construct a building of their own.

In order to concentrate the activities in the western part of Kalliyoor village another Grama Vikasana Samathi was constituted and registered in February 1978 with the office at Poonkulam including fifty progressive farmers of the area. Within a short period of two months 26 crop loans and 32 cow loans were issued to the farmers through the State Bank of Travancore. A community dairy also could be started in this area within this short period enabling the farmers to get reasonal price for the milk. The formal inauguration of this Grama Vikasana Samithi was done by the Dean College of Agriculture Vellayani. Higher officials of the State Bank of Travancore also attended the function.

National Dpmonstration Project

As per the approved programme of the ICAR, 25 demonstrations were laid out in Trichur District.

During the Ist crop season, 19 demonstration were laid out including seven groundnut as an inter-crop in tapioca. In the Mundakan season, 13 demonstration plots were laid out, of which 12 plots were under paddy and one under tapioca and horsegram as companion crops.

During the Punja season, 21 demonstrations were conducted of which two demonstrations were on groundut as a pure crop in rice fallows

An average yield of 1,342 Kg. of groundnut pods and 2,628 Kg. of haulms were recorded from these seven plots, while there was no difference in the yield of tapioca, whether it was as a pure crop or as a crop mix. The maximum yield of paddy obtained from the Ist crop was 5040 Kg. per hectare, while the lowest was only 4,400 Kg. per hectare. In the the Mundakan season the maximum yield of 5,860 Kg. paddy was recorded from the Kole area. In the companion cropping system horsegram was grown along with tapioca and it was found to be promising 360 Kg. of horsegram was obtained from one hectare of land. The yield of tapoca was also not affected due to this cropping programme.

The highest yield of 8,040 Kg. of paddy was obtained from the problem soil area at Kattukambal during Punja season.

Under the deomonstration conducted in rice fallows, groundnut was found to be the most paying crop with an average production of 1,115 Kg. of dry pods and 1,400 Kg. of haulms from one hect. of land.

Field days under National Demonstration Project

The National Demonstration staff conducted 32 field days during the year under report at the demonstration sites, The local farmers, Co-operative Societies, Schools and All India Radio particiated in the programme. Success stories and articles on the achievements of the project were published in the local dailies and journals and through All India Radio.

Field trials on cultivators' fields

The staff attached to the National Demonstration Project took up multilocational adaptive research trials in cultivators' field at Kattukambal and at Eruthempathy. The object of these studies were (1) to find out suitable indigenous soil ameleorants for the reclamation of furrows' rich acid soils of Kattu-kambal Kole area and (2) to find out profitable

cropping patterns suitable for the rainfed and drought prone areas of Eruthempathy (Chittoor) in Palghat District.

Soft coal dust and arecanut peelings recorded increased yields over control plots in the Kattukambal Kole area.

The dry farming experiments conducted at five centres at Eruthempathy revealed very useful relay cropping patterns.

Tapioca either as pure crop or as relay crop in groundnut and cotton proved to be highly profitable for the rainfed and drought prone areas. ARC. 11775 and Culture 12814 paddy strains were also found to be suitable for the area.

Chakarichor, a waste product from the coir industry obtainable in Kerala at very low cost was observed to have ameleorative effects. The yields of paddy from acidic and iron rich of Kattukambal Kole area could be increased 538 kg per hect) substantially by the application of Chakarichor at the rate of 1,000 kg. (50 bags) per hectare.

Institute of Agricultural Technology, Tavanur.

The Institute was taken over by the Kerala Agricultural University with effect from 12—12—1975. The following courses were couducted at the Institute.

1. Diploma course in Agricultural Science
2. Training course in maintenance and repair of Agricultural Mechineries and plant protection equipments.
3. Demonstrators Training course
4. Livestock Assistants Training course

University Press

During 1977-78, a new HMT Automatic printing machine was purchased to cope up the increasing volume of printing work. During the period under report, 131 items of printing work were completed.

Workshops

Dr. V. S. S. Potti, Director of Extension Education and Sri. A. I. Thomas, Associate Professor attended the Annual workshop of the All India Co-ordinated Project on National Demonstration held at Panaji, Goa in January 1978.

Sri. P. Ramachandran Nair attened the National Agricultural Information and Communication work shop held at Expo 77, New Delhi in December 1977.

National Service Scheme

The scheme seeks to correct the phenomenon of seclusion of education from the society by exposing the student community to a ballast of social realities. The exposure is sought to be achieved by providing students a wide range of opportunities to study the problems of society at first hand and to understand the implications of efforts to tackle them through enabling the students to make such efforts. Education through service is thus the additional dimension, the National Service Scheme imparts to the Educational system.

The N. S. S. unit of the College of Agriculture carried out multifarious uplift work in the two adopted villages namely, Kalliyoor and Keezhayoor. A basic survey of the villages was conducted. This unit was responsible for running a Community Centre at Keezhayoor. Film shows and exhibition were also conducted. A well for drinking water was constructed and donated to the colony at Keezhayoor. Fifty vegetable gardens were raised in these adopted villages. Fifty numbers of mats were provided for the needy inmates of the villages.

The NSS volunteers raised a sun of Rs. 1,400/- and purchased mats and collected cloths and distributed to the victims of the fire mishaps at Vizhinjam.

An annual camp of National Service Scheme of the College of Agriculture, Vellayani was celebrated at Kakkamula during January, 1978. A campaign was arranged participating the villagers, 50 NCC volunteers and about 300 N. C. C. cadets and reconstructed the Vellayani Kayal bund connecting the Kakkamula area and Agricultural College road and made available to thousands of villagers for traffic. Public meeting were arranged in four days participating the officials of the Department of Soil Conservation, Farm Information Bureau, Family Welfare and Field Publicity. Film shows were also arranged in all the four days.

Fifty kitchen gardens were started in the area in the house premises for which seeds and manures were issued free of cost. Mahila Samajam and a reading room was started functioning in the area. A feeding centre was started in the area with the assistance of CARE and Nemom Block

The NSS unit of the College of Horticulture Vellanikkara initiated a concentrated drive for increasing prpduction in Agriculture, Animal Husbandry, through promoting the adoption of improved production technologies Vegetable seeds, banana

suckers and fruit plants were distributed to the cultivators. One sprayer was purchased and given to the farmers of the village free of rent for the plant protection operations. The NSS unit took up the weeding of the hostels premises and levelling of the ground around the hostel. Five NSS volunteers have donated blood for the patients in the General Hospital and Mission hospital, Trichur.

This unit conducted a benefit show for the purpose of constructing a waiting shed at Mannuthy bus stop. An amount of Rs. 4,00 /-was realised from the show. This unit took part actively in the flower, fruit and vegetable show organised by the Trichur Agri. Hort. Society. Deepening Panchayat well at Madakkathara, thatching two small huts, distribution of Kalpadhenu to the farmers were the other items of work attended to by the Horticultural College Unit.

The N. S. S. unit of the College of Veterinary and Animal Sciences, Mannuthy took up clinical examination of the inmates of the hostels. An intensive National Savings Scheme drive was organised and a sum of Rs. 1,21,410/- was deposited in 150 new accounts. An afforestation programme inducing people for planting more trees was taken up.

CHAPTER V

WORKS

Sri. A. T. Devassy (on deputation) continued as the Director of Physical Plant throughout the year. Control and maintenance of buildings, procurement of equipment, vehicles and machinery, designing and constructing new buildings and maintainance of buildings etc. are vested with Director of Physical Plant.

Major works taken up during the year under report are detailed below:-

Sl. No.	Name of work	Estimat amount (in lakhs)
1	Digging an exploratory bore well 13.5 cm. dia in Instructional Farm	0 65
2	Constructing a new road to the Hostel Block University Main Campus	0.50
3	Providing irrigation facilities at Pepper Research Station, Panniyur	0.86
4	Constructing a building for Meat Technology at Mannuthy	9.00
5	Soling, metalling 'A' road in University Main Campus, Vellanikkara	1.64
6	Black topping roads leading to Goat shed, Mannuthy	0 54
7	Improvements to Piggery Styes at P. B. F., Mannuthy	
8	Constructing an extension to Veterinary College-supply and irrection of reagent shelt and cup boards to R. C. C. Laboratory tables	1.90
9	Digging tanks in various parts of Instructional Farm for providing water supply arrangements, Vellanikkara-digging a well	0 70
10	Constructing Dining block near Hostel Block for Boys' at University Main Campus, Vellanikkara-balance work	2.30
11	K. A. U. Main Campus, Vellanikkara constructing staff quarters-Duplex 25 blocks	10.88
12	Constructing Type VI Residential quarters at Mannuthy	4.50
13	Formation of 'C' road in Main Campus, Vellanikkara-soling and metalling	0.60
14	Constructing a bore well, pump house, installation of pump-Instructional Farm, Vellanikkara	0.99
15	R. R. S. Vyttila-construction of Laboratory and Office building	0.63
16	Construction of Laboratory, Office cum - store building at A. R. S., Chalakudy	2.25
17	Constructing a stage for open air Theatre at Vellanikkara.	0.50
18	Semigrouting the 'A' road in Main Campus, Vellanikkara	1 42
19	R. R. S. Vyttila-construction of additional fish ponds	0.53

20 Constructing clinical pathology laboratory in Veterinaiy Hospital, Kokkalai construction of additional floor to the store shed 0 82

21 Constructing a building for Dairy Technology at Mannuthy 6.50

22 Black topping approch road and extension of culvert at Agricultural College, Vellayani 0·81

23 A. I. C. R. P. on poultry-construction of two brooder houses at Mannuthy 2.40

24 A. I. C. R. P on poultry-construction of two cage houses at Mannuthy 3·20

25 Digging a tank-providing pump house ground level tank in Pepper Nursery Farm, Main Campus 0.69

Spill over works in execution in 1977–78

1 Formation of Main Campus road Vellanikkara-Ch.0 to 1200 M. 3.60

2 Construction of Teachers Hostel, Vellayani 4.51

3 Construction of Teachers Hostel, Pattambi 4.73

4 Exploration of underground water-drilling on trial bore wells at University Main Campus 0.50

5 Construction of Hostel Block No 1 at Main Campus, Vellanikkara 14·2

6 Providing irrigation facilities to Instructional Farm, Vellanikkara 1·20

7 Soiling, metalling, semi grouting Main Campus, 'B' Road 2 45

8 Providing fixture to Conference Hall 0 63

9 Constructing tank for fish farming at R. R. S; Vyttila 2.00

10 Drilling bore well of 13.5 cm. diametre upto a depth of 90 m. for Academic Block K. A. U. 1.20

11 Providing water supply arrangements to C. R. S. Pampadumpara 0 66

12 Providing irrigation water to Instructional Farm, digging a tank near Poultry unit at Mannuthy 0·90

13 Constructing a dining block and connecting corridor near Hostel Block for Boys' I & II at Vellanikkara 3·00

14 Providing water supply arrrngements to U. L. F. Thiruvazhamkunnu 0 83

15 Constructing Ladies Hostel for 100 students at Vellayani 8·75

16 Formation of Main Campus 'A' Road and constructing a culvert at L. S. 110 M. road at Vellanikkara 2 85

17 Construction of brooder houses for duck in Veterinary College, Mannuthy 0·80

18 A. I. C. R. P. on poultory-constructing two Nos. of poultry houses at Mannuthy 3.00

19 Construction of Poultry Brooder house at Veterinary College Campus, Mannuthy 1.15

20 Construction of Farm Building and workshop building for stndents at Vellanikkara 1·22

21 Constructing main gate on 'A' road for the K. A. U. Main Campus, Vellanikkara-providing catt'e trap gate watchman shed, compound wall at the end of 'B' road 2·00

22 Improvements to buildings at Rural Institute, Tavanur 1·73

23 Providing barbed wire fencing around the Instructional Farm, Vellanikkara. 0·50

Besides the above Rs 7,36,880/- was spend on maintenance and repairs of buildings etc. in 1977–78. The total expenditure including mainteance and repairs under work is Rs. 61,04,828/-

Major works completed during the year 1977–78

1 Constructing a building for young stock, University Livestock Farm, Mannuthy.

2 Construction of a building for loose box at Mannuthy.

3 Black topping the road in front of Nutrition Laboratory, Veterinary College, Mannuthy.

4 Constructing hostel block No. I, Main Campus, Vellanikkara.

5 Constructing Academic Block No. I -do-

6 Constructing Academic Block No II -do-

7 Constructing Academic Block No. III -do-

8 Construction of watchman shed and gate at Main Campus, Vellanikkara.

9 Wiring electrical installation to Type V, VI & VII quarters for teaching staff.

10 Providing water supply and sanitary arrangements to -do-

11 Construction of a covered threshing shed at R. R. S. Pattambi.

12 Providing R C. C. tables for laboratory and sanitary arrangements including septic tank at Veterinary College, Mannuthy.

13 Construction of Goat shed at Mannuthy.

14 Construction of quarters for economically weaker sections, Mannuthy.

15 Constructing connecting corridors to Academic Block No. II & III.

The total outlay for the year 1977–78 was Rs. 70,44,000/-which excludes purchase etc. and work done for Rs. 17,77,752/-against funds placed by other officers out of their contingencies.

The details of staff position attached to the Engineering Wing is appended (Appendix--XV).

CHAPTER VI

FINANCE

The Budget Estimates for the year 1977-78 was approved anticipating an income of Rs. 448.06 lakhs on the receipt side against an expenditure of Rs. 481.34 lakhs disclosing a deficit of Rs. 33.28 lakhs

At the close of the financial year 1977-78, the actual receipt was Rs. 431,65,356.23 and the actual expenditure was Rs. 411,65,795.85 leaving a cash balance for Rs. 19,99,560.38.

During the year, the State Government have sanctioned and released a sum of Rs. 228.58 lakhs under statutory grant, ie, Rs. 155.58 lakhs under non-plan and Rs. 70 lakhs under plan. The total grant received from ICAR was Rs. 77.96 lakhs.

A statement showing the details of receipts and expenditure is appended (Appendix—XVI)

AUDIT

Sri. V. Gopakumar in the cadre of Deputy Examiner of Local Fund Accounts was the Govern. ment Auditor for the period 1-4-1977 to 9-5-77. Subsequently Sri V. R. Ramakrishnan Ezhuthachan took charge as Government Auditor on 10-5-77 and continued as such till 31-3--78.

Audit of accounts for the years 1973-74 and 1974 75 have been completed and Audit Reports issued. Audit of accounts for 1975-76 was taken up and was in progress. Audit of ICAR schemes and Central Assistance was given priority in order to issue audit certificates in respect of grants from ICAR. A total No. of 30 Audit Certificates in respect of grants received for various schemes for the years. 1971-72, 72-73, 73-74, 74-75, 75-56 and 76-77 covering a total expenditure of Rs. 52, 98, 287.35 were issued during the period 1977-78.

CHAPTER VII

ESTATE

An area of 379.5615 hectares have been acquired by the Government ef Kerala for the Kerala Agricultural Universityand handed over to the University on 1-5-1973, where most of the research activities are to be started being the Main Campus of the University. An additional area of 27.119 hectares have been acquired on 8-1-1977. The schemes under the Cashew, Pineapple Pepper, Floriculture and Instructional Farm for Horticultural College have already been started functioning in the campus. A total area of 149.3 hectares have been earmarked for the above schemes and farm. An area of 8.4 hectares have been allotted to the Plant Introduction Scheme of the India Council of Agricultural Research (I. C. A. R.), and an area of 14 hectares have been allotted for Kerala Agricultural Development Programme (KADP) which scheme is expeccted to be implemented by the beginning of 1978-79. An area of 60 hectares have been earmarked for the Botanical Garden, the planting of the trees in the garden will be carried out in a phased programme. The area containing rubber trees which are unfit for tapping is about 25 hectares. An area of about 12.00 hectares have been utilised for buildings and roads. About 170 hectares are covered with tapping trees. This 170 hectares includes the area earmarked for Instructional Farm, Pepper scheme and Botanical Gardens.

Shri. T. M. Ibrahimkutty continued as the Estate Officer during the year under report.

During the year 1977-78, a quantity of 66,800Kg of finished rubber latex has been produced in the factory attached to the Estate. An amount of Rs. 5,93,640/-has been received being the cost of rubber latex sold. 6,629 trees have been cut and removed fetching an amount of Rs. 1,66,578.75.

During the period under report, the expenditure was Rs. 7,50,157.77 and receipt was Rs. 8,49.066/41. A stock balance of 24.787 Kgs. of finished rubber latex was in hand as on 31-3-1978.

PART II

TECHNICAL

CROP SCIENCES

RICE

Research on rice is conducted mainly at the Rice Research Stations at Pattambi, Moncompu, Kayamkulam and Vyttila. Some experiments are also carried out at other stations such as the Agronomic Research Stations at Chalakudy and Karamana, the Instructional Farms at Tavanur, Mannuthy and Vellayani and the Horticultural Research Station, Ambalavayal. The work carried out under the different disciplines is summarised below:

BOTANY

1. BREEDING FOR LODGING RESISTANT, FERTILIZER RESPONSIVE VARIEIES WITH INTERMEDIATE HEIGHT (PATTAMBI)

Breeding work was carried out using the high yielding tall varieties such as Mashoori, Bhavani and H4. A few cultures having medium height and Mashoori type grain, out with shorter duration, were identified. One culture (No. 1907) which is a derivative of a cross involving Bhavani/Trizveni has been found to be promising.

In a yield trial with available intermediate statured varieties the following four varieties perfomed well:

i) BR. 51—46—5 (4648 kg/ha)
ii) B. 541 B-KW-58-5-3 (5555kg/ha)
iii) OTP-8 (5960 kg/ha)
iv) Bhavani (5266 kg/ha).

2. BREEDING FOR DISEASE RESISTANCE-SHEATH BLIGHT AND STACKBURN-(PATTAMBI)

Twenty new cultures derived from different crosses had been identified to be disease resistant during the last year. These were put under yield trial during this year and five cultures (Nos. 1661, 1686, 1727, 1744 and 1747) were found to be promising.

3. SCREENING FOR DRY SOWN FIRST CROP (PATTAMBI)

Variety ARC-11775 (Suvarna modan) which has been recommended for modan cultivation was also found to be suitable as a dry sown rice variety maturing in 105-110 days.

4. BREEDING FOR DEEP WATER AREAS (PATTAMBI)

F2 cultures of the following crossess were raised and seeds collected for further selections.

i) Triveni/Vellathil Kolappla
ii) Jaya/ D. M. 53
iii) Annapoorna, LMN/Ptb-33

Bulked seeds of the cross Jaya/Vellathil Kolappala were multiplied for further testing. This culture is found to withstand a water level upto 90-100cm.

5. BREEDING FOR BPH RESISTANCE

Further work was carried out at Moncompu with 38 F2 cultures of different crosses produced at Pattambi. The more promising lines have been selected for screening studies. A number of new crossess were affected and the F1 and F2 seeds collected for further work. A culture viz. M.11-57-5-1 which is a cross between IR-8 x Ptb 20 was found to possess BPH tolerance during the last year and this has been proposed for release. In a screening trial 151 cultures were subjected to preliminary laboratory testing of which 36 cultures showed consistent resistance. These have been selected for field evaluation. In another trial (National Screening Nursery) 540 pre-release cultures supplied by the AICRIP were screened and 99 cultures were found to be tolerant or resistant.

At Mannuthy, 131 F4 cultures selected from 15 cross combinations were screened for resistance to pests and diseases. A total number of 44 promising cultures have been selected for further work.

6. BREEDING FOR SHORT DURATION, SEMI-TALL VARIETIES (MONCOMPU)

Crosses were made between the following sets of varieties.

i) CR 13-3058 x UR 19
ii) CR 262-13 x Ptb 33
iii) Ptb 33 x M4-264-2
iv) M 14-2-3 x Njavara

Cul. M 14-2-3 (Kochuvithu x IR 8) developed at Moncompu was found to be semitall in appearance having a duration of 110 days during the Punja season. But during the additional crop season it takes 120 days and hence further crossing with shoet duration varieties will be undertaken.

7. EVOLVING HIGH YIELDING ACID TOLERANT VARIETIES (MONCOMBU)

The object of this project has been to evolve varieties suitable for the highly acidic acid sulphate soils of the Kuttanad. A number of cultures were obtained by effecting crosses between IR-8x

Karivennel, Jaya x MO 1 and IR-8 x Ptb 20. These were tried on the highly acid soils of Vadayar and Purakad. Of the 57 cultures tried at Vadayar seven were found to have very good tolerance to acidi conditions and these will be subjected to further studies. Two of these cultures were found to be BPH tolerant as well. Of the 58 cultures tried at Purakad 28 have been selected for further screeing.

8 EVOLUTION OF HIGH YIELDING PHOTO-SENSITIVE VARIETIES FOR THE DIFFERENT AGRO-CLIMATIC ZONES

(Moncombu and Kayamkulam)

The F2 generation plants obtained from the corsses, Ptb 20 x Jaya, Ptb 4 x TR 17 were planted at Kayamkulam during the Mundakan season and the plants which flowered after November were selected on the basis of plant characters which contribute to high yield. The F1 plants of some other crosses were grown in pots and the seeds have been collected for further work.

9 SCREENING OF VARIETIES SUITED TO ONATTUKARA CONDITIONS (Kayamkulam)

During the first crop season of 1977—78, 72 varieties were screened for high yield and resistance to pests and diseases. Higher yields were recorded by Cul. 1, Sakti, Cauvery, Annapporra, Cul.4, Kanchi, Triveni, IR. 21—255, Bala and Cul. 16. During the second crop season of 1977—78, seventy five varieties were screened and the highest yields were obtained for Jagannath, IR-8, Rohini, Mashoori, Blue bonnet, Pankaj, TKM—6, Triveni, MN 54-42 and Annapoorna.

10 EVOLUTION OF HIGH YIELDING VARIETIES FOR THE POKKALI AREA (Vyttila)

Crosses were made between the present Pokkali varieties and the high yielding varieties such as Jaya, IR-8 and T N-1. Due to water pollution the crops raised from the crosses were destroyed, but a few seeds were salvaged from each culture. These seeds are reserved for multiplication and trial during the ensuing pokkali season.

11 RICE VARIETIES FOR THE WYNAD AREA (Ambalavayal)

In a comparative study of 56 Wynad varieties, 10 varieties gave yields of more than 2000 kg/ha, the highest yield of 2800 kg/ha being for the variety 'Chettuveliyan'.

In the hybridization work involving varieties Wynad-2 and Rohini, two lines viz., Wr-4 and Wr-7 which were found to be the best during 1975-77 were again put under a comparative yield trial. Line Wr-4 gave the highest yield of 1033 kg/ha as compared to 623 kg/ha for Rohini.

In the experiment to evolve an improved strain from the variety 'Adakan' by selection the culture AD 49 gave the highest yield as in the previous year. But in the pure line selection in Jeerakasala the three cultures put under comparative yield trial and District trials did not appear to be as good as the Jeerakasala bulk crop.

12 HIGH PROTEIN STRAINS

The object of this project is to obtain high protein strains of paddy by screening existing varieties or through induced mutations. So far 384 varieties types have been collected at Mannuthy which include both first crop and second crop season varieties. In the induced mutation work Jyothy seed was subjected to gamma ray irradiation and selections have been made from the progenies for further work.

13 GERM PLASM COLLECTION

At Pattambi, 614 varieties were maintained during the first crop season and 401 varieties during the second crop season under the germ plasm collection. The number of varieties maintained at Vyttla was 22.

YIELD AND EVALUATION TRIALS

The cultures found promising in the earlier studies were subjected to evaluation trials. The results obtained are given below.

1 COMPARATIVE YIELD TRIAL OF SHORT DURATION RICE CULTURES/VARIETIES

At Pattambi 21 cultures were tested during both crop seasons along with 3 local checks viz., Jyothy, Triveni and Annapoorna.

During the first crop season, culture IET-2715 gave the highest yield of 5763 kg/ha followed by IET-2706 (5741 kg/ha), Cul. 23332 (5556 Kg/ha) BR 51-46-1-C1 (5529 kg/ha), Jyothy yielded only 5019 kg. per hectare.

During the second crop season, Culture Ir-2070-414-3-9 recorded the highest yield of 4833 kg/ha followed by IET 2706 (9583 kg/ha) and BR 51-46-I-C1 (4333kg/ha). Jyothy yielded only 4083 kg/ha.

It was found that Cul BR-5I-46-I-C1 gave significantly higher yields consistently.

At Mannuthy two comparative yield trials were conducted, one with varieties of flowering duration less than 94 days and the other with a duration of

more than 94 days. In the first trial the highest yield was recorded by Culture 10-1-1 followed by Culture 749-2-1. In the second trial, culture 2128-1 recorded the highest yield followed by Culture 2023-1.

2. COMPARATIVE YIELD TRIAL OF MEDIUM DURATION RICE CULTURES (PATTAMBI)

Fifteen cultures/varieties were tested in both the crop seasons along with Jaya and Bharati as the check varieties, Bharati outyielded all others (5647 kg/ha) during the first crop season, but was on par with 4 other test entries. During the second crop season culture 1-5-4 outyielded all others.

3. FINAL EVALUATION OF BPH RESISTANT (MONCOMPU AND PATTAMBI)

Out of the 585 cultures supplied from Pattambi during 1975, 18 cultures were finally selected at Moncompu on the basis of their resistance to BPH both under laboratory and field conditions. Based on yield, duration and other desirable characters 8 cultures have been selected for a preliminary yield trial during the additional crop season of 1977-78.

4. EVALUATION OF THE SELECTED CULTURES OF THE CROSS IR-8 X KARIVENNEL (MONCOMPU)

From the cross IR-8 x Karivennel, 18 cultures were tried in a preliminary yield trial and 7 cultures were tried in an initial evaluation trial. In the PYT the maximum yield was recorded by Cul.M 23-7-1-1 (6078 kg/ha) and in the initial evaluation trial, Cul 17-1-1 recorded the highest yield (7710 kg/ha). During the additional crop season of 1977 also Cul.M 23-7-1-1 recorded the highest yield.

5. BPH RESISTANT VARIETIES TRIAL (MONCOMPU)

Thirty six cultures received from AICRIP, Hyderabad were tried in this experiment. Six of these were found to be of good resistance and 15 of moderate resistance to Brown Plant Hopper.

6. PRELIMINARY YIELD TRIAL (MONCOMPU)

Eighteen cultures of the cross M.24 (Kochuvithu x IR 8 // MO 1 x IR 8) were put in a yield trial. The maximum yield of 5680kg/ha was given by the culture M 24-76-4 followed by the culture M 24-109-1 (5532 kg/ha). Five of the cultures having good yield and resistance to pests and disease have been selected for further studies.

7. EVALUATION OF THE ADVANCED CULTURES OF DIFFERENT CROSSES (MONCOMPU)

Five advanced cutlures from various crosses were tried along with Jyothy and Bharati in an evaluation trial. The maximum yield was recorded by Cul.M15-36-2 (6155 kg/ha) followed by the standard, Bharathy (5777 kg/ha.). Three cultures have been selected for district trials.

8. EVALUATION OF VARIETIES AND CULTURES SUPPLIED BY CULTIVATORS (MONCOMPU)

Three cultures, viz,, NP 3, NP 73 and NP 93 received from a farmer were tried along with Jaya, Jyothy and Cul M 11-57-5-1 (7241 kg/ha) followed by Jaya (7108 kg/ha). The shortest duration (114 days) was for Cul.NP 3 while Cul. NP73 required 122 days. All cultures were susceptable to leaf roller attack. Resistance to BPH could not be assessed as there was no incidence of this pest.

9. INITIAL EVALUATION TRIALS (KAYAMKULAM)

One culture of the cross Tadukkan x Jaya and 13 cultures of the cross cul.36 x Triveni were tried during the first crop season. The highest yields were obtained for Cul.54-1-3 (3659 kg/ha). Triveni yielded only 3401 kg/ha. But the results were not statistically significant.

During the second crop season, three selected cultures of the cross Kotarakkara I x Poduvi were put under a yield trial. The highest yield was given by Ptb 20 (2600 kg/ha) followed by Cul. 24-8 and Cul 31-1-(2200 kg/ha), the results being statistically significant.

10. YIELD TRIAL OF CULTURES OF INTERMEDIATE HEIGHT UNDER BROADCAST CONDITIONS

During the first crop season at Kayamkulam the highest yield was recorded by Cul. 1020 (3007 kg/ha) followed by Cul. 1005 (2353 kg/ha) and cul. 1015 (2092 kg/ha) while Ptb 23 gave a yield of only 1373 kg/ha. The results were statistically significant. In the traials conducted at Thavanur cultures 1015, 1016, 1017 and 1029 were found to be promising. These cultures yielded from 4.7 to 5.9 tons/ha while the check varieties recorded only 4.5 tons/ha.

11. COMPARATIVE YIELD TRIAL OF MEDIUM DURATION CULTURES OF PATTAMBI (KAYAMKULAM)

Cul. 1063 (TN-1 x Co-25) recorded the highest yield of 2315 kg/ha during the year 1976-77, the maximum yield was given by Cul. 1-5-4 (Tn-1 x CO--25).

12. YIELD TRIAL OF SHORT DURATION CULTURES OF PATTAMBI (KAYAMKULAM)

During the first crop season of 1977-78, the maximum yield of 2657 kg/ha was recorded by Cul. 23372 (induced mutant of MN 54-22), but there was no significant difference in the mean yields of grain. During the previous second crop season, the maximum yield was recorded by Cul. 23548 followed by Cul. 23372, both induced mutants of MN 54-42.

13. DISTRICT TRIAL OF CHERUVIRIPPU CULTURES (VYTTILA)

The promising lines of selection from Cheruvirippu were tried in farmers' fields. Cul 174 was found to yield 30% more than the control (Cheruvirippu bulk.)

14. AGRONOMIC EVALUATION OF NEW PROMISING PRE-RELEASE VARIETIES (KARAMANA)

Nitrogen at the rate of 80 kg/ha was found to be a suitable dose for all the varieties studied. For variety Jaya and Culture 1065 the date of sowing should not be delayed beyond the last week of June. Culture 1065 was found to be superior even to Jaya.

15. VARIETAL TRIALS UNDER THE ALL INDIA CO-ORDINATED RICE IMPROVEMENT PROJECT

Under this project, three sets of trials are being carried out, viz.,

i) The preliminary variety trials (PVT)
ii) The Uniform variety Trials (UVT)
iii) The International Rice Yield Nursery Trials (IRYN)

In the preliminary variety trial at Pattambi intended to compare the performance of different rice cultures/selections originated at different rice research stations, forty entries were compared in one trial and 64 entries were compared in another. Varieties such as Jyothy, Cauvery or Ratna were used as the checks. The more promising entries have been identified and these will be tested during the next year.

Similarly under the Uniform Variety Trials, three trials were conducted at Pattambi during the first crop season and two trials during the second crop season For evaluating the different cultures/selections evolved at the various research centres. At Mannuthy also 3 trials were conducted during the first crop season and two trials during the second crop season. On the basis of these trials a number of promising varieties have been identified for further work.

The trials under the International Rice Yield Nursery form part of the IRTP progromme of the International Rice Research Institute, Manila. Three trials were conducted at Pattambi and a total number of 83 entries were compared. Fourteen of these were found to be top yielders.

AGRONOMY

1 INCREASING POPULATION DENSITY BY PAIRED ROW TECHNIQUE (PATTAMBI)

The maximum number of productive tillers was produced in the case of 15 cm x 10 cm spacing. The highest yield was obtained in the planting with a spacing of 15 cm x 10 cm during the rainy first crop season. During the second crop season closer planting with 10 cm x 10 cm spacing recorded the highest yield. The results indicate that there is no advantage in adopting paired row technique of planting for increasing rice yield.

2. FERTILIZER NITROGEN FOR RICE

In an experiment conducted at Pattambi to study the efficincy of nitrogen as affected by different sources, time and rate of application, the treatment receiving N at 60 kg/ha in the form of sulphur coated urea at planting recorded the highest grain yield. The mean response per kg of N in this form was 13.2 kg of grain, while the response to granular urea applied at the same level was only 8.3 kg of grain per kg of N.

In another experiment it was found that by applying N in the form of sulphur coated urea the dose could be reduced to 56 kg/ha from the recommended dose of 80 kg/ha applied as ordinary granular urea. In an experiment conducted during the second crop season the deep placement of nitrogen in the form of urea incorporated mud balls was found to be very effective, the nitrogen use efficiency being 17.7 kg grain per kg of applied N.

At Moncompu the application of 90 kg N in the form of urea in paperpackets recorded the maximum yield of 5480 kg/ha during the Punja season, as

compared to 5238 kg/ha for nitrogen application according to the current Package of Practices.

In the experiment on the long range effect of continous cropping conducted at Karamana the average response to N was 11.8 kg grain per kg N upto 120 kg N/ha

3. PHOSPHATE SOURCES FOR RICE

The efficiency of 'Phosmak', a cheap source of rock phosphate of marine origin was tested at Moncompu along with other forms of phosphatic fertilizers. The yield data did not show any statistical significance. The highest yield of 5252 kg/ha was obtained for the treatment receiving 20 kg P_2O_5 as superphosphate, followed by the treatment receivin 120 P_2O_5 in the form of ultraphos (5175 kg/ha). The lowest yield of 4792 kg/ha was for the control treatment receiving no P application.

An experiment on phosphate for flooded rice conducted at Pattambi (AICRIP) also revealed no significant differences between the different forms of P used. At Karamana also the response to phosphorus was absent during the kharif season and as such no difference was noticed between the sources of phosphorus. No residual effect was noticed during the Rabi season for the P applied during the previous season.

4. NPK REQUIREMENT OF RICE IN SEQUENTIAL CROPPING OF RICE-RICE-DAINCHA AND RICE-RICE-SESAMUM (CHALAKUDY)

In rice virippu crop preceded by Daincha crop the highest yield was recorded at NPK level of 60-45-45. In rice crop preceded by sesamum crop the highest yield was recorded at NPK levels of 90-45-45.

During the second crop season the highest yield of 1314 kg/ha was recorded for the NPK level of 90-45-45, the yield at 60-45-45 being 1060 kg/ha. This indicates that the reduction in applied fertilizer N can be made only in the Virippu season if the Virippu crop is preceded by a green manure crop.

5. SKIPPING P AND K APPLICATION

In both the Virippu and Mundakan seasons at Chalakudy, there was no significant difference in yield due to the skipping of P application. But the application of K had significant influence on crop yield, registering a yield increase of 6.03 Q/ha in Virippu crop and 5.96 Q/ha in Mundakan over the crop not receiving any Potassium.

6 MONITORING FOR SOIL FERTILITY UNDER CONTINUOUS RICE CULTURE (AICRIP, PATTAMBI)

In this experiment to study the effect of N, P and K alone and in combination on soil fertility and grain yield of rice the highest grain yield was obtained for the treatment receiving NPK in the ratio 2:1:1 (60+30+30) kg/ha). However, N applied alone at 60 kg/ha also produced grain yield which was statistically on par with this treatment.

Applied P and K generally had no significant influence on grain yield.

7. RESPONSE TO MICRONUTRIENT APPLICATION.

The response to zinc and coppor was studied in three soils, viz., Pattambi, Eruthampathy and Chitoor. Copper had no effect on Pattambi soil in both seasons. Zinc showed some response during Kharif season. In Eruthampathy and Chittoor soils copper application had good effect in increasing the yield during the Kharif season.

At the Rice Research Station, Pattambi, some pockets of paddies had revealed certain physiological diseases. Field experiments using copper and zinc did not show any response during the Virippu season; but during the Mundakan season the treatment differences were significant.

At Mannuthy two experiments were conducted on the soil application of the micronutrients along with fertilizers. In the first experiment no significant effect was obtained for the application of the micronutrients, but NPK + Copper sulphate at 50 Kg/ha gave the maximum yield during the first crop season. In the second revised experiment, the application of micronutrients did not have any effect on the yield of grain in either of the two seasons.

8. EFFECT OF AZOTOBACTER INOCULATION ON THE YIELD OF RICE.

Azotobacter inoculation had no effect on the yield of rice at Pattambi.

9. OBSERVATIONAL TRIAL ON AZOLLA (PATTAMBI AND KAYAMKULAM)

Azolla is a water ferm. The nitrogen fixing blue green alga *Anabaena azollae* lives in association with azolla. The incorporation of azolla into the soil at the rate of 5 ton/ha was found to result in appreciable increase in the yield of rice at Pattambi and Kayamkulam.

10. FERTILIZER ECONOMY THROUGH ORGANIC MANURE (KARAMANA)

In this experiment to study the possibility of economising nitrogenous fertilizers thrh gh organic manures in a crop sequence, it was found that NPK at 60+30+30 Kg/ha could be replaced by an application of 12 tonnes/ha of farm yard manure. The response to N application was insignificant beyond 90 k g/ha.

11. PERMANENT MANURIAL TRIAL.

The results of experiments conducted at Pattambi show that a combination of organic manures with inorganic fertilizers is superior to the application of either of these alone. Similar results were obtained at Kayamkulam also.

12. DATE OF PLANTING AND YIELD (KARAMANA, PATTAMBI)

In an investigation of the reasons for the low vield of high yielding rice varieties during the 2nd and 3rd crop season at Karamana, advancing the date of planting by one month resulted in increased yield. In the experiment on crop weather effect of newly evolved varieties conducted at Pattambi sowing done from the second half of April to the first half of June was found to give maximum yield.

13 WATER MANAGEMENT (CHALAKUDY)

The highest grain yield was obtained when the crop was irrigated on attaining saturation point during "maximum tillering to heading" and and"heading to maturity". For summer rice under limited resources of water, phasic stress irrigation can be practiced to the advantage of saving substantial quantity of irrigation water without any significant reduction in yield.

In another study of the response of semi-medium duration rice under different water management practices and fertility levels, the highest grain yield was recorded when the crop was irrigated at saturation point, closely followed by the treatment when 5 cm of continuous submergence was given. Yield decreased when moisture stress increased.

Studies on the effect of water-logging have shown that flooding during maximum tillering phases and in late booting and early heading periods results in heavy yield reduction. So the time of planting in flood prone area may be suitably adjusted to avoid these critical periods from the normal flood periods of the locality.

14. WEED CONTROL

In the investigation carried out at Vellyani Relof 25G at 1.0 Kg active ingredient per hectare and Benthiocarb G at 2.0Kg ai/ha. were found to be useful for weed cradication in rice, and the effect was on par with hand weeding.

At Pattambi the experiments with weedicides revealed ihat the pre-emergence herbicides, phenoxalin and benthiocarb are efficient in controlling weeds in direct sown rice grown under semi dry conditions.

At Moncompu the lowest weed growth was recorded in the hand weeedd plots and the maximum grain yield was also obtained from this treatment. The different weedicides tried were found to be less effective, In another trial conducted at Moncompu it was seen that the weedicide 2,4 D could be mixed with urea solution and sprayed effectively.

15 MIXED CROPPING, INTERCROPPING AND MULTIPLE CROPPING

Studies in mixed cropping at Karamana have shown that the cultivation of high yielding varieties of paddy in both the seasons gives the highest total yield and profit rather than local varieties in both the seasons or a high yielding variety in one season and a local variety in the other.

In a study of the possibility of growing relay crops in modan lands to increase the production potential it was found that maize can be grown successfully in the rainfed modan lands. Crops like bajra and castor could also be relay cropped in modan lands after rice.

16 CROPPING PATTERNS AND SEQUENCES

In one experiment to find out suitable cropping pattern for Kuttanad under the changed conditions consequent on the construction of Thanneermukkom Barrier various crops like cowpea, greengram, blackgram, gingelly, sweet potato, ragi and jute were tried at Moncompu immediately after the Punja crop. The cowpea yielded an average of 610 kg/ha while blackgram recorded an average yield of 495kg/ha. The growth and performance of green gram, gingelly and ragi were poor. Sweet potato had lo be harvested before maturity due to heavy rains and water logging. Jute started flowering on the 30 th day after sowing and hence retting and fibre collection could not be taken up Only seeds could be collected. After the harvest of these crops paddy was again planted on 9-6-1978.

In a simalar experiment at Kayamkulam intended to formulate an improved cropping pattern for the Onattukara region, groundnut, blackgram cowpea and

gingelly were tried as rainfed crops during the third crop season. The yields were as follows: Groundnut 3800 kg/ha; blackgra, 1235 kg/ha; cowpea, 810 kg/ha; and gingelly, 444 kg/ha.

At Chalakudy, it was found that the following cropying patterns could be followed in the sandy loam soils of the region.

Kahriff	Rabi	Summer
Rice (SM)	Rice (M)	Groundnut–Daincha
Rice (S)	Rice (S)	Tapioca
Rice (SM)	Rice (SM)	Cowpea–Daincha
Rice (M)	Rice (SM)	Vegetables
Rice (M)	Rice (M)	Sesamum–Daincha

In the experiment conducted at Mannuthy, the cropping sequence of Rice–Rice–Tapioca showed the maximum production potentiality while the highest income was obtained from the sequence Rice–Rice Groundnut.

CHEMISTRY

1 SOIL TEST FOR N AMD ITS RELATIONSHIP WITH RICE YIELD (AICRIP–Pattambi)

In this experiment to standardise soil test for N and its relationship with rice yield the response to N was found to increase upto 80 kg/ha, after which it tended to decline.

2 INVESTIGATION OF THE CAUSES OF PERMATURE DRYING OF PADDY LEAVES (Moncompu)

One experiment was conducted at Moncompu in which the mojor treatments included the application of lime and bleaching powder, washing at weekly intervals after the dough stage etc. The minor treatments consisted of the application of micronutrients and spraying Benlate and Agrimycin. None of the treatments tried had any effect in controlling the premature drying of paddy leaves.

3 EFFECT OF PRE-SOAKING OF PADDY SEEDS IN POTASSIUM DIHYDROGEN PHOSPHATE (Moncompu)

The pre-soaking of paddy seeds in solutions of Potassium dihydrogen phosphate of different concentrations did not produce any significant difference in respect of grain yield.

4: EFFECT OF PRE-SOAKING OF PADDY SEEDS IN MICRONUTRIENT SOLUTIONS (CHALAKUDY)

The pre-soaking of paddy seeds in solutions of various micronutrient was not found to have any significant effect on the yield.

Entomology

1. NEW INSECTICIDES TRIAL (AICRIP, PATTAMBI)

Eight granular insecticides were evaluated for their efficacy for the control of paddy pests during both the seasons. Encapsulated Furadan was highly effective in controlling stem borer and gall midge, and AC 64-475 in controlling only gall midge.

Eighteen insecticides, each at 0.75 kg active ingredient per hectare were evaluated as sprays during the first crop season and fourteen during the second crop season. Sumicidin alone was found effective in controlling gall midge and leaf roller. As regards the grain yield, plots treated with San 155, Azinphos, Ottanol, Metacid and Fundal were better and equal to the maximum protected plot.

2. INSECT PEST CONTROL TRIAL (AICARP, PATTAMBI)

In an experiment to evaluate the effectiveness of selected insecticides against specific insect pests of rice four granular insecticides (each at 0 5 and 1.0 kg ai/ha) and ten insecticides as sprays (0.5 kg ai/ha) were tried. Lebaycid, Counter, Nuvacron, Azodrin, Ekalux and Padan were effective in controlling stem borer attack, while Counter was effective against gall midge also. Nuvacron and Knockbal were effective in checking leaf roller attack.

3. PEST MANAGEMENT TRIAL (AICRIP, PATTAMBI)

In this experiment to evaluate the resistance of newly evolved cultures to the major rice pests, 119 entries were evaluated in the International Rice Gallmidge nursery '74 entries in the gall midge resistant variety trial and 60 entries inthe gall midge screening trial. Of these 20,4 and 21 entries respectively were found to be resistant. In general crosses involving Warangal cultures and RPW 6-13 gave better resistance against gall midge.

4. EFFECT OF INSECTICIDES ON THE NATURAL PARASITES AND PREDATORS OF PESTS (PATTAMBI)

The use of insecticides will affect the parasites and predators which control the crop pests to some extent. Carbofuran, phorate, carbaryl, Ethyl parathion and Endrin were highly detrimental to mirid bugs immediately after application. The toxicity of carbofuran, phorate and Endrin persisted even after 15 days. These chemicals were detrimental to spiders also but not to the extent of mirid bugs.

5. BROWN PLANT HOPPER AND ITS CONTROL

a) Biotypes in Brown Plant Hopper (Pattambi)

In a study of the biotype differences exhibitted by Brown Plant Hopper in Kerala 128 entries in the international BPH nursery and 133 entries in the BPH screening trial were screened under green house conditions. Twenty one entries in the former and 25 entries in the latter showed resistance reactions. Entries possessing Mudgo and Asd 7 type genes were susceptible. Varietal reaction did not fit into any of the three biotypes identified so far. Varieties Ptb 33, Ptb 19 and ARC 6650 continued to give the same resistance reaction. Survival studies of nymphs on selected varieties were also conducted. Though early mortality was low the development was slow and the size of insects was small in resistant varieties.

b) Survey of natural enemy complex of BPH (Moncompu)

Mirid bug, Coccinellid beetle and spiders were collected and identified to be the natural enemies of Brown Plant Hopper. In an experiment on the effect of different insecticides on BPH and its natural enemies it was seen that the application of carbofuran gave the maximum control of the hopper with the minimum disturbance to the predator population. The next best effect was that of BHC.

c) Ecology of the Brown Plant Hopper (Moncompu)

The common weeds in the wet land do not serve as alternate hosts. Daily light trap collection showed that the population is very high during the months of February and March, whereafter it declines and remains more or less static. This peak population synchronises with the reproductive phase of the Punja crop. The very low population density of the insect during the other months indicate that the pest does not multiply abundantly during the additonal crop season. Narrower spacing and higher levels of nitrogen application were responsible for greater incidence of BPH.

d) Resistance spectrum of PBH (Moncompu)

One experiment with carbofuran showed that there was no significant reduction in mortality even in the 50th generation which suggests that there is no indication of development of resistance.

e) Effect of water management on population build up (Moncompu)

In a prelinary pot culture study significant reduction in the population of the pest was recorded in pots in which the moisture was maintained at the field capacity level.

f) Effect of different oils in reducing the population build up (Moncompu)

There was significant reduction of BPH population in plots treated with Birlane S. O. Kerosine and Diesel 48 hours after application. These oils had been applied on the surface to the water. After 96 hours there was further reduction in pest population in plots treated with Birlanne S. O. whereas in Kerosine and Diesel treated plots slight increase in the pest population was noted due to the emergence of young ones. In plots treated with Birlane S. O., the young ones which emerged from eggs might have been destroyed by its prolonged fumigant action.

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

A spacing of 20 x 15 cm or 20 x 10 cm and a nitrogen level of 90 kg/ha was found to be the best suited for the varieties Jaya and Jothy.

6. ROOT ZONE APPLICATION OF CARBOFURAN AND UREA FOR EFFECTIVE RICE PEST CONTROL AND IMPROVED FERTILIZER EFFICIENCY (MONCOMPU & KAYAMKULAM)

At Moncompu, it was seen that the root zone application of furadan in conjection with urea was significantly superior to broadcast application in controlling stem borer attack in the early stages of the crop. For gall midge and whorl maggot infestation, both methods of application were equally effective. There was no significant difference in yield for the two methods of application. But at Kayamkulam, the maximum yield of grain was recorded for the root zone application of urea and insecticide.

7. INSECT INFESTATION PATTERN ON RICE CROP IN THE ONATTUKARA AREA (KAYAMKULAM)

Stem borer was found throughout the second crop season, the infestation being a maximum towards the second half of November and first half of January. Occurrence of Silvershoot was maximum during the last week of November. The extent of infestation of gall fly was found to be 16% during the second crop season. Leaf roller infestation was prevalent during the tillering as well as the flowering stages of the crop. Green leaf hopper infested the rice crop throughout its growth period. Rice bug counts showed that it infests the rice crop towards the second half of

December. Infestation of Rice hispa was maximum in the month of November and whorl maggot infestation was more during the initial stages of the crop.

Plant Pathology

1. SHEATH BLIGHT AND ITS CONTROL

Screening of sixty high yielding varieties of rice at Vellayani revealed that the varieties IR-2031-35-4, Suhasini, Culture M 4356-2, IR-28 and Cul.M 15-26-2 are tolerant to the disease while cul M 21-30-1, Bala and Cul-1-Kayamkulam, showed the maximum hill infestation-the pathogen is not found to be seed borne.

In one experiment conducted at Vellayani the application of herbicides was not found effective in reducing the intensity of sheath blight infestation.

Application of certain fungicides was found to have some effect in controlling sheath blight in one expreiment conducted at Pattambi. Soil application of Thiram along with Hinosan as foliar spray recorded 41.1% decrease in disease intensity over control followed by PCNB (soil application) with Hinosan (foliar spray) which resulted in 26.9% decrease in the disease intensity. The corresponding increases in yield were 19.9 and 15.7 per cent respectively.

At Moncompu, it was noted that higher levels of fertility increased the susceptibility to the disease. Plants inoculated between flowering and dough stage were more susceptible to sheath blight infection. Out of 154 varieties/cultures tested for sheath blight resistance at pattambi, 7 were found to be resistant.

2. LEAF BLIGHT AND ITS CONTROL

In a preliminary screening study with six antibiotics conducted at Vellayani, Terramycin was found to have the maximum effect in controlling the disease.

Epidemiological studies on bacterial leaf blight at Moncompu showed that the disease appeared during the last week of June, 1977 in the additional crop planted on 6-3-1977. In the punja crop planted on 15-10-1977 the disease appeared by the end of December 1977, and continued till early February 1978. Varieties Taichung Native 1 and Jyothy were more susceptible than others.

In a screening trial conducted at Moncompu varieties Aswathy and Mala and Cultures Rp 9-4 and 57-5-1 were found to tolerate bacterial leaf blight better than the other varieties/cultures.

3. BLAST AND ITS CONTROL

In a study of the effect of different fungicides in controlling rice blast at Pattambi, Bavistin recorded 47.8% decrease over control followed by Hinosan which resulted in 25.3% decrease during the first crop season. During the second crop season, the reduction in the disease intensity was 69.6% and 45.2% respectively for the two chemicals. The excellence of Bavistin in controlling blast was confirmed in one more experiment conducted at Pattambi.

A total number of 475 varieties received from the IARI was screened at Pattambi, of which 104 entries were found to be highly resistant to blast.

4. EARHEAD CONPLEX

In a study conducted at Moncompu during the additional crop season, none of the fungicides tried gave significant control of the disease. But during the punja season, Benlate, Bavistin, Kitazin and Difolatan helped to reduce the disease incidence.

At Kayamkulam also none of the fungicides tried was found to be effective in controlling the earhead complex disease. However, the plots treated with Kitazin had comparatively less infection.

5. HELMINTHOSPORIUM BLIGHT

In the experiments conducted at Pattambi, Dithan Z-78 was found to be the most efficient against helminthosporium blight followed by Kitazin E. C. and Dithane M-45. This was reflected in the yields obtained as well as by the disease index.

6. YELLOWING DISEASE IN RICE

One experiment involving the use of various soil amendments an a different times of planting was conducted at Kayamkulam to find out the possible cause of the 'yellowing' disease of rice, but no conclusive results were obtained.

7. DETECTION OF SEED-BORNE ORGANISMS OF RICE (MONCOMPU)

The object of this study was to correlate disease intensity with the associate organisms of the seed and to study the effect of fungicidal application on the crop in relation to the health of the seed. It was noted that the intensity of infection was more than 50 per cent in the seeds collected from the experimental plot sprayed for the control of brown spot, and that none of the fungicides could control seed infection to any appreciable extent. The seeds collected from the plot which had been sprayed for the control of the blast disease did not show any statistical significance between treatments as regards the percentage of seed infection. The seeds gathered from the unprotected control plots recorded the maximum peacentage of infection.

COCONUT

Research on cocoi ut is being carried out mainly at the Coconut Research Stations at Pilicode/ Nilseswar, Balaramapuram nnd Kumarakom.

BOTANY

1 PREPOTENCY STUDIES IN WEST COAST TALL (Nileswar)

The object of this trial is to study the possibility of choosing pre-potent (very high yielding) parent palms for seed nut collection and to work out standards for selection of such pre-potent parents and progenies. Twenty seedlings from each of the 15 mother palms originally selected as best transmitters at Kuttiyadi were utilized for this study. Planting was done in 1961. The progenies of tree with numbers 54 and 78 are giving consistently high yields since the last seven years and there for these parents seem to be best transmitters. The study is being continued.

2 STUDY OF 'OFF TYPES' OF DIFFERENT DWARF VARIETIES (Nileswar)

The 'Off types' (natural cross seedlings) of dwarf varieties may turn out to be high yielders and hence the object of this project is to study the performance of the 'Off types' of different dwarf varieties. The experiment was started in 1973. One seedling in Chowghat dwarf green and two seedlings in Chowghat dwarf yellow flowered in February and December, 1977 respectively.

3 CROSS PROGENIES OF EXOTIC TALL x INDIGENOUS VARIETIES (Nileswar)

The trial was started in 1967 with 21 treatments. Flowering was completed in Tall x Java and Tall x Cochin China during the year in addition to Philippines x Dwarf which completed flowering last year. The maximum number of leaf production was in Laccadive Small x Dwarf followed by Java x Tall.

The palms are only in the early stages of bearing and so it is too early to assess yield performance.

4 SECOND GENERATION SELVES AND SIBMATIC PROGENIES (Nileswar)

The object of this study is to evolve inbred lines in coconut and to find out whether hybrid vigour is met within crosses between the first generation selves. Selfed and sibmated progenies of 6 grand parents were planted in 1961. The yield data are being recorded. The sibmatic progenies of all parents showed an increase in yield over the selfed progenies.

5 EVALUATION OF TALL x DIFFERENT DWARFS (Nileswar)

The object is to study the comparative performance of different Tall x Dwarf hybrids with Dwarf x Tall hybrids and West Coast Tall. The seedlings were planted in 1972.

None of the seedlings have flowered so far. Growth measurements showed that West Coast Tall x Andaman Dwarf, West Coast Tall x Green Dwarf and West Coast Tall x Malayan Dwarf are superior in that order in respect of collar girth. As regards leaf production the maximum number was produced by West Coast Tall x Green Dwarf followed by Yellow Dwarf x West Coast Tall.

6 PROGENY ROW TRIAL WITH T x D AND T x GB SEEDLINGS (Balaramapuram)

The biometric data have revealed that T x D seedlings flower and start bearing earlier than T x GB seedlings.

7 PRODUCTION OF NEW CROSS COMBINATIONS (AICCAIP)

The All India Co-ordinated coconut and arecanut improvement project centre at Pilicode/Nileswar is to take up the production of hybrids involving four parental combinations, viz., West Coast Tall x Laccadive Dwarf, West Coast Tall x Chowghat Dwarf Orange, West Coast Tall x Gangabondam and West Coast Tall x Malayan Dwarf Yellow. The seedlings from these crosses are to be sent to other centres for planting and the seedlings from the other centres are to planted at this centre.

During 1975–76 and 1976–77 crosses of West Coast Tall with Chowghat Dwarf Orange and Gangabondam only were effected. During 1977–78 crosses involving all the four combinations were made. The nuts from 1975-76 crossings were harvested during 1976-77 and sown in the nursery. These were ready for supply during May-June 1978.

8 TRIAL OF PROMISING SEED MATERIAL (AICCAIP–Nileswar)

The planting was done in 1976 and growth measurements were recorded during the year. In respect of collar growth and number of leaves produced Tall x Gangabondam was superior, while Java recorded the maximum height. The next best was West Coast Tall in respect of growth, S. S. Green in respect of number of leaves and Tall x Dwarf in respect of height.

9. EXPLOITATION OF HYBRID VIGOUR (EVALUATION OF TALL × DIFFERENT DWARFS) AICCAIP-NILESWAR

The object of this project is to study the performance of different hybrids involving 15 parental combinations of Tall and Dwarfs. Planting was done in 1973. Growth measurements were recorded during the year, in respect of girth of collar. Tall x Gangabondam recorded the maximum girth followed by Gangabondam x Laccadive ordinary. The number of leaves produced during the year was maximum in Tall x Chowghat Dwarf Green, while Tall x Nyior Gading topped the list in respect of the total number of leaves. Twenty plants belonging to the various crosses flowered during the year.

10. GERM PLASM COLLECTION

The germ plasm collection at Pilicode/Nileswar was enriched by the addition of one more variety, viz Ayiramkachi received from Veppankulam in Tamilnadu. This brings the total number of indigenous cultivars to 34 and exotic cultivars to 29.

At Vellanikkara, 33 cultivars of coconut have been collected and planted during the last two years. A minimum of 6 plants have been planted under each variety.

Detailed description of the morphological characters of 15 more cultivars has been completed which brings the total number described so far to 50.

AGRONOMY

1. EFFECT OF NPK LEVELS AND FREQUENCY OF APPLICATION ON YIELD AND BEARING LIABILITY T × D HYBRIDS (NILESHWAR)

In one experiment, two levels of NPK were tried and the yield data show that higher yields were given by trees receiving the higher level of NPK.

Another experiment under the All India Co-ordinated Coconut and Arecanut Improvement Project was started in 1976 and is in progress.

2. NPK FERTILIZER TRIAL STARTING FROM YOUNG SEEDLINGS (BALARAMAPURAM)

The results indicate that the application of NPK at higher levels induces earliness in flowering and results in better yields.

3. SPACING-CUM-MANURIAL EXPERIMENT STARTING FROM SEEDLINGS (BALARAMAPURAM

The data collected so far indicate that planting coconuts at 7.5 m x 7.5 cm would be optimum and would result in higher yields.

4. SIMPLE FERTILZER TRIALS IN CULTIVATORS' FIELDS

The trial started in 1976 in eight coconut gardens each at Pilicode and Nileshwar was continued. Data on total number of leaves, number of leaves produced during the year, number of female flowers and number of nuts produced were recorded. Similar experiments on cultivators fields have been started in the Balaramapuram, Kumarakom and Mannuthy areas also.

5. INTER CROPPING IN COCONUT GARDENS

A number of experiments on intercropping in coconut gardens are in progress at Pilicode/Nileshwar. As regards the different varieties of pepper the maximum number of vines established was in the case of Panniyur-1, followed by Karimunda and Balankotta. In respect of also growth Panniyur-1 stood first. The vines have not flowered as yet. The growth of cocoa and pineapple also have been good.

Four varieties of banana, viz , Robusta, Nendran, Njalipoovan and Palayankodan were tried as intercrop in coconut gardens at Pilicode. Due to acute drought during the flowering and fruiting period, the fruit development was poor. A mean bunch weight of 8.2 kg was obtained for Robusta closely followed by 8.1 kg for Palayankodan.

One experiment on intercropping with cocoa (conducted under the All India Co-ordinated coconut and arecanut improvement project during 1971-76) has been concluded. It has been shown coclusively that interplanting coconut gardens with cocoa is a very good means of augmenting the returns from a unit area of land It has improved the general condtion of coconut palms and there by increased the yield of nuts per palm. Of the two systems of plantings tried the double row planting to accommodate about 600 plants per hectare was the best in respect of its beneficial influence on coconut palms as well as the overall income from the coconut garden.

6 EFFECT OF TAPPING ON THE YIELDING OF UNECONOMIC PALMS

An experiment to find out whether tapping will improve the yield of nuts from uneconomic palms was started at Nileshwar during 1976. Trees

receiving irrigation have given higher yields of toddy. The tapping will be continued for one more year after which the yield data will be recorded.

7 EFFECT OF CHEMICAL NUTRIENTS ON THE SETTING OF NUTS IN COCONUT (Vellayani)

The harvest data of 98 coconut palms were collected and processed, based on which 54 palms have been selected for the treatments.

CHEMISTRY

1 Forms of nitrogen in coconut growing soil before and after Monsoon (Nileshwar)

The object of this study is to find out the form of nitrogen in Coconut garden soils before and after the monsoons in areas where non-lethal yellowing of coconut is manifested The indications are that the non-lethal yollowing usually met with in coconut leaves is not due to lack of available nitrogen in the soil.

2 Nutrition through leaf axil in diseased and healthy palms

Experiments are in progress both at Pilicode and at Kumarakom on the effect of applying fertilzers in the leaf axils as compared to soil application. The application of fertilizers through leaf axils is seen to result, in premature drooping and shedding and scorching and decay of the leaf base.

3 Response to comon salt application

Common salt is said to have some benefical effects on the growth and yield of coconut palms. To study the response of coconut palms to sodium chloride one experiment involving the application of common salt alone and in combination with different proportions of potash was started in 1976 at Nileshwar and Mannuthy. The number of leaves produced and the yield of nuts are being recorded. It is too early to draw any conclusion at this stage.

4 Selection of Index leaf for determination of nutrient deficiencies (Vellanikkara)

The nitrogen content reached a maximum with leaf No.5 or 6 taking leaf No. 1 as the first leaflet well separated. The contents of P and K were highest in the younger leaves and gradually decreased with increasing age of leaf.

ENTOMOLOGY

1 Effect of sodium chloride application in the leaf axil for the control of Rhinoceros beetle (Pilicode/ Nileswar

This experiment was started in 1976 to find out whether the application of sodium chloride in the leaf axil has any effect in controlling the Rhinoceros beetle. The observations so far made have shown that the treatment with common salt is not effective in controlling the beetle attack on the fronds. However there is some reduction in the damage to the bunches due to salt treatment.

2 Effect of soil insecticides on the pupating grubs of Rhinoceros beetle (Vellayani)

The relative toxicities of different insecticides to the grubs of the rhinoceros beetle were found to be in the order BHC > Aldrin > Heptachlor > Chlordane > Toxaphane > Carbofuran

3 Rodent control (Pilicode/Nileshwar)

Preliminary trial was started in December 1977 to find out an effective method of rat damage in coconut gardens. As regards bait acceptance it was observed that rats accept the baits Ratobar, Ratafin concentrate with rice flour in gingelly oil and zinc phosphide mixed with tapioca flour or wheat flour.

PLANT PATHOLOGY

1. ROOT (WILT) DISEASE AND ITS CONTROL

In a study of disease resistance in hybrid coconuts at Moncompu observations recorded during the 4th year of planting revealed that only in TxG and West Cost Tall the root (wilt) disease incidence was more than 10%.

The effect of change of pH on root (wilt) disease by the application of 'Sagar' manure both in the basin and in the crown of wilt affected palms was studied at Kayamkulam. There was some improvement in certain palms during certain seasons, but complete cure could not be obtained.

In another experiment seven coconut palms of different ages and at different stages of disease infection were treated with a chemical complex containing Zirconium. The treatments were given in April 1977. Three palms were seriously affected by bud rot during the exprimental period. The other four palms are being observed.

Two projects for the integrated control of the root (wilt) disease have been started at Kumarakom.

2. LEAF ROT AND ITS CONTROL (VELLAYANI)

Application of F. M spray and Bordeaux mixture were not found effective in controlling the disease and the disease is seen in a super-imposed condition over root (wilt) disease.

3. STEM BLEEDING AND ITS CONTROL (PILICODE)

From the studies on the symptomatology of the disease it is noticed that the disease infection is more in trees of age more than 13 years. Under the infected condition the roots are seen dead and necrotic area appears in the bole region. Discoloration of the petiole and necrosis of the bud portion are also seen in severely affected palms. Further work is in progress.

CASHEW AND SPICES

CASHEW

Research on cashew is being carried out mainly at the Cashew Research Station, Anakkayam and under the All India Co-ordinated Spices and Cashew Improvement Project, Madakkathara.

I: Breeding improved varieties of cashew

Four hybrid progenies viz., H.3-7, H.3-12, H.3-17 and H.3-19 which were planted during 1963-64 at Anakkayam have recorded yields above 15 kg per tree during 1978. The highest yield of 37.0 Kg was recorded by H.3-19 followed by 19 0 kg by H 3-12. The above four varieties can be recommended for large scale plan-ting in the State.

Hybridisation work has been started at Madakkathara also. Nineteen sets of crosses were made during the year and the F1 seeds collected.

2. Study of promising clonal progenies

Among the progenies planted at Anakkayam during 1967 the progenies of G 3-9 have recorded the maximum mean yield of 7·5 kg per tree followed by those of the hybrid T.34 recording 6.0 kg. per tree. Among the progenies planted during 1968 those of hybrid H.3-13 have recorded the maximum mean yield of 5.8 kg per tree followed by the hybrid H.3-17 recording 4.8 kg.

2. Comparative yield trial

In one experiment started at Madakkathara in 1973,16 different types are being compared. The seedling progeny of H.4-7 recorded the highest mean yield of 3 66 kg nuts per tree followed by a Vridhachalam type, M-6/1 giving a mean yield of 2.42 kg nuts per tree.

In another experiment at Madakkathara, 16 Anakkayam selections are being compared. During the year variety K-22-1 recorded the highest yield followed by BLA. 39-A.

In a similar experiment being conducted at Anakkavam the plants have not yet started uniform flowering.

4 Germ plasm collection:

At Anakkayam 47 clonal and 43 seedling types have been planted since 1963. Of these, 11 clonal types and 6 seedling types yielded more than 15Kg nuts per tree during 1978.

At Madakkathara 23 new types were added during the year thus bringing the total number of collections to 92.

5. Propagation trial (Madakkathara)

In this experiment aimed at standardising the techniques of budding, veneer grafting, and side grafting, the monsoon months of May - June to September-October are found to be the most optimum period for these operations.

6. Standardisation of air-layering technique.

At Vellanikkara air-layering was done at fortnightly intervals for one year and observations on shoot growth were recorded to find out whether there was any relationship between rooting of layers and shoot growth cycles. The effect of planting the layers in different months of the year and the effect of nutrient solution on the layers were studied. Investigations were made on the effect of plant growth regulators on rooting and establishment of layers also.

7. Agronomic experiments

In the cultural trial started at Anakkayam in 1972 the different treatments such as light annual digging, cover cropping with calapagonium, clean cultivation and mulching with dry leaves did not have significant effect on the growth measurements such as hight, spread and girth of plants.

A fertilizer experiment involving 3 levels of nitrogen, 2 levels of phosphorus and 2 levels of potassium and their combinations was started at Anakkayam in 1975 with 10 year old trees. The results showed that the application of N resulted in increased yield. Pooled analysis of data for the three years 1976, 1977 and 1978 revealed that treatment effects did not differ significantly between years.

A multilocational fertilizer trial in cultivators fields is in progress at three centres in Malappuram and Cannanore Districts since 1976-77. The treatments consist of three levels of N, two levels of P and two levels of K and their combinations. The pooled analysis of yield data for 1978 revealed that treatment effects did not differ significantly.

8. **Diseases and their control**

For the control of the Dieback disease of cashew various fungicides were tried in an experiment at Anakkayam. Calixin (0.1%) was found to be the most effective, followed by Difolatan (0.2%). Even by pruning the affected twigs the intensity of the disease could be appreciably reduced.

In another experiment at Anakkayam various species of fungi are being isolated from cashew and their pathogenicity studied. The results obtained during the year have shown that 3.2% of fruit drop at peanut stage is due to fungus infection, and 10.4% drop is due to secondary fungus iufection following insect attack.

Cardamom

The work on cardamom is carried out at the Cardamom Research Station, Pampadumpara.

Botany

1. **Hybridization**

The object of this project is to evaluate the poly-cross types by comparing the performance of the progenies. The plants have not yet started bearing.

2. **Comparative yield trial**

The yield performance of light selections maintained in the station were compared and type No.17 was found to be superior to the others.

3. **Germ plasm collection**

A new type with pink coloured shoot and leaves called "Mini Cardamom" collected from the Cardamom Board nursery was added on to the existing collection of 24 types.

ENTOMOLOGY

1. **Insects and nematodes associated with cardamom**

The plants in the Research Station as well as the neighbourig estates, were observed regularly for the incidence of pests. The incidence of caterpillars infesting roots and thus devitalisiag the plants was observed. To study the biology of the recently observed insects like shoot flies, white flies and winged grasshoppers has been undertaken. The effect of nematode infestation on cardamom is also being studied.

2. **Role of honey bees in the pollination of Cardamom**

This project has been implemented in collaboration with the Central Bee Research Institute, Pune. The results obtained indicate that pollination in cardamom is mainly through the agency of the honey bees. Hence it should be possible to increase fruitset in cardamom by apiculture in cardamom estates.

3. **Control of shoot flies in the nursery**

The work has just been started. The number of shoots decayed due to shoot fly infestation has been counted and recorded.

4. **Cardamom thrips and their control**

In this study to test the efficacy of different insecticides to control cardamom thrips it has been found that any one of the following insecticide sprays can be used to reduce thrips infestation to a satisfactory level:- Fenthion 0.05%; Quinalphos 0.03%; Fenitrothion 0.05%. Phenthoate 0.03%; Phosalone 0.03; Methyl parathion 0.05%. Among the dust formulations, Quinalphos (Ekalux), Parathion (Folidol), Carbaryl (Sevin), Phenthoate (Phendal) BHC and Malathion (Cythion) were found to be effective.

5. **Other pests and their control**

Work has also been started for finding out suitable insecticides for the control of cardamom shoot and capsule borer.

Another project has been initiated for evaluating granular systemic insecticides against insect pests and nematodes infesting cardamom and the vectors of virus diseases.

PLANT PATHOLOGY

1. **Katte disease and its control**

In a project to identify different insects transmitting Katte disease no new vector could be identified. Two Katte control-demonstration plots are being maintained.

2. **Azhukal disease and its control**

A plot has been selected in a private estate, where the Azhukal disease is prevalent, for starting a field experiment. As there was no incidence of the disease this year the proposed experiment was not undertaken.

3. **Chenthal disease and its control**

An experiment was conducted to try the effect of various fungicides, bactericides, insecticides etc. against chenthal disease. The results indicate that none of the treatments was effective in reducing the incidence of the disease.

4. Combined (Synergisitic) effect of fugicide-insecticide mixtures against insects and diseases.

The results of this study have indicated that the following combination are very effective against thrips infesting capsules: (i) Fytolan + Ekalux 0.03%; (ii) Dithane + Ekalux 0.03% and (iii) Thiram + Ekalux 0.03%.

Pepper

Research on pepper is being carried out mainly at the Pepper Research station, Panniyur and under the Pepper Research Scheme at Vellanikkara.

BOTANY

I. Hybridization and screening of varieties

At Panniyur about 3000 hybrid and open pollinated seeds were sown in the nursery. Seedlings selected from previous year's nursery were transplanted in the main field. Now there are about 2000 progeny seedlings at different stages of growth. More than 100 of these seedlings have started flowering.

Of these, plants with numbers 94, 341, 354 and 406 which exhibited desirable growth and spike characters have been multiplied by taking cuttings and put in a preliminary yield trial.

At Vellanikkara an experimental plot was planted with rooted cuttings of 144 open pollinated and hybrid varieties. Screening will be started after taking rooted cuttings of the established plants.

2. Comparative yield trial

In this experiment the growth characters and yield potential of four locally popular varieties are compared with the performance of the hybrid variety Panniyur-1 The data recorded so for at Panniyur show that Panniyur is much superior to the other four varieties in respect of growth and yield. A similar experiment has been started at Vellanikkara also.

3. Varietal trial in coconut gardens

This trial is being conducted in a coconut garden at Pilicode. The pepper plants are trained on the coconut trees themselves. The plot is intercropped with cocoa and pineapple also. All agronomic practices were carried out as per schedule and measurements of the growth characters were recorded.

4 Multilocational trial on pepper

To find out the suitability of Panniyur-1 for the High Ranges this experiment has been started at Pampadumpara to compare its performance along with four other local varieties. The plants have not started yielding.

5 Germ plasm collection

A large number of pepper types and varieties has been collected from different parts of Kerala and planted at Panniyur and Vellanikkaaa. A survey of the natural forests of Kottayam, Idukki and Ernakulam districts resulted in a rich collection of wild types with increasingly varied characters. A good number of bisexual plants with good percentage of berry setting are found among the wild types. Purely male and female plants too were not uncommon in the forests. Very bold berries with high pungency were found on some plants.

AGRONOMY

1. Planting material

The observations so far recorded at Panniyur show that the seedlings raised from the middle portion of basal runners are the most vigorous in growth characters. This is followed by seeldings raised from the top 1/3 portion of basal runners. Seedlings raised from lateral shoots are the shortest in stature and the percentage of survifal is also low.

2. Establishment of a progeny orchard and Model Pepper (Panniyur-1) garden.

Nea ly 5 ha of land was planted with Panniyur-1 in July 1976 at Vellanikkara. From the available planting material 1200 rooted cuttings were raised and used for gap filling. The growth of the vines is satisfactory.

3. Fertilizer Trials

In the experiment on fertilizer-cum-standard trial started at Vellanikkara the necessary growth measurements were recorded.

In the NPK trial at Panniyur intended for the formulation of an effective and economic manurial schedule for variety Panniyur-1, the application of fertilizers and other operations was carried out according to schedule. Data so far obtained show that higher levels of N do not increase yields proportionately.

Another fertilizer experiment is also in progress at Panniyur, the object of which is to find out the effect of graded doses of N with and wihout lime on the yield of variety Panniyur-1. Three levels of N were tried, viz., 60, 120 and 180 g N/plant. The results indicate that more than 60 g N/plant is unnecessary.

One experiment to determine the manurial requirements of the local varieties Karimunda and Arakulam Munda has been started in cultivators' fields in Alakode area.

4. Intercropping in pepper garndens

The object of this experiment at Panniyur is to find out whether crops such as banana, yams, colocasia, ginger and turmeric can be grown successfully in pepper gradens. The experiment was started in June 1977. All Agronomic operations to the main crop and intercrops were carried out as per schedule The crops were harvested. The yields of all the intercrops were satisfactory.

5. Effect of mulching

This experiment at Panniyur aims to study the effect of different mulching materials such as saw dust, plastic sheet, cocoanut husk, arecanut husk and dry leaves on the growth and yield of pepper. The experiment was started in November, 1977 and the plants were harvested in January, 1978. It is too early to draw any conclusions from the data collected so far.

CHEMISTRY

1. Nutrient uptake and oleoresion content in pepper

The object of this study undertaken at Panniyur is to find out the rate of uptake of the major nutrients when applied at different levels and their effect on the oleoresion content of the berries of Panniyur-1, variety of pepper. Leaf and berry samples have been collected from plants receiving graded doses of fertilizers. The chemical analysis will be carried out in the college of Horticulture, Vellanikkara.

ENTOMOLOGY

1. Root-knot nematode and its control (Vellayani)

The root-knot nematode decreased the height of plant, number of leaves and the growth of the shoot and root Histopathological studies showed that the starch grains were depleted by the nematode infection and than the xylem vessels were disrupted. Nemagon @ 40.1/ha, Dasanit @ 60 kg a.i./ha, Mocap @ 10 kg a i./ha, Temik @ 10 kg a.i./ha and Neem cake @ 2000 kg/ha gave good control of the nematode.

PLANT PATHOLOGY

1. Spike-shedding and its control

The results obtained at Panniyur indicate that spike-shedding is mainly a varietal character. Considerable individual variations within the same variety was also observed. High doses of nitrogen as well as attack of certin fungi, may also result in extensive spike-shedding.

In an experiment to study the effect of various hormones on spike shedding none of the hormones tried was found to be effective in controlling it. However, in plants treated with NAA, the weight of spikes and the volume and weight of green berries were seen to have incraeased considerably.

2. Quick-wilt and its control

The studies conducted at Panniyur indicate that this disease first makes its appearance in the field during July-August and from then onwards the disease may occur at any time till December-January. Experiments on the control of the disease have shown that one Bordeaux pasting (before or at the time of setting in of the S.W. Monsoon) along with two or three Bordeaux sprayings gives effective control of the disease.

3. Slow-wilt and its control

One experiment to find out whether the application of any of the common nematicides can control the slow wilt disease has been laid out in a farmer's field at Alakode.

4. Pollu and its control

Experiments have been started both at panniyur and Vellanikkara to study the etiology and ecology of fungal "Pollu" in pepper. Fifty spikes were collected at weekly intervals and isolation of the pathogen was tried. Data collected so far show that the pathogen is present in a majority of spikes from the second half of July onwards. In May and June the pathogen could be detected only in a small per cent of the spikes. The incidence of the disease was more under conditions of heavy rainfall.

Laboratory studies have shown that Bordeaux mixture is very effective against the pathogen. Field experiment to find out the most optimum time for the application of the fungicide will be undertaken.

5. Use of stickers or adhesives along with fungicides.

The experiments conducted at Panniyur have shown that the addition of stickers does not reduce the fungicidal property of any of the chemicals tried. Triton A. E. was found to be the best sticker.

GINGER

BOTANY

1. Blossom biology and hybridization studies (Vellanikkara)

Six varieties were studied, The time of flower opening was found to be between 1.15 p.m and 4 15 p.m., the maximum opening being between 2. p.m. and 3. p.m. The pollen was found to be

viable, but no fruit set was obtained by selfing, crossing or open pollination.

2. **Varietal trial (Vellanikkara)**

Preliminary yield trial of 29 exotic and indigenous types has been conducted during the last year and detailed trials were carried out during 1977. The more promising varieties were found to be, Nadia 54, 823 kg/ha) Bajpai (45253 kg/ha), Narasa Pattam (45190 kg/ha) and Maran (38403 kg/ha).

3. **Germ plasm collection.**

Thirty varieties are maintained at Amblavayal where Rio-de-Janeiro continues to be the highest yielder (Fresh weight – 49.5 t/ha).

AGRONOMY

Yield and quality of ginger in relation ot NPK application (Vellanikkara)

A nitrogen application of 80 kg ha gave the highest yield of rhizome. The effect of phosphorus and potassium on the yield was not significant.

ENTOMOLOGY

1. **Nematode diseases of ginger (Vellayani)**

A survey of the ginger growing areas of Kerala has shown that practically the whole area is infested with nematodes. Twently varieties of ginger were screened against one of the species and two were found to be highly susceptible and sixteen moderately susceptible.

PLANT PATHOLOGY

Soft-rot and its control (Ambalavayal)

Five fungicides were compared for their effect against the soft rot disease. The minimum incidence was noted in the case of the fungicide Thiride. The highest yield was also obtained in this treatment.

Turmeric

1. **Varietal trial (Vellanikkara)**

Detailed trials were conducted with 19 types. The yield of green turmeric was highest in the case of Chayapasupa followed by Kodur, Kunchupudi, G. L. Puram and Mannuthy Local. The weight of the cured product was highest in the case of Mannuthy Local followed by Chayapasupa, Kunchupudi and Amalapuram (CII-73)

2. **Germ Plasm collection**

The 20 varieties available at Ambalavayal were maintained. The variety Ettamukkala produced the highest yield of 38.8t/ha (fresh weight)

Cinnamon

1. **Stage and harvest of cinnamon leaves**

The experiment conducted at Odakkali shows that the normal practice of two harvests in a year gives the maximum oil yield.

Clove and nutmeg

1. **Germ Plasm collection (Vellanikkara)**

The growth measurements of the nutmeg plants in the germ plasm collections were recorded.

2. **Propagation studies**

Layering and in-arching were tried. Layering was found to be not successful without plant growth regulators. In-arching was about 95% successful using, *Myristica fragrans* as root stock

3. **Diseases of tree spices**

Work carried out at Vellayani has shown the presence of fungi like *Colletotrichum gloeosporiods*, *Corticium salmonicolor*, *Cephaleuros parasiticus* and *Capnodium* Sp. On cloves *Colletotrichnm gloeosporiodes* was recorded.

Chillies

1. **Evolution of high yielding varieties**

A genetic study of 30 varieties of chillies has been carried out at Vellayani on the basis of which the parents are being selected for breeding work.

2. **Germ plasm collection**

A germ plasm collection of 30 varieties is maintained at Vellayani.

FRUIT CROPS

Banana

Research on banana is being carried out mainly at the Banana and Pineapple Research Station, Kannara.

Botany

1. **Evolution of new varieties**

Attempts are being made to evolve new varieties of Nendran by irradiation with gamma rays. The irradiated suckers were planted in the field. Three months after planting the main shoots were destroyed and the side suckers were transplanted.. This second generation progenies are being studied.

2. **Varietal collection**

Biometrical studies on 13 morphological characters of 59 dessert types and 32 culinary types were

undertaken. The results showed wide significant variations among the varieties in all the characters studied. Thirty nine dessert types were analysed for various nutritive constituents like total sugars, reducing and non-reducing sugars's acidity, sugar-acid ratio etc. Statistical analysis of the data showed significant variations among the varieties in fruit qualities.

3. Clonal variation studies

The object of these studies is to assess the genetic variability existing in Nendran variety and to select promising clones for popularisation. Suckers of selections collected from cultivators' fields based on the performance of the mother plant were used int he experiment. The morphological characters and yield were studied. Wide variations were noted in the growth and yield characters. Yields varied from 3.5 to 14.5 kg per bunch. Promising 80 selections which produced bunches of weight more than 11 kg have been again planted for further studies.

4. Flower initiation studies

Nendran, Palayankodan, Poovan and Pisang lilan were planted for flower initiation studies. The experiment is in progress.

Agronomy

1. Frequency of application of nitrogen and Potash to Irrigated banana

In this experiment nitrogen and potash were applied either in one full dose or in split doses at different stages. The growth and yield characters were studied. The maximum yield was obtained in the treatment in which N and K were applied in two equal split doses, 30 and 150 days after planting.

2. Varietal trial (rainfed) in banana

The object is to study the performance of four promising varieties of banana viz., Robusta, Poovan, Palayankodan and Grosmichel, under rainfed conditions. In the experiment conducted the performance of all the varieties tried was not satisfactory, but Poovan and Palayankodan were comparatively better than the other two varieties.

3. Monthly planting trial under rainfed conditions (varieties Palayankodan and Robusta)

From the observations recorded so far the indications are that planting during the period November to April is not desirable in the case of both the varieties because of the heavy casuality due to drought. Planting in May–June is also not desirable because of the risk from drought at the flowering stage. The performance of Palayankodan planted during August-October was comparatively satisfactory whereas that of Robusta was very poor.

4. Irrigation trials in Nendran

In one experiment at Kannara drip irrigation at the rates of 5, 10, 15 and 20 litres per plant per day was compared to basin method of irrigation at the rate of 60 litres per plant once in three days. The observations so far made indicate that the performance of the plants receiving 5, 10, and 15 litres per day is not quite satisfacto.y.

In another experiment conducted at Chalakudy bunch weight was maximum (12.05 kg.) when 5 cm irrigation was given once in 20 days. Plants mulched with paddy straw retained 1.27% more moisture than non-mulched plot.

In another experiment conducted at Chalakudy bunch weight was maximum (12.05 kg) when 5 cm irrigation was given once in 20 days. Plants mulched with paddy straw retained 1.27% more moisture than non-mulched plot.

5. Weed control

In an adaptive trial with different weedicides. gramaxone with 2,4-D was found to be superior to Diuron, but the difference was not statistically significant.

CHEMISTRY

1. Nutritional (NPK) requirements (Robusta)

Nitrogen at 100, 200 and 300 g per plant, phosphorus at 0,40 and 80 g per plant and potash at 0,200 and 400 g per plant were given in three split doses. The effect due to nitrogen at the levels tried was not significant whereas there was response to P and K levels.

PLANT PHYSIOLOGY

1. Physiological basis of variation in yield between two varieties of banana Nendran and Zanzibar

Three samplings were carried out. In the first sampling variety Nendran exhibited a higher biomass as compared to Zanzibar, while in the final sampling Zanzibar exhibited a higher biomass.

2. Pre-and post harvest physiology of bananas

The object of this experiment is to study the biochemical changes that occur during development, maturation and storage of banana fruit. The total soluble salts, acidity, sugar content, sugar-acid ratio etc. of four varieties, Nendran, Palayankodan, Poovan and Robusta were determined.

3. **Physiological deterioration of seed material in banana, variety Nendran**

The experiment was laid out with 10 suckers of uniform age and size, with a spacing of 2 m x 2 m, and according to the recommended package of practices.

HORTICULTURE

1. Desuckering trial

The object of the experiment is to study the effect of desuckering in banana and retaining varying number of suckers on plant growth and yield. The treatments which were significantly superior in respect of bunch weight were the following:–

(i) Removing all suckers except the one produced suckers after flowering

(ii) Removing all suckers except the 1st and 2nd produced suckers after flowering.

2. Population density trial(Var. Robusta)

The object of this experiment is to find out the optimum spacing for banana for the maximum yield per unit area. The maximum establishment of 95.6 per cent was obtained in the single hedge method (5000 plants/ha) followed by 94-98% establishment in the double hedge method (7000 plants/ha). Data on other vegetative parameters were recorded at intervals of three months.

ENTOMOLOGY

1. Nematode parasites and their control

A survey has shown that several species of parasitic nematodes are present in banana roots and soils. The more wide-spread of these are the *Radopholus* sp. and the *Pratylenchus* sp. A pot culture study has shown that the plant growth was affected when the nematode populaion exceeded 100 nos in 10g of root.

Another study has shown that the nematicides Nemacur, Temik and Thimet are very effective for the control of *Radopholus similis* and the root knot nematode.

2. Role of parasitic nematodes on the occurrance of Kokkan disease

Nematodes extracted from the diseased plants were inoculated to healthy plants to see whether disease symptoms would be produced. As no disease symptoms were produced it is to be concluded that nematodes are not responsible for the disease.

3. Rhizome weevil and its control

A screening of ten varieties showed that none of them is resistant to the pest attack. Field experiments have shown that the infestation of the weevil can be reduced by insecticidal treatment of the suckers or by the soil application of insecticides around the rhizome Disyston, BHC suspension and Solvirex were found to be the best for sucker treatment, while chlordane ond BHC10%were found to be the best for soil application.

PLANT PATHOLOGY

1. Bunchy top disease and its control

In a preliminary screening trial using 10 varieties of banana, the variety 'Kanchikela, showed some toerance to the buncy top disease. This was conformed by two more experiments. It was also found that the tolrancec was more in the case of older plants

In another experiment it was found that the foliar application of insecticides and the soil application of granular insecticides were effecive in controlling the aphid population which spreads the disease. Of the different insecticides tried Thimet and Disyston were found to be very effective in controlling the aphid population.

In a third exp eriment the insecticides Furadan, Thimet and Solvirex were applied in different concentrations at three stages viz., at time of planting 70 days after planting and 140 days after planting. The apnid population was more in the control plots as compared to the other treatments, but there was no remarkable difference between the various treatments.

In another experiment at Vellayani, Solvirex, Thimet and Furadan at the rate of 5 g/plant were applied in two demonstration plots in the adopted villages of Muttakad and Kalliyoor. The incidence of the disease was less than 3 per cent in the treated plots

2. Leaf spot disease and its control

In a screening trial 144 varieties were graded against leaf spot disease according to the intensi y of infection. Red banana, Chenkadali, Sannachenkadali Pisang lilin, Paka Manoranjithan, Tomgate, Adakkakunnan and Thiruvanandapuram were found to be more tolerant of the disease as compared to the other varieties.

From the varietal succeptibility studies conducted at Vellayani it was found that Robusta and Chakkarkeli were the most susceptible varieties, while Venatter monthan and Mars were the least susceptible. Power oil was observed to be the best for the control of leaf spot disease.

In a search for suitable control measures for the disease an experiment was conducted in which different insectides were sprayed at fortinghtily

intervals. The effect of the treatments as revealed by the yield was not statisticlaly significant However the mean bunch weight was more in the case of plants treated with Bordeaux mixture. The total sugar content was also more in the case of the Bordeaux mixture treated plants.

3. Kokkan disease and its control

No conclusive results were obtained in an experiment in which various insecticides were tried for the control of the Kokkan disease.

Pineapple

The work on pineapple is carried out mainly at the Banana and Pineapple Research Station, Kannara

BOTANY

1. Hybridization programme

From the ratoon crop crosses have been made between Pulimath local x Kew. Ripely queen x Kew and Espinola roja x Kew. Further work is in progress.

2. Germ plasm collection

A total number of 23 varieties including a scented variety from West Bengal is maintained. The collection of biometric data on the morphological characters of these varieties has been completed in the 1976 year crop.

AGRONOMY

1. Nutritional studies in pineapple (variety Kew)

The object of this experiment was to find out the optimum dose and method of application of nitrogen. In the experiment conducted the data on the weight of fruits per plot, average weight of fruits etc. did not reveal any significant difference for the different levels of nitrogen applied, As regards the method of application full soil application, as well as 25% foliar along with 75% soil application, were found to be superior to the other treatments.

2. Weed control

The data from an experiment started in 1974–75 showed that the application of Diuron at 3 kg/ha was the most effective and economical in controlling a broad specturm of weeds.

HORTICULTURE

1. Optimum size of suckers for planting

The experiment conducted with suckers of different sizes indicates that suckers of length more than 45 cm flower more uniformly and early in the crop season. The number of leaves produced is also more in the case of suckers of longer length.

2. Adaptive trial to compare the results of research with local practices

In this experiment improved methods of pineapple cultivation are compared with local practices. The data so far obtained indicate that weed growth is very low under improved practices as compared to the local practiees of cultivation.

3. Growth regulators and their application

In one experiment on the effect of growth regulotor application to suckers, as well as crowns, it was noted that both types of planting material responded to the treatment. The treated suckers started flowering from the 14th month onwards while the the plants in the control plots under natural conditions started flowering only from the 19th month. The crowns also responded well to growth regulator application for all the ages tried, the extent of flowering varying from 81.8 to 89.0%. Plants raised from crowns in the control plots started flowering when they had attained 19–20 months of age after planting and the extent of flowering at that time was only 17.9%.

In another experiment it was noted that none of the growth regulators tried was effective in inducing flowering in plants of age 11 and 12 months. Response to growth regulator application was obtained only after the plants raised from suckers had attained the age of 14 months. "Ethrel" alone and in combination with urea and calcium carbonate was found to be superior to the other treatments. Growth regulator application was most effective during the crop season from October to December.

Another experiment has also been started to study the effect of growth regulators on the size and maturity of the fruit.

ENTOMOLOGY

1 Survey of pests

A survey was conducted in some areas of Trichur District. Mealy bugs were noticed in traces.

PLANT PATHOLOGY

1. Survey of diseases

A survey conducted in some parts of Trichur District has revealed the occurrence of a mild infection of leaf spot disease.

Citrus

The work on citrus is carried out at the Horticultural Research Station, Ambalavayal.

ENTOMOLOGY

1. **Scale insects and their control**

The experiment was started only in 1976. The treatment of chemicals will be given only after the plants get fully established. The damaged and unhealthy plants were removed and replanted with healthy ones.

2. **Nematodes associated with citrus**

An examination of the soil samples collected from the different blocks in the Research Station at Ambilavayal has revealed the presence of seven genera of parasitic namatodes, the predominant one being the citrus nematode, *Tylenchclus semipenetrans*

PLANT PATHOLOGY

1. **Fungal diseases and their control**

The plants for the experiments for the control of diseases like mildew, citrus scab, leaf fall and fruit rot were maintained properly. The differential treatments will be given after the plants are fully established.

2. **Die back and its control**

The object of this experiment is to study the performance of six promising root stocks supplied by the Citrus Experiment Station, Gonicopal under Wynad conditions. The plants under the trial are maintained properly.

Mango

(College of Horticulture, Vellanikkara)

1. Standardisation of Mango root stock for commercial varieties

The root stocks were potted for grafting to be done in July-Agust, 1978.

2. Survey and collection of pickle varieties and propagation by vegetative means

Two types of pickle mango varieties were collected. Further work is in progeess.

3. Regulation of flowering and fruiting

The yield data of the plants in the experiment were collected. In the old trees which were pruned in November 1976 no flowering was noted. The vegetative growth was satisfactory.

Jack

1. Survey and collection of promising jack varieties

A new collection of superior jack varieties was planted in the field in the College of Agriculture, Vellayani.

2. Effect of cutting jack leaves at different intensities on yield

As an observational trial 75 severely pruned trees available in the Instructional Farm at Mannuthy were studied for immature fruit number and yield of harvested fruits. The average number of immature fruits in this group of trees was six per tree as against 13 per tree in the 50 uupruned trees. None of the pruned trees gave any harvestable fruit.

Papaya

Survey and collection of papaya varieties (Vellayani)

The object of this work is to make an exhaustive collection of seedling varieties of papaya and study their performance for selecting the better performers for further multiplication. A few desirable types have been isolated and maintained through mound layering. Hybridization was also done and the seeds collected for further studies.

TUBER CROPS

Tapioca

BOTANY

1. Comparative yield trial of the crosses between Malavella x M4 Tapioca (Ambalavayal)

The object of this experiment was to compare the performance of the progenies (9 lines) of the crosses between Malavella x M4 along with varieties H 1323, H 2304 and H 1687 and the parents Malavella and M 4. The highest yield was given by variety H 2304 followed by M4. Of the nine progenies of the crosses, lines T 1 and T 4 recorded the highest yields.

2. Uniform regional trial (Pilicode)

Nine varieties, viz., H=165, H-226, H-97, H-2304, H-1687, H-312, A=3641, ME-7 and M4 were compared in this experiment. The heighest yield of 14 9t/ha was recorded by H-2304. The next best yielders were H=226, M4 and H-165, Varieties ME-7 and H-165 required the least time for cooking (30 mts.) whereas the maximum time (45 mts) was taken by H-167, H-97 and M4. Volume of expansion on cooking was highest for M4 followed by ME-7 and negligible for the hybrid varieties.

Agronomy

1. Fertilizer trial (Pilicode)

An experiment with the combination of three levels of nitrogen and potash at the rates of 60, 120 and 180 kg/ha was started.

2. Irrigation: Effect of different irrigation schedules based on IWCPE ratio (Chalakudy)

In this experiment water productivity was the heighest (1.620 MT/hs cm) for the crop irrigated at IW/CPE=0.35, indicating the possibility of harvesting the crop, two months earlier with considerable yield increase over un-irrigated crop.

3. Inter-cropping of Tapioca (Pilicode)

The trial was conducted with five intercrops, viz blackgram, greengram, cowpea (New Era), Cowpea (Do-fasli) and bhindi. Though the initial growth of inter-crops was satisfactory, all the crops were severely affected by unprecedented heavy rainfall. The intercrops were, therefore, a failure.

PLANT PATHOLOGY

1. Bacterial wilt (blight) (Vellayani)

Different improved varieties were screened against the disease and variety H-165 was found to be the most susceptible. Of the 18 local varieties tried, 8 were found to be susceptible to the disease. The causal organism was identified to be *Zanthomonas manihotis*.

Sweet potato

BOTANY

1. Hybridization and selection (Vellayani)

From the large number of hybrid clones raised from 8 selected sweet potato varieties, 68 promising clones were put to comparative yield trial along with their parents and local clones. Of the 17 hybrid clones evaluated so far four were found to be significantly superior.

AGRONOMY

I. Fertilizer trial (Pilicode)

In this experiment the combinations of three levels of nitrogen and potash (both at 30, 60 and 90 kg/ha) were tried. The highest yield of 6,540 kg/ha was recorded at the highest level of NK combination (90 kg/ha each). Application of potash had very pronounced effect on the yield of tuber.

Dioscorea

Multi-locational Trials (Pilicode)

In one trial with five varieties of *Dioscorea alata* the highest yield of 12.24 t/ha was recorded by variety Da-48; followed by Da-60 (11.60 t/ha), Da-122 (10.96 t/ha), Da-42 (10.32 t/ha) and Da-80 (9.76 t/ha) During the previous year Da-60 had given the highest yield. Variety Da-48 is also superior in quality.

In another trial with four varieties of *Dioscorea esculenta* the highest yield of 12.41 t/ha was given by variety De-11 followed by De-40 (11.94 t/ha), De-17 (11.94 t/ha) and De-23 (11 76 t/ha). Variety De-11 is superior in quality also. During the previous year the highest yield had been given by variety De-17 followed by De-11.

Colocasia

1. Uniform regional Trial (Pilicode)

Six varieties viz Narkatia. Kavur, C-25, C-73, C-9 and Kasibhunga were used in this experiment. Variety Kasibhunga recorded the highest yield of 11.90 t/ha followed by Kovur with a yield of 4.70 t/ha.

Coleus

1. *Manurial-cum-spacing* trial (Pilicode)

Two levels of Nitrogen (40 and 80 kg/ha) and three levels of potash (40,80 and 120 k/ha) along with two spacings (60 x 15 cm and 60 x 45 cm) were tried in this experiment. The highest yield of 10.6 t/ha was recorded tor the treatment, 60 x 15 cm spacing with nitrogen at 80 kg per ha and potash 40 kg/ha.

FODDER CROPS

Most of the work on fodder crops is done under the All India Co-ordinated project on Forage crops at the College of Agriculture, Vellayani.

1. *Mutation breeding* (Department of Agr. Botany)

Open pollinated seeds of a selected clone of guinea grass were subjected to chemical mutagen treatment and from the M1 generation selections were made based on tillering capacity, yield of fodder and non-flowering character. A total number of 15 superior clones were selected and planted for further studies.

2. Collection and evaluation of indigenous and exotic varieties.

Under this programme, 80 types of different fodder grasses, 11 varieties of cereal fodders, 70 varieties of legumes and 14 varieties of fodder trees were collected for studies.

3. Final evaluation trial on 14 varieties of Dinanath grass

The results showed that the maximum yield was recorded by PP-3 from a single cut followed by PP-5 and PS-38. Variety JP-12 recorded the lowest yield

4. Comparative performance of Guinea grass and Hybrid Napier in coconut gardens and the open under varying levels of nitrogen and cutting intervals.

In coconut gardens, guinea grass proved to be superior by recording higher yields. The green fodder yield increased with increase in the level of nitrogen. Maximum yield was recorded by 250 kg N ha. With longer cutting intervals significantly higher fodder yields were recorded. In the open field also significantly higher yield was recorded by Guinea grass.

5. Manurial trials on 3 promising Guinea grass types viz., FR.600, FR.599 and Mackuenii

The results indicaied that there was no significant difference between these 3 types. Further, there was no significant yield increase beyond the lower level of N viz., 150 kg ha.

6. Fodder production potential trial to find out a suitable cropping pattern for fodder crops.

At Vellayani, guinea grass gave the maximum yield followed by hybrid napier. The lowest yield was recorded with hybrid maize followed by cowpea. In dry matter yield also the same trend was recorded. The highest leaf stem ratio of 3.68 was recorded by guinea grass.

In an experiment aimed at the development of an economic forage cropping pattern for the middle laterite belt of Kerala the highest yield (68 t/ha) was recorded by Hybrid Napier followed by Guinea grass (44 t/ha) during the first season at Vellanikkara. The yield of maize and sorghum was much lower Cowpea mixing gave less of perennial grasses but more of annual grasses. During the second season the trend in yield was similar to that of the first season. During the third season the treatments that had cowpea mixing during the previous seasons recorded higher grass yields.

7. Response of Dinanath grass to varying leavels of N and P.

The results indicated no difference in yield for different levels of nitrogen and phosphorus

8. Effect of plant population on the yield and quality of Koobabool (Coconut gardens)

The difference between the treatments were not significant. However the maximum green matter yield was recorded by the spacing 1 m x 10 cm. The same treatment also recorded the maximum plant height.

9. Evaluation of production potential of grasses/legumes under varying combinations with forage trees (coconut gardens.)

Among fodder trees *Sesbania aegyptica* recorded the maximum fodder yield followed by koobabool and *Sesbania grandiflora*. The best silvipasture comoination was found to be koobabool together with setaria and velvet bean in coconut gardens.

10. Evaluation trial of hybrid napier types for disease resistance and yield

Seventeen hybrid napier types were tried for fungus disease resistance and yield Type HGA-BN-5 recorded higher fodder yield. But no fungus disease was noticed in any of the types which may be due to the low amount of rainfall received.

PULSES AND VEGETABLES

Cowpea

Release of improved variety

An improved variety of Cowpea, a selection from Kunnamkulam local was released as an improved variety. It has been named as Ptb. 1 Cowpea or 'Kanakamani'. It is the first variety of cowpea released from the Kerala Agricultural University.

BOTANY

1. Breeding for high yielding varieties

In order to breed high yielding cowpea varieties with short flowering phase crosses were produced between P-118 x Kolingipayar and pusa Dofasly x Kunnamkulam local. The F4 generation from these crosses were put to further study at Pattambi. At

Vellanikkara a preliminary selection of 50 varieties has been made from a germ plasm collection of 217 types for further evaluation.

2. *Selection of suitable variety for Kuttanad*

In a trial with 7 varieties of cowpea at Moncompu observations on the general growth have indicated that the varieties PTB. 1, C-152 and New Era have better adaptability than the others.

3. *Diallel analysis of yield and its components (Vellayani)*

Eight selected parents were crossed in all possible combinations and the F1 progenies were evaluated along with the parents. The parent Calicut-78 showed good general combining ability for yield and its components. The parents S-58, S-51 and Panmthodan S-25 were the best general combiners for yield. In most of the characters studied considerable heterosis was observed. The hybrids of Aralummudu S-54 x Panmthodan S-25 may be pointed out as the best considering the overall performance. Other hybrids of significant importance were Calicut-78 x S-58, Thodupuzha 2 x Kolingipayar and S-51 x S-58.

4. Varietal trial (Pattambi)

In a Co-ordinated varietal trial at Pattambi, 18 varieties were compared of which the variety V-16 was found to be the highest yielder followed by C-152 and V-37.

At Kayamkulam the highest yield of 662 kg/ha was recorded New Era followed by Kunnamkulam local (523) kg/ha) and Cul-1 (406 kg/ha). The differences were statistically significant.

5. Effect of Malic Hydrazide on flowering, pollination and fruit setting

Cowpea variety Co-2 was sparyed with 5 different concentrations of M. H. (200, 400, 500, 600 and 800 ppm) at three stages viz, before flower initiation, after flower initiation and during the flowering period. Delayed flowering was noticed in the treated plants. The maximum pollen sterility (41.90%) was recorded by the plants treated with 800 ppm. M. H before the flower bud initiation. The statistical analysis of the data revealed that the treatments do not show any significant difference over control.

6. Germ plasm collection

During Khariff 1977, a total number of 153 types of cowpea were grown and maintained at Pattambi.

AGRONOMY

1. Fertilizer trials

In fertilizer trial conducted at Pattambi NPK application of 20-30-10 per hectare recorded the highest yield of 783 kg/ha of cowpea.

In another experiment conducted at Vellanikkara nitrogen at 21.6 kg/ha was found to be the optimum level for maximum grain production. As regards phosphorus there was linear response even beyond the highest level of 40 kg P_2O_5/ha tried in the experiment. Pottassium did not show any significant Influence on the yield components.

At Vellayani the effect of different levels of magnesium and molybdenum on the performance of cowpea with and without bacterial culture was studied in an experiment in one season. Magnesium levels up to 10 kg Mg O/ha increased the yield. There was also a trend for increased yield with the application of bacterial culture.

2. *Application of rhizobial cultures*

Rhizobial inoculation was found to be very effective for the nodulation of cowpea root, symbiotic nitrogen fixation and for better growth of cowpea at Vellayani. Soil application of Molybdenum resulted in enhanced nodulation. Pelleting the seeds with calcium corbonate after rhizobiol inoculation resulted in siguificantly increased number of nodules and dry weight of plant and shoot. Nodulation was significiantly inhibited by soil application of the granular insecticide, Furadan.

ENTOMOLOGY

1. *Pests and their control*

Disulfotan at 1 kg a.i./ha applied at the time of sowing was found to be effective for controlling pea aphid upto 5 weeks after planting. Spraying of insecticides commencing from the time of flowering reduced the incidence of the pea aphid and pod borers and increased the yield significantly.

Blackgram

1. *Varital trial*

Of the fourteen varieties tried at Pattambi Pant U-19 was found to be the highest yielder with 270 kg/ha followed by Pant U-30 (219 kg/ha) and T-9 (212 kg/ha). But the differences in yield were not statistically significant.

At Kayamkulam the highest yield of 1024 kg/ha was recorded by variety CO-2 followed by KM-1 (809 kg/ha) and SI (804 kg/ha), the differences in yield being significant.

At Vellayani 72 varieties of Blackgram cultivars were collected from which 6 parents have been selected for hybridization work.

2. Germ plasm collection

The number of varteties of blackgram grown and maintained at Pattambi was 21.

3. Fertilizer trial

At Kayamkulam the maximum yield of 1204 kg/ha was recorded for the NPK treatment of 20-50-30 kg/ha.

Greengram and Horsegram

1. Varietal trials

At Pattambi of four varieties of greengram tried, viz. Philippines, NP-26, Madura and NP-40, the variety Philippines recorded the highest yield of 454 kg/ha. But considering the yield data for 3 years variety NP-40 has been giving consistantly high yields.

As regards horsegram, 14 varieties were tried at Pattambi. The highest yield was recorded by varietiey HPK-2 (425 kg/ha) followed by HPK-6 (363 kg ha) and Pattambi local (302 kg/ha).

2. Germ plasm collection

Forty nine varieties of greengram were grown and maintained at Pattambi during the Khariff season.

Soyabean

1. Varietal trial

At Vellanikkara, 25 varieties suitable for South India were compared for their yield in two seasons. The performance of the varieties was highly variable during both the seasons Variety EC-39824 which recorded the highest yield during the first season did not even flower during the second season. Two varieties, EC-3982 and improved Pelican showed superior yield in both seasons.

At Vellayani, 119 varieties were collected and grown in the field for screening and testing their adapiability to local conditians. Based on their performance 65 varieties have been selected and observations on ten characters were taken. The data are being analysed for computing the genetic divergence

VEGETABLES

(Cucurbits, Bhindi, Brinjal, Tomato etc.)

1 Selection of cucurbit varieties (Vellanikkara)

Comparative yield trials were laid out with 25 types each of bitter gourd and snake gourd and 29 types of Pumpkins. The highest yield was recorded by type MC-23 in the case of bitter gourd, type TA-19 in the case of snake gourd and type CM-21 in the case of Pumpkins.

2 Hybridization in bhindi (Vellayani)

One promising hybrid culture (T 5) produced by crossing Pusa Sawani x Kilichundan was raised for seed multiplication. The seeds have been sent to ten research stations for comparative yield trial.

In another experiment 28 hybrids were raised from eight parents. The study of the hybrid and parents has shown that the treatments were significant only for plant height, number of branches and days to flowering in the case of the crosses, local x New white, Perkin long green Pusa mukhmali and Pusa red x New white.

3 Genetic studies in Brinjal in relation to wilt disease (Vellayani)

Thirty six varieties were screened for wilt resistance. Two selected varieties were crossed and the F_1 were subjected to radiation to enhance the recombination potential in the segregating population. Further work is in progress.

4 Evolving high yielding varieties of tomato with resistance to bacterial wilt (Vellayani)

Nineteen varieties were collected from different stations and the seed multiplication has been done.

5 Effect of nitiogen and potassium on the yield and quality of brinjal (Vellanikkara)

Fruit yield per plant was found to be highesr in the treatment receiving 25 kg each of nitrogen and potash. Chemical analysis of the fruits for vitamin C, total soluble salts and total and reducing sugars showed that these factors did not vary with fertilizer treatment.

6 Yield potential and fruit quality of tomatoes in relation to potassium nutrition (Vellanikkara)

The percentage of fruit set was higher in treatments where potash was applied at the rates of 50 and 100 kg/ha. With increase in the level of potash there was a regular increase in yield, but at the highest

level of 100 kg/ha there was a slight decrease. The fertilizer treatment had no effect on the titrable acid ty and the vitamin C and sugar content of the fruits.

7 Integrated control of pests of vegetables

In a study conducted at Vellanikkara Disulphoton and Phorate at 1.0 kg. a. i./ha were found to be equally effective in suppressing pest population for upto 30 days after sowing in bhindi crop.

8 Root-knot nematodes of vegetables and their control

A study conducted at Vellayani has shown that Dasanit 5g. at the rate of 1.0 g per plant or Furadan 3 g. at the rate of 1.3 g per plant will give good control of the root-knot nematodes of bhindi.

9 Bacterial wilt of tomato and its control

A study conducted at Vellayani has shown that the pathogen is capable of surviving under different soil conditions and in the rhizosphere of non-host plants. Grafting tomato to *Solanum torvum* gave absolute control of the disease. Organic amendments of the soil with antibiotic sprays reduced the severity of the disease.

10 Mosaic disease of snake gourd

The symptoms of the disease are formation of dark green blisters, crinkling and deformation of the leaves. The infected plants blossom sparsely. The virus is transmitted through the sap and by insects. *Aphis gossypii* and *A. craccivora* were identified as vectors The virus has been identified as a strain of *Cucumur virus 1.*

11. Integrated control of diseases of vegetables

The effect of seed treatment on the germination of Bhindi seeds was assessed with different fungicides, at different concentrations. Vitavax (0.4%), Aureofungin (0.015%)and Thiram (0.4%) were found to be non toxic to bhindi seeds.

OIL SEEDS

Sesamum

11. Initial evaluation trial of hybrid culture of Sesamum (Kayamkulam)

The highest yields were recorded by culture No.8 (582 kg/ha) and culture No. 14-1 (581 kg/ha) The maximum number of pods was also recorded in the case of culture No.8

2. Inter varietal trial (Kayamkulam)

The maximum yield was recorded by selection-14 (384 kg/ha) and followed by Kayamkulam-1 (372 kg/ha) and Tvm. 3 (391 kg/ha). The yield differences between varieties were not significant.

3. Varietal improvement (Kayamkulam)

Sixty varieties were raised under the germplasm and their characters were studied. The performance of 30 varieties was studied in an inter-varietal trial. The maximum yield was recorded bp varieties No.4, UT. 43, IS-614, GP-111-2, IS-50 and E-8. The differences between varieties in the matter of yield were significant.

4. Genetic studies in Sesamum Vellayani

Forty nine morphologically different elite varieties of sesamum were studied. It was found that he varierles fall under genetically distinct constellations which vary in their relative genetic distance. Path coefficient analysis was worked out to define an ideal plant type of sesamum for maximum yield of seed and oil recovery.

5. Fertilizer trial (Kayamkulam)

The highest yield of 866 kg/ha was recorded for the treatment NPK at 30-15-30 kg/ha and cattle manure at 5 t/ha, followed by the treatment NPK at 30-15-15, (P basal and N and K at interculture).

6. Effect of potassium and magnesium on yield, oil content and protein in Sesamum (Vellayani)

In this pot culture study the yield data showed that there is increase in yield due to the application of potash and magnesium. Further chemical analysis is in progress.

7. Effect of irrigation

The experiments conducted at Kayamkulam and Chalakudy have shown that the yield of summer sesamum can be enhanced by giving two irrigations, one at the vegetative phase and the other at the reproductive phase.

8. Insect pests

At Kayamkulam sesamum leaf roller has been found to be the major pest of Sesamum throughout the third crop season.

). **Diseases of Sesamum**

The study conducted at Kayamkulam has shown hat during the third crop season a few plants were ffected by phyllody. Powdery mildew was occa–ionally seen. But during August–October the crop vas seriously affected by *Cercospora* and *Coronspora.*

GROUND NUT

1. **Varietal trial (Kayamkulam)**

Among the different varieties tried the maximum yield was recorded by the variety Gangapur (8738 Kg/ha) followed by TMV—2 (7844 Kg/ha), Pollachi–2 (7661 Kg/ha) and Pollachi–1 (7483 Kg/ha).

2. **Fertilizer trial**

The highest yield of 6567 Kg/ha was recorded by the NPK treatment of 10–50–40 Kg/ha along with lime at 1500 Kg ha. The NPK treatment of 10-20–40 Kg/ha with lime at 1000 Kg/ha yielded 6470 Kg/ha.

ESSENTIAL OIL AND MEDICINAL PLANTS

Most of the work in this group is done at the Lemongrass Research Station, Odakkali.

Lemongrass

1. **Comparative yield trial**

Variety OD-408 gave the highest oil yield. Varieties OD–312,313,326 4-0 also gave higher oil ields than OD–19. But none of these types was uperior to OD–19 in grass yield and citral percentage n the oil.

2. *Varietal cum-manurial trial*

The performance of two new varieties, Sd-68 and tRL—16 was compared with that of OD–19 at ifferent levels of nitrogen application. The grass ield was highest in the case of OD–19 and SD–68 vith 100 Kg N/ha. Variety SD–68 with 100 Kg N/ha lso gave the highest oil yield. The highest mean itral content was also given by SD-68 without any itrogen application.

3. Induction of mutation and polyploidy

At Odakkali the selections from the M2 genera-ions of Gamma irradiated lemongrass were studied. The data recorded on individual plants on yield omponents show that thtee plants obtained from rradiated plants are superior morphologically.

At Vellayani further screening of the initially elected types resulted in the isolation of 60 ew types. These were propagated clonally.

4. Fertilizer trial

In this study of the effect of graded doses of itrogen and three methods of application on the ield and quality of lemongrass oil it has been found hat the application of nitrogen at the rate of 50 Kg/ha in one single basal dose gives the maximum grass yield while the application of nitrogen at the ate of 100 Kg/ha in four split doses gives the ighest oil yield.

5. **Uptake of nutrients**

The object of this experiment is to find out the total quantity of nutrients (NPK) removed in a cropping period. The plant and soil samples have been collected and analysed after two harvests. The analysis of the plant samples has shown that the removal of Potassium by the plant is comparatively more than that of nitrogen and phosphorus

6. **Stage of harvest.**

The maximum grass yield was obtained when harvesting was done at intervals of 45–50 days, while the oil yield was maximum when the harvesting was done at intervals of 40–45days. The highest citrai percentage in the oil was for harvesting intervals of 55-60 days.

7. **Fungal parasites**

The work carried out at Vellayani has led to the isolation of several species of fungi causing leaf spot and one species causing rust of lemongrass leaves. A new earhead disease, the etiology of which is not known, is under investigation.

PALMAROSA

Mutation breeding by irradiation

For getting adequate herbage yie'd for distillation elated plants of M2 generation based on the morpho-logical characters were multiplied. Out of this 20 lines are being studied.

2. **Fertilizer trials**

In one experiment phosphorus and potassium were kept constant at 30 kg/ha, and combined with three levels of nitrogen, viz., 20,40 and 60 kg/ha along with a no manure control. The NPK treatments tried were found to have no effect in increasing the oil yield.

In another experiment it was found that nitrogen and phosphorus at 40 kg/ha without any potash gave the maximum grass and oil yields.

3. **Spacing trial**

Five spacing combinations were tried of which the spacing 30cm x 30cm gave the maximum grass and oil yield. The highest geraniol percentage in the oil was recorded for the spacing 30 cm x 40 cm.

4. Stage of harvest

The data obtained during the year have shown that the crop harvested on the sixth day of flowering during the pre-monsoon period and on the 7th day during the Monsoon period gave the maximum oil yield.

Eucalyptus

Stage of harvest

It was seen that the first harvest conducted in the middle of May and the second harvest in early November gave the highest oil yields.

Distillation and biochemical studies

I. **Standardisation of steam distillation technique**

The data obtained indicate that for Palmarosa grass, Eucalyptus leaves and Cinnamon leaves, 10 lb, 20 lb and 15 lb pressures respectively are optimum for getting the maximum oil recovery. The experiment has to be repeated for conclusive results.

2. **Physical properties of essential oils**

The specific gravity and refractive index of Lemongrass oil, Palmarosa oil, Eucalyptus oil and cinnamon leaf oil produced at the Lemongrass Research station, Odakkali were determined and were found to confirm to the ISI specifications.

3. Effect of antioxidants on the keeping quality of Lemongrass oil

The data obtained indicate that the application of various substances such as Pyrogallol, Citric acid, Boric acid, Hydroxy toluene, powdered chillies and Betel leaves in varying concenteations had no effect in keeping steady the citral content in the oil during storage.

BEVERAGE AND CONFECTIONERY CROPS

Cocoa

1. Propagation studies (Vellanikkara)

Preliminary trials conducted with fourty branch cuttings have shown that rooting was possible under controlled humid conditions.

2. Spacing-cum-manurial trial (Vellanikkara)

The experiment was laid out in July 1976. The fertilizers were applied as per schedule. The growth measuements were recorded.

3. Control of attack by squirrels on ripe pods (Pilicode)

Preliminary observations indicate that pods covered with polythene bags, or polythene bags smeared with fish oil soap and pods covered with cashew shell liquid are not attacked by Squirrels.

Sugarcane

The following experiments were carried out under the Co-ordinated Research Project on Sugarcane at Thiruvalla.

1. Varietal trial

Of the 12 varieties tested Co-62175 was the only variety superior to the control, Co-977. The increase in yield was 48% over control.

2. Fertilizer trials

In one experiment the response to applications of nitrogen and phosphorus was significant. The optimum level of nitrogen was found to be 154 kg/ha. The response to Potash was not significant.

In another experiment the response of promising early and midlate cane varieties of the region to graded doses of nitrogen from 80-240 kg/ha was studied. Variety Co-62175 was found to be the best and the optimum level of N was found to be 164 kg/ha. Fertilizer levels and varietal differences had no effect on the sucrose percentage.

FLORICULTURE

The work on Floriculture is carried out under the All India Co-ordinated Floriculture Improvement Project at Vellanikkara.

Rose

1. Root stock trial

Rose varieties when budded on the root stock of *Rosa multiflora* were found to establish and grow well under Vellanikkara conditions.

2. Improvement in the method of cultivation

Continuous pruning of rose done below three leaves as soon as all folowers in the bunch shed their petals is found to increase the total number of flowers produced on each plant. Combined with this one drastic pruning removing all the branches up to the main stem during the rainy season is to be done in the initial stages. But the size of the flowers will be reduced. In order to produce quality blooms of

exhibition type only two main stems are to be retained removing all other branches and twigs.

3. Plant Protection trial

A quantity of 5 ml of Rogor diluted with 3 litres of water and sprayed on the rose plants was found to control leaf eating hairy caterpillar.

Bulbous Plants

1. Collection and maintenance of varieties

following varieties of bulbous plants were collected and maintained:- Hippeastrum hybrid, Red and white; Spider Lily Haemanthus; Zypharanthus, Hedycheum; and Cannas, three varieties.

2. Method of cultivation of bulbous plants for production of corms and cut flowers

It was found that artificial flowering could be induced in Haemanthus as and when required during the dormancy period of the bulb by the following method.- Plant full grown bulbs in pots filled with potting mixture and goat manure and allow them to under-go their full vegetative phase. Withhold watering when senescence starts on bottom leaves. Dry in the sun for three days and thereafter keep out of contact with moisture. Keep in position and water whenever flowers are required.

Artificial off season flowering could be induced in Hippeastrum hybrid lilies by the following method: After leaf senescending out the dormant bulbs from the field and store in a layer of dry sand under shade. Plant in pots or in the field, water immediately so that the flower spikes are induced and come to full blooming stage within a period of three weeks. The bulbs when stored under sand completely under dry conditions can be carried over the rainy season. Thus it is found possible to get flowers all the year round.

In cannas planting after topping was found to induce more suckers for further propagation than planting without topping.

Jasmine and other annuals

1. New introductions

Three varieties of Jasmine, four varieties of Petunia, one variety ot Aster and elevan varieties of Marigold were newly introduced and maintained.

2. Imporvement in agro-techniques for higher yield and better quality

Continuous flowering could be induced in two year old cuttings of *Jasminum sambae* single, perfumed seasonal variety by adding one kg of an equal quantity of poultry guano and goat manure and watering continuously during the summer months.

Some varieties of Petunia do not set seed under Vellanikkara conditions. In such cases the middle young portion of the plant was found to germinate readily and establish well. Petunia single white and single Mauve were crossed and the progenies studied.

After Double Violet was found to grow well and produce good flowers when kept under shade and watered properly.

Of the eleven varieties of Marigold newly introduced, Valencia, Giant Double African Orange, Giant Double African Lemon and Spungold were found to be the best suited under Vellanikkara conditions.

Orchids

1. New introduction

Orchid variety, *Vanda roxburghii* was newly introduced. It thrives well in pots containing loose bark of Jack trees as well as laterite stone peices covered with moss.

In another trial *Vanda densiflora* seedling was planted in pot containing laterite stone pieces covered with moss and kept under moist conditions in shade. The plant has established and is growing well. The growth of Dendrobium introduced from Karnataka State was found to be poor.

2. Hybridization programme

Attempts to make a cross between *V. roxburghii* (unattractive flowers with good fragrance) and *V. densiflora* (beatiful flowers with no perfume) did not meet with success.

3. Orchid culture and embryo culture

The seedling of *V roxburghii* obtained by artificial culture of the embryo and transferred to dried bark of jack tree is growing well.

Bougainvilleas, Hibiscus and Ixora

1. New Introductions

Two new varieties of Bougainvilleas, seven varieties of Hibuscus and four varieties of Ixora were newly introduced.

2. Vegetative propagation trial

When the branches of Mahara Red variety of Bougainvillea were cut into three portions, top, middle and bottom and planted, the percentage of rooting was found to be maximum in the case of the of the cuttings taken from the middle portion.

MISCELLANEOUS STUDIES

In addition to the crop-oriental research being carried out in the different research stations, a number of other projects of both fundamental and applied interest are also undertaken in the various disciplines, mainly in the Colleges of Agriculture and Horticulture. The results of these studies are briefly given below:

Agricultural Botany (Vellayani and Vellanikkara)

1, Reproductive mechanism in crops

In Lemongrass anthesis commences immediately after full emergence of panicle and lasts for about 30 days. Spikelets open in the early morning, the peak time being 7.30–8.30 a m. There are four diss tinct stages in anthesis of a spikelet. There is slight protogyny which might facilitate natural cros-pollination.

2. Analysis of embryo structure in seeds

Anatomical studies of the rice embryo were undertaken. Various methods of fixing, embedding and microtome sectioning were attempted. Goods sections could not be obtained by using embryos of stored grains. A different method of processing and wax infiltration is being tried using grains at different stages of maturity.

3. Study of cytological changes induced by insecticides and fungicids

The effect of Furadan and Thimet on the yield and sterility of rice was studied. Pest control was very effective and better with Furadan. The use of Thimet resulted in more of pollen sterility. Cytological observations like anaphase, bridges, unequal distribution, micronuclei, laggards etc. were made. The results indicate that pollen sterility is correlated with the cytological observation and the chaff grain ratio.

4. Effect of gametocides on flowering, pollination and fruit set pepper

Various concentrations of M. H and Asafoetida were used in this experiment. It was found that none of the treatments tried could induce more than 50% pollen sterility. There was uniform fruit set in all the treated spikes.

5. Cytomorphological studies on the effect of Colchicine and the Induction of polyploidy in sorghum

Sorghum, variety V2, was treated with 3 concentrations of Colchicine (0, 15, 0.25 and 0.5% for 3 durations $2\frac{1}{2}$ hrs., 5 hrs. and $7\frac{1}{2}$ hrs) Observations on on germination, height of plants, leaf area, number of stomata and days to flowering were made. In maney treatments there was a positive association between percentage of meiotic abnormality and pollen sterility.

6. Intervarietal hybrids of greengram

In a study conducted to assess the worth of increasing the productivity in green gram through intervarietal hybridisation it was found that there is scope for heterosis breeding. Estimates of heritability and genetic advance under selection seemed to suggest that in order to initiate an effective heterosis breeding programme selection of parents must be made on the basis of number of branches, numaer of pods and yield of grain which possess high values for the above parameters.

7. Blossom biology of oil palm

The flower morphology, time of flower opening and the structure of the flower were studied.

Agricultural chemistry (Vellayani)

1. The rice growing soils of Wynad

Six profiles and 60 surface samples collected from the rice growing soils of North and South Wynad were studied. These soils were found to have low cation exchange capacities, low base status and high sesquioxide contents. It was concluded that these soils have developed from local lateritic alluvium. Both total and available phosphorus and potassium were low. The lime requirement of these acidic soils was considerably decreased by water-logging. On an average the waterlogged soils had a lime requirement of 630 kg, calcium carbonate per hectare while that of the airdried soils was 1420 kg/ha.

2. The salt affected soils of Kerala

Six profiles and 34 surface samples were collected from the salt affected Kaipad, Pokkali and Orumundakan areas and studied for their morphological features and physico-chemical properties. Seasonal variations in the acidity and salinity of these soils and surface waters were also studied. They were found to contain appreciable amounts of the chlorides and sulphates of sodium and magnesium. With the onset of the mansoon there is a rapid fall in the salinity level. However even during the period from July to December sudden increases in salinity due to tidal water ingress were noted. The present system of mound cultivation facilitates efficient leaching away of the salts. But the pits in between the mounds

have high salinity during the period July to December which wou d explain the comparatively poor stand of crops in the areas between the mounds.

3. Solubilisation of iron in submerged rice soils

From an incubation study, it was found that sea water inundation progressively releases soluble iron from the soil. Treatment with acid forming fertilisers like Ammonium sulphate and organic matter treatment released more iron, while Muriate of Potash and lime suppressed iron solubilisation.

4. Aluminium toxicity

Six rice growing soils were studied for the various forms of Aluminium and the changes in these forms with progressive submergence under water.

5. Phosphorus and potassium fixing capacities of Kerala soils

One field experiment with rice was conducted at Pattambi applying phosphatic fertilizers based on the soil test values Soil samples were again tested for available P in the wet samples drawn from the field at two stages. The results indicated that there may be appreciable difference between the available P as determined by chemical methods and the actual P supplying capacity of the soil in the field.

At Vellayani the Potassium fixing capacity of twelve major soil types of Kerala was determined. Total sesquioxides, total Ca and Mg contents, cation exchange capacity and exchangeable K, Ca, and Mg were also determined to study the correlation of these characters with the potassium fixing capacity.

6. Use of Mussoorie rock phosphate in the acid soils of Kerala

In a pot culture experiment with six different rice growing soils response to phosphorus application was obtained in five soils except in pokkali soils. In all these soils Mussoorie phosphate in general was found to be as good as superphosphate.

In a field experiment with green gram, variety Co.1, it was seen that liming at the rate of 500 kg/ha increased the yield significantly. Superimposing this treatment with P fertilizer the response was evident at 15 kg P_2O_5 ha. The increrse in yield was about 80% Mussoorie rock phosphate compared very well with Factomfos and superphosphate in this experiment.

7. Foliar application of complex fertilisers

Experiments conducted at Vellayani and Vellanikkara have shown that foliar application of complex fertilisers was just as efficient as soil application

Agricultural Entomology (Vellayani & Vellanikara)

1. Pesticide residues in plants

In one field trial the residue of carbofuran in rice straw was found to be .725ppm for an application of the insecticide at 0 5 kg a.i ha and 1 233 ppm for an application of 1.0 kg a i/ha.

2. Use of insecticides as granules for rice crop

The absorption of carbofuran and phorate were more at field capacity than at flooded condition There was not much difference for the persistance of the same insecticide under different water levels Carbofuran and Nephostolan persisted longer than phorate.

3. Biological activity of essential oils and plant extracts.

In the trial with essential oils one day old last instar nymphs of the red cotton bug were used for the bioassay. Maximum malformation of the emerged adults was recorded in Citronella oil in which 30% malformed adults and 70% dead larvae were noted.

Different plant extracts were also tried for insecticidal, hormonal and antifeedant actions. None of the plant extracts except that of neem was found to have any toxicity aganist the larvae of *S. litura*. Insect hormonal activity was observed in most of the plant extracts and essential oils tested As for antifeedan action extracts from crotin and Thevetia were found to have feeding inhibitory properties against *S. litura* and *Epilachna* beetles. Water extract of neem when sprayed on bitter gourd under field conditions gave 90% reduction in the podulation of Epilachna beetles.

4. Effect of juvenil Hormoneanalogues as pest control agents

The chemosterilant effect of the juvenile hormone analogue "Attosid on the females of different insects was assessed. The fecundity was found to be reduced by 30-40% in all the insects by the application of this chemical. The latent mortality of larvae caused by the application to female insects ranged from 75-89%.

5. Virus diseases of Lepoidopterous crop Pests

The following viruses were deteced:

i) Nuclear polyhedrosis virus of *Euproctis fraterna* Artificial inoculation of the virus to third instar larvae showed that the virus caused 40-50% mortality in 5-6 days.

ii) Nuclear polyhedrosis virus of *Nymphula depunctolis*. This virus was found to be highly infective causing 60-70% mortality of larvae in 3-4 days.

During the course of the survey fungal diseases of some insects were also noticed

6. Namatode pests

Examination of sixty soil samples collected from different parts of Kerala has shown that the rice root nematode is present in all the paddy growing tracts of Kerala

7. Biology of the Tea mosquito bug

While in captivity the insect was seen to lay eggs on the mid ribs of leaves there was perference to shoots and floral branches under field conditions The temperature perferentum for oviposition was 25°C and for embryonic development, 28°C.

Plant Pathology And Microbiology

1. Mushroom cultivation

It has been found that the paddy straw Mushroom, *Volvariella diplasia* can be successfuly cultivated under Kerala conditions. Preparation of spawns on wheat grain is better and more economical.

2. Microbial population of Kuttanad

Several species of fungii were isolated from the soil samples from Kuttanad and identified.

3. Studies on the preservatlon of Neera

The predominant microbes in Deera were found to be yeast and staphylococci. Storing neera under refrigerated conditions and addition of 2% citric acid were not found to be effective in preserving neera. Though heating for half an hour at 80°C was found to be useful, the treated neera on preservation showed sedimentation Autoclaving destroyed the flavour of the product completely Vaccuum evaporation at 90°C and subjecting it to steaming was useful method. Sterilization of the tapping clay and container helped to reduce the initial microbial count.

4. Deterioration of stored products with special reference to Copra.

A number of micro-organisms responsible for spoilage of copra were isolated and their pathogenicity established. The quantitative and qualitative changes occurring in Copra due to infection and production of aflatoxin were studied in detail. Suitable control measures were also evolved.

Irrigation Technology (Chalakudy)

Experiments in the recycling of sub-surface water tapped through sub-surface tile drains have shown that thl continuous sub-surface flow can be used to irrigate about 0.6-0.9 ha of Rabi rice and for pre-sowing and early irrigation of summer crop in about 0.5 ha.

Agricultural Engineering (Vellayani)

1. Development of a low cost garden tractor

Survey of available stationary engines was conducted and a 5 H P Lombordini diesel engine was identified as a suitable prime mover for the basic design of the garden tractor already originated.

2. Development of a wind powered water pump

The vertical axis wind mill design recently developed at the I.A R.I has been selected for prototype fabrication and study.

3. Equipment and systems for extraction of Mud blocks for land reclamaiion

Several design concepts for improved excavation tools were evolved. Trials with one such tool which utilizes a suction principle for holding and releasing the mud were carried out. A design concept for a lever system by which the tool can be operated from a boat has also been evolved.

4. Centrifugal jet pump combination in low lift pumping

A modified version of a jet pump attachment developed and patented in Philippins was designed. The new design utilises a commen suction point both for the centrifugal pump and the jet pump device.

5. Development of seed drills for paddy crop

A multihopper seed drill developed by the I R.R.I was selected for proto type fabrication for which drawings were obtained from that institution. Fabrication of an initial unit is being negotiated with the Kerala Agro-Industries Corporation.

6. Development of fertilizer applicators for paddy crop

A granule fertilizer applicator developed at the I R.R.I. has been selected for proto type fabrication for which drawings have been ootained from that Institution.

7. Development of weeders for garden lands

Two new designs for hand-operated weeders have been evolved which make use of revolving wheels to reduce ground resistance and to provide partial support of weight. The detailed drawings have been prepared,

8. Mechanical control of floating fype aquatic weeds.

The 'spread density' of salvinia infestation in selected areas was estimated. This was found to vary from 30-125 T/ha depending on the habitat and the stage of growth.

Models of V – shaped gathering screens when tried against salvinia were only partially effective.

9. Development of a low cost paddy drier

A paddy drier utilising rice hull furnace developed by I.R.R I. has been identified for proto type fabrication and testing under Kerala conditions. Detailed drawings of the unit have been obtained.

10. Development of local inovations in Agricultural Engineering:

About seven innovators have been located who have either developed initial designs or fabricated working models of new equipment such as tree climber, rice huller, Cassava huller, jet propelled boat etc.

Agricultural Economics (Vellayani)

1. Over dues of short and medium ferm credit of co-operative credit Institutions (Trivandrum District)

Details of default of short and medium term credit in the case of 63 service co-operatives and the area under cultivation of the farmers in each of the societies were gathered as on 30-6-1976. The percentages of arrears outstanding in the case of small farmers and big farmers was 91.76 and 42.15 per cent respectively. The M.T. arrears position of 52 service co-operative societies as on 30-6-1977 was collected and the percentage of arrears outstanding came to 6.8.

2. Marketing of Agmark products in Trivandrum District

Data on commodities graded by the State Agmark Laboratory were collected for the period 1969--1977. Out of 15 packers in Trivandrum District 8 were not undertaking grading at present for various reasons. The reasons pointed out by packers of coconut oil were the low premium for graded oil, the fluctuating prices of copra and oil, and the locking up of money due to the time lag from production to packing.

Agricultural Statistics (Vellayani)

1. Fertilizer response functions at various localities using available data

The data from a larger number of fertilizer experiments were collected and response functions fitted.

Agricultural extension (Vellayani)

1. Credibility of various sources of human nutrition Information

There is differential utilization of communication sources by the village women. Radio ranks first in the source of utilization and films rank last. Mahilasamajam rank second in this respect closely followed by Block personnel. ANP Camps have the fourth position. Magzines rank 5th and News papers 6th Inter personal communications like friends neighbours and relatives have only the 7th, 8th and 9th ranks respectively.

2. Motivational pattern of rural women for participation in training programmes

The level of education of the respondents significantly influence all the motives behind the decision of respondents to participate in training programmes. Economic status influenced all motives except self image, Occupation influence all motives except security, prestige and self image and age of the respondents did not influence prestige and self image. Exposure to mass media except Radio and Cinema influence all the motives.

3. Study on the correspondence course for farmers on paddy cultivation

Participants in the age group of 15-35 years joined this course mainly in the hope of securing a job on the strength of the certificate awarded at the end of the course. Participants of age above 35 years joined the course with self actualisation motive. Educational background of the participants had no influence on their motives. The majority of the participants felt that the course was useful for them.

4. Gain in knowledge of women by Applied Nutrition Programme camps

The study indicated that with the passage of time there was decline in the amount of knowledge retained However, even after a lapse of three months there was significant retention of the knowledge gained through ANP training camps.

5. Attitude of Extension training personnel towards inservice training

Junior Agriculture Officers have a favourable attitude towards In-service Training. Age and length of experience in extension work were significantly related to their attitude towards In service Training Programme.

VETERINARY AND ANIMAL SCIENCES

CATTLE

I· 1. Cattle improvement

1. Evaluation of Brown Swiss sires by Progeny testing

Work is in progress for progeny testing of Brown Swiss Sires stationed at Indo-swiss Project, Mattupatti

2. Relationship of blood constituents in heifers to their future milk producing ability.

27 heifers whose blood samples were analysed have been inseminated. Out of this, 23 became pregnant and 13 have calved.

3. Investigation on the reproductive failures in bovines due to infectious bovines due to infectious bovine rhinotracheitis/ infectious postular vulvo-vaginitis virus.

Limited studies concucted indicate the presence of so ne viral agent in certain cases of abortions. Further investigations and characterisation of isolated agents are in progress.

4. Investigation on the incidence, nature and magnitude of prevallence of infertility condition among crossbred cattle of Kerala

The work so far conducted enabled to detect abortions due to Leptospiral infection and Brucellosis but not Vibrios and Trichomoniasis. Further study is in progress

5. Efficacy of intra-uterine administration of antibiotics to improve breeding efficiency of cows

The conception rate in cows was better if anibiotics were injected immediately after insemination (ie. 51% for the Antibiotic group as compared to 35% of the control group without antibiotics)

6. Studies on post-partum anoestrum in cattle

The cross-bred animals maintained by loca owners exhibit heat, on an average, only about 4 months after calving. This results in prolonged intercalving perlods and consequent economic loss to the owners. Systematic examination of such animals brought for insemination revealed that their overies exhibited signs of previous ovulation much earlier than 4 months, though there was no exhibition of heat detected by the owners at that time.

It was also observed that animals under low nutritional level when supplemented with minerals responded with evidence of heat and ovulatlon within 20 to 30 days of treatment.

7. Utero-tubal insufflation test as an aid in the diagnosis and treatment of tubal pregnancy in cows.

Work is in progress to develop an equipment for diagnosis of tubal pregnancy

8. Statistical assessment of the number of Artificial inseminations revealed that 51% conceived and that calves were born in 35% of the total number.

9. Data are being collected to evolve a formula to assess the body weight of animals on the basis of their height and body measurements.

I. 2. Lactation and quality of milk

1. Studies on cross bred animals in relation to plasma protein bound iodine (PBI) and feeding of iodised salt

The objective is to evaluate the level of PBI on plasma as a means of predicting the milk production and also the effect of feeding iodised salt on milk production.

2. Hormonal induction of lactation in bovine

Lactation could be induced in heifers and cows by injecting hormones. The milk so produced was also found normal.

3, Evaluation of feeding value of tea-waste for milk production

The feeding value of tea-waste as a cheap substitute for part of the concentrate feed is being investigated. This also involves collection of data pertaining to milk yield, blood values, physical and chemical composition of milk, quality of butter etc.

4. Studies on microflora of milk

Samples of milk have been collected from University Livestock Farm, Mannuthy, Co-operative Milk Supply Union and from some of the individual households around Trichur town.

The samples were suojected to bacteriological examinations and the organisms were isolated and identified. Simultaneously the keeping qualily of boiled milk at varying temperatures was also tested. The work is in progress.

5. Lactation studies in cows with rubber seed cake.

The incorporation of rubber seed cake as a partial substitute for concentrates fed to dairy cattle was found to cause no detrimental effect either in quantity of milk yield or on the quality of milk.

3. Nutrition

Studies were undertaken on feed enrischment, evaluation of conventional feeds and testing of large products as cattle feed.

1. Utilization of paddy straw treated with urea and molasses as cattle feed.

Paddy straw treated with urea and molasses is well consumed by cattle. It shows no deleterious effects.

2. Evaluation of the nutritive value of solvent extracted coconut meal for cattle.

Digestive trial were carried out using De oiled 'coconut meal' in cocentrate rations of cattle. It was found to have Digestible Crude Protein (DCP) of 18% and Total Digestible Nutriert (TDN) of 71%.

3. Poultry litter as cattle feed

Poultry litter has been chemically analysed, It contains 16% of crude paotein and good amounts of other organic nutrients but also contains high amount of ash (41%). As a next step, the utilization of these ingredients is being investigated by conducting feeding trials.

4. Evaluation of the nutritive value of African Payal

It contains many of the important nutrients. But its acceptance as a cattle feed is not satisfactory at present on account of the low palatability, very high moisture content (more than 90%) and the expenditure involved in collecting drying the powdering the material.

5. Evaluation of the nutritive value of coconut pith for cattle

Chemical analysis of samples of coconut pith has been done and experiments to find out the acceptability of the material to cattle and its nutritive value in term actual digestibility are being carried out.

6. Studies on the effect of feeding rubber seed cake on reproduction in heifers.

Limited data gathered so far suggest that rubber seed cake at 30% level has no deleterious effect on reproduction in heifers

7. Studies on the effect of feeding rubeer seed cake on sexual maturity, semen quality, etc. of cattle

Incorporation of subber seed cake at 30% level in the concentrate mixture and fertility in females and semen characteristics in males.

8, Studies on the toxic principles of leaf fodpers with special reference to hydrocyanic acid

The object is to find out mainly the Hydrocyanic acid content of common fodder leaves, particularly tapioca leaves and to find out suitible methods for its removal to make it suitable for feeding animals. The work is in progress.

9. Effect of supplementation of tallow on digestibilites of nutients in different rations containing agricultural by products.

The work is in progress, incorporating tallow in cattle rations.

1. 4. Diseases

1 It was found that a functional fistula could be established uniting the rumen and rectum in the bovine. This technique might be of significance in treating certain cases of chronic tympany of the rumen.

2 Study is being conducted to record intra ocular pressure variations in cattle.

3 Satisfactory surgical treatment for removal of rubber latex consumed by cattle has been perfected.

4 Investigation was conducted on the causation of 'Tail necrosis' in cattle and its treatment.

5 The conclusion that could be drawn from experiments so far conducted is that it is caused by a fungal toxin. Cattle are affected by consuming fungus, infested paddy straw. Better storage of paddy straw, free from moisture, is advocated as preventive measnie. In early stages of the disease curative treatment is sometimes successful.

6 Investigations are going on regarding Hydrocyanic acid poisoing in animals by consuming certain leaves and plants.

5. Calf Rearing

1. Feeding sour colostrum to calves

The feeding of sour colostrum to young calves was found to be benificial. The colostrum was stored at room temperature for 10 days to bring about natural fermentation and souring.

2. A study of calf starter with locally available ingredienls

Part of the quantity of milk required for calf feeding cauld be saved for human consumption by feeding calves partly with different types of concentrate mixtures called calf starters. Using 18 cross-bred

calves, it was found that 141.4 kg whole in the food be saved in the manner and that the net gain in feeding cost of one calf was Rs. 186.83 during the first 24 weeks of age

3. Growth studiss in calves with rubber seedcake

It has been concluded that rubber seed cake can be beneficially and economically incorporated at 30% level in the concentrate mixture given to growing calves.

4. Investigation on the incidence, pathogenicity and control of parasitic disease in cross-bred animals of Kerala

Th, ophanate (naimafan) at the dose rate of 50 mg/kg body weight was found to be very effective against ascaris and strongyle infections of crossbred calves.

BUFFALO

1. Buffalo Project

The objective is to study the potentialities of the buffaloes in growth and meat qualities and compare it with Zebu cattle.

The work conducted so far indicate that bufaloes are better adapted to the agro-climatic conditions of Kerala as compared to cross-bred cattle but conclusions can be drawn only after the experiment is completed. The work is in progreas.

2 Another experiment using buffaloes and cross-bred cattle indicate that buffaloes are more adaptable to the climatic and envsronmental conditions prevailing in Kerala.

GOAT

3. 1. Goat improvement

1. Detailed studies on reproductive perforformance of Malabari goats

The objective is to standardise the different traits of reproductive efficiency of Malabari goats. The age at first service, the mean age at first kidding, interval between kidding have been studied in certain number of goats. The work is in progress and more data are to accumulate before conclusions could be drawn.

2. Production performance of Malabari goats, standardisation of Phenotype and studies on factors influencing the same

The data collected so far consists of first lactation yield, length of first lactation period, peak yield in the first 100 days and dry period pertaining to 91 Similar data pertaining to second lactation of 27 animals and third lactation of 18 animals have been collected. More data are being collected.

3. Adaptability of Malabari and cross-bred goats to the agro-climatic conditions of Kerala - A comparative study

Data on the incidence of common susceptible diseases like Mastitis, caseous lymphadenitis, infectious deseases, contagious disease, abortions, still births etc. are being collected pertaining to different genetictgroups

4. Breeding

Local female goats divided in to 3 different groups were crossed with Saanen, Alpine and the local male goats respectively.

It was observed that Saanen X Malabari F. I. had higher growth rate and body weight than Alpine X Malabari F. I. Crosses and the Malabari goats. The lactation yield and reproductive performance of cross-breds were observed as better than Malabari goats.

5. Physiology

The kidding percentage by artificial insemination was found to be 44.

6. Studies on birth weight and growth rate in Malabari kids

The body weight at birth, at 6 months and at 1 year have been studied in the 3 genetic groups, namely (i) Malabari X Saanen-Malabari, (2) Alpine-X Malabari and (3) Saanen-Malabari X Alpine-Malabari.

The weights at birth were 1.91 kg. 2 46 kg and 2.1 kg respectively. The weight at 6 months were 8.38; 11.53 and 12.5 kg. The weight at 1 year were 14.62, 19.57 and 15.17 kg.

Work is in progress

7. Post-natal development of testis and epididymis of cross- bred goats

In order to establish a comparitive assessment of the age of sexual maturity of cross-bred and malabari goats, 18 pairs of testis epididymis collected from goats of different ages from birth has been studied microscopically.

The work is in progress.

8. Age of semen and conception rate in goat

It was found that the length of storage of goat (bnck) semen proportionately decreases the percentage of conception.

3. 2. Anatomy

Poss-natal development of ruminent stomach of goat

The object is to study the gross and microscopic anatomy of the compartments of the stomech in goats from birth to adult stage.

The materials from 14 kids of different ages were collected and their microscopic anatomy has been noted. The study is in progress.

3. Nutrition

Establishment of feeding standards for goats

The objective is to determine the nutritional requirements for goats for maintenance, growth and actation and to evolve feeding standards for goats for general adoption in the State.

The goats used for experiment divided into groups are fed with different composition of feeds and their dung and urine collected after these digestive trials are also subjected to analysis. The work is in progress.

4. Diseases

1. Studies on Bacterial species associated with pneumonia in goats

The important species of bacteria identified were *Klebsiella pneumonae*, *Pasturella multocida*, and *Corynebacterium, pyogenes*. The drugs Nitrofurans and Chloramphenicol were found effective.

2. Studies on bactetial species associated with enterities in goats

Out of total 31 samples examined culturally five strains of salmorella were identified It was found that chloramphenicol was the drug of choice for enteritis in goats

3. Studies on certain gastro-intestinal nemaiodes with special reference to those found in goats

Different drugs are being tried for their efficacy. The work is in progress.

4. Aflatoxicosis in goats

Studies are being made by feeding Aflatoxin to goats used for the experiments. The work is in progress.

5. Pathology of endocrine gland in cattle, goats and pigs

Changes produced in various endocrine glads in cases of Johnes disease of goats, were investigated. The general conclusion of the changes noticed was that it was a manifestation of stress response due to chronic infection.

6. Pneumonia

Mortality due to pneumonia in adults has been reduced to a very great extend by auto-vacine and supportive treatment.

7. Globidiosis has been completely eradicated from the flock.

8. Goat pox

The incidence of goat pox and foot rot has been controlled by suitable hygienic and management measures.

9. Mastitis

The loss due to Mastitis was reduced to a large extent by timely treatmen of sub-clinical infections.

POULTRY AND DUCKS

. Improvement of birds

Studies are being conducted on the metabolic ctivities of the reproductive system of chicks' with he object of assessing the activity of some of the nzymes on the reproductive system and plasma of hicken during the growing stage and in the egg roduction stage.

The work is in progress.

2. Studies on production performance of two way and three way crosses in white leghorns revealed that two way-crosses are more suitable

3. Poultry for high egg production (AICRP)

The objective of the project is to procure and evaluate the performance of some indigenous and

and exotic strains of white leghorns under optimum conditions and to evolve a strain suitable for various agroclimatic conditions, with a capacity of producing 200 or more eggs a year.

The work is in progress with the F strain available in Kerala and P & N strains made available from the Hyderabed centre.

4. 2. Anatomy

Histoclinical differentiation at skeletal muscle in the duck

Study is inprogress to determine the age a which differentiation of skeletal muscle is completed in the duck.

4. 3. Nutrition

1. Rubber seed meal could be incorporated in layer ration upto 15% without adversely affecting egg production, feed efficiency and body weight maintenance. But there was slight reduction in the weight of egg.

2. Rubber seed meal at 15% and above affected body weight gain in broiler chicken;

3. Dried poultry manure could be incorporated in boiler rations up to 10% without any significant adverse effect on growth and feed efficiency.

4. In layer rations incorporation of oried poultry manure at 15% level was found to cause improvement in egg production.

4. 4. Diseases

1. An investigation on the aetiology of plague-like diseases in ducks in Kerala

A viral agent was isolated from cases of duck-plague-like-disease which was prevalent in Kerala during April, 1976 to January, 1977. This was subjected to duck embryoin oculation studies, physio-chemical characteristics, haemagglutination with R. B. C. chicken tests, and experimental infection of ducklings.

The results proved that the disease was caused by a virus. Which was indistinguishable from the Duck Plague virus,

2. Pathogenicity and treatment of helminth parasites of ducks.

Three round worms causing anaemia in ducks were identified. Nine drugs were tried against these worms, of which Tetramizole hydrochloride in dose of 50 mg/kg body weight was found most suitable.

3. Aflatoxicosis in ducks and chicken

Mixing of low grades of aflatoxin in the feed caused depression in the egg yield and the egg weight was also low. The Hatchability was poor. In male bird, production of sperms was reduced. In broiler chicken the weight gain was relatively poor.

5. PIGS

5. 1. Reproduction

1. Effect of early weaning on the reproductive efficiency of sows.

Experiments were conducted by weaning piglets at 15th, 30th, 45th and 60th day after farrowing

It was found that the ideal period to wean piglets was 15 days after farrowing, if the inter-farrowing period of the sow is to be shortened. This will increase the overall productivity of sows.

2. Synchronisation of Oestrum and artificial insemination in breeding swine.

Experiments were conducted to find out the suitable diluent (extender) for boar semen. Thirteen different extenders were tried, of which only 3 were found suitable. Viz. Kiew-I, Kiew-II, G C B C.

2. Diseases

1. Studies on Enterobacterial infection in pigs in Kerala

The object was to identify the bacteria responsible for causing digestive disorders in pigs and to evolve suitable control measures.

Sixty one samples were collected and screened. Six species of haemolgtic E. coli, four species of Pseudomonas aeoginosa and one species of Aerobactes aerognes were isolated and studied.

The Pseudomonas strains were resistant to common chemotherapeutic agents available in the market, except Polymyxin-B. This finding is of immense value in the treatment. Other organisms were sensitive to chloramphenicol.

2. **Studies on Porcine enterovirus in Kerala.**

The objective were (1) to assess the extent of prevalence of enteroviruses in pigs in Kerala, (2) to assess their pathogenic role, (3) to identify the characters of the virus and to evolve methods to combat their role in causing disease in pigs.

One hundred and eighty six specimens were examined and forty viral agents were recovered.

Pathogenicity studies are in progress.

6. ELEPHANTS

Studies on the nutritional requirement of the Indian Elephant.

The work on ascertaining the feeding value of palm leaves in elephant is in progress.

7. GENERAL STUDIES

7. 1. A Study of the nature and problems of livestock enterprise in Trichur Taluk

A survey has been conducted to assess the existing problems of livestock enterprise in Trichur taluk. The analysis of the data is in progress.

7 2. A survey of the outlook of farmers on Animal Husbandry

The work is in progress.

7 3 Tannic acid content and digestibilities of nutrients in tree leaves.

It was found that though tree leaves commonly fed to goats are fairly high in crude protein and low in crude fibre, they contain higher amounts of tannic acid, which is one of the incriminatory factors responsible for the low digestibility of crudea protein in tree leaves.

7 4 Studies on the evaluation of parasiticidal efficiency of newly introduced drugs in animals and birds

Thiophanate (Nemofan) at a dose of 50 mg/kg body weight showed 80 to 100% efficiency against Toxacariasis of lion and 100% efficiency against strongylosis of wild boars and at a dose of 14 mg/kg body weight exerted 100% efficacy against strongylosis of elephants.

EBEN (Mebendazole) at a dose rate of 100 mg/kg body weight exerted 100% efficacy against hook worms of dogs.

7 5 Studies on the flies producing cutaneous myasis in animals in Trichur

Infestation of skin with maggots (cutaneous myasis) was found common in Trichur during January to March. The flies responsible are found to be Chrysomia and Sarcophaga species.

Lemongrass oil proved to be the best-fly-sepellant to treat these maggot infestations. Campor-in-oil, Eucalyptus, and Kerosine oil and turpentine oil were also effective.

7 6 An investigation in to the parasitic fauna in the pasture of Mannuthy Farm

An important source of infection for strongylosis was found to be pasture. The incidence of the disease was seasonal, more during winter and less during summer.

7 7 Studies on the tick effecting livestock in Kerala

Four types of common ticks affecting livestock were gathered in different parts of Kerala. Detailed study on their life cycle indicated that it is completed within a periop of 45 days.

Two drugs, namely Nuvan (0.1%) and Dipterex (0.4%) were found to possess marked ovicidal and larvicidal properties and hence were effective for treatment.

7 8 Incidence, etiology and Pathology of the tumours of the ethmoid in domestic animals

Ten cases of tumour were investigated. The symptoms were recorded and the tissues were subjected to histopathological examination and identified.

The work is in progress.

7 9 Embryo mortality in hatcheries

Four hundred and forty three cases were stuidied and the pathological conditions responsible for embryo mortality were classified. The cause of embryo mortality was found to be one or the other of the 8 conditions classified in this manner.

1. Cranioschsis 3
2. Head at wrong end 2
3. Oedema of head and neck 15
4. Imperfect closure of amiblicus and umbilical infection 150
5. Sticky embryo 27
6. Short upper beek, split upper beek 4
7. Yolk sac infection 26
8. Very early embroymic 26

7 10 Incidence and nature of the diseases of young stock in Kerala

Studies were conducted on mortality in calves, kids and piglings.

The important conditions causing death in these young stock were found to be enteritis, Coccidiosis and pneumonia. Further investigation is in progress.

7 11 Two indigenous plants tried on dogs were found to be useful in the treatment of liver disorders.

7 12 Administration of corticoststeroids was found to prolong the survival time in dogs injected with calculated doses of cobravenom. This information is of value in treating cases of snake bite.

7 13 One hundred animals were on an average screened to detect subclinical mastitis. Causative organisms were identified and their sensitivity to various drugs was ascertained. Further work is in progress.

7 14 The administration of cashewnut shell oil to dogs suffering from Ancylostomiasis was not found to be very efficient. Further studies are in progress.

PART III

APPENDICES

LIST OF APPENDICES

APPENDIX—II

Members of the Statutory Authorities

I. GENERAL COUNCIL

1 Her Excellency the Governor of Kerala
Raj Bhavan,
TRIVANDRUM

2 Hon'ble Minister for Agriculture,
TRIVANDRUM

3 The Vice Chancellor,
Kerala Agricultural University,
VELLANIKKARA

4 The Secial Specretary to Government&
Agricultural Production Commissioner,
Goverment Secretariat,
TRIVANDRUM

5 The Secretary (Development),
Govrenment Secretariat,
Trivandrum

6 The Speciai 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,
Vazhuthacadu, TRIVANDRUM

12 The Registrar of Co-operative Societies,
TRIVANDRUM

13 The Dean,
Faculty of Veterinary & Animal Scisnce,
College of Veterinary & Animal Sciences,
MANNUTHY

14 The Dean,
Faculty of Agriculture,
College of Agriculture,
Vellayani

15 The Director of Extension Education,
Kerala Agricultural Uuiversity
VELLANIKKARA

16 The Director of Research,
Kerala Agricultural University,
VELLANIKKARA

17 Shri.C. Sundarresan Nair,
Post-graduate student,
College of Agriculture,
VELLAYANI

18 Shri. K. J. Abraham,
Post-graduate student,
College of Agriculture,
VELLAYANI

19 Shri. Ranjan S.Karippai, B. Sc. (Ag) Student,
College of Agriculture, Vellayani,
TRIVANDRUM

20 Shri. Vijayan Nadar, R.,
B. V. Sc. & A. H. Student,
College of Veterinary & Animal Sciences,
MANNUTHY

21 Shri. P. K. Haridasan,
Student, Rural Institute,
Tavanur

22 Shri. Rajappan Nair. N.
Associate Professor of Agrl. Botany,
Rice Research Station,
Moncompu

23 Dr. M. Krishnan Nair,
Professor,
Department of Pathology,
College of Veterinary & Animal Sciences,
Mannuthy

24 Shri. Neelakantan Kartha,K.M.,
Livestock Assistant Grade I,
Pig Breeding Farm, Mannuthy

25 Shri. Gervacis Areekkal,
President, Ankamali Panchayat,
Ankamali.

26 Shri. K. S. Vasudeva Sarma.
Prestdent,
Venmony Panchayat,
Alleppey Dist

27 Shri. N. Chellappan Pillai,
President,
Trikkovilvattom Panchayat,
Quilon Dist

28 Shri. Kunhahammed, V. K.
President,
Kayakkodi Panchayat,
Calicut Dist

29 Shri. Pappachan, P.J.
Chairman,
Kunnamkulam Municipality,
Trichur Disi

30 Shri. M. Janardhanan Nair,
Retired Director of Agriculture,
Jawhar Nagar,
TRIVANDRUM

31 Shri. Jacob P. John,
Retired Additional Director of Agriculture,
Chakai, TRIVANDRUM

32 Shri. N. I. Devassykutty, M. L. A.
Nadakkavukaran House,
Kandassankadavu,
TRICHUR DIST

33 Shri. E. John Jacob, M. L. A.
Elenchical,
Mankotta,
Veeyapuram, p. O.
ALLEPPEY DIST

34 Shri. E. Gopalakrishna Menon, Ex. M. L. A.
Ayyanthole P. O.
TRICHUR DIST

35 Shri. V. S Vijayaraghavan,
Erimayoor
Erimayoor, P. O.
PALGHUR DIST

36 Shri. V. Gopalakrishna Kurup,
Chairman,
Block Development Council,
Chambakulam,
'Rashmi'
ALLEPPEY-3

37 Shri. P. Vijayadas,
Vijayavilas,
Venjaramoodu
TRIVANDRUM DIST

38 Shri. C. Cheriyan,
Chemmeen,
Cochin-5,
ERNAKULAM DIST

39 Shri. S. Harihara Iyer,
705/14
Valiyakkunnu,
Attingal,
TRIVANDRUM DIST

40 Shri. James Mackil,
Secretary,
Association of Plants of Kerala,
Kaloor P. O.
Cochin, ERNAKULAM

41 Mrs. K. Maheswari Amma,
Chairman,
Block Development Counucil,
Ambalapuzha P. O.
ALLEPPEY

42 Shri. M. Mangala Bhanu,
Retired Chief Engineer,
Vazhuthacaud,
TRIVANDRUM

43 Prof. K. M. Chandy,
Kizhakkayil,
Palai,
Kottayam

44 Shri. P. R. Francis, M. L. A.
Porathoor House,
Ollur P. O.
TRICHUR DIST

45 Shri. M. K. Kesavan,
Mundodythara,
Vaikom,
KOTTAYAM

46 Shri. V. S. Ouseph,
Professor,
Mar Ivanios College,
TRIVANDRUM

47. Dr. Silas, E. G.
Director,
Central Marine Fisheries Research Institute,
Gopala Prabhu Road,
Ernakulam, COCHIN-18

48. Prof. T. P. Muhammed Kunhi,
Sir Syed College,
Taliparamba,
Cannanore Dist

49 Sri. V. G. Kurup,
Vapalathu Kizhakkeyil,
Kidangoor, P. O.
Kottayam Dist

50 Dr. M. G. Krishna Pillai,
Professor,
Department of Physics,
University of Cochin,
Cochin-22

51-54: Members elected by the Legislative Assembly: Vacent

II. LIST OF MEMBERS OF THE EXECUTIVE COMMITTEE

1 Sri. N. Kaleeswaran, Vice Chancellor — Chairman

2 The Secretary to Government,& Agricultural production Commissioner, Agriculture Department. — Member

3 The Secretary to Government, Finance Department — ,,

4 The Secretary to Government, Development Department — ,,

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, Departement of Pathology, College of Vety & Anlmal Sciences, Mannuty — ,,

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, M. L. A. Porathur house, Ollur, P. O. Trichur — ,,

11 Sri. K. S. Vasudeva Sarma, President, Venmony Panchayat, Alleppey — ,,

12 Registrar — Convener

III. LIST OF ACADEMIC COUNCIL MEMBERS

1 The Vice Chancellor — Chairman

2 Dean, Faculty of Agriculture — Member

3 Dean, Faculty of Veterinary & Animal Science — ,,

4 Director of Research — ,,

Director of Extension Education — ,,

6 Registrar — Member-Convener

7 Sri. K. P. Padmanabhan Nambirar, Associate Professor, Coconut Research Station. pi'icode — Membe,

8 Dr. C. R. Ananthasubramaniam, Research Officer, ICAR Co-ordinated Project on Agrl. By-products, Maunuthy — ,,

9 Sri. K. Srinivasan, Prosessor of Horticulture, College of Agriculture, Vellayani — ,,

10 Secretary to Government Agricultuie Department, Government of Kerala — ,,

11 Director of Agriculture, Kerala Trivandrum — ,,

12 Director of Animal Husbandry, Kerala, Trivandrum — ,,

13 Sri. K. P. Vasudevan Nair, Ph. D. Student, College of Horticulture, Vellanikkara — ,,

14 Dr. P. C. Sivaraman Nair, Associate Dean, College of Horticulture, Vellanikkara — Member

15 Sri. A. G. G. Menon, Professor of Extension, College of Horticulture, Vellayani — ,,

16 Dr. A. Venugopalan, Professor of Surgery, College Vety, & Animal Sciences, Mannuthy — ,,

17 Dr. M. J. Sebastian, Professor of Fisheries, Kerala Agrl. University — ,,

18 Sri. Abdul Gaffer, Secretary, College Union, College of Agriculture, Vellayani — ,,

19 Sri. I. A. Chacko, President, College Union, College of Horticulture Vellanikkara — ,,

20 Sri. Justine Fernandez, President, College Union, College of Vety. & Animal Sciences, Mannuthy — ,,

21 Sri. Radhakrishnan, T. R., General Secretary, Students' Union Institute of Agrl. Technology, Tavanur — ,,

IV LIST OF MEMBERS OF BOARD OF STUDIES IN AGRICULTURE

1	Dean, Faculty of Agriculture	Chairman
2	Prof. of Agronomy	Member
3	Prof. of Agricultural Botany	,,
4	Prof. of Agricultural Chemistry	,,
5	Prof. of Agricultural Entomology	,,
6	Prof. of Plant Pathology	,,
7	Prof. of Agricultural Extension	,,
8	Prof. of Horticulture	,,
9	Prof. of Agricultural Economics	,,
10	Assoc. Professor of Agrl. Engineering	,,
11	Prof. of Agricultural Statistics	,,
12	Dr. K. K. Krishna Moorthi, Dean i/c. College of Agriculture & Research Institute, Coimbatore – 3.	Member
13	Dr. K. Ramakrishnan, Dean, University of Agricultural Sciences, Hebbal, Bangalore--24.	,,
14	Dr. M Aravindakshan, Associate Professor, College of Horticulture, Vellanikkara	
15	Dr. P. C. Sivaraman Nair, Associate Professor, College of Horticulture, Vellanikkara	

V. LIST OF MEMBERS OF BOARD OF STUDEIS IN VETERINARY AND ANIMAL SSCIENCES.

1	Dean, Faculty of Veterinary & Animal Sciences	Chairman
2	Prof. of Anatomy	
3	Prof of Physiology & Biochemistry	
4	Prof. of Nutrition	
5	Prof. of Dairy Science	
6	Prof. of Animal Management	
7	Prof. of Animal Breeding & Genetics	
8	Prof. of Extension	
9	Prof. of Pathology	
10	Prof. of Bacteriology	
11	Prof. of Obsterics & Gynaecology	
12	Prof. of Medicine	
13	Prof. of Pharmacology	
14	Prof. of Therapeutics	
15	Prof. of Poultry Science	
16	Prof. of Surgery	
17	Prof. of Veterinary Public Health	
18	Prof. of Statistics	
19	Dr. V. Ratnasabhapathy, Dean, Director Research, Madeas Veterinary College, Madras. 7	
20	Dr. G. Veerararaghavan, Professor and head of Department of Animal Sciences, College of Veterinary Sciences, Andhra Pradesh Agricultural University, Rajendra Nagar, A. P. Hyderabad	
21	Dr. A. Rajan Assocsate Professor. Deportment of Pathology College of Veterinary & Animal Sciences, Mannuthy	
22	Sri. J. B. Rose, Associate Professor, College of Agriculture, Vellayani	

VI. LIST OF MEMBERS OF THE FINANCE COMMITTEE

1	Vice Chancellor	Chairman
2	Secretary to Government (Finance)	Member
3	Secretary to Government & Agricultural Production Commissioner, Agricultural Department	,,
4	K. S. Vasudeva Sarma, President, Venmony Panchayat, Alleppey	
5	The Comptroller, Kerala Agricultural University	

APPENDIX II

(Sub Committees Of The University)

I. RESEARCH COUNCIL

1. Director of Research — Secretary
2. Dr. V. S S S. Potti, Director of Extension Education
3. Dr. N. Sadanandan, Dean, College of Vety. & Animal Sciences
4. Dr P. G. Nair, Dean, College of Vety. & Aaimal Sciences
5. Dr. C. A. Ninan, Head, Department of Botany, University of Kerala, Kariavattom, Trivandrum
6. Dr. K. J. Joseph, Head of the Department Department of Zoology, University of Calicut
7. Dr. M. V. Paily Cochin University
8. Sri. M. Janardhanan Nair, Retired Addl. Director of Agriculture, Lakshmi, Sasthamangalam, Trivandrum
9. Shri. P. C. Sahdevan, Retired Addl. Director of Agricultuse, 'Glass Bunglow' Artillery Road, Connanore
10. The Agricultural Production Commissioner, Government Sscretariat, Trivandrum
11. Professor S. D. Kologi, Chief Scientific Officer (Hort) Agricultural Research Station, Madigire, Bangalore
12. Dr. S, N.Rao, Principal, S. V. Agricultural College, Andhra Pradesh, Agrl University, Thiruppathy
13. The Director of Research. Tamilnadu Agrl. University, Coimbatore
14. The Vice Chancellor, Kerala Agricultural Universitv

II. FACULTY RESEARCH COMMITTEE

a) Faculty Research Committee (Agriculture)

1. Dean, College of Agriculture, Vellayani — Chairman
2. Dean i/a, College of Horticulture, Vellanikkara — Member
3. Heads of Department — ,,
4. Dr. P. C. Sivaraman Nair, Associate Professor, College of Horticulture — ,,
5. Dr. M. Aravindakshan, Associate Professor, College of Horticulture — ,,
6. Sri. N. Gopalan, Associate Professor, Rice Research Station, Pattambi — ,,
7. Sri. N. Rajappan Nair, Associate Professor, Rice Research Station, Moncompu — ,,
8. Dr. U. P. Baskaran, Associate Professor, Agronomic Research Station, Chalakudy — ,,
9. Dr. M, M. Koshy, Professor of Agrl. Chemistry, College of Agriculture, Vellayani — Part-time Secretary and Convener.

b) Faculty Research Committee (Veterinary & Animal Sciences)

1. Dean, Veterinary & Animal Sciences — Chairman
2. Heads of Departments — Member
3. Superintendent, University Livestock Farm, Thiruvazhamkunnu — ,,
4. Research Officer, Cattle Breeding Earm Thumburmuzhi — ,,
5. Dr. M. Sthanumalayan Nair, Fodder Reacarch Officer — ,,
6. Dr. K. T. Ponnoose, Assoc. Professor Scheme for studies on Porcine Enterovirus — ,,
7. Dr. M. Krishnan Nair, Professor of Pathology, College of Vety. & Hnimal Scienees — Part-time Secretary & Convener

III. RESEARCH ADVISORE COMMITTEE

1	The Viee Chancellor, Kerala Agricultural University, Vellanikkara	Chairman
2	The Director of Recearch, Kerala Agricultural University, Vellanikkara	Convener
3	All non-official members in the Executive Committee	Member
4	All the members of the Research Council of the Kerala Agricultural University	,,
5	All the Deans in the Kerala Agricultural University	,,
6	The Directors or representatives of the ICAR Recearch Institutes in the State.	,,
7	The Directors, Forest Research Institute, Kerala	,,
8	The Director of Agriculture, Kerala	,,
9	The Director of Animal Husbandry, Kerala	,,
10	The Director of Fisheries, Kerala	,,
11	The Chief Conservator of Forests, Kerala	,,
12.	The Director of Dairy Development, Kerala.	Member
13	All the members of the General council nominated by the Chancellor under section 10 (9). KAU Act, 1971.	,,
14	All the M. L. As. 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) Shri. Vasudevan Nair, Punnapuram House, Pirappancode P. O., Trivandrum Dist.	
	2) Shri. E. P. Madhavan Nair EPM EPM Industrial & Agricultural Estate, Palappuram, Ottappalam, Palghat Dist.	,,
	3) Shri. T. N. Rishikesan Bhattathiripad, Kudamaloor, Kottayam Dist.	,,
	4) Shri. T. V. Varghese Vaidyar, Kalpakavady, Thottappally, Alleppey Dist.	,,
	5) Shri. Joseph Alappattu Thoppil Karanchira, Trichur Dist.	,,
	6) Shri. Vasudevan Namboodiripad, Karuvakundu, Palghat Dist.	,,
17)	The Farm Radio Officers, All India Radio, Trichur and Calicut.	,,
18)	All the members of the Faculty Research Committees of the Kerala Agricultural University.	,,
19)	All the Project Co-ordinators in the KAU	,,

IV Variety Evaluation Committee

I	Director of Research, Kerala Agricultural University, Vellanikkara.	Chairman
2	The Director, CTCRI, Trivandrum or his nominee-	Member
3	Director, CPCRI, Kasaragod or his nominee.	,,
4	The Director of Agriculture, Trivandrum or his nominee.	Member
5	Director of Extension Education, Kerala Agricultural University, Vellanikkara	,,
6	Professor of Agronomy, College of Agriculture, Vellayani	,,
7	Professor of Plant Pathology -do-	,,
8	Professor of Agrl. Botany -do-	,,
9	Professor of Horticulture -do-	,,
10	Professor of Entomology -do-	,,
11	Associate Professor i/c., Rice Research Station, Pattambi ,,	,,
12	Associate Professor i/c. Coconut Research Station, Pilicode	,,
13	Associate Professor, Directorate of Research, Kerala Agricultural University	Convener

V Selection Committee

1	Shri. E. Gopalakrishna Menon	Chairman
2	Shri- P. R. Francis, M. L. A.	Member
3	Prof. V. S. Ouseph	,,
4	Sri. K. S. Vesudeva Sarma	,,
5	Dr. N. Sadanandan	,,
6	Dr. M. Krishuan Nair	,,
7	Registrar	Member & Secretary

VI Students welfare committee

1	Shri- P. R: Francis, M. L. A	Lhairman
2	Shri E. Gopalakrishna Menon	Member
3	Shri. K, S. Vasudeva Sarma	,,
4	Prof. V. S. Ouseph	,,
5	Dr. M. Krishnan Nair	Convener

VII. COMMITTEE FOR DEPUTATION OF ACADEMIC STAFF

1	Vice Chancellor	Chairman
2	Dean, Faculty of Vety. & Animal Sciecees, Mannthy	Member
3	Dean, Faculty of Agriculture	,,
4	Director of Research	,,
5	Director of Extension Education	,,
6	Comptroller	,,
7	Registrar	Convener

V111. POST-GRADUATE COMMITTEE

1	Shri. N. Kaleeswaran Vice Chancellor	Chairman
2	Dr. P. G. Nair, Dean, College of Veterinary & Animal Sciences, Mannuthy	Member
3	Dr. N. Sadanaudan, Dean, Faculty of Agriculture	,,
4	Dr. V. S S. Potti, Director of Extension Education Directorate of Extension Education Kerala Agricultural University, Vellanikkara	,,
5	Shri. V. K. Damodaran, Dean i/c. College of Horticulture Vellanikkara	,,
6	Dr. A. Venugopalan, Professor of Surgery, College of Veterinary & Animal Sciences Vellayani	,,
7	Dr. M M. Koshy, Agricultural Chemistry, College of Agriculture, Vellayani	,,
8	The Director of Research	,,
9	Registrar	Convener

IX. Selection Commttee For Under-Graduate Courses

1	Dr. P. G. Nair, Dean College of Vety. & Animal Scienes Mannuthy	Chairman
2	Dr. N. Sadanandan, Faculty of Agriculture	Member
3	Shri. Damodaran, V. K. Dean i/c. College of Horticulture	,,
4	Dr. A. Venugopalan Professor of Surgery College of Vety. & Animal Sciences	,,
5	Sri. K. Srinivasan, Professor of Horticulture	,,
6	The Registrar	Convener

X. Sports Board Of Kerala Agrl University

1	Shri. N. Kalee waran Vice Chancellor	Chairman
2	Shri. C. Poulose, Regsitrar	Member
3	Dr. N. Sadanandan, Dean, College of Agriculture	,,
4	Dr. P. G. Nair, Dean College of Vety. & Animal Sciences	,,
5	Shri. V. K. Damodaran, i/c. College of Horticulture	,,
6	Dr. V. S. S. Potti Director of Extension Education	,,
7	Director of Research	,,
8	Sri. P. Rajagopal Comptroller	,,
9	The Director of Physical Plant	,,
10	Dr. M, Krishnan Nair, Professor College of Vety. & Animal Sciences	,,
11	Dr. Radhakrishnan, College of Vety. & Animal Sciences	,,
12	Prof. A. G. G. Menon, College of Agriculture	,,
13	Dr. K. M. N. Namboothiri, College of Horticulture	,,
14	Shri. Sundaresan Nair, C. Gr. C. Student member	Member
15	Sri. K. J Abraham -do-	,,
16	Shri Ranjan S., Karippai, G. C. Student Member	,,
17	Shri. Vijayan Nadar, R. -d=o	,,
18	Shri. Haridasan, -do-	,,
19	Shri. Raju P. M., Athetic oecretary, College of Vety, & Animal Science	,,
20	Shri N. K Vinayachandran, Athletic Secretary, College of Horticulture	,,
21	Shri. K. Raman, Atheletic Secretary, College of Agriculture	,,
22	Shri. Loveson, Athletic Secretary, I. A. T., Tavanur	,,
23	Shri. Pathros P. Mathai, Deputy Director of Students Welfair (S & G)	Member-Convener

XI Extension advisory committee

1	Vice Chancellor, Kerala Agricultural University	Chairman
2	The Agricultural Production Commissioner Secretariat, Trivandrum	Member
3	Director of Agriculture, Vikas Bhavan, Trivandrum	,,
4	Director of Animal Husbandry, Vikas Bhavan, Trivandrum	,,
5	The Milk Commissioner, Dairy Development Department, Trivandrum	,,
6	The Dean, College of Agriculture,, Vellayani	,,
7	The Dean College of Vety. & Animal Sciences, Mannuthy	,,
8	The Dean, i/c. College of Horticulture, Vellanikkara	,,

9 The Director of Research, Kerala Agricultural University — Member

10 Prof. A. G. G. Menon, Prof. of Extension. Colleg of Agriculture, Vellayani

11 Prof L. Sreenivasan, Professor of Horticultnre, College of Agriculture, Vellayani

12 Dr. G. R. Nair, Professor of Extension, College of Vety. & Animal Sciences, Mannuthy

13 Dr. M Subramoniam, Professor of Dairy Sciences, Mannuthy

14 Dr. M. Aravindakshan, Associate Professor, College of Horticulture, Vellanikkara

15 Dr. P. C. Sivaraman Nair, Associate Prefessor, College of Horticulture, Vellayani

16 Dr. M. S. Nair, Fodder Research Officer, University Livestock Farm, Mnnuthy

17 Shri. V. K. Kunhahammad, President, Kayakkodi Panchayath, Calicut Dist.

18 Sri. Vasudeva Sarma, President, Venmony Panchayat Alleppey Dist.

19 Sri. S. Balakrishnan, Associate Professor, Banana Research Station, Kannara

20 Sri. N. Gopalan, Associate professor, Rice Research Station, Pattambi — Member

21. Mrs. L. Maheswari Amma, Chairman, Block Development Committee, Ambalapuzha

22. Sri. P. K. Gangadhara Menon Special Officer, Institute of Agricultural 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 Developmeent, Calicut.

26. The Director Directorate of Coconut Development, Cochin.

27. Sri V. Gopalakrishna Kurup Rashmi, Alleppey—3

28. Dr. V. S. S. Potti, Director of Extension Education, Kerala Agricultural University — Convener.

XII. Planning And Development Committee

1. Vice Chancellor — Chairman
2. Special Secretary to Government, Agricultural Department and Agricultural Production Commissioner. — Member
3. Shri. K. S. Vasudeva Sarma
4. Prof. V. S. Ouseph
5. Dr. N. Sadanandan, Dean. — Member-Convener.

APPENDIX - IV

LIST OF ADMINISTRATIVE STAFF OF KERALA AGRICULTURAL UNIVERSITY

OFFICE

1.	Vice Chancellor	1	Rs 2500/	
2.	Deans	2	1400 - 1900	
3.	Dean (P. G Studies)	1	1400 - 1900	
4.	Director of Research	1	1400 - 1900	
5.	Director of Extension Edn.	1	1400 - 1900	
6	Registrar	1	1400 - 1900	
7.	Comptroller	1	1400 - 1900	
8.	Special Officer (Ecosystem)	1	1200 - 1800	
9.	Estate Officer	1	850 - 1450	
10.	Public Relations Officer	1	850 - 1450	
11.	Associate Professor (Agri-Botany)	1	850 - 1450	
12.	Assistant Registrar	1	850 - 1450	
13.	Assistant Registrars	2	710 - 1200	
14	Assistant Comptroller	3	710 - 1200	
15.	Labour Officer	1	710 - 1200	
16.	Section Officer	20	495 - 835	
17.	P. A. to Vice Chancellor	1	495 - 835	B
18.	Senior Grade Stenographer (PA to Registrar/Comptroller)	2	465 - 775	B
19.	Office Superintendents (FC&D)	2	465 - 775	
20.	Senior Grade Assistant	24	410 - 715	
21.	Senior Grade Typist	4	410 - 715	
22.	Grade I Stenographer	3	325 - 660	
23.	Sergeant	1	330 - 575	
24.	Assistant Grade I	40	285 - 550	
25.	Typist Grade I	9	285 - 550	
26	Stenographer Steno Typist Grade II	1	240 - 540	
27.	Assistant Grade II	8	240 - 445	
28.	Typist Grade II	1	240 - 445	
29.	Drivers	8	230 - 385	C
30.	Clerical Assistant	1	230 - 385	
31.	Duplicator Operator	2	230 - 385	D
32.	Duffadar	1	230 - 385	
33.	Special Grade Peon	2	210 - 340	
34.	Conductor	1	210 - 340	F
35.	Cook-cum-Caretaker	1	200 - 285	E
36.	Peon	15	196 - 265	
37.	Hostel Boy for Teachers Hostel	1	196 - 265	
38.	Watcher-cum-Gardner	1	196 - 265	
39.	Watch and Ward	12	196 - 265	
40	Watchmen	7	196 - 265	
41.	Sweeper-cum-Scavenger	2	196 - 265	
42.	Sweeper-cum-Scavenger-cum Gardener	1	196 - 265	
43.	Sweeper	1	196 - 265	
44.	Apprentice Clerks	9	Rs. 130/-	

A. Till the present incumbent holds the post

B. Plus C. A. Rs. 50/-p.m.

C. One post with a C. A. of Rs. 40/-p. m.

D. Plus C.A. Rs. 25/-p.m.

F. Plus C. A. Rs. 10/-p. m.

E. Plus C. A. Rs. 20/-p. m.

APPENDIX - V

COLLEGE OF AGRICULTURE

LIST OF ACADEMIC STAFF FOR THE YEAR 1977-1978

Department of Agronomy

1. Professor
   Vacant
2. Associate Professors — 5
   1. Dr. C. Sreedharan
   2. Shri K P. Madhavan Nair
   3. Shri. P. Chandrasekharan
   4. Shri. U. Mohammed kunju
   5. Dr. K. M. Sukumaran (Till 28-11-75)
   6. Shri. K. Pushpangadan (from 29-11-77)
3. Assistant Professors — 3
   1. Shri. E. Tajuddin
   2. Shri. G. Raghavan Pillai
   3. Dr. Abraham Thomas (till 12-1-78)
4. Instructors — 2
   1. Shri. M. Gopalakrishnan Nair
   2. Shri. S. Janardhanan Pillai
5. Junior Instructors — 2
   1. Shri. M. Oommen
   2. Shri. S M. Shahul Hameed

Agricultural Botany

1. Professor
   Dr. (Mrs.) Mary K. George
2. Associate Professors — 4
   1. Shri. A. T. Abraham
   2. Shri. N. Gopinathan Nair
   3 Dr. V Gopinathan Nair
   4. Shri. K. Gopakumar
3. Assistant Professors — 4
   1. Shri. P. D. Vijayagopal
   2. Shri. Luckins C. Babu
   3. Dr. S. T. Mercy
   4. Sri. R Gopimony
4. Instructor
   Shri. N. Ramachandran Nair
5. Junior Instructor
   Shri. S. G. Sreekumar

Agricultural Chemistry

1. Professor
   Dr. M. M. Koshy

Associate Professors — 4
   1. Dr. R. Subramonia Aiyer
   2. Shri. P. Ramasubramanian
   3. Dr. K. P. Raja Ram
   4. Dr. V. Gopalaswamy

Assistant Professors — 5
   1. Dr P. Padmaja
   2. Smt. Alice Abraham
   3. Shri Abdul Hameed
   4. K. Babukutty
   5. Shri. P. A. Korah

Junior Instructor — 1
   Dr. (Smt.) S. Kabeerathumma

Agricultural Entomology

1. Professor — 1
   Dr. M. R. G. K. Nair (till 31-10-77)
   (From 1-11-77 vacant)
2. Associate Professors — 5
   1. Dr. N. Mohandas
   2. Shri. J. J. Johnson
   3. Shri. S. P. Christudas
   4. Dr. John Kurian
   5. Dr. T. S. Venkitesan
3. Assistant Professors — 6
   1. Dr. Abraham Jacob
   2 Dr. D. Dale
   3. Shri. M. J. Narayanan
   4. Dr. A. Visalakshy
   5. Shri. P. A. Rajan Asari
   6. Shri. George Koshy
4. Instructor — 1
   Smt. K. Santhakumari
5. Junior Instructors — 2
   Shri. P. J Joseph
   Shri. T. Nalinakumari

Plant Pathology

1. Professor — 1
   Dr. M. Ramanatha Menon
2. Associate Professors — 5
   1. Dr. K. I. Wilson
   2. Dr. M. Chandrasekharan Nair
   3. Dr. S. Balakrishnan (till 26-6-77)
   4. Smt. L. Remadevi (from 23-1-78 to 18-1-78)
   5. Dr. James Mathew (from 30-1-78 to 18-3-78)
3. Assistant Professors — 2
   1. Dr. James Mathew
   2. Smt. L. Remadevi

4. Instructors — 2
   2. Smt. K J. Alice
   1. Shri. A Sukumara Varma (19-1-1978)

5. unior Instructor — 1
   Smt. M. Suharban

Microbiology Unit

1. Associate Professor — 1
   Shri. P. V. Paily

2. Assistant Professors — 2
   1. Shri. Ignatius D. Konikkara
   2. Smt. Susamma Philip (from 3-3-78)

Agricultural Extension

1. Professor — 1
   Shri. A. G G. Menon

2. Associate Professors — 2
   1. Dr. A. M. Thampi
   2 Dr G. T. Nair

3. Assistant Professors — 3
   1. Dr. (Smt.) L. Prema
   2. Shri. B Babu (on deputation for higher studies)
   3. Shri Abdul Rehiman Kunju

4. Instructors — 2
   1. Shri. M. Mohammed Hussain
   2. Shri. K. I. Thomaskutty

5. Junior Instructor — 1
   Shri. R. Raju

Horticulture

1. Professor — 1
   Shri. K. Srinivasan

2. Associate Professor — 1
   Shri. P. Sethumadhavan

3. Assistant Professor — 1
   Dr N. Mohana Kumaran

4. Junior Instructor — 1
   Shri. Abdul Vahab

Agricultural Engineering

1. Associate Professor — 2
   1. Dr. Jose Samuel
   2. Sri. P. Jacob John

2. Assistant Professor — 1
   Smt A. N. Rema Devi

3. Lecturer — 1
   Shri. M. S. Thomas

4. Instructor — 1
   Shri. Jippu Jacob

Agricultural Statistics

1. Professor — 1
   E. J. Thomas

2. Assistant Professor — 1
   Smt. P: Saraswathi

3. Instructor — 1
   Shri. M. P. Abdurazak

Agricultural Economics

1. Professor — 1
   Vacant

2. Associate Professor — 1
   Shri K. S. Karayalar

3. Assistant Professor — 2
   1. Shri. S. Venugopalan
   2. Vacant

Animal Husbandry

1. Associate Professor — 1
   Shri. J. B. Rose
   Shri. K. Parameswaran Nair (upto 10-6-77)

2. Assistant Professors — 2
   Dr. Skariah Oommen
   Dr. E. T. Jacob.

APPENDIX - VI

LIST OF PUBLICATIONS, COLLEGE OF AGRICULTURE

Department of Agronomy

1	C. Sreedharan & V. K. Vamadevan	Duration of rice as influenced by seasons and meteorological elements	Agri. Res. J. Kerala. 15 (1) 17-23, 1977
2	C. Sreedharan & V. K. Vamadevan	Grain shattering in rice as influenced by Agro-climatological factors.	Agri. Res. J. Kerala, Vol. 14 No. (2) 1977.
3	C. Sreedharan & V. K. Vamadevan	Estimation of global radiation by indirect methods.	Paper presented at the 64th session of the Indian Science Congress held at Bhuvaneswar, 1977.
4	G. K. Balachandran & C. Sreedharan	Effect of split doses and time of nitrogen application on the content uptake and utilisation efficiency for direct sown rice in puddled soil.	Agri. Res. J. Kerala 1977 15 (1) 41-46.
5	C. Sreedharan & V. K. Vamadevan	Influence of climatological factors on E. T. of rice.	Agri. Res. J. Kerala Vol. 14 No. (2) 77.
6	C. Sreedharan & V. K. Vamadevan	Effect of periodical sowing and water management on protein, Amylase and yield of rice.	Oryza Vol. 13 No. 1. 1976.
7	C. Sreedharan & P. Padmaja	Saving of nitrogen in puddled soil of rice.	Kalpadhenu, Vol. No. 2 1977
8	C. Sreedharan & V. K. Vamadevan	Influence of meteorological factors on growth and production of rice.	Paper presented in Rice Symposium 77 held at Pattambi.
9	C. Sreedharan & P. Padmaja	Effect of dewatering rice field on nutrient loss.	Kalpadhenu, 1977 Vol 4. 4-5
0	M. Oommen, N. Sadanandan, U. Mohammed Kunju, & V. K. Sasidhar (1977)	Effects of slow release nitrogenous sources on growth and yield of rice variety Jaya.	Agri. Res. J. Kerala 15 (1) 24-28
1	M. Oommen, N. Sadanandan & U. Mohammed Kunju	Protein content of Paddy grains as influenced by slow release nitrogen fertilisers.	Agri. Res. J. Kerala 15 (2 184-185 1977.)
2	I. P. S. Nambiar, N. Sadanandan & U. Mohamed Kunju (1977)	Effect of CCC on the starch content of sweet potato tubers.	Agri. Res. J. Kerala 15 (1) 93-94.
3	S. Kabeerathumma, V. K. Sasidhar, U. Mohamed Kunju and N. Sadanandan (1977)	A note on the effect of magnesium and molybdenum on soybean yield.	Agr. Res. J. Kerala 15 (2) 197-199.

Agricultural Botany

1	V. Gopinathan Nair	Effect of combined mutagenic treatments on sensitivity and mutation frequency in rice.	Agri. Res. J. Kerala 15 (1) 59-65-1977.

2	N. Ramachandran Nair and V. Gopinathan Nair	Mutagenic efficiency of gamma rays in sesamum.	Agri. Res. J. Kerala 15 (2) 142-146 1977.
3	R. Gopimony	A note on clonal reactions to leaf spot disease in Banana.	Agri. Res. J. Kerala 15 (1) 73-76 1977.
5	E. R. Somanatha Pillai, Mary K. George and S. T. Mercy.	Studies on inter-specific hybrids of five species of *Capsicum* with special reference to qualitaltive and quantitative characters.	Agri. Res. J. Kerala, 1977 15 (1) 1-5.
4	S. T. Mercy, Luckine C. Babu and Mary K. George	Anatomical studies of the aerial stem rhizome, leaf sheath and root of *Elettaria cardamum* (Maton)	Agri. Res. J. Kerala 1977 15 (1) 10–12.
6	K. P. Radhakrishnan, S. T. Mercy and Mary K. George	Crossability studies and analysis of incompatibility in three species of *Capsicum*.	Agri. Res. J. Kerala 1977 15 (2) 124-127
7	K. Pushkaran, P. Sukumaran Nair and K. Gopakumar	Analysis of yield and its components in sweet potato (Ipomoea batatas L.)	Agri. Res. J. Kerala, 1976 15 (2) 153-159
8	J. Sreekumari Amma and P. D. Vijayagopal	The role of rain water in the pollination of pepper	Agri. Res. J. Kerala 1977 15 (1)
9	J. Sreekumari Amma K. M. N Namboodiri and Mary K. George	Comparative performance of F_1 and parents in intervarietal crosses of rice.	Agri Res. J. Kerala 1977 15 (1) 13-17

Agricultural Chemistry

1	S. Kabeerathumma, V. K. Sasidhar, N. Sadanandan and M. M. Koshy	A note on the effect of zinc in combination with nitrogen on the yield and yield attributes of rice variety Triveni.	Agri. Res. J. Kerala 1977 15 (1) 77-79
2	K. A. Mariam and M. M. Koshy	The effect of zinc in combination with lime on the growth and yield of rice.	Agri. Res. J. Kerala 1977 15 (2) 137-141.
3	Abraham Thomas and M. M. Koshy	Response of rice variety Triveni to graded doses of Magensium silicate:	Agri. Res. J. Kerala (1977) 15 (1) 83-84
4	P. Padmaja and M. M. Koshy	The protein and mineral content of some banana varieties	The Ind. J. Nutr. Dietet (1977) 14:235–236.
5	P. Padmaja and M. M. Koshy	A note on run off losses of nutrients in water logged Rice Soils (1978)	J. Ind. Soc. Soil. Sci. 26:75-75
6	N. Sethunathan, R. Siddaramappa, K. P. Rajaram, S. Barik & P. A. Wahid	Parathion – residues in soil and water-	Residue Reviews (1977) 68, 91–122
7	S. Kabeerathumma & S. Patnaik	Effect of submergence on the transformation and availability of deficient and toxic nutrients in acid sulphate soils.	Paper prensented at the symposium on Rice Research and Development held at Pattambi in December, 1977.

8	R. S. Aiyer & V S.S. Potty	Introduction of Agricultural Technology in tribal development in Kerala State	Paper presented in the Symposium on 'Strategy' for Agricultural Development in Kerala held in Department 1977 by the Kerala Agrl. University
9	K. Vijayakumar and M. M. Koshy	Effect of Magnesium silicate on the growth, yield and uptake of nutrients by Rice	Paper presented at the Symposium on Rie Reesearch and Development held at Pattambi in Dec. 1977
10	P. Padmaja ,S. Patnaik and C. C. Bidoppa	Comparative efficiency of conventional and Thermo-dynamic assessment of the K-Status of water logged rice soils	Paper presented at the Syposium on rice research and development held at Pattambi in Dec 1977
11	K. A. Mariam and M. M. Koshy	The effect of zinc in combination with lime on the composition and absorption of nutrients by rice	Paper presented at Symposium on rice research and development, held at Pattambi Dec. 1977
12	P. Padmaja	Influence of N levels on Manganese and Iron utilization of rice	Paper presented in the Symposium, on Rice Reserch and development held at Pattambi in Dec. 1977
13	R. S. Iyer and V. Samikutty	Seasonal variation in soil reaction and salinity levels of the Pokkali, Kaipad and Orumundakan soils of Kerala	Paper presented in the Symposium on Rice Research and development held at Pattambi Dec. 1977
14	Abdul Hameed and M. M. Koshy	An investigation into the chemical characteristics of the kole soils of Kerala	Paper presented at the Symposium on Rice Research and Development held at Pattambi in Dec. 1977
15	Abdul Hameed and M. M. Koshy	Morphological and physical properties of kole soils of Kerala	Paper presented in the Symposium on Rice Research and Development held at Pattambi in Dec.
16	R S. Iver and A. G. G. Menon	Agricultural development activities of primitive Tribes in Kerala	Paper presented in the world Malayalam Conference held in Trivandrum in January 78
Agricultural Entomology			
1	N. M. Das, Susamma Mathai, and S. P. Christudas (1977)	Control of the insect pests attacking cowpea, *Vigna sinensis*	*Agric. Research J* Kerala 15 (1): 69 – 72.
2	N. M. Das and M. J. Thomas (1977)	Effect of water level in rice fields on the population build up on the brown plant hopper, *Nilaparvata lugens* and in the incidence of hopper brown	*Agric. Res. J* Kerala 15 (1): 38.
3	P. A. Rajan Asari and D. Dale (1977)	Studies on the use of antifeedants for protecting stored paddy from Angumois grain moth. *Sitotroga cerealella*	*Bull. Grain* Tech., 15 123-125.

4	D. Dale, S. Chandrika and M. R. G. K. Nair (1977)	Biological effect of citronella oil on the red flower beetle *Tribolium castaneum*	Paper presented in the Prof. K. K. Nair endowment Symposium held at the University of Kerala, Kariavattom
5	M. Prem kumar, D. Dale and M. R. G. K. Nair (1977)	Consumption, digestion and utilisation of food by larvae of *Spodoptera litura*	Entomon (1) : 7-10
6	K. Saradamma, D. Dale and M. R. G. K Nair (1977)	On the use of neemseed kernal powder as a protectant for seed paddy	*Agric. Res J* Kerala 15 (1) 102-103
7	D. Dale and M. R. G. K. Nair (1977)	Some new methods for the control of insect pests of rice	Paper presented in the Golden Jubilee Symposium on Rice Research and Development held at the Rice Research Station, Pattambi
8	P. A. Rajan Asari, S. Balakrishnrn, Abraham Jacob and C. K. Peethambaran (1977)	*Paecilomyces farinosus* a new fungal parasite of the mango leaf webber, Orthaga *exivinacea*	Curr. Sci. 46 (5): 163
9	P A. Rajan Asari, A. Sreedharan and J. Johnson (1977)	*Duplachionaspis divergens*, a pest of Lemongrass in Kerala	Agric. Res. J. Kerala 15 (1) :95
10	George Koshy, Visalakshy and M. R. G. K. Nalr (1977)	Bio'ogy of *Acanthocoris scabotor* a pest of Mango	Entomon 2 (2) : 145-147.

Plant Pathology

1.	K. I. Wilson, D. Joseph, M. A. Rahim and M. R. G. K. Nair (1977)	Control of cardamom thrips by spray insecticides.	Agric. Res. J Kerala 15 : 192-194,
2.	K. I. Wilson, D. Joseph, and B. Rajagopalan (1978)	On the frequency of insecticidal application against cardamom thrip	Pesticides, 7 : 27
3	A. Sukumara Varma and M. R. Menon (1977)	Fungicidal trial on the control of sheath blight of rice	Madras Agric. J. 64. 416-417
4	V. P. Sukumara Dev, J. Sam Raj and M. R. Menon (1977)	A mosaic disease of horse gram	Agri. Res. J. Kerala 15 : 33-36
5	P. Anandavally Amma N. Shanmugham and M. C. Nair (1977)	Respiratory and enzymatic changes in sclerotial root-rot of groundnut	Agri. Res. J. Kerala 15 : 6-9
6	P. Anandavally Amma N. Shanmugham and M. C. Nair (1977)	Preliminary changes associated with the sclerotial root rot of groundnut	Agri. Res. J. Kerala 15 : 199-123
7	P. Anandavally Amma, N. Shanmughom, and M. C. Nair (1977)	Changes in the amino acid content of hypocotyl tissue of groundnut infected with *Sclerotium rolfsi*	Agric. Res. J. Kerala 15 : 200-201

Agricultural Engineering		
1 Jose Samuel (1977)	New Dimensions in Rice Technology	Paper presented at the Symposium on Rice Research held at the Rice Research Station, Pattambi
2 Jose Samual (1977)	Jet pump attachment for low-life pumping	Paper presented at the Symposium on Rice Research held at the Rice Research Station, Pattambi
3 Jose Samuel and Jippu Jacob (1977)	Prospects of Mechanical control of Salvinia in Kerala State	Paper presented at the Symposium in Rice Research held at the Rice Research Station, at Pattambi
4 Jose Samual 1978	Appropriate Technology in Agriculture	Kerala Sastra Sahitya Parishad
5 Jose Samual (1978)	Agricultural Implemenes and Machinery Agriculture in Kerala	Kerala Sastra Sahitya Parishad
Agricultural Statistics		
1 E. J. Thomas (1977)	Prediction of Rain fall at Pattambi	Agric. Res. J. Kerala 15 (2) : 108-11

APPENDIX - VII

COLLEGE OF HORTICULTURE

LIST OF ACADEMIC STAFF

Associate Professors

1 Sri. V. K. Damodaran
2 Dr I. C. Sivaraman Nair
3 Dr. P. K. Gopalakrishnan
4 Dr. M. Aravindakshan
5 Dr R. Vikraman Nair
6 Dr. A. I. Jose
7 Dr C. C, Abraham
8 Dr. Abi Cheeran
9 Dr. K. M .N. Namboodiri
10 Dr. P. B. Pillai

Assistant Professors

1 Sri. S. Ramachandran Nair
2 Sri. G. Sreekandan Nair
3 Sri G. Ravindranathan Pillai (on leave)
4 Smt. K. Leela
5 Smt. G. Droupathi Devi
6 Dr. C. K. Peethambaran
7 Sri. M. Abraham
8 Dr. P. J. Joy
9 Dr. K. Kumaran
10 Smt. V. K. Mallika
11 Sri. K. P. Ramachandran Nair
12 Sri. E R. NarayananaNair
13 Sri. P. V. Prabhakaran
14 Dr. P. B. Gopinath
15 Shri. G. Madhavan Nair

Instructor

Sri. Abraham K. George

Junior Instructors

1 Sri. Vilasachandran. T
2 Sri. Joseph Philip
3 Sri Nybe E. V.
4 Sri. P. K. Valsala Kumari

APPENDIX - VIII

LIST OF PUBLICATIONS, COLLEGE OF HORTICULTURE

1	C. C. Abraham and K. S. Remamoney 1977	New Record of *Pachypeitis maesarum* (Kirkaldy) as a pest of cashew of Kerala	Science and culture 43 (12) 553-554
2	C. C. Abraham 1978	Regulation of progency production and sex ratio on *Bracon* brevicornis wesmael	Abstract of papers presented in the All India work shop on population Ecology on relation to insect of Economic Importance Bangalore 18-20 January 1978, p. 33-34-
3	P. J. Joy 1978	Relative incidence of the pupal parasites infesting *Nephantis serinopa* in Kerala.	Ibid p. 34-35
4	P. B. Gopinathan	Population trend of the Army worm *Mythimna seporata* walker under the influence of the key abiotic and biotic components.	Ibid, 4-5
5	C. C. Abraham 1977	New record of *Rhizopetha dominica* (Fab) as a field pest of cowpea *Vigna sinensis* savi in Kerala.	Indian Journal Ent. 39 (4) 1977, 392.
6	P. J. Joy 1977	The advantages, disadvantages, and the possibilities of the utilization of *Brachymeria* parasites for the biological control of *Nephantis serinopa*	Agri. Res. J. Kerala 15 (1) 66-68
7	P. J. Joy 1977	The first record of *Teleonemia scrupulosa* stal.(Hemiptera: Tingidae) lantana from Kerala.	Agri. Res. J. Kerala 15 (1)
8	P. J. Joy 1977	Heads and its appendages of *Brachymeria westwood*	Entomon 2 (2): 181-187
9	P. J. Joy 1977	On the wing venation, pteralia and wing coupling in *Brachymeria westwood*	J. Anim. Morph, Physiol. 24 (2): 269-276
10	M. Arvindakshan C. Ramachandran and J. S. Pynadath 1977	Effect of planofix on fruitset in mango	Agri. Res. J. Kerala
11	M. Arvindakshan and S. Ramachandran Nair, 1977	Studies on Airlayering in Jack.	Punjab Hort Journal
12	S. Balakrishnan, M. Aravindakshpn and N. K. Nair 1977	Efficiency of certain growth regulators in inducing flowering in pineapple	Agri. Res. J. Kerala
13	S. Balakrishnan, M. Aravindakshan et al. 1977	Growth and yield of pineapple variety 'Kew' as influenced by planting densities	South India Hort.
14	K. K. Vidyadharan and Aravindakshan, M. 1977	An unusal case of precosity in seedling cashew	Cashew. Bull 15 (11) 5

15	Aravindakshan and Gopi Kumar 1977	Effect of rainfall on the quality of nuts in cashew	Cashew Bull.
16	G. Sreekandan Nair 1977	A note on the use of detached sprouts as a planting materials in ginger	Agri. Res. J. Kerala 15 (1): 1977
17	P. V Prabhakaran 1976	Prediction of rainfall at a place.	*Agri. Res. J.* 14
18	P. V. Prabhakaran	Optimum plot size for field trials with banana	Accepted for publication in *Agri. Res. J.* Kerala
19	P. V. Parbhkaran	Relationship between yield and some quantitative trials in pineapple.	Accepted for publication in the Agril. Res. J. Kerala.
20	A. I. Jose 1977	Transformation of phorphorus in soils during rice growth under submerged conditions.	Paper presented at the symposium on Rice Research Development 21-23 December 1977, at Rice Research Station, Pattambi
21	U. P. Bhaskaran & K. Leela 1977	Water management in coconut	*Indian Coconut* Journal, 18 8 (2) 1-3, Sept. 1977
22.	U. P. Bhaskaran and K. Leela 1978	Irrigation response of coconut in relation to production status of palms and soil type.	Paper presented in the first annual symposium and plant ation crops held at Kottayam in March 1978.
23	K, Leela and U. P. Bhaskaran 1978	Effect on intercropping groundnut on soil fertility and plantation management in coconut	Paper presented in the first annual symposium and plantation crops held at Kottayam in March 1978.
24	K. P. Ramachandran	Educational Component in Agricultural Extension Service.	Paper presented at the symposium on Rice Research Development, on 22 Dec. 1977 at Rice Research Station, Pattambi).
25	P. Balakrishna Pilli 1977	The effect of different sources of sulphur and iron on the uptake of nutrients and grain yield of rice on calcareous soils.	Paper presented in the Golden Jubilee symposiunm on Rice Research and Development on 21-12- 77 at the Rice Research Station, Pattambi.
26	P. Balakrishna Pillai 1978	Chemical weed control in rice under semi dry condition.	Paper presented in the symposium on Weed control organised by the Indian Society of weed Science.
27	T. P. George. U. P Bhaskaran and A. K. George 1978	Tapping surface water for irrigation.	Intensive Agriculture, Vol. XV December, 1977, January, 1978.

APPENDIX - IX

COLLEGE OF VETERINARY AND ANIMAL SCIENCES

LIST OF ACADEMIC STAFF FOR THE YEAR 1977 - 78

Department of Anatomy

1. Professor
   Dr. K. Radhakrishnan
2. Associate Professor
   Dr. P. A. Ommer
3. Assistant Professor
   Dr. (Mrs.) Lucy Paily
4. Instructors
   1. Dr. K. R. Harshan
   2. Dr. C. K. Sreedharan Unni

Department of Animal Breeding and Genetics:

1. Professor — 1
   Vacant
2. Associate Professor — 2
   1. Dr. B R. Krishnan Nair
   2. Dr. G. Mukundan (on deputation)
3. Assistant Professor — 3
   1 Dr. Sosamma Iype
   2. Dr. K. C. Abraham
   3. Dr. C. A. Rajagopala Raja
4. Instructor — 1
   Dr. K. V. Raghunandanan
5. Junior Instructor — 1
   Dr. B. Nandakumaran

Department of Animal Management

1. Professor — 1
   Vacant
2. Associate Professor — 1
   Dr. T. G. Rajagopalan
3. Assistant Professor — 3
   1. Dr. Kurian Thomas
   2. Dr. K. S. Sebastian
   3. Dr. P. Ramachandran
4. Instructor — 1
   Vacant
5. Junior Instructor — 2
   1. Dr. Francis Xavier
   2. Dr. J Abraham

Department of Dairy Science

1. Professor — 1
   1 Dr. M. Subrahmonyam
2. Associate Professor — 1
   1 Dr. K. Parameswaran Nair
   (on other duty at Thumburmuzhi)
3. Assistant Professor — 3
   1 Dr. K. Pavithran
   2 Dr. M. N. Parameswaran
   3 Dr. Morley Mohan Lal. (till 12-2-1977)
4. Instructor — 1
   Vacant

Department Of Extension

1. Professor — 1
   Dr. G. R. Nair
2. Associate Professor — 1
   Dr. T. Prabhakaran
3. Assistant Professor — 1
   Dr. P. S. Pushkaran
4. Instructor — 1
   Dr. A. J. John (till 27-10-77 only)

Department of Microbiology

1. Professor — 1
   Dr. P. K. Abdulla
2. Associate Professor
   1. S. Sulochana (transferred to the Departmen of Pathology from 22-2-78)
   2. Dr. K. T. Punnoose
3. Assistant Professor
   Nil
4. Instructor — 1
   Sri. V. Jayaprakasan
5. Junior Research Officer
   Sri. P. C. James
6. Junior Instructor
   Sri. M. C. George

Department of Nutrition

1. Professor — 1
   Dr. N. Sivaraman
2. Associate Professor — 1
   Dr. C. T. Thomas
3. Assistant Professor — 2
   1. Dr. T. V. Viswanathan
   2. Dr. K. S. Sebastian (now working on working arrangement in the Dept of Animal Management)
4. Chemist — 1
   Sri. N. Nandakumaran

Department of animal reproduction

1 Professor — 1
   Dr. C. K. Surendra Varma Raja
   (on deputation for higher studies w. e. f. 1-2-78)
2 Associate Professors — 3
   1 C. P. Neelakanta Iyer (full addl. charge of professor w. e. f. 1-2 78)
   2 T. R. Bharathan Namboodiripad
   3 K. Prabhakaran Nair
3 Assistant Professors — 2
   1 E. Mathai(on other duty as Jnnior physiologist in ICAR project on goats)
   2 V. Sudarsanan
4 Instructors — 4
   1 T. Sreekumaran
   2 Joseph Mathew
   3 Vacant
   4 Vacant

Department of parasitology

1 Professor — 1
   1 Dr. R. Kalyanasundaram
2 Associate professor — 1
   1 Dr. K. Rajmohanan
3 Assistant professors — 5
   1 Dr. K. Madhavan pillai
   2 Dr. K. Chandrasekharan
   3 Dr. George C. Varghese (on deputation to foreign service)

4 Dr. V. Sathianesan
5 Dr. C. Pythal

Department of pathology

1 Professor — 1
Dr. M. Krishnan Nair
2 Associate professor — 1
Dr, A. Rajan
3 Assistant professors — 3
1 Dr. K. I. Maryamma
2 Dr K. V. Valsala
3 Vacant
4 Instructors — 2
1 Vacant
2 Vacant
5 Junior Instructor — 2
1 Dr. K. C. George (7-3-77 to 19-9-77)
Dr. B. Mohanachandran (16-1-78 to 23-6-78)

Department of pharmacology

1 Professor — 1
Dr. M. K. Rajagopalan
(Deputed to undergo Ph. D. at Hariyana Agrl. University for 3 years w. e. f. 10-1 78)
Dr. Jacob V. Cheeran, (from 10-2-1978)
2 Associate professor — 2
1 Dr. Zacharias Cherian
2 Vacant
3 Assistant professor — 2
1 Dr. Jacob V. Cheeran (upto 9-2-78)
2 Dr. P. Marykutty
4 Instructor — 1
Dr. K. Venugopalan (from 25-3-1977)
5 Junior Instructors — 3
1 Dr. Sant a E George (on study leave to undergo M. V. Sc w. e. f. 7-2-77 to 13-8-1977
2 Dr. Jayakumar (Transferred on working arrangement to the Department of Therapeutics
3 Dr. A. D. Joy (on other duty at small animal breeding station, Mannuthy)
6 Pool Officer — 1
Dr. N. Gopakumar (w. e. f, 6-3-1978)
7 Chemist — 1
Dr. V. R. Raghunandan

Department of physiology and Biochemistry

1 Professor — 1
Dr. G. Nirmalan
2 Associate Professor — 1
Dr. G. Venugopal (on deputation for higher studies)
3 Assistant professors — 3
1 Dr. M. G. Ramakrishna pillai
2 Dr. K. P. Sadanandan
3 Dr. K. P. Surendranathan
4 Junior Instructor — 1
Dr. P. T. Philomina
5 Chemist — 1
Sri. P. K. Ismail

Department of Poultry Science

1 Professor — 1
Dr. A. K, K. Unni
2 Associate professor — 1
Dr. R. Sabarinathan Nair
3 A sistant professor — 1
Vacant
4 In structors — 2
1 Dr A. Jalaludeen
2 Vacant
5 Junior Instructor — 1
Dr. V. K. Elizabeth

Department of Preventive Medicine

1 Associate professors — 2
1 Dr. E. P. Paily
2 Dr. P. T. Georgekutty
Junior Instructor — 1
Dr. M. R. Saseendranath

Department of Surgery

1 Professor — 1
Dr. A. Venugopalan
2 Associate Professors — 2
1 Dr. P. O. George
2 Dr P. J. Philip (since deceased)
3 Assistant Professor — 2
1 Dr. A, M. Jalaluddin
2 Dr, K. N Muralledharan Nayar
4 Instructor — 2
1 Dr. (Miss.) T. Saradamma
2 Dr. C. Abraham Varkey

Department of Statistics

1 Professor — 1
Dr. P. U. Surendran
2 Assistant Professor — 1
Dr. P. V. Prabhakaran
3 Instructor — 1
K. L. Sunny

Department of Therapeutics

1 Associate Professor and Head — 1
Dr. K. M. Alikutty
2 Assistant Professor — 1
Dr, N. M. Aleyas
3 Junior Instructors — 2
1 . Dr. K. M. Jayakumar
2 Dr. Francis Xavier (working in the Department of Animal Management on working arrangemenr)

Department of Veterinary Public Health

1 Associate Professor — 2
1 R. Padmanadha Iyer
2 M. Soman
2 Assistant Professor — 1
P. Prabhakaran
3 Instructors — 2
1 N. Vikraman Nair
2 Vacant

APPENDIX - X

COLLEGE OF VETERINARY & ANIMAL SCIENCES

LIST OF PUBLICATIONS

1	**Department of Animal Breeding and Genetics**		
1	B. R. K. Nair & R. K. Kelath	Studies on tne first lactation yield of Brown Swiss & Zebu (F1) cows in Kerala.	Kerala J. Vet. Sci., (1977) 8 (1) : 1-8.
2	B. R. K. Nair, K. V. Reghunandanan & T. G. Rajagopalan.	Studies on the possible effects of sire on certain preweaning traits in Large White Yorkshire Pigs.	Kerala J. Vet. Sci., (1977) 8 (2) : 157-166.
3	A. K. K. Unni, B. R K. Nair & G. Raghunathan Nair.	Studies on the sexual dimorphism in shanklength and its relationship with body weight in broiler breeds of poultry	Kerals J. Vet. Sci., (1977) 8 (2) : 167-172.
4	K. V. Raghunandanan, K. J. Eapen & M. K. Phagi.	A. comparative study of cellular constituent of blood in Hariana and its crosses with exotic cattle.	Indian J. Dairy Sci., (1977), 30 (4):348-350
5	K. V. Raghunandadan, B R. K. Nair, Kurian Thomas, & T. G. Rajagopalan	Pre-weaning performance of purebred Vz crossbred pigs	Sent for presentition in the National Seminar on 'Progress of Research in Animal Breeding and Genetics during a decade to be held at the N. D. R. I., Karnal.
2	**Department of Animal Management**		
1	B. R. K. Nair, K. V. Raghunandanan & T. G. Rajagopalan (1978)	Studies on the possible effects of sire on certain preweaning trails in large white Yorkshire pigs.	Kerala J. Vet. Sci. 8 (2) 1978 pp 157-166.
2	K. V. Reghunandanan, B. R. K. Nair & Kurian Thomas & T. G. Rajagopalan (1978)	Pre - weaning performance of purebred Vz cross bred pigs.	Presented at the semininar on progress of Research in Animal Genetics and breeding during a decade at Karnal.
3	K. S. Sebastian (1978)	Studies on the feeding value of tapioca starch waste as an ingredients in Swineration	Kerala J. Vet Sci. 8(2) 1978 pp. 133-138.
3	**Department of Microbiology**		
1	S. Sulochana & J. B. Derbyshire (1977)	Scanning Electron Microscopical observations on the Cytopathology of Porcine enteroviruses in PKL 5 cells	J. Gen. Virol. 27:415-418
2	S. Sulochana & J. B. Derby shire (1978)	Immunoodiffusion reactions among procine enteroviruses and other picanno viruses	Vet. Microbiol. 2:205-210
4	**Department of Nutrition**		
1	N. Kunjukutty, P. Ramachandran, P. A. Devassia, C. T. Thomas & M. Nandakumaran	Evaluation of the feeding value of tea waste (Camalia thea) as an ingredient in the rations for growing pigs.	Kerala J. Vet. Sci. (1977) 8 (2) 127-132
2	C. S. James, C. T. Thomas & N. Kunjukutty	A note on the chemical composition and tannic acid content of the locally available tree leaves	Kerala J. Vet. Sci; (1977) 8 (2) 247-249
3	C. T. Thomas, N. Kunjukutty, M. Nandakumaran & P. A. Devassia	A short note on the chemical composition of Africian Payal	Kerala J. Vet. Sci; 1977 8 (1)

4	M R Murugan and C. R. Ananthasubramoniam	Effect of early introduction of roughage on rumen development in the kid.	Kerala J. Vet. Sci. (1977) 8: (1) 15—20
5	P K. Naveen, C. R. Ananthasubramoniam and P. A. Devassia	Effect of feeding arsenicals on growth in poultry	Kerala J. Vet. Sci. (1977) 8: (1) 31—36
6	C R. Ananthasubramoniam and Maggie D. Menacherry	Nutritive value of tea waste (*Camellia sinensis* Linn) for cattle.	Kerala J. Vet. Sci. (1977) 8; (1) 37-41
7.	C. R Ananthasubramoniam, Maggie D. Menacherry and A. M Chandrasekharan Nair.	Nutritive value of Jack of (Artocarpin hicryphyllus Linn fruit waste for cattle	Indian J Nutr. Dietet (1978) 15, 12-16,
8	P. K Naveen, C R. Ananthasubramoniam and P. A. Devassia.	Studies on the use of arsenicals in layer poultry ration.	Indian J. Nutr. Dietet; 1977 I 4: 47-51.

5 Department of Animal Reproduction

1	T. Sreekumaran and C. K. S. V. Raja	Biochemical characteristics of Yorkshire bears	Kerala J. Vet. Sci 8: 211.
2	B. C. Appa Rao and C. K. S. V. Raja	Studies on the Vitamin A. deficiency on sexual organs of boars growth rate and clinical symptoms of deficient boars	Kerala J. Vet. Sci. 8 87.
3	B. C Appa Rao and C. K. S. V. Raja	Development of testis and accessory sex organs of the deficient boars	Kerala J. Vet. Sci. 8: 95
4	B C. Appa Rao and C. K. S. V. Raja	Replacement Therapy of Deficient Boars	Kerala J. Vet. Sci. 8: 109
5	K. Prabhakaran Nair E Mathai and C. K S. V Raja	A Note on utero tubal insufflation of the caprine genitalia.	Indian Vet. J. (1978) 242
6	K. Prabhakaran Nair and C. K. S. V. Raja	A preliminary study on uterotubal insufflation of the bovne genitalia	Indian Vet. J. (1977) 54-309
7	V. Sudarsanan	A preliminary report on the potentials of *Cassia leschenaultians*	Kerala J. Vet. Sci. (1977) 8: 151 152.
8	S. N. Luktuke and T K B. Namboothiripad.	Andrological Investigation of sites	J. Remount and Vet. Corps (1977) 16:45-47

6 Department of Parasitology

1	V. Sathianesan and C. T. Peter	A detailed study on the free living larval stages of *Haemonchus deptortus* Rudolphi, (1803)	Kerala J. Vet. Sci. (1977) 8: (2) 205-210.
2	K. Rajamohan	The host parasite relationship between buffalo and *Schistoma nasale* (Trematoda, Schistomatidae)	Proceedings of the Indian Science Congress Association 65th Session 1978 (Part III)

7 Department of Pathology

1	A. Rajan, M. Krishnan Nair, K. M. Alikutty K. I Mariamma and K. V. Valsala (1977)	Pathology of Necrosis of Extrimities in Bovines. A disease resembling Degnala disease	Kerala J. Vet. Sci. 8: 77-86

	T. Sreekumaran and A. Rajan (1977)	Pathology of the skin in experimental Hypothyroidism in goats	Kerala J. Vet. Sci 227-234
3	M. Krishnan Nair (1977)	Studies on endocystosis by chicken macrophage - Electron microscopic observations	Proc. Ind. Sci. Cong. 265-418
4	T. Sreekumaran and A. Rajan (1977)	Thyroid Pathology in experimental hypothyroidism	Indian J. Vet. Path. 2: 14-18
5	M. Krishnan Nair (1977)	The inflammatory exudate in granulomas	Proc. FAO International Seminar 2: 38-42
6	M. Krishnan Nair (1977)	Problems of prenatal mortality in India.	Proc. FAO International Seminar 2: 74.
7	T. Sreekumaran and A. Rajan	Clinical Pathology in experimental hypothyroidism	Vet. Path. 15:549.
8	**Department of Pharmacology**		
1	Zacharias Cherian M. P. Jose and Jayakumar	Trials with Decaris Tetracap and Bifuran on ancylostomiasis in dogs	Kerala J. Vet. Sci 8:71-72 (1977)
2	P. Marykutty and K. P. D. Nair	Influence of siquil (Trifluopromzine hydrochloride) on barbiturate Anaesthesia in dogs	Kerala J Vet Sci. 8: 61-64
9	**Department of Physiology and Biochemistry**		
1	M. G. Ramakrishna Pillai and G. Venugopal (1977)	Aminonitrogen content in the developing chick embryo	Kerala J. Vet. Sci 8:47-54
2	P. K. Ismail, G. Nirmalan and S G. Nair (1977)	Separation of alkaloids in fodder grasses by paper partition chromatography.	Kerala J Vet Sci. 8: (2) 55-60
10	**Department of Poultry Science**		
1	A. K. K Unni, B. R. Krishnan Nair and G. Reghunathan Nair (1977)	Studies on the sexual dimorphism in shank length ank its relationship with body weight in broiler breeds of poultry	Kerala J Vet Sci. 8: (2) 167-172
2	Sabarinathan Nair, R. A. Ramakrishnan, C. K. Venugopalan, and A.K.K. Unni (1977)	Effect of certain feed additives on broiler performance (1) processing yields and losses and economics.	Kerala J Vet Sci. 8:(2)(139-144)
3	A.K K. Unni, G. Reghunathan Nair, and A. Ramakrishnan 1977.	A preliminary note on the efficacy of methadilazine in broiler production	Kerala J. Vet. Sci. 8 (2): 153:156
4	P. U. Surendran, A. K. Kochugovindan Unni and A. Ramakrishnan (1977)	Studies to exploit heterosis in broiler production	Kerala J. Vet. Sci. 8 (1) 9-14.
11	**Department of Statistics**		
1	P,U. Surendran, K.L.Sunny and P V Prabhakaran (1977)	Prediction of weekly rain fall of a place.	Agri. Res. J. Kerala 15 (1);47-55
2	P. U. Surendran, A K Kochugovindan Unni and A Ramakrishnan (1977)	Studies to exploit heterosis for broiler production	Kerala J. vet. Sci. Vol. (8) 1: 9-14.
3	P. U. Surendren (1977)	Certain factors inducing imbalance in the economic development of Kerala	Indian Soc. Agri. Stat. 29 (1): 121-123

12 Department of Therapeutics

1	A. Rajan, M. Krishnan Nair, K. M. Alikutty, K. I. Mariamma and K. V. Valsala	Pathology of Necrosis of extremities in Bovinces. A disease resembling Degnala disease	Kerala J. 8 Vet. Sci. (1977) 8 (1): 77-78
2	Zacharias Cherian, M. P. Jose and K. M. Jayakumar	Clinical trials with Decaris, Tetraoap and Furaxone in Ancylostomiasis in Dogs	Kerala J. Vet. Sci. (1977) 8 (1): 71-72

APPENDIX-XI

Institute Of Agricultural Technology, Tavanur. List of academic staff

Associate Professor	Sri. P. K. Gangadhara Menon		
Assistant Professors	1. Sri. M. K. Mammen	Junior Instructors	2. Sri. K. John Thomas
	2. Dr George Mathew		1. Sri. Johnkutty
	3. Sri Alexander David		2. Sri. C. K. Prabhakaran Thampi
	4. Dr. C. Pythal		3. Sri. C. Rajan
Assistant Engineer	Sri. C. P Mohammed		4. Sri. V. V. Radhakrishnan
Instructors	1. Sri. A. M. Chandrasekharan Nair.		5. Sri. A. D. Joy
			6. Sri. P. C. Alex
			7. Sri. D. P. V. Mathai.

APPENDIX-XII

STAFF OF RESEARCH STATION

1. AGRICULTURAL RESEARCH

1 Coconut Research Station, Nileswar
- 1 Associate Professors (Agronomy, Entomology & Chemistry) 3
- 2 Assistant Profesors (Agronomy, Agrl. Botany & Plant Pathology) 3
- 3 Supporting staff 43

2 Coconut Research Station, Kumarakom
- Associate Professor (Plant Pathology) 1
- 2 Assistant Professor (Entomolgy and Plant Pathology) 2
- 3 Instructor (Agronomy) 1
- 4 Supporting staff 8

3 Coconut Research Station, Balaramapuram
- 1 Associate Professor (Agronomy) 1
- 2 Assistant Professor (Agrl. Entomology and Plant Pathology) 2
- 3 Supporting staff 9

4 Rice Research Station, Pattambi
- 1 Associate Professors (Agri. Botany and Chemistry) 2
- 2 Assistant Professors (Plant Pathology and Chemistry) 2
- 3 Instructor (Plant Pathology) 1
- 4 Junior Instructors 3
- 5 Supporting staff 72

5 Research on Rice, Mannuthy
- 1 Instructors (Agrl. Botany & Chemistry) 2
- 2 Junior Instructor (Agronomy) 1
- 3 Supporting staff 8

6 Rice Research Station, Kayamkulam
- 1 Associate Professor (Agrl. Botany) 1
- 2 Assistant Professor (Agronomy) 1
- 3 Assistant Professor (Agrl. Botany) 1
- 4 Junior Instructor (Plant pathology) 1
- 5 Junior Instructor (Entomology) 1
- 6 Supporting staff 13

7 Rice Research Station, Vyttila
- 1 Associate Professor (Agronomy & Agrl. Botany) 2
- 2 Supporting staff 7

8 Rice Research Station, Moncompu
1 Associate Professors (Agrl. Botany, Chemistry & Agronomy) 3
2 Assistant Professor (Entomology) 1
3 Supporting staff 10

9 Horticultural Research Station, Ambalavayal
1 Assistant Professor (Agronomy, Botany and Entomology) 3
2 Supporting staff 37

10 Pepper Research Station, Talipearamba
1 Assistant Professor (Agronomy, Chemistry & Botany) 3
2 Junior Instructor (Entomology) 1
3 Supporting staff 7

11 Cashew Research Station, Anakkayam
1 Associate Professor (Agronomy) 1
2 Assistant Professor (Plant pathology) 1
3 Supporting staff 6

12 Banana Resaerch Station, Kannara
1 Supporting staff 6

13 Lemongrass Research Station Odakkali
1 Associate Professor (Agronomy) 1
2 Assistant Professor (Agrl. Chemistry) 1
3 Junior Instructors (Botany & Chemistry) 2
4 Supporting staff 15

14 Cardamom Research Station, Pampadumpara
1 Assistant Professor (Chemistry & Entomology) 2
2 Supporting staff 9

15 Agronomic Research Station Chalakudy
1 Supporting staff 3

16 Agricultural Research Station, Karamana
1 Junior Instructor (Botany) 1
2 Supporting staff 2

17 Livestock Farm Mannuthy
1 Associate Professor (Nutrition) 1
2 Junior Instructor 1
3 Supporting staff 15

18 Livestock Farm Thiruvazhamkunnu
1 Associate Professor (Nutrition) 1
2 Instructor (Agronomy) 1
3 Junior Instructor 1
4 Supporting staff 27

19 Cattle Breeding Farm Thumburmuzhi
1 Assistant Professor 1
2 Supporting staff 11

20 Poultry Farm Mannuthy
1 Junior Instructor 1
2 Supporting staff 7

21 Pig Breeding Farm Mannuthy
1 Superintendent 1
2 Junior Instructors 2
3 Supporting staff 8

22 Mobile Veterinary Dispensary
1 Supporting staff 2

23 Veterinary Hospital Trichur 1
1 Superintendent
2 Supporting staff 6

II Research Projects/Schemes

1 Establishment of a unit project for Higher Education and Training in Food and Nutrition
1 Assistant Professors 2
2 Supporting staff 2

2 Establishment of Nematology Section
1 Assistant Professor 1

3 Establishment of Microbiology Section in the Department of Plant Pathology
1 Assistant Professor 1

4 Strengthening of the Department of Agricultural Economics.
1 Special Officer (Agrl. Economics) 1
2 Assistant Professor 1
3 Instructor 1

5 Post Graduate Course in Agrl. Extension
1 Associate Professor 1
2 Assistant Professor 1

6 Micro-nutrient Laboratory
1 Instructor 1

7 Applied Nutrition Programme
1 Junior Instructor in Nutrition 1
2 Supporting staff 1

8 Mobile Diagnostic Laboratory
1 Supporting staff 1

9 Extension Mobile Unit for expert service on sexual health control of cattle
1 Supporting staff 1

10 Improvement of Library facilities
1 Junior Instructor 1

11 Development of Livestock Farm, Thiruvazhamkunnu
1 Assistant Professor (Genetics) 1
2 Instructor (Dairy Science) 1
3 Assistant Professor (Obstetrics) & Gynaecology 1
4 Instructor (Pathology) 1
5 Supporting staff 9

12 Strengthening of College of Horticulture
1 Associate Dean 1
2 Associate Professor (Agro.Met Divn.) 1
3 Assistant Professors (Microbiology, Chemistry) 3
4 Supporting staff 29

13 Establishment of a Statistical Unit in the Main Campus.
1 Assistant Professor (Statistics) 1

2 Instructor 1
3 Supporting staff 3

14 Organisation of the Department of Fisheries
1 Professor 1
2 Assistant Professor (Fish culture) 1
3 Instructor (Fisheries) 1
4 Supporting staff 7

15 Establishment of Faculty of Basic Science and Humanities.
1 Dean 1
2 Supporting staff 1

16 Instrumentation Centre
1 Professor of Instrumentation 1
2 Instrumentation Engineer 1
3 Supporting staff 1

17 Faculty of Forestry
1 Special Officer (Forestry) 1
2 Supporting Staff 1

18 Research on Pepper, Vellanikkara
1 Junior Instructor (Entomology) 1
2 Supporting staff 4

19 Fodder Research & Development Centre
1 Assistant Professor (O & G) 1
2 Instructor in Agronomy 1
3 Supporting staff 9

20 Research on Dry Land Farming in Chittoor Block
1 Supporting staff 1

21 Providing supporting staff to K A D P
Supporting staff 13

22 Scheme for the investigation on the incidence, nature and magnitude of infertility conditions among crossbred cattle in Kerala.
1 Instructor 1
2 Junior Instructor 1
3 Supporting staff 2

23 Establishment of Duck Farm for training and Research.
1 Supporting staff 1

24 Scheme for the investigation of microbial ateology of infectious abortions in Livestock
1 Junior Research Officer/Instructor 1
2 Junior Instructor 1
3 Supporting staff 2

25 Scheme for studying the possible changes in the Eco-system of Kuttanad consequent on the construction of Thanneermukkom Barrier.
1 Instructor in Agronomy 1
2 Supporting staff 4

26 Integrated Research Project on mixed farming of Coconut, Livestock and Fish, Kumarakom.
1 Junior Instructor (Vety. Scince) 1
2 Junior Instructor (Fisheries) 1
3 Supporting staff 3

27 Train ng Service (DEE) Vellayani/Tavanur
1 Assistant Professor (Agrl. Extension) 2
2 Assistant Professor (Agronomy) 1
3 Junior Instructor 2
4 Supporting staff 6

28 Communication Centre
1 Information Officers (Asst. Professors) 2
2 Supporting staff 3

29 University Press
1 Press Manager 1
2 Supporting staff 13

30 Livestock Assistants Training course
1 Assistant Professor 1
2 Junior Instructors 2

31 Diploma Course in Agriculture
1 Instructor in plant Pathology 1
2 Junior Instructor (Agronomy) 1
3 Supporting staff 1

32 Organisation of the Department of Students Welfare
1 Director of students welfare 1
2 Deputy Director of students welfare 1
3 Lady Lecturer-in -Physical Education 1

33 Operational Research Project on Integrated Control of Rice Pests in Kuttanad
1 Associate professor (Entomology) 1
2 Assistant Professor (Plant Pathology) 1
3 Instructor in Entomology 2
4 Junior Instructors 2
5 Junior Statistician 1
6 Supporting staff 2

34 A. I. C. P. in National Demonstration on major food crops, Trichur.
1 Associate Professor (Agronomy) 1
2 Asst. Professor (Entomology, Chemistry & Agrl. Engg) 3
3 Supporting staff 2

35 Project for development of rice varieties resistant to BPH & GSV Pattambi/Moncomp.
1 Associate Professor (Botany) 1/1
2 Assistant Professor (Entomology & Agronomy) -/2
3 Junior Instructors 1/3

36 Scheme forr aising Azotobactor Nurseries to bring about more fixation of Nitrogen
1 Research Fellows 2

37 AICRP on Nematode Pests and their control
1 Associate Professor (Nematologist) 1
2 Junior Instructors 2
3 Supporting staff 2

38 AICRP on biological control of crop pests.
1 Professor of Entomology 1
2 Instructors (Sr. Tech. Assistants) 2
3 Supporting staff 3

39 Project for studies on the pests of stored cashew and their control (sponsored by CEPC Cochin)
- 1 Supporting staff 1

40 Model Agronomic Centre, Karamana
- 1 Associate Professor (Agronomy) 1
- 2 Supporting staff 5

41 Research on Cardamom, Pampadumpara
- 1 Associate Professor (Plant Pathology) 1
- 2 Assistant Professor (Botany) 1
- 3 Instructor (Plant Pathology) 1
- 4 Junior Instructor (Botany) 1
- 5 Supporting staff 4

42 Research on Pepper
- 1 Associate professor (Botany) 1
- 2 Assistant Professor (Plant Pathology) 1
- 3 Instructor (Plant Pathology) 1
- 4 Supporting staff 5

43 Research on Cashew, Mannuthy/Anakkayam
- 1 Associate Professor (Botany) 1
- 2 Junior Instructor (Botany) 1
- 3 Supporting Staff 3

44 AICRIP–Double Cropping Main Centre, Pattambi
- 1 Associate Professors (Pathology, Entomology, Botany & Agronomy) 4
- 2 Assistant Professors (Pathology, Entomology, Botany & Agronomy) 4
- 3 Supporting staff 6

45 Special Disease and Pest Research Sub Centre, Moncompu.
- 1 Associate Professor (Plant Pathology) 1

46 Double Cropping Sub Centre, Mannuthy
- 1 Associate Professor (Agronomy) 1

47 AICARP–Staff at Headquarters
- 1 Associate Professor (Agronomy) 1
- 2 Assistant Professor (Agrl. Chemistry & Agrl. Statistics) 2
- 3 Junior Instructor 3
- 4 Supporting staff 1

48 Research Project at Malappuram
- 1 Assistant Professor (Agronomy) 1
- 2 Supporting staff 11

49 Research Project at Karamana, Trivandrum
- 1 Assistant Professor (Agronomy) 1
- 2 Supporting staff 11

50 AIC Fruit Improvement Project, Kannara
- 1 Associate Professors (Botany, Horticulture, Plant Pathology) 3
- 2 Assistant Professors (Agronomy, Botany & Entomology) 3
- 3 Junior Instructors (Agronomy, Botany, Chemistry, Entomology & Plant Pathology) 5
- 4 Supporting staff 1

51 Research on Forage Crops Vellayani 1
- 1 Assistant Professor (Agronomy)
- 2 Junior Instructor (Agronomy) 1
- 3 Supporting staff 5

52 Integrated Research project on Water Management & Soil Salinity Chalakudy
- 1 Associate Professor (Agrl. Chemistry Agronomy & Agrl. Engineering) 3
- 2 Junior Instructors 4
- 3 Supporting staff 6

53 AIC Floriculture Improvement Project
- 1 Associate Professor (Botany) 1
- 2 Junior Instructors (Botany) 2
- 3 Supporting staff 1

54 AIC Coconut and Arecanut Improvement Project
- 1 Associate Professor (Botany) 1
- 2 Instructor (Agrl. Entomology) 1
- 3 Junior Instructor (Botany) 1

55 AICRP on Sugarcane
- 1 Associate professor (Agronomy) 1
- 2 Junior Instructor (Agrl. Botany) 1
- 3 Supporting staff 1

56 AICP for improvement of tuber crops (other than potato)
- 1 Assistant Professor (Agronomy) 1
- 2 Junior Instructor (Agronomy) 1
- 3 Supporting staff 1

57 AICFIP Citrus Die-back centre H. R. S. Ambalavayal
- 1 Associate Professor (Agrl. Botany) 1
- 2 Assistant Professor (Plant Pathology) 1
- 3 Junior Instructor (Botany & Chemistry) 2
- 4 Supporting staff 4

58 AIC project for intensificaion of research on pulses Pattambi
- 1 Assistant Professors (Botany & Agronomy) 2
- 2 Junior Instructors 4
- 3 Supporting staff 7

59 Scheme for the study of incidence, etiology and pathology of tumours of the ethimoid in domestic animals
- 1 Professor (Pathology) (Project Officer) 1
- 2 Associate Professor of Virology 1
- 3 Supporting staff 3

60 Scheme for investigation of Agricultural Byeproducts for evolving economic ration for livestock feed
- 1 Associate Professor 1
- 2 Assistant Professors 2
- 3 Instructor 1
- 4 Junior Instructors 2
- 5 Supporting staff 12

61 AIC Research project on Goats
1 Associate Professor (Genetics & Nutrition) 2
2 Assistant Professors (Pathology Genetics & Farm Management) 3
3 Assistant Professor (Statistics) 1
4 Junior Instructors 3
5 Supporting staff 34

62 AICRP on Poultry
1 Professor of poultry Science 1
2 Associate Professor (Nutrition) 1
3 Assistant Professor (Farm manger, Poultry) 1
4 Assistant Professor (Jr poultry pathologist) 1
5 Assistant Professor (Jr. poultry Geneticist, 1
6 Assistant Professor (Statistician) 1
7 Junior Instructors 3
8 Supporting staff 22

63 AIC Research Project on Brackish water Fish Farming
1 Associate Professor of Fisheries 1
2 Junior Instructors (Biology & Chemistry) 2
3 Supporting staff 6

64 Kerala Agricultural Development Project Research and Training by K. A. U.
1 Professors 4
2 Associate Professors (Chemistry, Instrumentation, Radiology) 3
3 Assistant Professors 5

65 Maintenance of Vellanikkara estate
1 Supporting staff 21

APPENDIX - XIII

LIST OF PUBLICATIONS BY THE RESEARCH STAFF

Rice Research Station, Pattambi

K. I	James and P. A. Varkey	Prospects of rice breeding in Kerala	Paper presented at the Golden Jubilee Symposium at R. R. S. Pattambi
2	K. I. James and P A. Varkey	Breeding for resistance to Brown Plant Hopperand Grassy Stunt in Kerala	IRRI News Letter, February, 1977
3	R. R Nair, T. F Kuriakose and N Saifudeen	Studies on the Management requirements of over aged rice seedlings	Paper presented in the Golden Jubilee Symposium at Pattambi.
4	T. F. Kuriakose	Yield potential of three early rice culture in the southern rice tract of Kerala	,,
5	P. N. Pisharody M. S. Nair, R. R. Nair and S. Seshadrinath	Investigations on phosphate and potash manuring of transplanted rice	,,
6	S. Seshadrinath, P. N. Pisharody and S. Pushkala	Effect of continuous application of organic manures and inorganic nitrogenous fertilizer with and without phosphorus and potash on the growth and yield attributes of tall indica rice in wet lands	,,
7	Sitharama Rao and N. Mohandas	Seedling dip treatments with slurries containing systemic insecticides on the control of pests of rice	,,
8	C. C. Abraham and B. Thomas	Efficiency of root zone application of water solutions of carbofuran in controlling insect pests of rice	Paper presented in the Golden Jubilee Symposium at Pattambi

9	K. Karunakaran and P. A. Varkey	Chlorophyll mutation yields of earlier and later tillers in rice	Agrl. Research Journal of Kerala 1977 15 (2) pp. 186-187
10	S. Seshadrinath	Efficacy of certain weedicides in rice culture	Paper presented in Indian Science Congress 1978
11	S. Seshadrinath	Efficacy of certain soil amendments in rice soils of Kerala	Paper presented in Indian Science Congress 1978
12	B. Thomas and K Karunakaran	Chemical control of the leaf roller	Kerala Agrl. Research Journal
13	N. Gopalan	Rice Research Station, Pattambi	Intensive Agriculture, November 1977
14	P. A. Varkey, T. C. Ramakrishnan and V. P. S. Dev.	Long term storage of paddy seeds	Agr. Res. J. Kerala 1977 15 (2): 200-201
15	V. P. Sukumara Dev, T. Samraj and M. R. Menon	Mosaic disease of horsegram (*Dolichos biflorus* L)	Agri. Res. J. Kerala 1977 15 (1): 33-36
16	R. R. Nair, K. K. Vidyadharan, P. N Pisharody and R. Gopalakrishnan	New herbicides on the control of weeds in direct seeded flooded rice	Pesticides Vol. XI, No.8, 1977
17	R. R. Nair, P. N. Pisharody and R. Gopalakrishnan	Economics of intensive cropping in double crop wet lands	Agri. Res. J. Kerala 1977 15 (2): 147-153
18	R. R. Nair, G. R. Pillai, P. N. Pisharody, and R. Gopalakrishnan	Investigations on the effect of heavy manuring of rice seed beds	Agri. Res. J. Kerala 1977 15 (2): 154-159
19	R. R. Nair, P. N. Pisharody, M. S. Nair and R. Gopalakrishnan	Influence of chronological age of seedlings at planting on the yield and yield attributes of rice	Food Farming and Agriculture Aug. 1977 Vol. IX
Rice Research Station Moncompu			
1	K. P. V. Nair and S. S Nair	Population fluctuation of Brown Plant Hopper in Kuttanad	International Rice Research News Letter 5/77
2	Thomas Varghese (1978)	Fractionation of soil potassium as an index of pedogenesis in the high altitude plantation crop soils of Western Ghats of Kerala	Paper presented in the plantation crop symposium, Kottayam, 1978
3	Thomas Varghese (1978)	Effect of geomorphological and climatic factors on the soil formations of Kerala	Report of the Seminar on the Geomorphology of Kerala organised by G. S. I.
4	K. V. Mammen (1977)	Occurrence of rice mealy bug in Kerala	I. R. R. I. News Letter 11 (2): 14-115
5	K V. Mammen (1977)	*Coccinella arcuata* as a predator of rice hrips in Kerala	Agri. Res. Journal of Kerala 15 (2): 195-196
6	K. M. Rajan (1977)	Population of *Pythium aphanidernatum* in soil in relation to saprophytes under organic amendments	Paper presented at the Symposium organised by the A. M. I. Madurai, October, 1977
7	K. M. Rajan (1977)	Certain chemical constituents of tapioca leaves in relation to susceptability to leaf spot disease	Journal of root crops Vol. III 1977

8 P. V. Nair and K. M. Rajan (1977)	Influence of manuring and spacing on the incidence of sheath blight disease and yield of paddy	Paper presented at the symposium on rice research and development at Pattambi, December, 1977
Rice Research Station & Instructional Farm, Mannuthy		
V. K. Sasidhar, V. Ramachandran Nair and N. Sadanandan	Effect of different methods of planting on the tuber yield of Malayan-4 tapioca variety.	J. Root Crop, 1977, Vol. 3 (1): 57-58
Coconut Research Station, Nileswar		
1 K. Kannan, P. K Narayanan Nambiar and K. P. P. Nambiar (1977)	Studies on spacing in coconut	Ind Coconut J VIII (2) 1-2
2 K. Kannan and K. Sudhakaran (1977)	Further studies on interplanting Cocoa in coconut garden	Ind. Coconut J. VIII (4) 1-3
Coconut Research Station, Kumarakom		
1 G. Mathai	Rats in coconut garden devise for mechanical catching	Indian coconut Journal Jan. 1978
2 G. Mathai	Effect of fungicides and silica on the control of sheath blight of rice caused by *Corticium sarakili*	Presented at the Symposium on Rice Research and development held at Rice Res. Station. Pattambi during December. 1977
Coconut Research Station, Balaramapuram		
1 Dr. K. M. Sukumaran, E. J. Thomas K. S. Remamoney	Studies on the response of coconut palms during early bearing stage on N P K in the red soil	Paper presented in the symposium on Plantation Crops held at Kottayam in 1978
2 K. S. Remamoney and Dr. C. C. Abraham	New record of *Pachypeltis measarum* (Kir kaldy) (Miridae, Hemiptera) as a pest of cashew in Kerala	Science and Culture Vol. 43, December, 1977
Cordamom Research Station, Pampadumpara		
1 K. I. Wilson, D Joseph, M A. Rahim and M. R G. K. Nair	Use of sum newer insecticides for the control of cardamom thrips *Sciothrips cardamomi* (Ramk)	Agri. Res. J Kerala 1977. 15 (2)
Lemongrass Research Station, Odakkali		
1 E. V. G Nair and K Chandrasekharan Nair	Review on the studies conducted on *Cymbopogon* spp. at the Lemongrass Research Station, Odakkali	Indian Perfumer Vol. XXI (3) (1977)
Pepper Rosearch Station, Panniyur		
1 V. Sukumara Pillai, S. Sasikumaran and P. K. Venugopalan Nambiar	A note on Preliminary observation of Spike Shedding in Pepper	Agres. Spices Bul. VIII (4) 93-94

2	V. Sukumara Pillai, S Sasikumaran and P. K. Venugopalan Nambiar	Studies on the effect of Planofix application on Pepper	Agri Res. J Kerala (1977). 15 (1) 56-58)

Banana & Pineapple Research Station, Kannara

1	G. R. Pillai, S. Balakrishnan, P. G. Veeraraghavan G. Santhakumari and R. Gopalakrishnan	Response of Nendran banana to different level of N, P and K	Agri. Res. J Kerala 1977. 14 (1) 37-50
2	K. K. R. Nair, D. Joseph and S. Balakrishnan	Control of banana rhizome weevil (*Cosmopolites Sordidus and banana aphid* (*Pentalonia nigronervosa*) by the use of granular systemic insecticides	Agri. Res. J Kerala 1977. 15 (1) 97

Pineapple

S. Balakrishnan, P. G. Veeraraghavan and M. Natarajan	Influence of planting suckers in the level ground and in trenches on fruit yield of pineapple	Agri. Res. J Kerala 1977 : 15 (2) 190

APPENDIX - XIV

List of Extension Education Personnel

Director of Exteasion Education. : Dr. V. S. S. Potti.

Public Relations Officer : Sri. V. K. Moideen Koya

Assistant Registrar (Tech) : Dr. T. R. Sankunny

Commmnication centre

Assistant Professor (Information-I) : Sri. K. C. Varghese

Assistant Professor (Information-II) : Sri. P. Ramachandran Nair

National Demnostration Scheme

Associate Professor (Agronomy) : Sri. A. I. Thomas

Assistant Professor (Entomology) : Smt. Sumangalakutty Amma

Assistant Professor (Agri. Chemistry : Sri P. A. Korah

Training

Assistant Professor (Agrl .Chemistry) Smt. N. P. Chinnamma : (1-4-77 to 31-3-78)

Institute of Agricultural Technology, Tavanur

Special Officer : Sri. P. K. Gangadhara Menon

APPENDIX-XV

LIST OF MEMBERS OF STAFF IN THE DIRECTORATE OF PHYSICAL PLANT

Sl. No.	Name of post	Scale of pay.	No.of sanctioned posts	No.of posts filled up.	Vacant
1	Director of Physical Plant	1400- 1800	1	1	—
2	Personal Assistant to DPP	560- 1100	1	1	—
3	Financial Assistant	560- 1100	1	1	—
4	Junior Engineer	465- 775	2		2
5	Head Draftsman	435- 775	1	1	—
6	Junior Superintendent	405- 660	1	1	—
7	Draftsman Grade-I	330- 575	1	1	—
8	Head Clerk	330- 575	1	1	—

9	Stenographer Grade-1	325- 660	1	1	—
10	U. D Clerk	275- 575	4	4	—
11	U. D. Typist	275- 575	2	2	—
12	Tracers	230- 385	2	—	2
13	L.D. Clerk	230- 385	4	4	—
14	L.D. Typist	230- 385	1	1	—
15	Driver	215- 370	1	1	—
16	Blue Printer-cum-Sterio Operator/Amonia Printer	210- 340	1	1	—
17	Peon	196- 265	1	1	—

1	2	3	4	5	6
II.	**Execution**				
1	Architect	850-1450	1	1	—
2	Assistant Engineer	560-1100	4	4	—
3	Junior Architect	560-1100	1	vacant from 3/75	
4	Divisional Accountant	495- 835	1	vacant	
5	Draftsman Grade-I	330- 575	22	19	3
6	Junior Engineer	465- 775	14	13	—
7	Electrician-cum-Mechanic	285- 550	1	1	—
8	U D. Clerk	275- 525	8	7	1
9	U. D. Typist	275- 525	2	1	1
10	Bull Dozer Driver	275- 525	1	1	—
11	Road Roller Driver	240- 445	1	1	—
12	Fitter-cum-Mechanic	240- 445	1	—	1
13	Tracer	230- 385	2	—	2
14	Plumber	230- 385	1	1	—
15	L. D. Clerk	230- 385	8	8	—
16	L. D. Typist	230- 385	3	3	—
17	Driver	215- 370	1	1	—
18	Pump Operator	215- 370	3	3	5
19	Peon	196- 265	9	4	—
20	Cleaner	196- 265	2	2	5
21	Watchman	196- 265	3	3	—
22	Helper to Electrician	196- 265	1	—	1

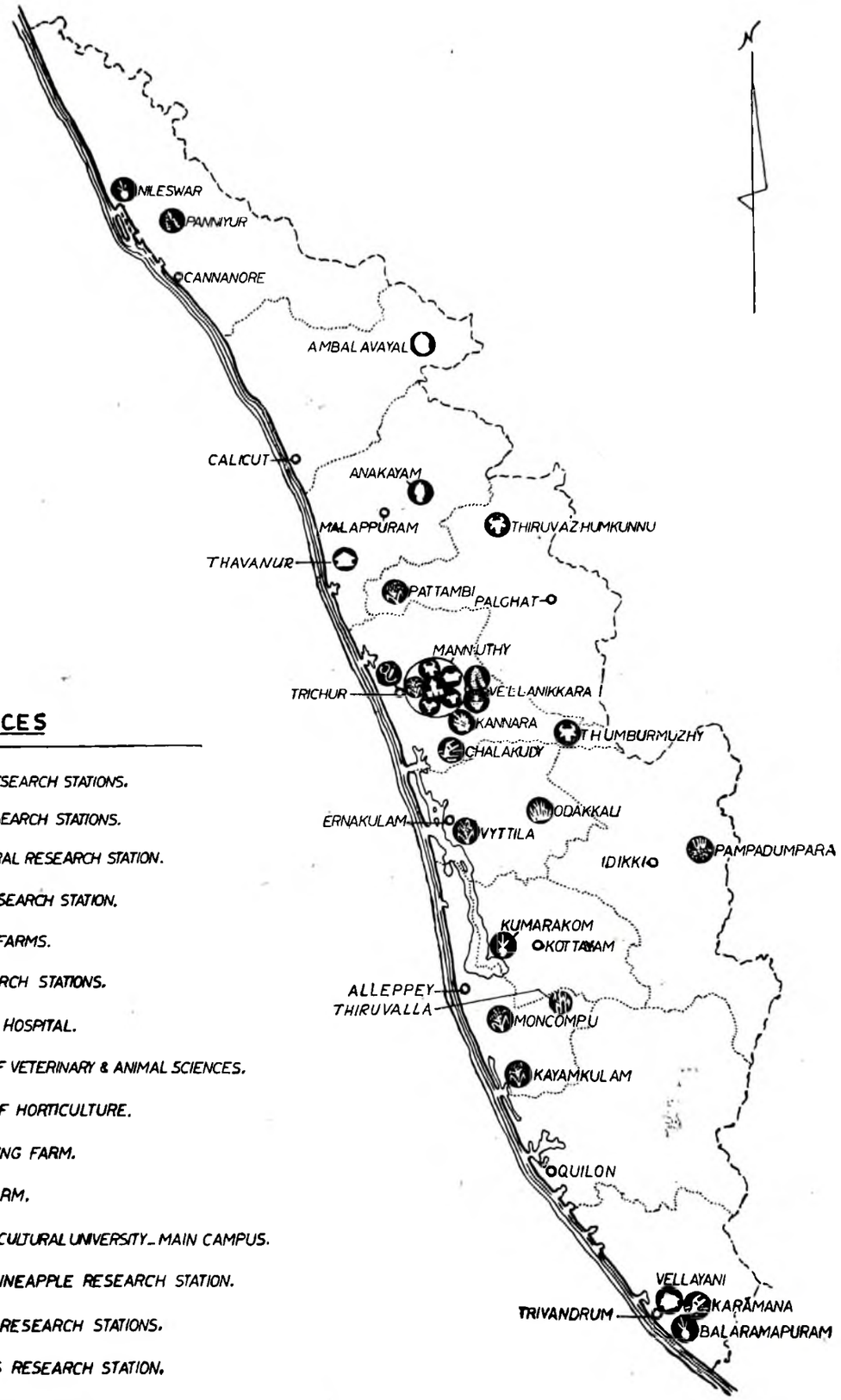
APPENDIX - XVI

ANNUAL STATEMENT OF RECEIPTS AND EXPENDITURE FOR 1977-78

RECEIPTS		EXPENDITURE	
A. General Fund		A. General Fund	
I. Statutory grant from State Govt.		I Direction	43,70,902.62
(a) Non-plan	158,58,000.00	II Resident Teaching	
(b) Plan	70,00,000.00	1 Colleges	68,57,728.30
II. Grant from other sources		a) Agrl. College; 32,35,293.72	
(a) I. C. A. R.	77,96,294.52	b) Vety. College; 22,37,309.89	
(b) Other sources	4,63,138.95	c) Hort. College; 7,85,124.69	
III Income from fees	7,06,753.20	68,57,728.30	
IV Income from University properties	41,34,149.24	2 Rural Institute, Tavanur and attached units	
V Income from Investment	2,042.04	III. Research	9,62,684.36
VI Other Miscellaneous Income	3,19,958.44	a) Direction	
Total. A. General Fund	362,80,336.39	b) Agrl. Research	34,54,750.71
B. Debt & Suspense Account	36,96,073.56	c) Research on Vety. & Animal Sciences	22,41,677.27
Total A + B	399,76,409.95	IV Plan Schemes including ICAR assisted schemes (According to the recommendations of Visiting Team)	127,02,560.99
		V. Schems/Projects sponsored by ICAR and other Agencies	
		a) Agrl. Research	24,01,924.27
		b) Veterinary Research	13,34,248.51
		c) Research on Fisheries	84,838.67
		d) National Demonstration	23,492.81
		e) K. A. D. P.	3,73,838.18
		VI. Maintenance of Vellanikkara Estate	7,96,375.90
		VII. Contribution for pension fund	3,75,000.00
		Total A. General Fund	359,80,022.59
		B. Debt and Suspense Account	51,85,773.26
		Total A + B	411,65,795.85
Add opening balance	31,88,946.28	Add closing balance	19,99,560.38
GRAND TOTAL	431,65,356.23	GRAND TOTAL	431,65,356.23

KERALA AGRICULTURAL UNIVERSITY

CAMPUSES, INSTITUTIONS & RESEARCH STATIONS.



REFERENCES

- COCONUT RESEARCH STATIONS.
- PEPPER RESEARCH STATIONS.
- HORTICULTURAL RESEARCH STATION.
- CASHEW RESEARCH STATION.
- LIVESTOCK FARMS.
- RICE RESEARCH STATIONS.
- VETERINARY HOSPITAL.
- COLLEGE OF VETERINARY & ANIMAL SCIENCES.
- COLLEGE OF HORTICULTURE.
- PIG BREEDING FARM.
- POULTRY FARM.
- KERALA AGRICULTURAL UNIVERSITY_MAIN CAMPUS.
- BANANA & PINEAPPLE RESEARCH STATION.
- AGRONOMIC RESEARCH STATIONS.
- LEMONGRASS RESEARCH STATION.
- CARDAMOM RESEARCH STATION.
- COLLEGE OF AGRICULTURE.
- INSTITUTE OF AGRICULTURAL TECHNOLOGY.
- SUGARCANE RESEARCH STATION.
- DISTRICT HEADQUARTES.