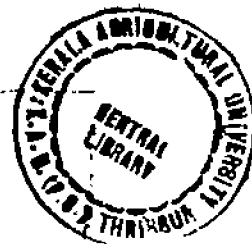
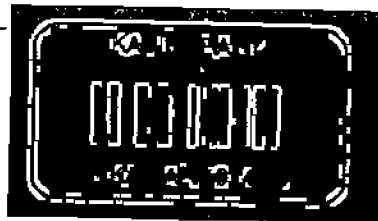


ANNUAL REPORT

1974-75

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KERALA AGRICULTURAL UNIVERSITY

MANNUTHY - 680 651 - KERALA

(ENGLISH)

ANNUAL REPORT 1974-75

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Kerala Agricultural University

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Kerala Agricultural University



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INTRODUCTION

The Executive Committee presents to the General Council under Section 57 (1) of K. A. U. Act (Act 33 of 1971) the third Annual Report on the working of the University. This annual report covers the period from 1-4-1974 to 31-3-1975 and is arranged in two parts - Part I relating to organisation and general administration of the University and Part II relating to research studies.

The administrative set up of the University continued unchanged except for the following:-

- 1 The term of appointment of Dr. M. R. G. K. Nair as Director of Research was over on 17-7-1974 and Dr. R. Gopalakrishnan, Rice Specialist held full additional charge of the post of Director from that date onwards.
- 2 The term of appointment of Dr. V. S. S. Potti as Director of Extension Education ended on 13-9-1974. He was appointed as Deputy Director till 26-12-1974. Thereafter, he was again appointed as Director with effect from 26-12-1974.

During the year, the General Council held 3 meetings including one special meeting, the Executive Committee 10 meetings and the Academic Committee two. The other 13 sub-committees constituted by the Executive Committee met according to necessity.

The Finance Committee, the Appointment Sub Committee, the Service Advisory Committee and the Campus Planning Committee were reconstituted.

The objective in establishing the University, is that, development of Agriculture in the State by furthering the advancement of learning and the prosecution of research and undertaking extension education is being achieved by the activities of the three constituent colleges, the 23 research stations and the Extension Education Wing. While Colleges of Agriculture and Veterinary & Animal Sciences offered both under graduate and post-graduate courses of studies, the College of Horticulture offered only under-graduate course.

Dr. Sam Raj continued as Dean, Faculty of Agriculture till 17-7-1974. He assumed charge of the post of Principal, College of Agriculture from that date and held full additional charge of the Dean till the date of superannuation on 28-2-1975. Dr. N. S. Money was appointed as Dean, Faculty of Agriculture from 1-3-1975. Eightythree students were admitted in this college to the first year B. Sc. (Ag) degree course. Ten students were admitted to the first year M. Sc. degree course. Seventeen students were also admitted to full time Ph. D. course and one student for part-time Ph. D. course. The total student strength in the College was 266. Fiftyfive students graduated during the year.

A total number of 139 scholarships were awarded to the students.

The students participated in the "Earn While You Learn" and "Work Experience" programme. The College Union consisted of 14 elected student representatives and Dr. N. S. Money, Dean was the Patron.

The members of the staff of this College participated in various seminars and conferences.

The departments in the College undertook studies on 37 research schemes. The Agriculture Extension Department continued to publish the 'Agres News'. The Plant Pathology Department conducted studies on sheath blight of rice and soil amendments. The Agricultural Engineering Department handled a scheme for establishment of a repair workshop and maintenance section and the Statistics Department analysed 22 sets of data.

The Agricultural College Farm distributed seeds of different high yielding varieties of paddy. A total number of 1,14,604 coconuts was produced in the farm. Eight thousand quality coconut seedlings were distributed during the year. Thirtytwo tonnes of tapioca were produced. Three thousand five hundred and sixty six sheets of rubber weighing 1415 Kgms were also produced from the rubber trees grown in the farm. Two thousand six hundred and ninety

three ornamental plants were also distributed during the year. Three thousand six hundred and eighty kilograms of vegetables were sold. Three thousand nine hundred and seventy two seedlings of fruit plants were also distributed from the farm. The farm has perfected the technique of grafting jack and 394 grafts of 'Muttam Varika' were distributed.

Dr. K. C. Naik was in charge of Dean, College of Horticulture till June 1974. Thereafter, Dr. V. S. S. Potti, Director of Extension Education took charge and continued to be so during the year. The total student strength in the College was 58. Scholarships were given to 37 students.

The Instructional Farm in the Horticultural College has 35 varieties of Mango of known parentage. There is a collection of ornamental plants. Commercial production of fruit and ornamental plants has been taken up in the farm.

The College of Veterinary & Animal Sciences also offered under-graduate and post-graduate courses of study. Dr. C. T. Peter continued as Dean till 31-5-1974. Dr. A. Venugopalan, Professor of Surgery held additional charge of Dean from 1-6-1974 to 3-2-1975. Dr. P. G. Nair took charge as Dean on 4-2-1975. Fortyfour students were admitted to the B. V. Sc. course in 1974-75 ; out of which one student was from Nepal and another from Lakshadweep. Fifteen students were admitted for post-graduate course. The total student strength in the College was 175, out of which 122 was in the trimester system and 53 under the traditional system. Thirty one students acquired B. V. Sc. degree under the traditional system. Two were awarded the Ph. D. degree. The students were awarded educational concessions.

The students were given practical training at Veterinary hospitals and livestock farms. Seven thousand nine hundred and four cases were treated in the Veterinary hospitals; 528 operations were performed; 5954 vaccinations were done and 4231 samples of clinical materials were examined. Some of the students were selected for the University athletic and ball badminton teams to participate in the Inter-University programme. Extra-curricular activities were arranged by the Students Union. The members of the staff attended 9 seminars during the year. Fiftyone papers were published. An Employment Information and Guidance Bureau was started during the year. Twentyseven research schemes were undertaken by the departments in the College.

The research stations were engaged in conducting research on rice, coconut, pepper, cardamom, ashew, pineapple, banana, etc. The rice research

stations conducted three hundred and sixty four experiments on various aspects of rice cultivation. The coconut research stations conducted thirtyone experiments on problems relating to coconut. Experiments were also conducted on pulses, oil seeds, lemongrass, cardamom, pepper, cashew, pineapple and banana. A scheme for biological control of African Payal was also undertaken by the University.

The following are the All India Co-ordinated Research Projects undertaken by the University.

- 1 All India Co-ordinated Agronomic Research Project, Malappuram.
- 2 All India Co-ordinated Agronomic Research Project, Karamana.
- 3 All India Co-ordinated Agronomic Research Project, Staff at Headquarters, Pattambi.
- 4 All India Co-ordinated Spices & Cashewnut Development Project, Research on Pepper, Taliparamba.
- 5 All India Co-ordinated Spices and Cashewnut Improvement Project - Research on Cardamom at Pampadumpara.
- 6 All India Co-ordinated Spices & Cashewnut Development Project - Research on Cashew, Mannuthy.
- 7 Scheme for Model Agronomic Research Station, Karamana.
- 8 All India Fruit Improvement Project, Kannara.
- 9 All India Co-ordinated Rice Improvement Project, Pattambi.
- 10 ICAR Co-ordinated Scheme for Research on new cropping patterns and water use in selected command areas, Chalakudi.
- 11 Co-ordinated Project for Research on 'Forage Crops, Vellayani.
- 12 All India Co-ordinated Research Project for Investigation on Agricultural By-products and industrial Waste Materials for Evolving Economic Rations for Livestock.
- 13 All India Co-ordinated Research Project on Goats for Milk Production, Trichur Centre.
- 14 Co-ordinated Scheme for Studies on Porcine Enteroviruses in Pigs.

The University has intensified the research on rice in the Rice Research Stations in different agro-climatic conditions. Till the end of 1974, 42 strains were evolved. These varieties surpassed the traditional varieties in yield. The seeds produced in the Research Stations met almost all the requirements of seeds in the State Seed Farms of the Agriculture Department. Comparative yield trials showed that

the Maharashtra strains namely, Sathya, Surya and Suhāsini, are more susceptible to pests and diseases. Intensive rotational trial in terraced uplands showed that rice followed by rice is the best crop rotation. Seedlings aged 35 days produced the highest yield in the first crop season and during the second crop season, younger seedlings were found to be more productive. The results of experiments on moderate nitrogen technology showed that application of Nitrogen, 50% basal, 25% after 45 days and 25% at panicle initiation gave the highest grain yield.

Trials with granular insecticides showed that Thimet and Furadan were most effective. The effectiveness of different fungicides in the control of blast showed that Hinosan was better in controlling the disease. Trial on multi-resistant varieties showed that Cultures No. 20-11-6-25-3 and 20-71-795-1-5 were resistant to major pests and diseases. The Culture M-11-57-5-1 (cross IR.8 x Ptb.20) was found to be resistant to brown plant hopper.

The total area under coconut cultivation in the State is estimated as 7.45 lakh hectares. According to the statistical data available, yield of coconut per hectare has been declining gradually. The pests and diseases affecting the coconut plantations are the major reasons for this state of affairs. The University is engaged in research to combat the pest and diseases and also for evolving high yielding varieties suited to different agro-climatic conditions. Several improved varieties were evolved at the Coconut Research Station, Nileswar. Studies on comparative performance of hybrid varieties showed that the hybrid Laccadive Ordinary x Gangabondam is superior to all other varieties.

Research on horticulture is mainly confined to banana, pineapple, pepper, ginger, cardamom and cashew. Varietal trials on comparative merits of four improved dwarf cavendish clones showed that Monsmarie recorded the highest yield followed by Giant Governor. Cultural and manurial experiments in pineapple including the effect of application of growth regulators are in progress. Inter-varietal hybridization involving 9 parental combinations of pepper have been done during the year. Studies on spike shedding in pepper also continued. Studies on 'Katte' and 'Azhukkal' disease of cardamom continued at the Pampadumpara Research Station. At Cashew Research Station at Anakkayam, studies on evolution of better varieties of cashew were continued. The research at the Horticultural Research Station, Ambalavayal yielded useful results. For Mandarin orange, the best root stock was found to be rough lemon. In ginger, 30 varieties could be collected from various parts of the country and

abroad. The varieties Rio-de generio, Maran, China and Wynad were found to be high yielders. The results of varietal trial on gingelly indicated that multipoded mutant is the highest yielder. Comparative yield trial on Lemongrass showed that OD 367 gave the highest grass and oil yield.

Biological control of African Payal showed that, though it is economical, it is a slow process. It would be advantageous to investigate simultaneously the mechanical and chemical control measures. But a permanent control can be achieved only by biological means.

Animal Science research on different aspects of feeding management and disease control of animals is being done at the Veterinary College, Mannuthy. The farms in the Mannuthy Campus undertook research on feeding pigs, poultry and goats. Exotic breeds of pigs, poultry and goats have been introduced and they are being used for improving the local breeds.

Training programmes were arranged by the Directorate of Extension Education for technical personnel, field workers, farmers and agri-business representatives of the Department of Agriculture, Animal Husbandry and Dairy Development. A few farmers and trainees from Lakshadweep also participated in the training programmes. Four issues of bi-monthly magazine, 'Kalpadhenu', three issues of 'Agres News' two issues of the 'Kerala Journal of Veterinary Science' and three issues of the 'Agri-cultural Research Journal of Kerala' and eight issues of the Kerala Agricultural University newsletter were published. Pamphlets on tungro virus disease, brown plant hopper, rational use of scarce inputs for optimum production, fertiliser application, lemongrass cultivation and on Rice Research Station, Moncompu were also published. Besides, several farm news and news releases were issued to dailies, periodicals and radio. The University participated in the organisation and conduct of seminars, workshops and Exhibitions. The University got the first-prize for the best pavilion in the Trichur Pooram Exhibition. A State level workshop on package of practices was held in February, 1975. The recommendations of the workshop were published as "Package of Practices Recommendations". The University collaborated with the Agri-Horticultural Society, Trichur and conducted a Fruit, Flower and Vegetable show at Trichur. A rolling trophy to the individual best exhibit was instituted. In collaboration with the Trichur Municipality, the University arranged a 'Pet Show' at Trichur and instituted a rolling trophy. A field demonstration project on 'Minimum Inputs for Maximum Production' was arranged by the University



A view of the KAU Exhibition at the Calicut University

in collaboration with the Department of Agriculture and Mangalore Fertilisers and Chemicals. Another project on 'Operation Farm' was also arranged by the University in collaboration with the Lions Club, Ankamaly.

Shri. A. T. Devassy continued as Director of Physical Plant. Eleven major works were undertaken. The total estimated cost of these works was Rs. 129.55 lakhs. A sum of Rs. 17.28 lakhs was spent for these works during the year. Eleven spill over works in execution in 1974-75 was also continuing. The amount spent for these spill over works came to Rs. 13.15 lakhs. Three major works were completed. Forty two minor works were in execution during the year.

Inauguration of the KAU Pavilion in the Trichur Pooram Exhibition



Against the estimated receipts of Rs. 319 lakhs for the year, the actual receipt amounted to only Rs. 243 lakhs. On the expenditure side, against the estimated expenditure of Rs. 351 lakhs, the accounts work out to Rs. 234 lakhs, leaving a cash balance of Rs. 9.00 lakhs. The grants from the Kerala Government amounted to Rs. 118 lakhs and from the ICAR to Rs. 50.26 lakhs only.

The yield of rubber in the Vellanikkara Estate was 97.581 m. tonnes. The total receipt of the estate was Rs. 7.15 lakhs and the expenditure Rs. 6.15 lakhs.

The main effort of the University is directed towards maximising agricultural production by intensive cultivation and combating successfully the pests and diseases affecting the agricultural crops. A more sustained and dedicated work in close co-



Laying the Foundation Stone of the Academic Block in the Main Campus

operation with other agencies engaged in the task of agricultural development will yield better results.

I. GENERAL

CHAPTER I

GENERAL ADMINISTRATION

This University was established in the year 1971 under the Kerala Agricultural University Act, 1971. The Headquarters of the University is located at Mannuthy in the Trichur District, about 10 kilometers from Trichur town and is temporarily housed in the building of the Nutrition Laboratory attached to the College of Veterinary and Animal Sciences, Mannuthy. It is expected that the Headquarters can be moved into the new building in the Vellanikkara campus in the first quarter of the 1976-77 financial year.

There are two campuses for the University, one at Mannuthy and the other at Vellayani. In addition to these, there are 23 Research Stations for Agriculture and Animal Husbandry. The total area of the land under the University is 1,909 hectares, as shown below:

1. Mannuthy campus	: 848 hectares. ?
2. Vellayani campus	: 243 ..
3. Research Stations	: 818 ..

No new College other than the following three existing constituent colleges has been started by the University during this year.

1. The College of Veterinary and Animal Sciences.
2. The College of Agriculture.
3. The College of Horticulture.

A map showing the campuses of the University, the constituent colleges and the research stations is appended (Appendix I). The names of the research stations, their location and area occupied by them are given in Appendix II. There is no change in the location and acreage of the campuses, colleges and research stations.

In respect of teaching, research and extension education programmes in the field of agriculture, the territorial jurisdiction and responsibility of the University extend to the entire State.

Authorities of the University.

The following are the authorities of the University functioning under section 9 of the Kerala Agricultural University Act.

1. The General Council
2. The Executive Committee
3. The Academic Council
4. The Board of Studies of the Faculties.

There is another statutory committee namely, the Finance Committee. It is constituted by the Executive Committee under Section 46 of the Kerala Agricultural University Act. The powers and duties of the above authorities are prescribed in the Act and the Statutes issued thereunder. The names of members of the General Council and other authorities are given in Appendix III.

The term of office of the 1st Executive Committee nominated by the Chancellor in exercise of the powers conferred by him under Section 61 of the Act expired in January 1975. The Executive Committee was reconstituted by holding elections under the statute. This committee came into existence with effect from 3-1-1975.

The executive committee held ten meetings during the year under report.

The General Council met twice during the year under report. A special meeting of the General Council was held on 31-12-1974.

The Academic Committee constituted by the Vice-Chancellor to discharge the functions of the Academic Council, continued. The Committee held six meetings during the year under report.

The University has constituted ad-hoc committee to discharge the functions of the Board of Studies and the Faculties for the Faculties of Agriculture and Veterinary and Animal Sciences.

The Finance Committee met twice to examine the financial matters and to finalise the budget estimate of the University for the year 1975-76.

The University organisation consisted of the following officers of the University.

1. Chancellor Shri. N. N. Wanchoo,
the Governor of Kerala,
Raj Bhavan, Trivandrum.
2. Pro-Chancellor Shri. Vakkom B. Purushothaman,
Minister for Agriculture & Labour,
Trivandrum.
3. Vice Chancellor Dr. C. M. Jacob.
4. Registrar Shri. K. Theyyanni Nair, I. A. S.
5. Comptroller Shri. P. Rajagopala Pillai.
6. Director of
Physical Plant Shri. A. T. Devassy.
7. Deans of Faculties:
 - (a) Veterinary & Animal Sciences:
Dr. C. T. Peter till 31-5-1974
Dr. A. Venugopalan, Professor
of Surgery in-charge of Dean
from 1-6-1974 to 3-2-1975.
Dr. P. G. Nair from 4-2-1975.
 - (b) Agriculture Dr. J. Samraj till 28-2-1975.
Dr. N. S. Money from 1-3-1975.,
8. Director of Research Dr. M. R. G. K. Nair
from 1-4-1974 to 17-7-1974.
Dr. R. Gopalakrishnan,
Rice Specialist i/c. of Director of
Research from 17-7-'74.
9. Director of
Extn. Education Dr. V. S. S. Potti.

UNIVERSITY ORGANISATION

Faculties:-

There are only two Faculties organised under the University.

1. Faculty of Agriculture, and
2. Faculty of Veterinary & Animal Sciences

However, the Act provides that the University shall have faculties such as Basic Sciences and Humanities, Co-operation, Home Sciences, Fisheries, Forestry, Agricultural Engineering and Technology, etc. Preliminary steps are being taken to establish Faculties of Fisheries and Forestry. A Special Officer for Fisheries has been appointed on deputation from the Department of Fisheries of the Government of Kerala. For the present, it is proposed to constitute a department of Fisheries under the Faculty of Veterinary and Animal Sciences as a first step.

The work in the organisation of the Forestry Department has not made much headway. Since the State Government have expressed their inability to spare the services of an Officer from the Forest Department to the University, negotiations are progressing to obtain the services of a competent and qualified officer from the Government of India.

SUB-COMMITTEES

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

1. Committee for Rice.
2. Committee for Coconut.
3. Committee for Horticultural Crops.
4. Variety Evaluation Committee.
5. Research Advisory Committee.
6. Sports Board.
7. Extension Advisory Committee.
8. Veterinary Research Council.
9. Appointment Sub Committee.
10. Selection Committee for under-graduate courses.
11. Committee for deputation of Academic staff.
12. Service Advisory Committee.
13. Campus planning Committee.

The following sub-committees were re-constituted during the year under report.

1. Finance Committee.
2. Appointment Sub Committee.
3. Service Advisory Committee.
4. Campus Planning Committee.

A list of members of the various Sub-Committees is appended (Appendix IV).

The research work is carried on in the various Research Stations and in the various departments in the Colleges of Agriculture, and Veterinary and Animal Sciences. They are directed generally to the agricultural advancement of the State.

The dissemination of the findings of research is done by the Directorate of Extension Education in the University. The Extension Wing conducted several training programmes, organised seminars, workshops, exhibitions, etc., and published the 'Kalpadhenu' besides the newsletters, pamphlets etc.

There are three libraries in the three colleges under the University. For want of physical facilities, the Central Library has not been organised so far.

The Engineering Wing has been attending to the construction of the buildings in the Main Campus and other stations. There is considerable progress in the construction of buildings.

The University continued to maintain the Rubber Estate in the main Campus in Vellanikkara in areas of the lands which are not utilised for the construction campus and for the location of Instructional farms.

The following are some of the important events during the year under report.

A special training course of three months duration in Poultry and Dairy was conducted by the University in which a batch of 7 students from the Lakshadweep took part.

The Kerala Agricultural University participated for the 1st time in the Trichur Pooram Exhibition which lasted about two months and was awarded the first prize for the best Pavilion.

A Summer Institute in Animal Nutrition was organised in June under the joint auspices of the University and the Indian Council of Agricultural Research.

From the Rice Research Station, Pattambi, three more high yielding paddy strains viz. PTB. 39, PTB. 40 and PTB. 41 named as Jyothi, Sabari and Bharathy were released.

Professor Joseph Mundassery, the Vice-Chancellor, University of Cochin released the Extension publication, "KALPADHENU".

The University achieved a major break-through in goat breeding for higher-milk-yield by crossing the indigenous Malabari breed with the Sannen and Alpine breeds of buck from Switzerland. The first born kids of these crosses were christened "Sarala" and "Kalpana".

The University participated in the world Literacy Day-Celebration and it took part in an exhibition conducted for the purpose, at the University of Calicut.

Shri. Vakkom B. Purushothaman, Minister for Agriculture and Labour and Pro-Chancellor of the University laid the foundation stone of the Academic Block in the main campus in Vellanikkara on 3-1-'75.

The Veterinary College Hostel Day-Celebrations was held on 16-1-1975 and Field Marshal Manekshaw was the Chief Guest.

An FAO team consisting of Dr. Szent Idanyi, Senior Animal Health Officer, Animal Production & Health Division, FAO and Mr. Thuraisingam, FAO Consultant discussed with Agricultural University staff on problems of beef export.

A batch of 13 farmers from Lakshadweep attended the one month training in Cattle Farming and Poultry keeping organised by the University.

A group of progressive selected farmers from various parts of the State visited the important research centres of the University. This was spon-

ored by the Regional Directorate of field Publicity, Government of India.

The University office consists of the following wings:

1. Office of the Vice-Chancellor.
2. Office of the Registrar.
3. Office of the Comptroller.
4. Directorate of Research.
5. Directorate of Physical Plant.
6. Directorate of Extension Education.

During the year under report, Dr. C. M. Jacob continued as Vice-Chancellor. All the matters relating to general control and discipline of the University, were dealt with in this office. Papers relating to meetings of General Council and Executive Committee are also dealt with in this office.

Shri. K. Theyyuni Nair, I. A. S. continued as Registrar during the year under report. All problems relating to general administration and academic matters were dealt with in the office of the Registrar. Papers relating to the Vellanikkara Rubber Estate were also dealt with in this wing.

Shri. P. Rajagopala Pillai continued as Comptroller during the year under report. Preparation of the budget, statement of accounts and audit were the subjects dealt with in the office of the Comptroller.

Till 17-7-1974, Dr. M. R. G. K. Nair was holding the post of Director of Research and afterwards till the end of 31-3-1975, Dr. R. Gopalakrishnan was holding full additional charge of the post of Director of Research.

All the research activities in the University were directed and coordinated by the Director of Research.

Shri. A. T. Devassy, continued as Director of Physical Plant. All the works relating to construction and maintenance of the University buildings etc. were directed and controlled by the Director of Physical Plant.

Dr. V. S. S. Potti, continued to function as the Director of Extension Education till 13-9-1974, when his period of appointment terminated. From 14-9-1974 to 26-12-1974 he was appointed as Deputy Director in full additional charge of the post of Director, Extension Education. He was again appointed as Director on 26-12-1974. He continued as such during the remaining part of the year under report. All extension works such as research programmes, training programmes, seminars, workshops, exhibition etc., were organised under the direct control of the Director of Extension Education. Publication of the bi-monthly, 'Kalpadhenu' and newsletters, pamphlets etc., are also done under his direction.

Shri. V. Balaram, Deputy Collector on deputation continued as Estate Officer during the period under report. The Vellanikkara Estate with an area of 379 hectares was acquired for the purpose of building different campuses of the University. There was a rubber factory inside this Estate. The land required for the construction of campus, for instructional farms, for research on cocount,

cashew and pineapple have been handed over, and the rubber trees have been clear-felled according to necessity. The rubber trees standing in the remaining area are being tapped and the rubber is processed in the factory.

The list of administrative staff of the University is appended (Appendix V).

△△

CHAPTER II

RESIDENT INSTRUCTION

COLLEGE OF AGRICULTURE, VELLAYANI.

Location	Vellayani
Year of establishment	1st of August, 1955.
Area	205 hectares

Short history of the college in general

The college is situated in the picturesque suburban area of Vellayani, surrounded on three sides by the Vellayani lake. The campus is about 18 km away from the Trivandrum City and less than 10 km from the famous Kovalam beach. The college first started functioning in the Vellayani Palace which was acquired for the purpose.

The minimum number of personnel required for teaching and research at the time when the college was formed, were drafted from the Department of Agriculture and the Research Department of the University of Travancore,

About 100 acres of garden land which was attached to the palace served as the College Farm. Government also handed over to the College part of the Vellayani lake which served as the wet land. Since the land available was found inadequate for a farm, fresh acquisitions were made in the subsequent years.

Staff position

On termination of his appointment as Dean, Dr. Samraj assumed charge of the post of Principal, College of Agriculture, Vellayani with effect from the afternoon of 17-7-1974. He was also placed in full additional charge of the post of Dean on the same day. On the superannuation of Dr. Samraj on 28th February 1975, Dr. N. S. Money who was the Vice-Principal then, was put in-charge of Dean. On the 5th of March, 1975, Dr. N. S. Money was later

appointed as the Dean, Faculty of Agriculture and he is continuing as the Head of the Institution.

Dr. N. S. Money continued to be the Vice-Principal till the date of his joining as the Dean. Dr. N. Sadanandan, Junior Professor of Agronomy continued to hold the charge of the post of Professor of Agronomy. Dr. M. M. Koshy continued to attend to the duties of the Professor of Chemistry.

A list of teaching and research staff working in the college is appended (Appendix VI).

ADMISSION OF STUDENTS

1) Under-graduate course

Eighty three students were admitted to the first year year B. Sc. (Ag) degree course.

2) Post-graduate course

Ten students were admitted to the first year M. Sc. (Ag) degree course and seventeen students were admitted to full time Ph. D. course and one student was admitted for part-time Ph. D. course.

Class strength

1st year B.Sc. (Ag)	79	students
2	79	"
3	47	"
4	Nil	"
1st year M. Sc. (Ag)	10	"
2	23	"
Ph. D. 1st year	10	"
Ph. D. 2nd year	18	"

Student achievement

Fifty five under-graduate students graduated during 1974-75.

Student aid and scholarships

i) Scheduled caste and Scheduled tribe students concession.	28
ii) Concessions under Kumara Piliai Commission Report.	50
iii) K. A. U. Merit scholarship.	24
iv) National merit scholarship to the children of school teachers.	1
v) National merit scholarship.	1
vi) National loan scholarship.	13
vii) I. C. A. R. merit-cum-means scholarship	15
viii) National science talent scholarship from I. C. A. R.	1
ix) I. C. A. R. Junior Fellowship.	5
x) I. C. A. R. Senior Fellowship.	1

Practical training programmes.

The students were given regular practical training in the college laboratories and in the college farm. They were also assigned small plots of land for cultivation. The staff and students contributed voluntary labour for raising food crops in the college farm as part of an intensive food production drive. The students, under "Earn while you learn and work experience programme" raised tapioca and banana in the college farm, reared pigs, collected and composted the noxious weed salvinia, and planted coconut, clove, cocoa, nutmeg and cinnamon in the college farm. The students were billeted on the farms of progressive farmers in the State for a period of one week so as to acquaint them with practical agriculture and to bring them into contact with the field problems faced by the farmers.

The third year B. Sc. (Ag) students were taken on an all-India tour in order to give them an opportunity to visit the institutions of agricultural importance and to learn the activities of these institutions. The 2nd year B. Sc. (Ag) students were given an opportunity to visit most of the research stations and farms in Kerala.

Extra-curricular and co-curricular activities

The following students were elected as Office bearers of the College Union.

President	Shri. Francis, A. J. I M. Sc. (Ag)
Vice-president	Shri. Vijayan Nair, III B. Sc. (Ag)
General Secretary	Shri. F. M Humayun Kaleel, III B. Sc. (Ag)
Assoc. Secretary.	Shri. Balachandran, P. V. II B. Sc. (Ag)

Arts Club Secretary	Shri. Abdussalam, C. K. III B. Sc. (Ag)
Speakers Club Secretary,	Shri. Jagdishkumar, T. N., I B. Sc. (Ag)
Athletic Association Secretary,	Shri. Joseph Antony, II B. Sc. (Ag)
Planning forum Secretary	Shri. Salahudin, V. U. I B. Sc. (Ag)
Camera Club Secretary	Shri. Francis Ausalan I B. Sc. (Ag)
Social Service League Secretary.	Shri. Gopinathan, R. II B. Sc. (Ag)
Students Editor.	Shri. Mathai Issac.

Class representatives:

I B. Sc. (Ag)	Shri. Thomas, K. M.
II B. Sc. (Ag)	Shri. Joseph, K. J.
III B. Sc. (Ag)	Shri. Ramachandran, N. K.

Dr. N. S. Money, Dean is the patron of the students union of the College of Agriculture. He nominated the following members to the posts mentioned against their names.

1. Dr. A. M. Thampi, Junior Professor of Extension.
President, Speakers Club.
2. Shri. J. B. Rose, Junior Professor of An ma Husbandry.
President, Athletic Association
3. Shri. K. S. Karayalar, Junior Professor of Economics.
President, Planning Forum.
4. Shri. K. Srinivasan, Professor of Horticulture.
President, Camera Club.

12. Seminars and conferences

The staff of the division of Horticulture actively participated in the training course in Horticulture conducted in March, 1975, for teachers selected from schools of southern Kerala.

Dr. N. S. Money (Professor) (now Dean) served on the ICAR Scientific Panel on Soil Science. In June 1974, Dr. M. M. Koshy took part in a farmers seminar at Thakazhi and in December 1974 he participated in an agricultural seminar at Champakulam. In January 1975, Dr. R. S. Aiyer, Junior Professor chaired a meeting of the Central Plantation Crops Research Institute at Kasargod.

Shri. E. J. Thomas, the Professor of Statistics, attended the Rice Worker's conference at Pattambi, in April 1974, and the conference of statisticians working on plantation crops at Kasargod in January, 1975.

Dr. M. Ramanatha Menon, Junior Professor (now Professor) of Plant Pathology attended the meeting of the evaluation committee to assess the

efficiency of spraying for the control of coconut leaf rots. Shri. P. V. Paily, Lecturer attended Rice Committee meeting at Mannuthy and Dr. K. M. Rajan, Lecturer attended the meeting of the Research Committee for horticultural crops at Mannuthy during the year under report.

Dr. D. Dale, Lecturer and Smt. S. Chandrika, Junior Research Officer, attended the training course on 'Insect Hormones' conducted at the University of Agricultural Sciences, Bangalore for five days from 29-11-1974.

Dr. (Mrs.) Mary K. George, Professor of Botany attended the Rice Research conference. Shri. N. Gopinathan Nair attended the workshop on fertilizer practices.

Shri. A. G. G. Menon, Professor of Extension delivered an extension lecture on communication at the College of Veterinary and Animal Sciences, Mannuthy.

Shri. T. F. Kuriakose, Agronomist attended the workshop on package of practices and the Rice Committee meeting held at Mannuthy. He also gave a talk on the "Ways and means of augmenting production of cattle fodder of high nutritive value" at the Summer Institute on animal nutrition (ICAR) held at the Veterinary College, Mannuthy.

Publications

The list of publications is appended (Apdx VII).

Other Activities

The Agricultural Research Journal of Kerala is published from this College.

The Co-operative Society of the College functioned successfully.

REPORTS FROM EACH TEACHING DEPARTMENT

Department of Agronomy

The following experiments were conducted during the period.

- 1) Fertilizer-cum-interval of cutting trial on guinea grass under rainfed conditions.
- 2) Spacing-cum-organic manure experiment on guinea grass under rainfed conditions in coconut gardens.
- 3) Inter cropping of pulses with guinea grass in coconut garden under rainfed conditions.
- 4) Comparative performance of different varieties of cowpea under different phosphate and potash manuring.
- 5) Final evaluation trial on cowpea varieties.

- 6) Final evaluation trial on pennisetum pedicellatum varieties.
- 7) Trial on velvet bean.

Brief report on the contribution to the development of agriculture

Guinea grass:- The production of guinea grass was found to increase with increasing levels of nitrogen application upto 200 kg/ha. Harvesting guinea grass at 45 days interval recorded maximum yield than that of 30 days and 60 days intervals under rainfed conditions.

Under rainfed conditions guinea grass produced highest green fodder yield at a spacing of 40 x 20 cm than that produced at other spacings of 60 x 30 and 80 x 40 cm when planted in the coconut gardens.

Higher fodder yield was obtained by growing cowpea in the interspaces of guinea grass during south-west-monsoon season followed by horsegram during the north-east-monsoon season.

Cowpea: Higher green matter yield was obtained by cowpea variety Fos—1 than other varieties viz. Calicut—78 and Russian giant, tried. Varieties were significantly different in leaf/stem ratio of 1.38. With increase in levels of potash and phosphorus the height of cowpea were found to increase.

Among 18 varieties of cowpea tried, variety CO—1 recorded the maximum green matter yield of 6.5 Tons/ha followed by variety No. 998.

Dinant grass:- Pennisetum pedicellatum

Among 13 varieties tried the maximum green matter yield of 29.9 tons/ha was recorded by the variety pp—15 followed by the varieties pusa—6 and pusa—1 recording 29.3 Tons/ha and 29.9 Tons/ha respectively.

Velvet beans: Velvet beans came up fairly well under conditions prevailing in the locality. Green matter yields upto 12.12 Tons/ha were recorded by one of these varieties.

Department of Botany

The following research projects were currently undertaken in this Department.

- Genetic studies in Sesamum population—
by Shri. K. Gopakumar.
- Genetic studies in Sweet potato —
by Shri. C. A. Joseph.

The field work relating to the following projects are concluded and the final papers are being prepared. The projects are :

- 1) Genetic studies in cowpea,
- 2) Studies on intervarietal hybrids of Tomato,
- 3) Studies on the F_2 of intervarietal hybrids in rice,
- 4) Studies on the mutagenic effectiveness and efficiency of gamma rays on Sesamum.

Three non-plan schemes were functioning in the Department.

1. Scheme for the establishment of a Cyto-genetics and Plant Breeding Laboratory.
The following projects are worked in the scheme.

a) Genetic studies of a collection of varieties for breeding high yielding, quality varieties.

The work is satisfactorily continuing.

b) Study on yield components in groundnut.

The work was started with a very few varieties.

It is being continued by adding more varieties to make the result on a broad basis.

In addition to the above specific projects, maintenance of about a hundred cowpea varieties, testing the germinability and other seed characters was a normal additional activity of the scheme.

2. Scheme for the improvement of vegetable crops.

A wide collection of different varieties of vegetable crops such as Bhinor, Brinjal, Chillies, Amaranthus, Beans, Cowpea, Tomato, Watermelon, Pumpkin, Cucumber and Gourde were maintained in the nature of a Germplasm bank.

The specific projects under study were the following:

a) Intervarietal hybridization studies on Tomato-

Five Australian varieties of Tomato with good yield were put under acclimatisation trial and were found satisfactory. Intervarietal crosses were conducted including some local varieties. Observations were recorded from the F_1 and F_2 hybrids. The work was in progress.

b) Varietal and acclimatisation studies on Soyabeans.

Twenty five varieties of Soyabeans were collected and sown in November—February to study the growth yield under local conditions. The varieties were ranked on yield basis. They are further grown in other seasons also to find out the adaptability in different seasons.

c) Hybridization work on chillies to evolve economical varieties with high ascorbic acid and capsaicin content.

The F_2 progenies from the crosses are under evaluation. Selfing and other studies have to be

conducted for two seasons and final results will be available on the project.

d) Hybridization work on Bhindi for evolving a high yielding mosaic resistant variety.

A high yielding mosaic susceptible variety Kilichundan was crossed with the resistant varieties Pusa Sawani and Pusa Red. From the F_2 generation selections were made and eight types are now under study. A preliminary yield trial was conducted in the F_2 stage. The crop is now under F_3 studies. If the selected types have attained complete homozygosity they can be put under adaptive research trials in cultivators plots in different parts of the State.

From the different projects, when the new types of Bhindi, Tomato, Chillies and Soyabeans will be distributed for large scale cultivation it will not only increase the vegetable food yield but also increase the food quality of the people considerably.

Department of Agricultural Chemistry

i) Trials with agricultural liming materials

Two field experiments were conducted during two seasons in 1974-75 to study the effect of a liming material called 'Geo-lime' on the growth and yield of rice variety Triveni. The first experiment did not reveal any significant effect for this material on the yield of rice. The crop in the second experiment was harvested and the yields recorded. The trend of results showed that Geo-lime helped to increase the yield of rice.

ii) Trials with indigenous sources of magnesium silicate.

Some samples of magnesium silicate (talc) available in Kerala were received from the Director, Geological Survey of India, Trivandrum. A pot culture experiment and a field trial were carried out with this material on rice. The pot culture experiment did not reveal any significant effect while the trend in the field trial was for magnesium silicate to increase the yield of rice. The trials are being continued.

Post-graduate students' work.

1) The effect of a manure supplement prepared from sea water on the growth, yield and quality of rice.

The effect of sagar manure, which is a fertilizer supplement prepared from sea water on the growth, yield and quality of rice was studied in a pot-culture and two field experiments. This mineral supplement was found to have some beneficial effect in improving growth and increasing the yield and quality of rice.

- ii) The effect of zinc in combination with lime on the growth, yield and absorption of nutrients by rice.

A pot-culture experiment with a randomized block design was carried out to study the effect of zinc in combination with lime on the growth, yield and absorption of nutrients by rice. The levels of zinc sulphate used were 0, 10, 20 and 40 kg/ha. and those of lime were 0, 250, 500 and 1000 kg/ha. The soil in the study had an initial pH of 4.3 and available zinc content of 4.0 ppm. The application of zinc resulted in increased height of plants, length of panicles and the number of grains per panicle, but there was no significant effect on the yield of grain or straw. The nitrogen content of grain was also increased by the application of zinc. The application of lime also resulted in beneficial effects on some of the growth and yield characters without a corresponding significant increase in the yield.

- iii) Fertility investigations in the kole lands of Kerala.

A systematic study of the soils of the kole area has been undertaken. The morphological and physico-chemical properties of seven profiles and forty surface samples were studied. All the soils were acidic in reaction, the PH varying from 2.6 to 6.3. The organic matter content ranged from 1.37 to 50.38%. The variations in total N, P₂O₅ and K₂O contents were in the ranges of 0.14—1.25%, 0.02—0.24% and 0.09—0.57% respectively. The levels of CaO in these soils were in the range of 0.19—2.08% and the MgO content varied from 0.05—0.90%.

Department of Entomology.

NON-PLAN SCHEMES

- 1 Scheme for research on insect toxicology and chemical control of insect pests:

Experiments on the control of the leaf roller pest of paddy showed that phosvel, dimecron, ekalux, nuvacron, labaycid, bidrin, folithion and parathion at 0.25 kg. active ingredient per hectare and sevin at 0.5 kg a. i. /ha were very effective when applied in the spray form. Sevin, labaycid and folithion gave good control of the paddy jassids.

Thimet and solvirex when applied in the granular form at 1 kg a. i. /ha were very effective in controlling whorl maggot, while the gall fly was successfully controlled by thimet.

Dip-treatment of rice seedlings with systemic insecticides revealed that Formothion and mythyl demeton at 0.8% level were phytotoxic and phorate had a persistent effect against the brown hopper *Nilaparvata lugens* even after nine days.

Laboratory tests by feeding the brown hopper pest with plants treated with furadan is superior to thimet, solvirex and cytolane treatment in controlling the pest. ??

- 2 Scheme for research on parasitology, insect pathology and biological control of insect pests

— An improved strain of *Bracon brevicornis* with consistently favourable sex-ratio of 1 male:3 females was established by selective breeding.

Studies on the seasonal occurrence of pests infesting vegetable crops and the population fluctuations of natural enemies were continued during the year.

With a view to integrate the chemical and biological control of *Nepenthes serinopa*, the toxicity of four systemic insecticides Rogor, Ekaton, Dimecron and Anthto and four non-systemics (Dipterax, DDVP, DDT and Thiodan) were evaluated during the year.

- 3 Scheme for non-insect pests and storage pests and their control.

Studies on the biology and development of the red spider mite *Tetranychus telarius* on twenty varieties of tapioca showed that Elavan H. 97, H. 226, Kalikalan, Kayyalachady and H. 165 were relatively resistant to *T. telarius* as evidenced by longer development duration, shorter longevity and lesser fecundity of the insect.

In an experiment conducted to find out the variations in the protein content of paddy grain by applying different doses of nitrogen in the field and the consequent susceptibility of the grain to storage pests, it was found that protein content of grain increased with the increase of nitrogen in the field. The incidence of damaged grain also showed a similar trend. But the protein content of the grain which was preserved in store did not influence the development and multiplication of the insect pests.

In the laboratory trials it was found that the fields rat *Rattus rattus* has less preference for H. 226 and H. 1657 than for M. 4 and a few other local varieties.

Preliminary trials on the effect of powdered neem seed kernel as protectant of stored grains revealed that application of 2% neem outside and inside gunny bag are equally effective and as effective as malathion 0.01%.

- 4) Scheme for research on insect biology, ecology and behaviour.

Studies on the biology of crop pests *Scirpophaga innotata* on paddy, *Orthaga exvinacea* on mango and *Azasia rubicans* on cowpea were conducted.

The effect of five different host plants on the biology of *Prodenia litura* was studied. Castor was found to be the most preferred host.

A common weed *Erocharia* sp. was noted as an alternate host for the rice case worm *Nymphula depunctalis*.

In connection with the All India Co-ordinated Project on grain storage, samples of field and stored paddy were collected from Alleppey, Palghat and Wynad areas and the percentage of pest incidence, moisture content and germination etc. were ascertained.

5) Scheme for the establishment of Nematology Laboratory in the Agricultural College.

A number of soil samples collected from different soil tracts and those received from Agricultural Stations were processed and the following plant parasitic nematodes were recorded.

Betal vine	<i>Meloidogyne incognita</i>
Rice	<i>Aphelenchodis besseii</i>
Sugar cane	<i>Hoplolaimus indicus</i>
	<i>Meloidogyne iavanica</i>

Department of Agricultural Extension.

Teaching:-

The Division offered courses in Sociology, Psychology, Agricultural Extension and Nutrition to the under-graduates of the College of Agriculture, Vellayani.

Research:-

The staff of the division conducted research in their respective fields of academic interest.

The following research projects were completed.

1. A project to study the attitude of farm women towards kitchen gardening.
- 2) Attitude of Agricultural students towards the profession and different subject matter areas.
- 3) A social survey of the families of the under-graduate students of the College of Agriculture, Vellayani enrolled during 1973.

The following research projects are in progress:

- 1) Study of the attitude of the Agricultural Extension personnel towards the high yielding varieties of paddy.
- 2) An exploratory investigation into the progressive attitude of the host farmers selected under the Billetting programme towards improved farming practices.
- 3) Study of the attitude of the Applied Nutrition programme personnel and village

women towards Applied Nutrition Programme.

Extension

- 1) A training course in Horticulture was organised by the Division for the school teachers of Kerala State.
- 2) The Division continued to publish the "Agres News", a quarterly news letter on research organised in the field of agriculture.
- 3) The visitors (students, officials, non-officials etc.) both from inside and outside the State were shown round the College.
- 4) Members of the staff of the Division handled classes for the participants of various training courses, camps, etc.

Scheme for Applied Nutrition Programme

Lecturer in Nutrition offered courses in Basic Human Nutrition to the undergraduates of the College. Lecturer in Nutrition participated in 53 A. N. P. camps organised by the N. E. S. Blocks in Trivandrum district and handled classes on nutrition. Film shows on various aspects of Applied Human Nutrition were also held for the benefit of the participants of these camps.

Department of Statistics

This department continued to associate itself with the research activities of the other departments and research stations, assisting them in the planning of experiments and analysis of the data therefrom. Twenty two (22) sets of data received from various research stations were analysed. Necessary assistance was given to the post-graduate students in the planning of experiments and in the analysis and interpretation of the results.

Department of Plant Pathology

Studies on sheath blight of rice showed that the intensity of infection could be reduced by spraying the crop with hinosan. The yield of rice was increased by the application of potash and silica. Soil amendments with oil cakes and industrial and agricultural waste products reduced the severity of the disease.

Varietal screening of tomato revealed that none of the varieties was resistant to bacterial wilt. Preliminary trials indicated that the disease intensity could be reduced by amending the soil with organic materials.

Spraying the sunflower crop with dithane M.45, miltox or benlate reduced the severity of Alternaria blight and increased the yield and oil content.

Department of Agricultural Engineering

The scheme for the "Establishment of a Repair workshop and Maintenance Section" for the maintenance and repair of the water supply, sanitary and electrical installations in the college campus, and of the laboratory equipment in various divisions of the college, continued to operate as a non-plan scheme under the division of Agricultural Engineering till the end of May 1974. The scheme was under the charge of an Assistant Agricultural Engineer (Maintenance) on Rs. 560/-1100 which post was held by Shri. D. Sathyanandan, D. M. E. The scheme with its staff was transferred to work under the Division of Entomology from 5-6-1974.

Department of Horticulture.

Research activities of the department included studies on vegetable multiplication of papaya, nutmeg, clove and cinnamon, studies on the effect on growth regulators on solanaceous vegetables etc.

The ornamental garden in front of the college building was maintained by this department.

Department of Agricultural Economics.

The department undertook some small research projects which are under progress.

Department of Animal Husbandry.

A Dairy Farm and poultry unit are being maintained for instructional purpose. This division has successfully completed an "Earn while you learn" work project during the year under report.

THE AGRICULTURAL COLLEGE FARM

The Agricultural College Farm which is attached to the Agricultural College is an instructional farm. The farm helps in giving training to about 400 students both graduates and postgraduates. Besides helping in teaching, the farm provides facilities for conducting thesis works of post-graduate students and the research workers of the various divisions.

The farm consists of 180 acres of dry land, 10 acres of double crop paddy land and 360 acres of kayal land. The major crops grown in dry land are coconut, tapioca, banana, rubber and other fruit plants viz., mango, jack, sapota, etc. An area of 10 acres are under fodder crops.

Shri. V. Ramachandran Nair was holding the charge of the Superintendent upto 10-9-1974 after which Dr. K. M. Sukumaran took charge as the Superintendent and he continued during the rest of the year.

Activities of the Farm:

PADDY

The double crop paddy land of 10 acres of the farm lies mostly on the fringes of Vellayani Kayal. The following quantity of seeds were distributed from the farm.

Triveni	6.5 tons
Annapurna	3.5 "
Jaya	480 kg
Aswathi	75 kg
IR. 8	850 kg

KAYAL CULTIVATION

Excluding bunds, reservoir and uncultivable area which come to about 120 acres, the net Kayal area sown would be about 240 acres. This area is cultivated once during puncha season by dewatering and raising a short duration crop. Excluding quantity of paddy given as wages in kinds, 97.0 tons of paddy was obtained from the crop in May 1974. 11,457 men and 10,249 women labourers were engaged for the cultivation. The varieties used were Triveni, Annapurna, Ptb. 9 and IR. 8.

COCONUT

The total area of coconut of the farm will come to about 40 acres. Three varieties namely W. C. T., T x D and Komadan are grown. 1, 14, 604 nuts were obtained during the period under report.

During 1974-75 a total number of 8,000 quality seedlings were distributed.

TAPIOCA

An area of 10 acres was planted with tapioca M-4, H-165 and local varieties during 1974-75. Thirty two tons of tapioca were produced.

RUBBER

Rubber was grown in an area of 5 acres. During the period under report 465 trees were available for tapping. The latex collected was made into sheets and were disposed. 3,566 Nos. of sheets weighing 1415 kg were obtained during 1974-75.

HORTICULTURAL CROPS

Mango, Sapota, Guava, Pineapple, Banana and Avocado are grown over 16 acres.

ORNAMENTAL PLANTS

A good collection of roses (442 varieties) is maintained which includes 283 hybrid type 137 floribunda and 22 miniature type. Budded plants of all these varieties were made and sold to the public. A good collection of Bogainvilleas, hibiscus and other ornamental plants is available in this farm. Seeds and plants of these ornamental plants were distribut-

ed to the farmers. Details of ornamental plants distributed are given below:

Roses	1520
Bougainvilleas	724
Gerbera	57
Maranta sp.	41
Hibiscus	57
Alocasia	162
Others	132

The farm won 16 prizes in the Rose and Vegetable competition.

VEGETABLES

About 3 acres were under vegetables like chillies, bhindi, amaranthus, cucurbits, snakegourd, beans etc. The following quantities of vegetables were also sold.

Chillies	112 kg
Bhindi	898 kg
Brinjal	848 kg
Snakegourd	218 kg
Bittergourd	418 kg
Cowpea	512 kg
Clusterbeans	68 kg
Amaranthus	606 kg

2918 packets of vegetable seeds were distributed to the cultivators.

Contribution to the development of Agriculture.

FRUIT PLANTS

Grafts, layers and seedlings of fruit plants suited to this locality were distributed during the period under report. The details are as follows:

Mango grafts	2999
Sapota grafts	65
Guava layers	437
Rose apple	26
Rambuttan	99
Malta lime	39
Red Jamba	133
Surinemcherry	110
Papaya	54
Star apple.	10

This farm has perfected the technique of grafting jack and is the only station where the above work is being done on a commercial scale. During 1974-75, 394 grafts of 'Muttom Varika' were sold to the cultivators.

COLLEGE OF HORTICULTURE

The College of Horticulture was established at the Mannuthy campus in October 1972.

The facilities at the Veterinary College Campus the erstwhile central farm and now Vellanikkara Estate were made use of for instructional purposes of the students.

Brief History of the College

In view of the importance of Horticulture and plantation crops in the State, the Horticultural College was started in 1972-73. The college offers a four year course of study under the trimester system of teaching leading to the award of B. Sc. (Hort) degree which is of four years duration after pre-degree. The first batch of graduates from the College is expected to come out at the end of the Academic year 1976.

The College is at present having the following disciplines.

1. Pomology
2. Processing Technology
3. Olericulture.
4. Floriculture and Landscaping

5. Spices and Medicinal plants
6. Plantation crops
7. Agronomy
8. Agricultural Chemistry
9. Agricultural Botany
10. Agricultural Entomology
11. Plant Pathology.

Staff position

Dr. V. S. S. Potti, Director of Extension Education who was in charge of the College handed over charge to Dr. K. C. Naik, the Advisor to the Vice-Chancellor, in September, 1973. Dr. K. C. Naik was in charge of Dean till June 1974. Thereafter Dr. V. S. S. Potti, Director of Extension Education took charge and continued to be in charge of the College till the end of the year under report.

In addition to the three Research Officers posted in February 1974 for the College, the services of other six Research Officers and six teachers from the College of Veterinary and Animal Sciences were utilised for teaching in the Horticultural College.

Four Associate Professors and nine Assistant Professors joined duty during the year under report.

A list of members of the staff of the College of Horticulture is appended (Appendix VIII).
Admission of students and class strength

Twenty students were admitted to the first year B. Sc. (Hort) during 1974-75 academic year, of which one student discontinued later. There were 18 students in the second year and 20 students in the third year during the academic year 1974-75.

Student achievement

In general the students of this College presented excellent performance in their academic programmes. There was only one academic probationer in the second year class.

Student Aid Scholarships

During the academic year 1974-75 out of the 57 students, 37 students enjoyed various scholarships and fee concessions.

Practical Training Programme

The students are given regular practical field training in the instructional farm attached to the College. They are also frequently taken to the nearby research stations for imparting practical training in various subjects. The students raised tapioca in the area attached to the College completely by their own efforts enjoying the profit out of the cultivation themselves.

Extra curricular and co-curricular activities.

The students of this college actively participated in the inter-collegiate sports and athletic meet of the University. Eventhough the strength of the College was only 57, a number of prizes and medals were bagged by the students of this College.

The Arts Club presented a variety entertainment programme in connection with the College Day celebrations.

Under the auspices of the planning forum, Mrs. Sreedevi Andarjanam gave talk on story writing.

The members of the Social Service League actively participated in arranging materials of the Agricultural Stall in Pooram Exhibition.

The League was also able to design and layout a kitchen garden in the Don Bosco High School, Mannuthy.

Seminars and conferences.

The staff of the College actively participated in the seminars and conferences arranged by the University.

Publications.

During the academic year 1973-74, the students of this college published the second issue of the College magazine.

INSTRUCTIONAL FARM, COLLEGE OF HORTICULTURE

This Instructional Farm is located at Munnuthy and has an area of 34.5 hectares.

The area under the farm was transferred to the Agricultural University from the District Agricultural Farm, Mannuthy. With the establishment of the College of Horticulture, this was converted into the Instructional Farm for the College.

The farm is intended to:-

- i) Providing facilities for imparting practical instruction to the students of the College of Horticulture as part of their curriculum.
- ii) Providing facilities for the teachers to carry out research activities.
- iii) Raising and maintaining crops for the purposes of practicals for the students.
- iv) Providing planting materials for the Instructional Farm to be developed at Vellanikkara from the existing orchards and nursery.
- v) Carrying out experiments on perennial horticultural crops for bringing out recommendations.

Staff position

The farm was headed by a Research Officer assisted by two Junior Research Officers.

Project / Experiment / Schemes laid out

1. Progeny orchard

Thirtyfive varieties of mango of known parentage are being maintained for production of progenies. Studies on bearing capacity under the condition prevailing, are being done in detail. Records of yield are maintained.

2. Nursery

A collection of various fruit plants and other miscellaneous rare plants is being maintained for planting in the Instructional Farm proposed at Vellanikkara.

3. Collection of ornamental plants, such as Roses, Hibiscus, Daliah, Bougainvillae, etc. are made and maintained.

4. Commercial production of fruit and ornamental plants has been taken up as a part of the activities.

The students are also being given chance for practical training.

5. Maintenance of existing coconut garden.

An area of 27.81 acres is under coconut plantation. This is being maintained for seed collection and bulk sale.

A coconut nursery of 1000 nuts has been raised for planting in the main campus.

6. Studies on jack

A collection and comparative study of the performance of the local varieties of jack has been taken up and is in progress.

7. Varietal trial of coconut

352 seedlings of 19 varieties have been planted in the farm at Vellanikkara for comparative studies.

COLLEGE OF VETERINARY & ANIMAL SCIENCES

Location Mannuthy, Trichur District, Kerala State.
Year of establishment 1955.
Area 80 acres.

Brief history

The College of Veterinary and Animal Sciences was established in the year 1955.

The academic programme of the College consists of the Degree of Bachelor of Veterinary Science (B. V. Sc.) of 4 years, Master of Veterinary Sciences (M. V. Sc.) of 2 years and Doctor of Philosophy (Ph. D) of 2-3 years duration.

The Internal Evaluation System (Trimester pattern) introduced from the Academic year 1972-73 for B. V. Sc. and 1973-74 for M. V. Sc. and Ph. D courses continues. However, the traditional system of education is also continuing for the benefit of the students admitted prior to 1972-73.

A students' hostel with accomodation for 216 students was completed and commissioned for use on 14th June, 1957. The Veterinary Hospital, Trichur as well as the Veterinary Hospital, Mannuthy are being used for imparting clinical training for students. The Veterinary Hospital, Trichur like a Research Station is under the administrative control of the Director of Research, Kerala Agricultural University. Students are taken in the University buses for the clinical training. A Veterinary Ambulatory Clinic started functioning from 10-1-1962 under the Extension wing of the College is also functioning under the Extension Department of the College.

The campus provides residential accommodation for some of the faculty members and administrative staff.

Dr. C. T. Peter was the Dean of the Faculty of Veterinary and Animal Sciences as well as the Dean of the College till 31-5-1974. Dr. A. Venugopalan,

Professor of Surgery was in charge of Dean from 1-6-1974 to 3-2-1975 consequent on the retirement of Dr. Peter. Dr. P. G. Nair took charge as the Dean of the Faculty of Veterinary and Animal Sciences from 4-2-1975.

Staff Position

A detailed list of staff is appended (Appendix IX)

Admission of Students

The admission of students were made by the Registrar, Kerala Agricultural University. After selection of candidates by selection committees, constituted for the purpose by the Vice-Chancellor.

Under-graduate course

44 students were newly admitted to the B. V.Sc. course during 1974-75 of which one student expired and one discontinued his studies. There was one foreign student (Nepalese) and one from the Lakshadweep Islands.

Post-graduate course:-

15 students were admitted during 1974-75 for post-graduate course in the following disciplines:

1. Obstetrics & Gynaecology
2. Pharmacology
3. Nutrition
4. Dairy Cattle Production
5. Poultry Production
6. Microbiology
7. Anatomy
8. Surgery
9. Parasitology

Class Strength

The class strength as on 7-2-1975 was as follows

	Trimester system	Traditional system
1st B. V. Sc.	42	Nil
2nd B. V. Sc.	40	2
3rd B. V. Sc.	40	15
4th B. V. Sc.	—	35

The first batch of students admitted under the trimester system is now studying in the III B. V. Sc. class.

Student achievement-Undergraduate studies

31 students qualified themselves for -B. V. Sc. degree from among the students admitted prior to 1972 (ie., those under traditional system). The Examinations were conducted by the Kerala Agricultural University as per the Calicut University Regulations.

Post-graduate studies

Dr. C. T. Thomas and Dr. K. P. Surendraniathan who had registered for the Ph. D. Degree course under the Calicut University were awarded the Ph. D. degree during the year.

Student aid and scholarship

The Government of Kerala continued their educational concession programmes to the students belonging to Scheduled Caste and Scheduled Tribes, Other Backward Community, Other Eligible Community, etc. The educational concessions to the Socially and Educationally Backward Community and Forward Classes students were awarded by meeting the expenditure from Kerala Agricultural University Fund.

The Government of India Merit-cum-Means Scholarship sanctioned to one student in 1972-73 continued. Three B. V. Sc. students were awarded the Government of India Merit-cum-Means Scholarship at the rate of Rs. 100/- per mensem during 1974-75.

Two M. V. Sc. students were awarded the I. C. A. R. Junior Fellowship (Rs. 300/-per mensem). An I. C. A. R. Senior Research Fellowship in Parasitology was also awarded to one Ph. D. candidate.

The Kerala Agricultural University Merit Scholarships were awarded to fourteen under-graduate and eleven post-graduate students during the year.

Practical training programme

Practical training was imparted to students in the two Veterinary hospitals and in the Livestock, Piggery, and Poultry Farms attached to the College. The teaching staff from various departments attended hospitals and farms to impart practical training to students.

7,904 cases were treated in the Veterinary Hospital at Mannuthy and 528 operations were performed and 5,954 vaccinations were done.

The clinical laboratory attached to the hospitals at Trichur functioned as a Centre for training of

students. A total number of 4,231 samples of clinical materials were examined there during the year.

Extra-curricular and co-curricular activities

Shri. C. D. Jose, Lecturer in Physical Education functioned as the Convener of the Agricultural University Sports Board. This year, the University participated in Foot-ball League Tournaments and in the Open Table Tennis Tournaments. Some of the students were selected for the University Athletic and Ball Badminton teams to participate in the Inter-University programmes during the year.

The extra-curricular activities of the students were arranged and conducted by the Students' Union of the College in which the staff were also ex-officio members. Dr. G. Nirmalan, Reader in Physiology and Dr. A. Rajan, Reader in Pathology, were nominated by the Dean as the Associate Patron and the Staff Editor of the Students Union respectively.

The Independence Day was celebrated on 15-8-1974 and Gandhi Jayanthi on 2-10-1974 in a befitting manner. Inauguration of the activities of the Students' Union was done by Shri. M. Krishnan Nair, Principal, Law College, Ernakulam on 6-11-1974. Student members of the Union organised a cleaning campaign of the Kerala State Road Transport Buses in the State Transport Garage at Trichur on 8-12-1974. Members of the Union conducted preventive vaccination against Haemorrhagic septicaemia in cattle, and again Ranikhet disease and Fowl pox in birds, in different parts of Trichur District.

Seminars and conferences

The following seminars and conferences were conducted/attended during the year.

- i) Participated in symposium on Endocrines and Hormones at Medical College, Trivandrum on 17-10-1974 and 18-10-1974.
- ii) Summer Institute on Animal Nutrition was conducted from 3-6-1974 to 2-7-1974.
- iii) Orientation course in Food and Nutrition was held for 2 weeks from 1-10-1974.
- iv) Participated in the workshop in cattle development organised by the ICDP on 19-12-1974.
- v) Dr. M. Subramaniam attended the XIX International Dairy Congress held in Delhi in December, 1974.
- vi) Participated in the International Physiological Congress at New Delhi.
- vii) Took part in the Summer Institute in Animal Reproduction held at Tirupathi.
- viii) Attended the Plan Week Seminar at Palghat on 18-11-1974.
- ix) Participated in the All India Radio Farm and Home Seminar at Kollencherry on 19-3-1975.

Publications

The papers published from various departments of the College are appended (Appendix X).

Other activities

A new Employment Information and Guidance Bureau was started with Dr. G. R. Nair, Professor of Extension as the Chairman for providing useful information and help for the placement of graduates in proper employment.

Dr. K. Chandra Menon, Professor of Animal Husbandry continued to be the Professor i/c of Library till 30-4-1974. Dr. M. Subramanian, Junior Professor of Animal Husbandry Department was the Professor i/c of Library from 1-5-1974 to 27-11-1974 consequent on the retirement of Dr. Chandra Menon on 28-11-1974. Subsequently, Dr. C. K. Surendra-varma Raja, Professor of Obstetrics and Gynaecology took charge as Professor i/c of Library. Smt. P. K. Chandrika and Shri P. A. Parameswaran continued to be the Librarian and Assistant Librarian respectively. The Library had on its register 5989 books and 2304 complete volumes of journals. One hundred and thirty foreign and Indian journals were subscribed for. An amount of Rs. 2, 18, 885/- was spent for the purchase of books and periodicals during the year.

The preparation of the scientific arrangement of the card catalogue of the books and the publication of the catalogue of the books published during the year was completed.

A research journal "Kerala journal of Veterinary Science" continued to be published by the Veterinary Research Council of the College.

A Students' Co-operative Society functioned dealing with sale of books, stationery, etc, to students at concession rates.

Two Lecturers of the College continued to be in Military service. Eight staff members were on deputation/study leave for advanced training in their respective disciplines.

Reports from Teaching Department

Department of Animal Husbandry

The Department of Animal Husbandry continued to have the sections of (1) Nutrition, (2) Genetics and Breeding, (3) Animal Hygiene and Management and (4) Dairy Science.

Dr. K. Chandra Menon continued to be the Professor of Animal Husbandry till 30-4-1974 when he was allowed to retire from service on superannuation. He functioned as the Director of the Summer Institute on Animal Nutrition for a period of 4

months from 1-5-1974. Dr. M. Subramanian, Junior Professor was given full additional charge of the post of Professor of Animal Husbandry from 30-4-1975.

The following courses were conducted in the department for trimester system students:—

i) Under-graduate courses

"APM 101"; "102"; "103";
 "BG. 101"; "102"; "101"
 "APM 205"; "206";
 "NUT 201"; "202"; "203";
 "BG 203"; "LPT 201"; "202";
 "APM 104"

ii) Post-graduate course:-

"NUT 501"; "505"; "508"; "525";
 "DCP 503"; "507"; "LPT 503"; "DCP 508";
 "LPT 502"; "NUT 510"; "SP 510";.

Practical training programmes

The students were given farm training in the Livestock Farm, Goat Farm and Pig Farm as part of their regular course curricula.

An All India Summer Institute on Animal Nutrition was conducted in the Department from 3rd June to 2nd July, 1974.

In orientation course in Food and Nutrition for a period of two weeks from 1-10-1974 conducted by the Indian Council of Agricultural Research at Lady Irwin College, New Delhi was attended by Dr. C. T. Thomas, Lecturer of this Department.

The workshop on Cattle Development organised by the I. C. D. P., Mavelikkara was attended by Dr. C. T. Thomas on 19-12-1974.

One hundred feed samples received from private individuals and University and Government institutions were analysed for their nutrient contents. Assessments were made on different cattle and poultry rations and individual feed items as to their suitability for feeding animals and birds. Feed formulae for different classes of livestock and poultry were evolved at the request of the Government Feed Factory and Livestock and Poultry Farms.

The following research schemes proposed by the department were revised in accordance with the suggestions made by the Indian Council of Agricultural Research.

i) Studies on Heterosis and Biochemical Polymorphism in swine;

ii) Studies on certain lactational performance in cross-bred animals in relation to plasma protein bound iodine and feeding of iodised salt.

The following research work was undertaken in the department:

i) Studies on the side effect and heritability of birth weight in cross bred cattle of University Livestock Farm;

ii) Studies on the factors affecting birth weight in Pigs at the University Pig Breeding Farm,

iii) Studies on the nutritive value of Neem seed cake;

iv) Studies on the nutritive value of amino acid pattern of mammalian globin and on the electrophoretic pattern of plasma proteins;

v) Evaluation of the nutritive value of different pulse proteins.

By way of extension activities the department was actively engaged in giving technical advice to the farmers on matters relating to feeding of animals, fodder production, starting of a dairy, management of dairy animals, economics of milk production and finding out of adulteration of milk.

A radio talk was given by Dr. T. G. Rajagopalan on some prominent breeds of country dogs in the All India Radio, Calicut.

The following seminars were attended by the staff:-

1. Dr. T. G. Rajagopalan presented a paper on "care, management and training of dogs" at a seminar conducted by the Trichur Municipality.

2. Dr. K. Pavithran attended an Animal Husbandry Seminar organised at Ankamali on 22nd February, 1975.

3. Dr. K. Pavithran attended an Extension seminar at Arimpur on 15th March, 1975.

Extension lectures for the post-graduate students and teachers of the College was organised in the month of January 1975 utilising the grant sanctioned for the purpose by the Indian Council of Agricultural Research.

The department participated in the Trichur Pooram Exhibition.

The following training programmes were conducted.

1. Short term training course was given to 7 trainees from Lakshadweep on Dairying from 30-5-1974 to 12-7-1974.

2. A programme of Training in Dairying was given to 12 farmers from Lakshadweep from 3-3-1975 to 29-3-1975.

Department of Anatomy

The Department of Anatomy conducted teaching at under-graduate and post-graduate level. The

subject of Anatomy included 3 major divisions (1) Gross Anatomy of Domestic Animals (2) Histology and (3) Embryology.

Dr. K. Radhakrishnan continued to be the Professor and Head of Department and P. A. Ommer continued as Lecturer. Mrs. Lucy Paily rejoined the Department as Lecturer on 20-8-1974 after her successful completion of M. V. Sc. degree course at Bangalore. Dr. K. P. Surendranathan joined the Department as Lecturer on 12-8-1974 on expiry of his leave for higher studies.

The following courses were conducted during the year under report.

i) Under-Graduate courses:-

"Anat. 105"; "106"; "107"; "101"; "104"; "102"; "105"; "106"; "107".

ii) Post-graduate courses:-

"Anat. "507"; "501"; "517"; "601"; "514"; "509".

The Two post-graduate students majoring in Anatomy made good progress in their research work. They are working on the prenatal development of testes and epididymis respectively of Malabari goat.

Histological studies on the temporal gland of Indian elephant was undertaken by the department during the year under report and studies on the post-natal development of testes and epididymis of cross-bred goats has been initiated.

The Anatomy museum which displayed many specimens and models depicting the various aspects of comparative anatomy continued to attract visitors coming to the college.

This department rendered all necessary assistance and help to make the Agricultural University pavilion of Trichur Pooram exhibition a success.

Department of Bacteriology

The following courses were offered:

i) Under-graduate courses:

"Mb. 201"; "202"; "203"; "204";

ii) Post-graduate courses:

"Mb. 506"; "509"; "505"; "517"; "503"; "507"; "601"; "511"; "519"; "508"; "501"; "512"; "513"; "502".

The department of Bacteriology is responsible for conducting the potency and safety tests of Biological products manufactured at the State Veterinary Biological Institute, Mannuthy. The details of the Biological products tested and released for field use are shown below:-

Fowl pox vaccine	7 Brews
Pigeon pox vaccine	2 brews
Ranikhet disease vaccine	12 ..
Ranikhet disease vaccine (F1)	3 ..
Haemorrhagic septicaemia vaccine	15 ..

This department also serves as central laboratory for diagnosis of animal diseases of bacterial, viral and Fungal origin.

Department of Extension

The department conducted regular classes at undergraduate level. In addition to regular theory and practical classes, students were also taken out for field extension work to the various poultry and dairy units organised by the extension department. Students were also involved in the organisation and conduct of preventive inoculation in cattle and poultry. A total number of 15, 410 birds and 624 animals were inoculated against contagious diseases during the year. Preparation of teaching aids and operation of audio-visual equipments were carried out for the benefit of students and public. The Artist-Photographer attached to the department also did work for other departments of the college as well as the Directorate of Extension, Kerala Agricultural University. One thousand three hundred and thirty two people visited the institution during the year and they were taken round the various departments of the College and University farms. Field film shows were conducted at 96 places. Besides, the professor of Extension initiated steps for studying the employment potential for Veterinary graduates and organisation of an Employment and Guidance Bureau.

Department of Medicine and Parasitology

During the year under report, the first batch of students under trimester system were promoted to the third year. So the department had to impart training in the subject of Parasitology for both the trimester pattern students and the traditional system of students. Two more candidates were admitted to Ph. D. course on part-time basis during the year under report. The subject of Veterinary Preventive Medicine was taught to the final year students under the traditional system. The list of courses conducted by the department are furnished below:

i. Under-graduate courses in Parasitology

"Para. 301"; "302"; "303"; "304".

ii Post-graduate courses in Parasitology

"Para. 512"; "513"; "506"; "507"; "514"; "701"; "504"; "510"; "516"; "514"; "701"; "503".

Three members of the teaching staff from the department were attending the Veterinary Hospitals

at Trichur and Mannuthy to impart clinical training to the students of third and final B. V. Sc.

The following research schemes were proposed by the department during the year of which the first 3 were sanctioned for implementation.

- Nematode infections of domestic ducks;
- Studies on *Schistosoma nasalis*;
- Studies on gastrointestinal nematodes with special reference to those found in goats;
- Helminthic infestations of domestic fowls.

The members of the staff contributed popular articles to Extension bulletins and similar publications and participated in seminars in different places.

Informative and educative materials from the department were displayed in the Trichur Pooram Exhibition.

Department of Obstetrics and Gynaecology

The department imparts training Obstetrics and Gynaecology and Artificial Insemination to both post-graduate and under-graduate students of the College of Veterinary and Animal Sciences.

Courses in Obstetrics and Gynaecology including Artificial Insemination were offered to students under the traditional pattern.

The following ten post-graduate courses were offered during the year under report.

"OG. 507"; "504"; "508"; "505"; "506"; "503" "501"; "509"; "502"; "518".

Practical training was imparted to both post-graduate and under-graduate students in Artificial Insemination and treatment of infertility condition.

Dr. C. K. S. V. Raja gave lectures to the delegates of Summer Institute in Nutrition at Kerala Agricultural University, Mannuthy and to the delegates of Summer Institute in Animal Reproduction at Veterinary College, Tirupati.

Dr. C. K. S. V. Raja continued to be a member of General Council of the University. He has been elected to the Executive Committee of the University from the teachers' constituency. He continued as a member of Research Council, Convener of Faculty of Veterinary and Animal Sciences and member of the Sports Board. Dr. Raja was also nominated as the Foreign Students' Advisor of Kerala Agricultural University.

The following research projects were under operation.

- Effect of early weaning on the reproduction performance of cow.

2. Biometrics of spermatozoa of boars.
3. Studies of Pathology of testis and epididymis in bucks.
4. Studies on preservation of boar semen in various extenders.
5. Physical histological and histochemical studies of C. L. during pregnancy in sheep and goat.
6. Studies on Sodium and Potassium ion concentration in the semen of domestic animals.

The A. I. Centre under the department of Obstetrics and Gynaecology supplied total 45,985 doses of semen from Jersey, Jersey cross and Sindhi bulls to the Veterinary institutions in Trichur district. The centre also carried out insemination in 2,381 cows and 628 buffaloes of the local public free of cost.

Prof. C. K. S. V. Raja and Dr. T. R. Bharathan Namboodiripad continued to be the members of the Editorial Board of "Kalpadenu", the bi-monthly published by Kerala Agricultural University.
Training programme

Practical training in artificial insemination was imparted to a batch of farmers/trainees from Lakshadweep.

Department of Pathology and Meat Hygiene.

The Department of Pathology and Meat Hygiene was engaged in teaching, research and diagnostic work. In the year 1974-75, courses were conducted for under-graduate and post-graduate students both in the traditional and trimester systems.

350 carcasses of animals and 1,189 birds received from the University farms and hospitals were autopsied and diseases diagnosed. Histo-pathological examination was done on 1,596 tissues received from the State farms and Veterinary Surgeons and reports sent. Another 7,695 tissues collected from autopsy cases done in the Department were also examined histo-pathologically. 36 animals, including dogs, cat, cattle and goats were examined for rabies and results communicated.

The following courses were offered for students under trimester system:

- i) Under-graduate:- "Path. 301"; "302";
- ii) Post-graduate:- "Path. 627"; "402"; "509"; "505"; "503"; "511"; "514"; "504"; "513"; "516"; "501"; "513"; "512"; "627"; "502"; "509"; "505"; "503"; "511"; "514"; "504"; "513".

The staff were engaged in research work on the following topics.

i) Bangkok haemorrhagic disease

Further studies were conducted on Bangkok haemorrhagic disease of chicken. The observations made during the present investigation indicated that the parasites noticed in the peripheral blood of the sick birds pass through developmental stages in the blood. In morphology, location and distribution, the parasite resembled *Akiba caulleri*. The parasite presumably passes through phase of gametogony in the chicken host. The free coccoid bodies encountered in birds immediately after onset of clinical signs appeared to be merozoites which had either been mechanically introduced into the birds (by a biting vector) or by rupture of schizonts which had developed in the host itself. The available evidence suggested that the haemorrhagic syndrome in chicken occurred during schizogony when the schizonts ruptured releasing the merozoites.

ii) Encephalomalacia in chicken

Investigations conducted on the mortality of broiler chicken of the University Poultry Farm revealed that the mortality was due to vitamin-E deficiency. The condition was controlled by supplementing vitamin-E in the feed.

iii) Mortality of chicken in Broiler Farm, Cochin

An investigation was conducted in the mortality of broiler chicken in a commercial farm. Damaged food grains which were fed to birds were screened for toxic substances by biological methods. The results of the investigation showed that the mortalities were due to a variety of causes like leukosis, coccidiosis, pericarditis etc., and not on account of an outbreak of any single specific condition.

iv) Foot and mouth disease

Investigations on the mortality of cross-bred cattle in a private dairy farm was conducted and it was found to be due to Foot and Mouth disease. The animals showed varying degrees of gastro-enteritis in addition to myocardial degeneration haemorrhage, and in many cases myocarditis.

v) Auto-immune thyroiditis

Auto-immune thyroiditis was induced in pigs experimentally. Studies were being conducted on the development of the lesions with the presence of antibodies.

Department of Poultry Science

The department offered courses in Poultry Science at the undergraduate and postgraduate levels.

Three full-time students were admitted to the M. V. Sc. course in Poultry Production.

The department continued to associate with the practical training of undergraduate students in the University Poultry Farm. In addition, a batch of 12 farmers from Lakshadweep were given practical training in various aspects of poultry farming.

Dr. A. K. Kochugovindan Unni, Lecturer, was deputed to undergo training in Poultry Breeding and Genetics held at the High Level Inservice Training (Poultry) Institute, Bangalore, between 10-2-1975 and 31-3-1975. He completed the training obtaining a grade "Excellent" in the training.

The following research schemes have been submitted for sanction.

- a) Effect of antibiotics, nitrofurans and arsenicals on growth of chicks.
- b) Effect of dubbing and de-winging on growth of chicks.
- c) Restricted feeding of replacement pullets.
- d) Water management of caged layers.
- e) Protein levels on egg quality.
- f) Eating pattern in layers.

Technical assistance to needy farmers was an integral part of the work of this department. During the period under report over 50 farmers availed of this facility.

The staff members of this department participated in seminars on poultry production organised by the University in collaboration with the following agencies.

- i) Lion's Club, Angamaly ;
- ii) Kerala Grandha Sala Sangham ;
- iii) Arimpur Panchayat.

Training Programme

The department associated itself with the training of farmers from Lakshadweep on Poultry Production.

Department of Pharmacology

The department offered both under graduate and postgraduate courses in Pharmacology. During the report year courses were conducted both in traditional and trimester systems.

The courses offered during the year under report are :-

Ph. 301, 302, 303, 304

Dr. M. K. Rajagopalan, Reader in Pharmacology participated in the Summer Institute in pharmacology held at Haryana Agricultural University, Hissar from 7-6-1974 to 6-7-1974.

Department of Physiology and Biochemistry

The department of Physiology and Biochemistry is a postgraduate department of the College conducting undergraduate courses in Physiology and Biochemistry and M.V.Sc. and Ph.D. courses in Physiology.

The following courses were conducted during the year.

i) Undergraduate courses:-

"Bioch. 101"; "102"; "103"; "Phy. 201"; "202"; "203".

ii) Postgraduate courses:-

"Phy. 502"; "503"; "512"; "514"; "515"; "523"; "524".

Of the two students who had registered for Ph. D., one has submitted his thesis to the University of Calicut for the award of Ph. D. degree.

Dr. S. G. Nair, Professor attended the International Physiological Congress at New Delhi and Dr. G. Nirmalan, Reader, attended the symposium on Endocrines at Medical College, Trivandrum. Dr. M. G. Ramakrishna Pillai, Lecturer attended the Orientation Training sponsored by ICAR/FAO at Lady Irwin College, New Delhi.

The following research projects were completed:

- 1) The effect of choline deficiency on the chemical composition of the skeletal muscles of chicks.
- 2) Studies on the distribution of enzymes in the different regions of the reproductive tract of chicken.
- 3) Identification of alkalosis in fodder grass.
- 4) Haemoglobin polymorphism in chicks.

Department of Surgery

Classes were conducted for the final B. V. Sc. students under traditional system.

There was one M. V. Sc. student majoring in Surgery. Six courses were also conducted for students taking minor courses in Surgery.

Practical training programme :

Intensive practical training (clinics) was given to the students at the two Veterinary Hospitals in addition to regular practical classes.

The department was engaged in clinical research at the two hospitals.

Department of Statistics

At present the department is meeting the statistical needs of teaching, research and extension acti-

vities of all the institutions in the main campus of the University.

Professor of Statistics continued to be the sole member of the staff of the department. The following courses were conducted during the year:-

i) Undergraduate courses:-
"Stat. 102"; "105"; "101"; "211"; "121".

ii) Post-graduate courses:-
"Stat. 501"

Three seminars and conferences conducted outside were attended by the staff.

Department of Therapeutics

Dr. K. M. Alikutty, Lecturer, continued to hold charge of the department.

Classes were conducted for undergraduate students of final B. V. Sc. class under traditional system and under trimester system 3 courses were offered.

Two postgraduate courses were offered.

Clinical training was imparted to students by the staff of the department at the Veterinary hospitals, Mannuthy and Trichur.

Training was imparted to farmers and other trainees from Lakshadweep.

Clinical materials from 78 selected cases attended to at Veterinary Hospital, Mannuthy were examined in the department for diagnosis of various disease conditions.

The Lecturer in charge of the department visited animals belonging to the Department of Dairy Development and Department of Animal Husbandry stationed at different locations in the State for carrying out investigations on their health problems and made necessary recommendations.

The following Research Projects were undertaken:

i) Experimental studies on weed toxicity in cattle.

Feeding trials were carried out using certain weeds suspected for causing toxicity in cattle and the clinical signs were reproduced on artificial feeding of the suspected weeds. Antidotes were tried and the doses were fixed. The findings of the experiment applied in subsequent field cases also gave encouraging results.

ii) Preliminary studies on Gangrene of Extremities in cattle.

In experimental reproduction of the condition in rats and guinea pigs certain observations were recorded. The experiment is proposed to be repeated.

iii) Clinical trials on "Gastina" for scour in calves
Trials carried out have been given effective clinical cure for scour in calves.

Department of Veterinary Public Health

Classes were conducted for final B. V. Sc. students. The post-graduate course No. VPH. 504 was also conducted.

Practical training to the students included laboratory work in milk hygiene, visit to Municipal slaughter house for meat inspection etc. Students got acquainted with various aspects of food hygiene, zoonoses, milk and meat hygiene, by visiting various institutions during their study tour.

Members of the teaching staff in the department participated in various extension activities.

Broadcasts through All India Radio, Trichur on the following topics by the staff was made during this year.

- 1) ശപിയായ പാൽ (T. R. Sankunny)
- 2) പാലിൽകൂടി പകരുന്ന രോഗങ്ങൾ (T. R. Sankunny)
- 3) പേയ്വിഷം മൃഗങ്ങളിൽ (M. Soman)
- 4) പാലിന്റെ പോഷകമൂല്യം (T. R. Sankunny)

Dr. T. R. Sankunny, Lecturer of this department edited the following pamphlets for the Directorate of Extension Education, Kerala Agricultural University.

- Tungro symptoms and control (English)
നെല്ലിന്റെ തൃശ്ശൂര രോഗം (Malayalam)

Dr. T. R. Sankunny also continued to be the editor of 'Kalpadhenu'. The extension education bi-monthly of the University.

Dr. R. Padmanabha Iyer, Lecturer of this Department was in charge of the final B. V. Sc. students' All India study tour for the year 1974-75.

Division of Refresher and Training courses

This section is mainly concerned with imparting and co-ordinating the training courses in Veterinary and Animal Husbandry subjects to the officers and other trainees deputed by the various departments and other Governmental agencies.

Dr. P. O. George, continued to be the officer in-charge of Refresher and Training courses during the current year also. Dr. V. Sathianesan was posted as Lecturer with effect from 2-7-1974.

Dr. P. O. George was also conducting classes for the undergraduates and post-graduates in the subject of Surgery. In addition, he was attending the University Veterinary Hospital, Trichur to impart clinical training to the students attending the Hospital.

Dr. V. Sathianesan, was conducting Parasitology classes to the III B. V.Sc. students.

Dr. V. Sathianesan, Lecturer is working on a project, "Studies on certain gastro-intestinal nematodes with special reference to those found in goats", sanctioned by the Kerala Agricultural University.

Dr. P. O. George gave a radio talk on "Mastitis in cattle".

A training programme of three months duration was conducted for the candidates deputed by

the Administrator, Union Territory of Lakshadweep, in poultry keeping and Dairy Science.

Another training course of four weeks duration was also conducted for the farmers, deputed from Union Territory of Lakshadweep.

For both these training programmes a study tour was arranged to visit the various Government and Private Dairy and Poultry Farms within the State.

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CHAPTER III

RESEARCH

AGRICULTURE

There are twenty three research stations under the University, engaged in conducting research on coconuts, pepper, rice, cardamom, cashew, pineapple, banana etc.

Dr. M. R. G. K. Nair was Director of Research from 1-4-1974 to 17-7-1974. When the term of appointment of Dr. Nair expired, Dr. R. Gopalakrishnan, Rice Specialist was placed in charge of the post of Director of Research on 17-7-1974 and continued as such till the end of the report year.

A brief report detailing the research schemes undertaken in each station, experiments conducted, progress and findings, is given elsewhere in this report as Part II. The administrative aspects of these stations are dealt with below:-

i Coconut Research Station, Nileswar

There are two research stations in Nileswar doing research on coconut, one at Pilicode and the other at Nileswar. They are called Nileswar I and Nileswar II in common parlour.

The research station, Nileswar I is situated in the Pilicode Village, Hosdurg Taluk, Cannanore District, 58 kilometers from Cannanore Town. The nearest Railway Station in Chervattur. Nileswar II is situated in the Hosdurg Taluk and it is about 2½ KMs south-west of Nileswar Railway Station. These stations were established in the year 1916. Nileswar I has an area of 27.65 hectares and Nileswar II 17.20 hectares.

The purpose of these stations is to study various aspects of coconut cultivation in different types of soil.

ii Coconut Research Sub Station, Balaramapuram

This research station, with an area of 14.13 hectares was established in the year 1963. It is situated at Kattachalkuzhi, 17 KMs from Trivandrum. Experiments were laid out in 1964 with a view to conduct manurial and cultural experiments on a coordinated and planned basis, as the studies on these aspects have a direct bearing on the soil and climatic conditions, prevailing in this coconut tract.

iii Coconut Research Sub Station, Kumarakom

This station was established in 1947 and has an area of 23.26 hectares. This station is situated on the eastern bank of the Vembanad Lake, in Kumarakom Village, Kottayam District. The main object of establishing the station was to conduct co-ordinated agronomical research work to study the cultural and manurial requirements of coconut palms under the soil, climatic and other peculiar conditions prevailing in the back water areas of Kuttanad tract.

iv Rice Research Station, Pattambi

Established in the year 1927 with an area of 63.62 hectares, this station is situated about a Kilometer east of Pattambi Railway Station. This station was upgraded to the status of the Central Rice Research Station in 1963.

The main objectives of this station are:-

- 1, to evolve high yielding varieties of rice suitable for different agro-climatic regions in the State.
- 2, to find out and recommend suitable cultural, manurial and other agronomic schedules for rice for the different seasons.
- 3, to do research on paddy pests and diseases and their control measures.
- 4, to study the chemical and biological aspects of rice soils.
- 5, to multiply and to distribute quality seeds and to do seed certification.
- 6, to serve as an authoritative information centre on matters concerning rice production, protection and conservation.

In addition to the selection and indentification of 35 strains from the cultivators bulk the following high yielding varieties were developed at the station-

- 1) Annapoorna 2) Aswathi 3) Rohini and 4) Triveni.

After the formation of the Kerala Agricultural University, the following strains were released from this station.

- 1) Jyothi 2) Bharathi and 3) Sabari.

Improved package of practices were formulated based on different agro-climatic regions. Lignite, fly ash, the by-product from the Neyveli Lignite Corporation were found to be effective as any other common liming material. Studies on water management brought out the magnitude of loss of major materials through deep percolation. In the Pathology and Entomology divisions, thousands of varieties were screened for multiple purposes in close collaboration with co-operative centres like All India Co-ordinated Rice Improvement Project, Central Rice Research Institute and International Rice Research Institute. Several chemicals were also screened under the control of major pests and diseases.

(v) Rice Research Sub Station, Moncompu

This station was started as paddy breeding station in 1944. It is situated about 12 kilometres from Alleppey and has an area of 8.67 hectares. This station has a small history. First, an experimental station was started at Kuttanad to explore the possibility for annual cropping in kuttanad and as a result of the trials conducted, it was proved that rice could be cultivated every year. When this phenomenon was established, the station was abolished in 1921. In 1926, another station called "Kari" was started in Purakkad to study the soil management problems, of Kuttanad. The trials conducted with the application of lime and phosphorus was

successful. The station was closed in 1931 when the above practice was got established.

With a view to breeding varieties suitable for this region, a paddy breeding station in charge of a botanist was started in 1940. The strains of paddy suited to this tract were evolved and released. This station was upgraded to the status of the regional station in 1963 to handle all problems of agronomy, plant protection etc. in addition to the breeding of varieties suited for Kuttanad.

(vi) Rice Research Sub Station, Kayamkulam

This station is situated about 1.6 kilometers east of Kayamkulam. It has an area of 11.65 hectares (Wet land 9.45 hectares and garden land 2.20 hectares). This station was established in 1958.

This station is located in the main campus of the University at Mannuthy. It has established in 1957 and has an area of 5.7 hectares. This station is intended for tackling the various problems confronting rice cultivation in the central portion of the middle lateritic region comprising of areas in Trichur and portions of Ernakulam Districts. Breed- of high yielding strains with responsiveness to heavy fertilisation and resistance to pests and diseases by the wellknown breeding methods of selection, hybridization and nutrition and also by introduction and fixing optimum manurial and cultural schedules for the rice crop.

(viii) Model Agronomic Research Station.

This station is located at Karamana about 3-kilometers southeast of Trivandrum. It was established in the year 1955. It has an area of 7.29 hectares. The main object of the station is to conduct complex, manurial, cultural and rotational experiments with paddy under the All India Co-ordinated Agronomic Research Project. This is the only Model Agronomic Research Station of the particular agroclimatic conditions of the region-Kerala.

(ix) Agronomic Research Station, Chalakudy.

This station was established in 1962 at Chalakudy in Trichur district. The area of the station 8.95 hectares.

The main objectives of this station are:-

- 1) to undertake studies on new cropping patterns in command areas and formulate suitable cropping patterns under different resource constraints, and
- 2) to conduct research on methods and practices for minimising water losses in the field to increase the water use;

The main crops cultivated are rice, pulses, cinnamon, tapioca, banana and coconut.

(x) Rice Research Sub Station, Vyttila

This station was established in 1859. The area of land occupied by this station comes to 8.7 hectares. The station is situated in the Ernakulam District, about 6 km. from Ernakulam.

The object of the station is to evolve high yielding saline resistant rice varieties and to try out suitable agronomic practices for the low lying coastal areas, popularly known as Pokkali lands.

(xi) Cardamom Research Station, Pampadumpara

This station was established in the year 1956. It has an area of 46.44 hectares. The main objective of the farm is to undertake research on different aspects of cardamom cultivation. An All India Co-ordinated Spices and Cashew Improvement Project of the ICAR was started during 1972 with a view to bring about improvement in the spices in the state by conducting research on selection and hybridisation, tackling problems of poor fruit sets, control of pests and diseases etc. of crops like cashew, pepper, cardamom ginger and turmeric.

(xii) Lemongrass Research Station, Odakkali.

It is located in Kunnathunadu Taluk, 43 kms. east of Ernakulam. It was established in 1954. The area of this station is 12.74 hectares. The object of the station is to conduct investigation on the agronomic, botanic and processing aspects of various essential oil yielding plants of Kerala with special reference to lemongrass.

(xiii) Banana & Pineapple Research Station, Kannara.

This station was established in 1962. The area of the station is 17.25 hectares. The station was intended to conduct research on Banana and Pineapple. In April 1974, a more suitable site for Pineapple research was selected in the University Main Campus, Vellanikkara. The objectives of the station are to evaluate and select superior varieties of Banana and pineapple by introduction from within the country and abroad for different purposes and to standardise their cultural and manurial practices, time and method of planting, pest and disease control measures, dose and method of application of hormones and growth regulators etc.

(xiv) Cashew Research Station, Anakkayam

The station was started in 1962. The area of the station extends to 10.1 hectares. The object of the station is to find out the ways and means for augmenting cashew production by improved cultivation and cultural practices and evolving high yielding varieties by hybridisation, selection and introduction, evolving suitable plant protection measures etc.

(xv) Horticultural Research Station, Ambalavayal.

This station is situated at Ambalavayal in south Wynad Taluk, Kozhikode District. It is 100 Kilometers away from Calicut city on the eastern side. The total area of the farm is 87.04 hectares. The station was established in 1946. The objectives of the station are:-

- 1) to carry out research on various aspects of improvement of agriculture in Wynad, in general.
- 2) to make available quality seeds and seedlings of selected varieties of various crops for distribution.
- 3) to render advice to the cultivators on different aspects of improved methods of agriculture.
- 4) Intensive research on fruits; spices and essential oils.

This station was upgraded to a central Horticultural Research Station in 1966.

(xvi) Pepper Research Station, Taliparamba

This station is situated in Panniyur village, Taliparamba Taluk. It is 8 kilometers away from Taliparamba. It was established in 1952. The area of the station is 12.97 hectares. The objectives of the station are to carry out research work on the evolution of high yielding varieties of pepper, control of insect pests and diseases, the manurial requirement of the crop and the optimum methods of cultivation to improve pepper production in the State.

VETERINARY AND ANIMAL SCIENCES**(xvii) University Livestock Farm, Mannuthy**

Adjacent to the College of Veterinary & Animal Sciences, this farm covers a total area of 56 hectares of land. The Dairy Technologist is the Controlling Officer. At present, the main objective of the farm is to function as a teaching, research and extension unit. The farm animals are allotted to the students of the college of Veterinary & Animal Sciences for various research works at the request of the different teaching departments of the College. Post-graduate students are doing research on various topics assigned to them by the authorities of the College of Veterinary & Animal Sciences. The B. V. Sc. graduates selected for the purpose are being given specialised training in the Dairy Farm Management for a period of 6 months.

The Herd Strength as on 31-3-1975 in the farm was 289 as against 259 as on 31-3-1974. During the year under report, 1,09,559.25 kg. of milk and 16.65 metric tons of fodder grass were produced in the farm.

(xviii) University Poultry Farm, Mannuthy.

This farm is also situated in the campus of the College of Veterinary & Animal Sciences. It is being utilised as the instructional farm in Poultry Science for the students of the College of Veterinary & Animal Sciences.

This farm was established in 1952. The stock of birds on 31-3-1975 was 913 as against 7216 on 31-3-1974. The total number of eggs laid during the period under report was 1, 74, 695. During this period, 23, 220 eggs were set for incubation, 36943 hatching eggs, 84223 table eggs were sold. Besides, 20385 birds of different varieties were sold from the farm.

(xix) University Pig Breeding Farm, Mannuthy.

This is situated adjacent to the campus of the College of Veterinary & Animal Science. It has an area of 5 hectares. It was established in the year 1975. It was functioning as a breeding centre for multiplication of improved varieties of exotic stock of pigs for supplying to the interested pig breeders and to develop swine industry in the State. The pigs brought from Gannavaram have started farrowing during this period and the studies of pure breeding of the Land Race and Large White Yorkshire Breed are in progress. The surplus piglets of these two breeds of pigs have been supplied to breeders. During this period, 720 piglets were produced in the farm, 178 pigs were sold to the breeders for rearing. 193 pigs were sold to Bacon Factory.

(xx) Cattle Breeding Farm, Thumburmuzhi.

This farm is situated 15 km. east of Chalakudy and it has an area of 25 hectares. The farm was started in 1955 as a dry cattle salvage farm. Dry cows are transferred to this farm from the University Livestock Farm, Mannuthy. Milch cows are transferred from this farm to Mannuthy to replenish the milch stock in that farm.

(xxi) University Livestock Farm, Thiruvazhumkunnu.

This farm is situated in the Mannarghat Taluk in Palghat District. It was established in the year 1950. The area occupied by this farm is 162 hectares. Breeding buffaloes and cattles is the main objective of this farm. 33911 kg. of milk was produced in the farm during the period. 34 graded Brown Swiss Surti calves were produced and 21 animals were sold/transferred.

(xxii) University Veterinary Hospital, Trichur

The Hospital is situated on the south-western side of the Trichur town. It was established 50 years back. It has an area of about 0.50 ha. Practical training is given in this hospital to the students of the College of Veterinary and Animal Sciences, in various aspects of, clinical diagnosis and treatment of animal diseases. This Institution is also intended to treat the animals and birds against all kinds of diseases and protect them from diseases by preventive vaccination.

A statement showing the staff position in various research stations is appended (appendix XI)

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CHAPTER IV**EXTENSION EDUCATION****I. Introduction.**

Dr. V. S. S. Potti, continued as Director of Extension Education till 13-9-1974 when his period of appointment terminated. From 14-9-74 he was appointed as Deputy Director in full additional charge of the post of Director of Extension Education and continued as such till 26-12-74. He was re-appointed as Director of Extension Education from 26-12-1974 and continued as such during the year.

Sri. V. K. Moideen Koya, District Information Officer, on deputation from the Department of Public Relations continued as Public Relations Officer.

Dr. T. R. Sankunny, Lecturer, College of Veterinary & Animal Sciences continued as Editor, in addition to his duties, during the year.

2. Training programmes.

Training programmes are regularly arranged by the University for technical personnel of the Depart-

ments of Agriculture, Animal Husbandry, and Dairy Development as well as field workers, farmers, agribusiness representatives etc. The following training programmes have been organised during the year.

i) Special Training in Cattle and Poultry Rearing

Training in cattle and poultry rearing for a duration of one month was conducted from March 3, 1975 at the College of Veterinary and Animal Sciences. Twelve farmers deputed by the Lakshadweep Administration participated in the training programme which included various aspects of dairy husbandry and poultry keeping, farm training, laboratory practical training and study tours to Dairy Plants, Intensive Cattle Development Projects, Livestock Farms and Poultry farms.

ii) Special Training Course in Dairy/ Poultry Science.

A Short-term Training Course in Dairy and Poultry Science for a period of three months from 15. 4. 1974 to 20. 7. 74, was conducted at the College of Veterinary & Animal Sciences. Seven trainees deputed from Lakshadweep attended the training. The course consisted of intensive theoretical and practical training in Dairying and Poultry Science and field tours.

iii) Training for Input Dealers.

A one-day training for input dealers in Trichur District was conducted in March, 1975 in collaboration with the Department of Agriculture. Thirty five dealers and agents of fertilizer and pesticide firms participated. The topics for the training were plant nutrients, fertilizers and fertilizer dosages for different crops, soil testing and liming, insecticides and their formulation, common pests and their control, fungicides and their formulations and common diseases and their control.

iv) Training course in Horticulture for School Teachers.

A Training Course in Horticulture for School Teachers enrolled in the Work Experience programme in Schools was conducted during March 1975. Forty seven teachers from High Schools and U. P. Schools deputed by the Department of Public Instruction attended the course. The training was conducted in two batches, one each at the College of Agriculture, Vellayani and at the College of Horticulture, Mannuthy. The period of training was five days.

v) Training of Technical Personnel in Plant Protection.

A special refresher training programme in plant protection was conducted at Rice Research Station,

Pattambi from 25-11-1974 to 21-12-1974. The subjects for the training included current pest and disease situation in the State, new range of pesticides, advancements in crop protection, pest and disease surveillance etc. Five course of 6 days' duration were also conducted and 141 technical personnel imparted training in plant protection.

3: Publications.

The following publications were brought out during the year.

i) Kaipadhenu

Dr. T. R. Sankunny, Lecturer, College of Veterinary Sciences continued as Editor.

During the year four issues of the bi-monthly magazine were published, thus completing the first volume. An index of the first volume was documented in the issue of October, 1974. Altogether 79 titles of academic importance in agriculture, horticulture and veterinary and animal sciences appeared in the first volume. Along with many features, 46 notes on research and articles on activities of 5 Research Stations were included.

ii) Agres-News

Sri. A. G. G. Menon,, Professor of Extension, College of Agriculture, Vellayani continued as the Editor of the quarterly technical newsletter.

During the year, three issues of Vol. V of the newsletter were published.

iii) The Kerala Journal of Veterinary Science

Dr. K. Chandrasekharan, Lecturer, College of Veterinary & Animal Sciences, continued as Editor till 19-11-1974. Dr. A. Rajan, Reader, College of Veterinary & Animal Sciences, took over as Editor from 20-11-1974.

During the year two issues of the Journal Vol.4 (2) and Vol. 5 (1) containing 40 Scientific articles were published.

iv) The Agricultural Research Journal of Kerala.

Sri. N. Mohandas, Junior Professor, College of Agriculture, continued as Editor during the year.

Three issues of the Journal, (Vol. XI, Part III Vol. XII, Parts I and II) were published. The Journal contained 42 research articles and 43 research notes.

v) KAU Newsletter.

Eight issues of the Newsletter containing information on the various educational, training, research, extension and public activities of the University were published during the year..

vi) Pamphlets and News releases

Pamphlets on Tungro Virus disease, Brown plant hopper, Rational Use of Scarce inputs for Optimum Production, Fertilizer Application, Lemon-grass Cultivation, and a fact sheet on Rice Research Sub Station, Moncompu were published during the year.

Farm News and News release on more than 200 items were issued to dailies, periodicals and radio.

4. Seminars, Workshops and Exhibitions

Officers of the University participated in the organisation and conduct of seminars at Cherpu, Arimboor, Vilvattom and Ankamali. They also participated in the workshop on financing Agriculture organised at Manjeri by the Canara Bank.

The University participated in the exhibitions conducted at the Calicut University, Palghat, Cherpu, Cranganore, Arimboor and Manantody.

The University participated in the Trichur Pooram Exhibition for the first time and was awarded the first prize for the best pavilion.

A State Level Workshop on Package of Practices was held at the Mannuthy campus during February, 1975. Officers of the Department of Agriculture including the Director of Agriculture and Additional Directors of Agriculture, experts from the University research stations and colleges, delegates from the Central Plantation Crops Research Institute, the Central Tuber Crops Research Institute, Director, Central State Farm and representatives of fertilizer and pesticide firms and dealers participated in the workshop. During the workshop the management

practices of over 29 crops grown in the State were reviewed and revised in the light of the latest research results and field experiences.

The recommendations of the workshop published as 'Package of Practices Recommendations' served as a definite source of information on crop culture in the State.

The University collaborated with the Agri-Horticultural Society, Trichur in conducting a Fruit, Flower and Vegetable Show at Trichur on January 18 and 19. The College of Horticulture, Mannuthy was awarded prizes for roses, bongainvilleas and foliage plants. The University instituted a Rolling Trophy to be awarded to the individual best exhibit at the Show.

A Field Demonstration Project with the concept "Minimum Inputs for Maximum Production" was jointly undertaken by the University, Department of Agriculture and Mangalore Fertilizers and Chemicals at Uzhinjapadam in Trichur District. As part of the project method demonstrations on field preparation, fertilizer application, transplanting of paddy seedlings and spraying with pesticides were conducted by the experts of the University.

A project entitled 'Operation Farm' jointly sponsored by the Lions Club, Ankamali, Multiple Cropping project, Department of Agriculture and the University was organised at Ankamali on February 12, 1975. At the Seminar organised as part of the project, experts of the University engaged training-discussion classes.

The University collaborated with the Trichur Municipality in conducting a 'Pet Show' at Trichur in February and instituted a Rolling Championship Trophy for the best animal at the show.



CHAPTER V

WORKS

The Engineering Wing of the University is the Directorate of Physical Plant. Shri. A. T. Devassy continued as Director of Physical Plant during the year under report. The control and maintenance of properties, procurement of equipments, vehicles and machinery, designing and construction of new buildings etc. are vested with the Director of Physical Plant.

Construction of Academic Block buildings and Hostels in Main Campus were taken up. In Veterinary Campus also, the extension building to College, P. G. Hostel and Livestock Buildings were newly taken up.

The House Allotment Committee, of which the Director of Physical Plant is the Chairman, for deciding allocation of quarters for residence to the members of the staff had five sittings during the year 1974-75.

Major Works

A list of major works taken up during the year under report are detailed below with estimate amount and expenditure incurred in 1974-75.

	Estimate	Expenditure
1 Academic Block buildings in Vellanikkara 3 No.	69 Lakhs	7.93 lakhs
2 Extension to Veterinary College. 1 No.	16.10 "	6.35 "
3 Hostel Block for 200 boys each at Main Campus 2 Nos.	28.00 "	0.02 "
4 P. G. Hostel for 40 students at Mannuthy. 1 No.	5.20 "	1.28 "
5 Cattle Barns at Mannuthy 3 Nos.	2.25 "	0.58 "
6 Central Feed Store at Mannuthy. 1 No.	1.15 "	0.01 "
7 Silo (Horizontal type Bunker) Mannuthy. 1 block	2.40 "	0.18 "
8 Faculty club Building at Mannuthy 1 No.	2.05 "	0.23 "
9 Ladies Hostel for 20 students (Providing additional accommodation at Mannuthy).	2.20 "	0.16 "
10 Black topping roads in Nutrition Laboratory.	0.57 "	0.01 "
11 Providing fixtures to conference hall.	0.63 "	0.53 "

II Spill over works in Execution in 1974-75

1 Additions to Nutrition Laboratory Building at Mannuthy	3.00 "	0.53 "
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2 Quarters for teaching staff at Vellayani 39 Nos.	12.05 "	2.30 "
3 Teachers Hostel at Mannuthy 18 suites	4.39 "	2.04 "
4 Teachers Hostel at Vellayani. do	4.51 "	0.46 "
5 Teachers Hostel at Pattambi do	4.73 "	1.90 "
6 Ladies hostel at Vellayani for 45 students.	3.87 "	0.01 "
7 Improvement to playgrounds for Veterinary College.	0.73 "	0.01 "
8 Stadium at Vellayani.	10.20 "	0.18 "
9 Formation and metalling road in Vellanikkara.	5.85 "	5.04 "
10 Water supply for Vellanikkara Drilling Bore wells	0.68 "	0.61 "
11 Constructing Goat shed and kidding shed at Mannuthy.	1.75 "	0.07 "

Minor Works

Forty two minor works including maintenance and repairs were in execution during the year under report.

The following Major Works were completed during the year

- 1 Additions to Nutrition Laboratory Buildings.
- 2 Metalling the roads in Main Campus.
- 3 Constructing Goat shed, kidding shed at Mannuthy.

4) The total outlay for the year 1974-75 was Rs. 41.86 lakhs which includes purchases and works done for Rs. 1.22 lakhs against funds placed by other officers out of contingencies.

5) Staff position

The details of staff attached to the Engineering Wing is appended (appendix XII).

6) Against the sanction of 3 divisions, only one division is functioning. Due to the moratorium on construction of nonfunctional buildings by the ICAR, there was no necessity for the additional divisions. However to supervise the works taken up there was not sufficient Junior Engineers and Overseers. The difficulty in getting Junior Engineers and Overseers on deputation still persists.

CHAPTER VI

FINANCE WING

Shri P. Rajagopala Pillai continued as Comptroller during the year under report.
Financial Report.

Budget estimate of the year under report was approved by the Finance Committee anticipating an income of Rs. 3,19,22,600/- with an expenditure of Rs. 3,51,21,500/- leaving a deficit of Rs. 31,98,900/-. The budget was finally revised to Rs. 2,93,87,910 as receipts and the expenditure as Rs. 2,73,41,900. At the close of the year the actual receipt was Rs. 2,43,82,928 and the expenditure was Rs. 2,34,40,812 leaving a cash balance of Rs. 9,42,116/-. Statement showing the details of expenditure and receipt is appended. (appendix XIII) Due to paucity of funds, the repayment of interest

free loan of Rs. 30 lakhs was postponed to 1975-76.
Assistance from Government of India/ICAR and other Agencies.

An amount of Rs. 50,26,642 was obtained from ICAR and other agencies as grant-in-aid to the Kerala Agricultural University. Out of this a sum of Rs. 44,70,000/- was towards ICAR assistance for the development of the University and the remaining sum was towards expenditure on Research Projects.

Grant from State Government.

State Government have sanctioned and released a sum of Rs. 1,18,00,000/- (Rs. 80,00,000/- under Non-plan and Rs. 38,00,000/- under plan) during the year.



CHAPTER VII

ESTATE

The Estate under the University is about 2 kms to the east of Mannuthy where the Headquarters of the University is situated, with an area of 380 hectares. About 226 hectares have been set apart for campus construction, formation of roads and establishment of instructional farms.

The main crop in the estate is rubber. The rubber trees standing in the areas remaining after handing over to the above purposes are being maintained properly. The rubber trees in the remaining areas

are being tapped regularly and the rubber is being processed in the factory on a commercial basis.

There is a rubber factory in the Estate. During the year, 143 persons were employed according to necessity. 97.581 m. tonnes of rubber was produced. The total receipt of the estate was Rs. 7.15 lakhs and the expenditure was Rs. 6.15 lakhs.

Shri. V. Balaram, Deputy Collector on deputation continued as estate Officer, during the year.



II. TECHNICAL

AGRICULTURE

RICE RESEARCH STATION, PATTAMBI

RICE

Varietal improvement

A total of 383 lines of F3 generation from the following eight cross combinations were grown and studied. Based on the desirable plant characters, 69 single plants have been selected and carried forward for further studies and selection.

Thriveni X Cul. 12814
C4-63 X Thriveni
MN54-42 X IR. 20
MN54-42 X C4-63
Jaya X (Annapurna X Lebmuenahng)
Jaya X Pokkali
Jaya X Dughan Shali
Jaya X O.Spontanea.

Trial of Assam Rice collections in uplands

Forty eight ARC cultures were put under a preliminary yield trial in uplands during the virippu season and 20 cultures were selected for further studies.

Comparative yield trial

Comparative yield trial with three Maharashtra rice varieties namely Satya, Soorya and Suhasini along with Jaya was conducted during both virippu and mundakan seasons. During both the seasons, Jaya was found to be significantly superior to Satya, Soorya and Suhasini in grain yield. The Maharashtra strains were found to be more susceptible to pests and diseases.

Observational trial.

Thirtythree short duration cultures and 76 medium duration cultures selected from various cross combinations were tested for their desirable characters and yield during the virippu season. Based on the yield characters and field tolerance to pests and diseases, 10 short duration and 16 medium duration cultures were advanced to preliminary yield trials.

Preliminary yield trials.

Two preliminary yield trials, one with eleven short duration and the another with sixteen medium duration cultures were conducted during the mundakan season. From this trial, 6 short duration and 9 medium duration cultures were selected. Out of these 15 cultures selected, four are induced mutants of MN. 54-42, 5 from the cross T(N) 1 x Co. 25, two from the cross Mashoori x Sabari and one each from the cross Triveni x T(N)1, Annapurna x Lebmuenahng, CO. 15 x IR. 262 and IR. 8 x CO. 25.

Mutation Breeding.

1. Culture MN, 54-42, a short duration high yielding red riced culture from the cross TN(1)xPTB.8 is susceptible to blast disease. Sixteen cultures selected from the irradiated progenies (Gama rays 11 KR and 22 KR) of these cultures were put under observational lines during the virippu season and from these 7 cultures were advanced to preliminary yield trial during the mundakan season. Based on the yield data and resistance to blast disease, four cultures were selected for further studies.

2. Orpandy, a fully awned, photosensitive tall indica variety tolerant to salinity was irradiated with gama rays and M2 generation was raised during the year. Single plants showing awnlessness have been selected for further studies in the saline areas.

AGRONOMY

Intensive rotational trial in terraced uplands

With a view to explore the possibility of raising more than one crop in the conventional single crop lands (Palliyals) a one year two crop rotation experiment was initiated during the first crop season 1972-73. There were 8 treatments comprising of a short duration variety of rice viz. Rohini in the first

crop season in all the plots followed by 8 different crops in the second crop season. (Annapurna Rice, gingelly, cowpea, tapioca, green gram, ragi, groundnut and horsegram). During the first crop season, higher rice yields were recorded in plots where gingelly, groundnut and cowpea were grown in the previous seasons. Judged from the results recorded so far and from the economic point of view, rice followed by rice is the best crop rotation for Palliyals.

Influence of age of seedlings and spacing:

This experiment was initiated to study the influence of age of seedlings and spacing on yield and associated characters. The treatments comprised of 12 combinations of four age groups (21, 28, 35 and 42 days after sowing) and 3 spacings (15 x 10 cm, 15 x 15 and 15 x 20 cm). The test variety was Jaya. Age of seedlings contributed significant yield difference during both the seasons. Seedlings aged 35 days produced the highest yield in the first crop season and during the second crop season the younger seedlings were found to be more productive. Seedlings during the second crop season attain physiological maturity earlier than during the first crop season. In the virippu season, age of seedlings can go up to 35 days after sowing. The effect due to spacing was significant during the virippu season only, 15 x 15 cm and 15 x 20 cm giving better yields than 15 x 10 cms.

Response of rice to micronutrients

Response of rice to zinc, copper, molybdenum and magnesium was studied in this trial. The micronutrients were applied 10 days after planting over and above the recommended dose of NPK of 90-45-45 Kg per hectare, the test variety being Aswathi. The treatments were:

1. Recommended dose of NPK at 90-45-45 kg/hectare;
2. Treatment 1 + ZnSO₄ at 15 kg/ha;
3. Tr. 1 + ZnSO₄ at 30 kg/ha;
4. Tr. 1 + CuSO₄ at 25 kg/ha;
5. Tr. 1 + CuSO₄ at 50 kg/ha;
6. Tr. 1 + Magnesium silicate at 100 kg/ha;
7. Tr. 1 + Magnesium silicate @ 200 kg/ha;
8. Tr. 1 + Ammonium molybdate at 1 kg/ha;
9. Tr. 1 + Ammonium molybdate at 2 kg/ha;
10. Tr. 1 + Farm-yard-manure at 5 tons/ha.

The differences in yield due to treatments were not statistically significant indicating little response to micronutrients in the area.

Economic application of phosphorus and potash

Response of low land rice to phosphorus and potash is erratic and inconsistent. Therefore it was

felt necessary to investigate whether application of these nutrients can be skipped over for one or more seasons without affecting the yield.

The experiment was laid out in Randomised Block Design with 10 treatments and 3 replications. The test variety was Thriveni with N P K dose of 70-35-35 kg/ha.

The treatments were:

	First crop	Second crop
1	N P K	N P K
2	N P K	N K
3	N K	N P K
4	N P K	N K
5	N K	N P K
6	N P K	N P
7	N P	N P K
8	N P K	N P
9	N P	N P K
10	N	N

The yield data of 2 seasons indicate that applied phosphorus and potash exerted no marked influence on grain yield.

Moderate Nitrogen technology.

The object of the experiment is to find out a moderate dose of nitrogen in the context of fertilizer shortage. The varieties used were Aswathi for the second crop and Thriveni for the first crop. Phosphorus and potash were given as basal dressing according to the recommendation in the Package of practices. The doses of nitrogen were 100%, 75% and 50% of the recommended dose (90-45-45 kg/ha) for Aswathi and 70-35-35 kg/ha for Triveni.

The experiment was laid out in Randomised Block Design with 8 treatments and 3 replications.

Tr. No.	Time of nitrogen application (% of N)				
	Basal	15 DAT	30 DAT	P. I.	Total
1	50	-	25	25	100
2	-	50	25	25	100
3	37.75	-	18.75	18.75	75
4	-	37.75	18.75	18.75	75
5	25	-	12.5	12.5	50
6	-	25	12.5	12.5	50
7	Only P and K - No nitrogen				
8	No manure				

During the first crop season the effects due to treatments were significant and 50% nitrogen given as basal and another 50% in 2 split doses recorded the highest yield. During the second crop season the results were vitiated due to severe drought. The trial has to be repeated for confirmatory results.

Nitrification inhibitory trial

This trial was taken up to compare the effectiveness of different indigenous oil cakes in inhibiting

nitrification. Urea alone and urea mixed with 5 different cakes viz. neem, marotti, punna, karimkotta and rubber were tried. The results revealed no significant difference between treatments.

Investigation on the effect of bacterial fertilizers

This investigation was initiated to study the effect of the bacterial fertilizer, Azo and the algal culture Algo on the yield of rice. There were 15 treatments in this trial. The test variety was Jaya. The treatments were:

1. No manure.
2. Azo treatment
3. NPK 90-45-45
4. N P K 45-45-45
5. Tr.4 + Azo
6. NPK 30-30-30
7. Tr.6 + Azo
8. Super compost @ 1000 kg/ha
9. Tr.8 + 45 kg N/ha as top dressing
10. Farm-yard manure @ 1000 kg/ha
11. Azo + Algo
12. N P K 45-45-45 + Algo + Azo
13. NPK 30-30-30 + Algo + Azo.
14. Super compost 1000kg/ha + Algo + Azo
15. Farm-yard manure 1000 kg/ha + Algo + Azo.

Results of the 2 seasons did not give any indication of the effectiveness of the algal as well as bacterial fertilizers probably due to the high initial fertility of the experimental plots during the virippu season and the drought condition during the mundakan season.

Trial with 'Sagar'

Effect of Sagar was investigated during the second crop season 1974-75. The treatments were:

1. N P K at 60-30-30
2. Sagar @ 200kg/ha
3. Sagar @ 100 kg/ha + NPK 30-15-15
4. Sagar @ 200 kg/ha + NPK 10-10-10
5. No manure - control.

The results revealed that Sagar applied at 100kg/ha with NPK at 30-15-15 was as good as NPK applied at 60-30-30.

Nitrogen variety trial

To study the yield potential of promising short duration varieties at different nitrogen levels under direct sown conditions in puddled soil, Six varieties viz. Cauvery, Kanchi, IET. 2913, Bala, IET. 2914 and Thriveni were tried at 0, 40, 80, 120 and 160 kg N/ha. A uniform dose of 80 kg P₂O₅ and 50 kg K₂O per ha was applied. In this trial Thriveni recorded the highest yield at 80 kg N/ha.

During mundakan season also a nitrogen variety trial was conducted with eight varieties viz. IET. 1444, 2233, 2508, 3262, 2881, 2923, Ratna and Jyothi. With 0, 40, 80 and 120 Kg N/ha. The varieties IET. 1444 at 80 kg N per ha has recorded the highest yield followed by IET. 2881 and IET. 3262.

Source and timing of nitrogen application (direct-sown).

The object of the trial was to study the efficiency of nitrogen as affected by different source, rates and timings. Ordinary urea and shellac coated urea were used as the sources of nitrogen. The results indicated that Shellac coated urea was not superior to ordinary urea. Basal application of nitrogen was found to be essential. Split application of nitrogen as basal and at panicle initiation stage was found to be the best schedule for direct sown short duration rice (Triveni) under puddled conditions.

Source and timing of nitrogen application (transplanted)

The sources of nitrogen used in this investigation were urea, isobutylidene diurea and shellac coated urea. Nitrogen applied as isobutylidene diurea was found to be better than ordinary urea. The recommended schedule of time of application ie, 50% basal, 25% at tillering and 25% at panicle initiation was found to be the best.

Management of nitrogen under moderate levels.

To work out the optimum agronomic practice for obtaining maximum nitrogen use efficiency at low levels of nitrogen application by adjusting the timings, rates and sources of nitrogen for a medium duration rice variety (Aswathi). The results showed that nitrogen applied 50% at planting and the rest before panicle initiation recorded the highest yield. The difference between ordinary urea and sulphur coated urea was not significant,

Optimum seed rate for direct wet seeding

To study the optimum seed rate for direct seeding on wet soils for a short duration variety (Jyothi), seed rates of 60, 80, 100, 120 and 140 kg/ha on a dry weight basis were used. Though the population density increased in proportion to the seed rate, more than 80 kg seed per ha was not found necessary for wet sowing.

Weed control trial for direct sown rice in puddle

To study the effectiveness of different methods of weed control in a direct sown crop on puddle. A basal dose of 60-40-30 NPK was given before sowing and 60 kg N/ha top dressed in 2 split doses. All the herbicides were applied 6 days after sowing of the pregerminated seeds. There was no signi-

ficant difference between treatments, but Butachlor (C) treated plots recorded the highest yield which was on par with hand weeded plots.

CHEMISTRY DIVISION

Permanent manurial trial with tall indica varieties

The effect of continuous application of green leaf, cattle manure, ammonium sulphate and their combinations with and without P_2O_5 and K_2O on yield and soil properties is being studied in this experiment. PTB.2 and PTB.20 were the varieties used during virippu and mundakan season respectively. Organic manure, P_2O_5 and K_2O were applied as basal and ammonium sulphate as top dressing one month before flowering. The trial was commenced during 1962. Total NPK level given was 40:20:20.

The treatments are:

1. Cattle manure at 8000 lb/ac.
2. Green leaf at 8000 lb/ac
3. Cattle manure at 4000 lb/ac+green leaf at 4000 lb/ac
4. Ammonium sulphate to supply 40 lb N/ac
5. Cattle manure 4000 lb/ac + 20:20:20 NPK
6. Green leaf 4000 lb/ac + 20-20-20 NPK
7. Cattle manure 2000 lb/ac+green leaf 2000 lb/ac+20-20-20 NPK
8. NPK at 40-20-20

The results indicated that in general cattle manure treated plots with and without N, P and K recorded higher yields than treatments getting green leaves and green leaf+N P K. A combination of organic manures and inorganic fertilizers is found to be the best.

Soil analysis data showed that cattle manure alone or in combination with inorganic fertilizers registered higher organic carbon value, phosphorus and potash contents and this was followed by green leaf applied plots. Treatments getting inorganics alone recorded comparatively less organic carbon, phosphorus and potash. Application of cattle manure alone, green leaf alone or combinations with inorganics had no marked effect on pH.

Permanent manurial trial with dwarf indica rice

Jaya was used as the test variety with a manurial schedule of NPK 90-45-45 kg/ha. The treatments were:

1. Cattle manure at 18000 kg/ha to supply 90 kg N/ha
2. Green leaf "
3. Cattle manure 9000 kg+green leaf 9000 kg/ha
4. Ammonium sulphate to supply 90 kg N/ha

5. Cattle manure 9000 kg + ammonium sulphate to supply 45 kg N + 45 kg P and K each/ha
6. Green leaf 9000 kg + ammonium sulphate to supply 45 kg N + 45 kg P & K each/ha
7. Cattle manure 4500 kg + green leaf 4500 kg + 45 NPK each/ha
8. Ammonium sulphate to supply 90 kg N + 45 kg P_2O_5 and K_2O each/ha.

In this trial also, it was clearly seen that a combination of organic manure and inorganic fertilizers was the best manurial practice. The soil analysis results were the same as in the permanent manurial trial with tall indica rice varieties.

Foliar nutrition experiment.

The effectiveness of applying urea as foliar spray on a transplanted medium duration variety was studied in this experiment during both the seasons. The treatments were :

1. 45 kg N/ha complete soil application (50% basal + 2 top dressing)
2. 45 kg N/ha soil + foliar (50% basal + 2 foliar sprays)
3. 45 kg N/ha - Two foliar sprays.
4. 65 kg N/ha complete soil.
5. 65 kg N/ha soil + foliar (50% basal + 2 sprays)
6. 65 kg N/ha in 2 foliar sprays.
7. 85 kg N/ha complete soil
8. 85 kg N/ha soil + foliar (50% basal + 2 sprays)
9. 85 kg N/ha in 2 foliar sprays.

From the results obtained it could be seen that foliar application alone or foliar application + soil application was in no way superior to soil application alone.

Leaf area index trial.

A trial to find out the relationship between leaf area index at flowering and yield components was initiated. Varieties Mashuri and 193-1 were used as major treatments and spacing as minor treatment. Data on leaf area index, total dry weight at flowering, total yield and yield components were recorded. During both seasons maximum leaf area index was seen at 10 x 10 cm spacing. Leaf area index decreased when wider spacings were given. Steady increase in tiller number, dry weight per plant, grain and straw yield per plant and length of panicle was noticed when spacing was increased. But the yield per unit area was maximum for 10 x 10 cm spacing.

ENTOMOLOGY

Evaluation of granular insecticides

An experiment with the object of finding out the effectiveness of need based application of 8 potential

granular insecticides was conducted against major insect pests of rice. The granules used were Furadan, Thimet, Galecron, Azodrin, Cytrolane, Solvirex, Ekalux and Sevidol. Furadan was applied at the rate of 0.5 kg a.i/ha and the other granules at 1 kg a.i/ha. The granules were applied on 13th and 56th day after planting. Gall midge attack was maximum in the control plots while it was least in plots treated with Cytrolane, Furadan and Galecron.

Evaluation of spray insecticides.

Nine insecticides viz. BHC, Sevin Phosvel, Dimecron, Ekalux, Nuvacron, Lebaycid, Bidrin and Folithion was used. Sprayings were done on 14th and 56th day after transplanting. Though the results were not statistically significant, Phosvel and Nuvacron gave good results in controlling gallmidge and stem borer.

Maximum protection trial.

With a view to study the yield loss of certain pre-release varieties due to pest infestation and also to screen the reaction of these varieties to the protection afforded by the insecticides the trial was conducted for two seasons. Maximum protection was given with nursery spray of 0.4 kg a.i/ha of Parathion, seedling dip with 0.02% Carbofuran suspension for 12 to 14 hours before planting and application of Cytrolane granules at 1 kg a.i/ha at 20, 40 and 60 days after planting. Eight varieties except IET. 2511 showed significant increase in grain yield in the protected Plots. Maximum protection treatment proved quite effective in minimizing pest incidence.

Chemical evaluation trial (Granules)

In this trial eight chemicals were tried during the first crop season and 7 during the second crop season, at 0.75 and 0.5 kg a.i/ha during first crop season and 0.75, 0.5 and 0.25 kg ai/ha during 2nd crop season along with maximum protection treatment and untreated control. The treatments were applied twice during the period of the crop growth, when insect population was noticed high enough to evaluate the insecticidal activity. The insecticides tried were: Cytrolane, Ekalux, Carbofuran, Birlane, Galecron, Paddigard, Thimet and Sevidol during the first season and Birlane, Carbofuran, Cytrolane, Dasanit, Ekalux, Paddigard, and Sevidol during the 2nd crop season. During the first crop season maximum grain yield was recorded in plots treated with paddigard at 0.5 a.i/ha followed by Carbofuran 0.5 kg a.i/ha, Cytrolane 0.5 kg a.i/ha and Thimet 0.75 kg ai/ha. The yield of these plots varied from 4403 to 4616 kg/ha. In the maximum protection plot the yield

was only 4261 kg/ha. During the second crop season Birlane 0.25 kg, Cytrolane 0.25 kg, Sevidol 0.5 kg, Dasanit 0.25 kg and Paddigard 0.5 kg a.i/ha recorded the maximum yield.

Chemical Evaluation Trial. (sprays) :-

Ten chemicals during the first crop season and 9 chemicals during the second crop season in 2 different doses viz. 0.5 and 0.25 kg ai/ha were tried along with maximum protection treatment and untreated control. The insecticides used were: Ambithion, Birlane, Dimecron, Dursban, Ekalux, Foliithion, Mipcin, Phosvel, Sevin, and Thioden during the first crop season and Birlane, Dursban, Ekalux, Foliithion, Mipcin, Phosvel, Tamaron, Thiodan and Vamidothion during 2nd crop season.

The treatments were applied twice during the total period of the crop growth when insect population was high enough to evaluate the insecticidal activity. During the first crop season maximum yield was recorded in plots treated with Phosvel 0.5 kg ai/ha followed by Phosvel 0.25 kg, Dursban 0.25 kg, Birlane 0.5 kg, Sevin 0.5 kg and Foliithion 0.5 kg ai/ha. The yield data also reveal that spraying is more effective than application of granules for the control of leaf roller which is a major pest of paddy.

New Insecticidal trial (Granules)

Ten chemicals during the first crop season and 12 chemicals during the second crop season in the form of granules at a single dose, viz. 1 kg ai/ha were tried along with maximum protection treatment and untreated control. The chemicals tried were: Agromule, Azodrin, Carlin, Dasanit, Endosulan, Polithion, Lebaycid, Mipcin, Rogour, and 4. C, 92-100 during the first crop season and Agromule 4 G, Agromule 6 G, AC 92-100, Azodrin, BPMC, Carlin, Endosulfan, Polithion, Lebacid, Mipcin, Thiodan + BPMC, and UC. 300-45, during 2nd crop season. The treatments were applied twice during the entire period of crop growth when insect population was high. During the first crop season maximum grain yield was recorded in plots treated with Mipcin followed by maximum protection treatment, Carlin, Endosulphan and Foliithion. In Dasanit, Endosulphan and Agromule treated plots the number of silver shoots recorded was very less. In the second crop season the general performance of the crop in plots treated with Thiodan + BPMC was very good.

New Insecticidal trial (Sprays)

In this trial 16 insecticides at 5 kg ai/ha along with maximum protection treatment and untreated control were tested. The insecticides were applied twice during growth period. During the first crop

season maximum yield was recorded in plots treated with Vamidothion followed by Fundal, Knockbal and Tameron. It was also observed that spraying is more effective for the control of pests than application of granules.

Seedling dip experiment.

In this experiment 10 seedling dip treatments, six late nursery applications and 2 untreated controls were tried. Seedling dip in general was found to be effective for the control of pests upto 30 days after planting than the late nursery applications. Out of the 10 seedling dip treatments, Fundal 0.02 % solution was found to be very effective followed by Dursban 0.02 %, Dasanit 0.02% and Rogour 0.02%.

Gall midge resistant cultures.

Twenty seven gall midge resistant cultures were studied along with Jyothi, Sabari, Thriveni, Jaya and IR8. Based on the resistance, 9 cultures were selected; two from the cross IR8 x PTB. 21; 5 from IR8 x W. 1257 and one each from CR. 56-17 x IR8 and IR8 x Siam-29.

PATHOLOGY

Fungicidal trial against blast disease.

Hinosan, Dithane M. 45, Aureofungin sol, Miltox Cuman and Difolatan were tested in the field to evaluate their efficacy in controlling the disease. The intensity of the disease was very mild and hence the treatment differences were not statistically significant. Still, the indication was in favour of plots treated with Miltox followed by Dithane M.45 and Hinosan.

Fungicidal trial against Sheath blight.

Hinosan, Dithane Z-78, Dithane M. 45, Aureofungin sol, Miltox, Difolatan and Ziride were tried. The disease intensity was very mild and there was no appreciable difference between treatments. The plot received Dithane M. 45 spray alone recorded better yield than unsprayed control, but the difference was not significant.

Yield trial of Disease resistant varieties.

Thirteen varieties selected from various disease screening trials on the basis of multiple resistance were tested for their yield potential. These varieties were compared with Thriveni, Jyothi, Jaya and IR8. Varieties which recorded higher yields than check varieties were selected for final yield trial. The following are the seven varieties selected on the basis of yield and disease resistance:

1) 15591-4(IR5 X CP12); 2) T(N)1 X MU:5; 3) IET2691, 4) IET. 2094, 5) IET. 2713, and IET.2931.

Blast resistant crosses.

From the 32 lines of Blast resistant crosses comprising of 4 different crosses, viz. IR8 x Thadukan, IR8 x Zenith, IR8 x Te-teP and CR36-148 x Te-tep, 15 lines were selected on the basis of disease resistance and good plant characters. These F6 lines will be tested for their yield potential.

Maintenance of Germplasm.

During the first crop season 513 entries and during the second crop season 281 entries were maintained as germplasm. Reaction of these varieties against various disease during different seasons was observed periodically to spot out resistant donors.

A total number of 439 varieties from UVT, SGVT, BOT, SBT, BLB, BRVT and PVT were screened in uniform blast nursery to evaluate their reaction towards blast disease. Among the 439 varieties screened, 14 were found to be highly resistant.

International uniform blast nursery

Three hundred and six varieties were tested for their reaction to blast. In this group 14 varieties were found to be highly resistant.

Screening for resistance to sheath blight

Seven hundred and four varieties in 2 series were screened for their resistance to sheath blight disease. Among these none was found to be resistant to sheath blight.

Screening for brown spot disease

Four hundred and thirteen entries were screened for their resistance to brown spot disease. Among these varieties none was found to be highly resistant, but 28 varieties were resistant and 203 moderately resistant.

Seed testing scheme

The seed testing laboratory attached to the Rice Research Station, Pattambi is the notified laboratory for the State to conduct seed testing work under the Seeds Act. The main function of this laboratory is to analyse seed samples received from certified seed growers, seed farms, Government farms and progressive farmers. Samples are tested free of charge. During the period under report 1832 paddy samples were analysed. Samples selected at random from the above samples were sent to Central Seed Testing Laboratory, I. A. R. I., for reference testing.

Seed production and distribution

A total quantity of 1, 13, 634 kg of paddy seeds and 19, 013 Kg of bulk paddy were produced and distributed from the Station.

RICE RESEARCH SUB STATION, MANNUTHY.

Varietal Improvement

Germplasm bank

A total of 410 types and varieties of rice were maintained at this station, which include indigenous and exotic varieties.

Hybridization

Progenies of 12 crosses were studied during the year. The crosses were T (N1) × Ptb. 8, Ptb. 10 × T (N) 1/2, (IR 8 × T. 75), IR 8, IR 8 × H4, IR 8 × Ptb. 32, Cochin-1 × IR 8, IR 8 × Ptb. 7, IR 8 × Ptb. 10, TKM 6 × IR 8 (Navara × IR 8), IR 8, (MN 54-42 × H 105) and (TKM 6 × IR 8) (CO25 × IR 8).

Among the advanced cultures tried in comparative yield trial from the above crosses, Cul. 703 (IR 8 × H4), Cul. 699-1-1 (IR 8 × Ptb. 32) and Cul. 518-2 (IR 8 × Ptb. 10) were outstanding yielders. Culture 79-69 (TN 1 × Ptb. 8) and Cul. 10-1-1 (Ptb. 10 × TN 1/2) have reached the pre-release stage.

Permanent manurial trial

The object of the experiment is to study the effect of continuous application of nitrogen both as organic and inorganic forms with and without phosphorus and potash on soil fertility and yield of paddy. The experiment was started during the year 1964, with the following treatments.

1. 80 kg N/ha as ammonium sulphate.
2. 80 kg N/ha as green leaf.
3. 80 kg N as ammonium sulphate + 50 kg P₂O₅/ha.
4. 80 kg N as ammonium sulphate + 50 kg K₂O/ha.
5. 50 kg each of P₂O₅ and K₂O/ha.
6. 80 kg N as ammonium sulphate + 50 kg each of P₂O₅ and K₂O/ha.
7. 80 kg N (Half as ammonium sulphate + half as green leaf) + 50 kg of P₂O₅ and K₂O/ha.

Highest yield was recorded in plots receiving organic form of nitrogen while the lowest yield was recorded in plots receiving phosphorus and potash without nitrogen.

Fractional application of nitrogen.

To study the effect of split application of nitrogen on the yield of high yielding varieties of paddy.

Treatment	Nitrogen kg/ha at				
	Basal	Tillering	P. I.	Booting	Heading
1	100	—	—	—	—
2	—	100	—	—	—

3	—	—	100	—	—
4	50	50	—	—	—
5	50	—	50	—	—
6	50	—	—	50	—
7	50	—	—	—	50
8	50	25	25	—	—
9	50	—	25	25	—
10	50	—	—	25	—
11	—	50	50	—	—
12	—	50	—	50	—
13	—	50	—	—	50
14	—	—	50	25	25
15	20	20	20	20	20
16	25	25	25	25	—

The general trend of the result was that the yield is better when nitrogen is applied in 3 or more split doses.

Spacing-cum-manurial trial

To find out the optimum spacing and manurial dose for high yielding varieties of rice. The experiment was laid out in a split design with 3 levels of nitrogen (40, 80 and 120 kg N/ha) in the main plot and 6 spacings. (20 × 15 × 10, 15 × 15, 15 × 10, 10 × 15 and 10 × 10 cm) in the sub plot.

In most of the seasons it was found that higher yields were obtained from plots receiving moderate dose of nitrogen. At lower dose of nitrogen 15 × 15 cm spacing gave maximum yield during first crop season while 10 × 10 cm spacing gave maximum yield during second crop season.

Moderate nitrogen technology

To find out the effect of moderate application of nitrogen to high yielding varieties of paddy. The trial was laid out in a randomised block design with 8 treatments and 3 replications. The details of treatments are furnished below:

Treatment	% of N	Basal	15 DAT	30 DAT	P..I
1	100	50	0	25	25
2	100	—	50	25	25
3	75	37.5	0	18.75	18.75
4	75	—	37.5	18.75	18.75
5	50	25	0	12.5	12.5
6	50	—	25	12.5	12.5
7	0 Nitrogen				
8	No manure control.				

The results indicated that higher yields were obtained when the full dose of nitrogen was added. The lowest yield was recorded when Phosphorus and Potash were applied without nitrogen.

Trial with nitrification inhibitors.

This trial to find out the effect of nitrification inhibitors on the yield of paddy, did not show any effect. The inhibitors tried were Neem, Marotti, Punna and Karingotta cakes.

Chemical evaluation trials (sprays and granules):

Effect of insecticidal sprays and granules on the control of pests and yield of rice was estimated in this trial. The chemicals evaluated were: BHC, Sevin, Phosvel, Dimecron, Ekelux, Nuvacorn, Lebaycid, Bidrin, Folithion and Parathion in the trials with sprays. Best results were obtained with Lebaycid followed by Sevin, Phosvel and Dimecron during the first crop season and Parathion followed by BHC during the second crop season.

Trial with granular insecticides, viz., Furadan, Thimmet, Galecron, Azodrin, Cytrolane, Solvirex, Ekalux and Sevidol showed that Thimmet and Furadan are most effective.

Screening of varieties and cultures.

Thirty four varieties from different Rice Research Stations of the State were screened for their reaction to pests and diseases.

Co-ordinated blast control trial.

The effectiveness of different fungicides in the control of blast was studied and it was found that Hinosan was better in controlling the disease/when compared to Dithane, Aureofungin sol, Miltox, Cuman and Difolatan.

Co-ordinated Sheath Blight control trial

Various fungicides for the control of sheath blight were evaluated and the results indicated that Hinosan and Dithane Z-78 were better in controlling the disease.

Trial of Multi-resistant varieties.

Eight cultures received from IARI to test their resistance towards various pests and diseases were grown and studied. Among these culture, 20-11-6-25-3 and 20-71-795-1-5 were found to be resistant to major pests diseases besides being better yielders.

RICE RESEARCH SUB STATION, MONCOMPU.

Breeding

Single plants numbering 433 were selected from 3 cross combinations for further studies. The crosses were (1) M. O. 1 x Jaya; (2) IR8 x Karivinnal and (3) M. 14. 59-2 x M. 21-39-1.

Varietal Trial with medium and Short duration varieties.

The results of these trials showed that among the medium duration varieties maximum yield was recorded by Kanchi and among the short duration varieties, highest yield was recorded by Thriveni.

Preliminary yield trial of advanced cultures.

Two series of trials were conducted. In the first series, a selection from the cross M. O. 1 x IR8 (culture M. 21-30-1-1) recorded the maximum yield, whereas in the second series M-11-57-5-1 a selection from the cross IR8 x Ptb. 20 gave the maximum yield. In addition to yield potential, this particular culture was found to be resistant to brown plant hopper.

Initial evaluation trial.

Fifty five hybrid cultures of different cross-combinations were studied during the year. The cultures were evaluated for their yielding potential and reaction to various pests and diseases.

Germplasm Bank.

Indigenous and exotic varieties numbering 106 were grown and maintained for utilisation in breeding programme.

Crop sequence trial.

The trial was conducted to evolve a suitable multiple cropping pattern for Kuttanad paddy fields. Being the first season of trial, only rice crop was raised. During subsequent years different crops like soyabean, cowpea, ragi, sunflower, jute, gingelly and green gram will be raised.

Trial with nitrification inhibitors.

To ascertain the effect of different kinds of oil cakes as nitrification inhibitors, urea was mixed with neem cake, Marotti cake, Punna and groundnut cake before use. The results of the trial did not reveal any significant difference in yield due to various treatments.

Agronomic studies with pre-release cultures.

The performance of 4 hybrid cultures evolved at the Station along with standard, Jyothi and Jaya were studied. Maximum yield was recorded by two cultures M. 15-34-1 and M. 15-6-3 at both levels of manuring vize. 60 : 30 : 30 and 90 : 45 : 45.

Moderate Nitrogen Technology.

The object of the trial was to formulate technology for efficient and economic use of nitrogen for rice crop in Kuttanad.

The treatment details are given below :-

Treatment	Basal	15 Dat	Tillering	P. I.
1	50%	—	25	25
2	—	50	25	25
3	37.5	—	18.75	18.75
4	—	37.5	18.75	18.75
5	25	—	12.5	12.5
6	—	25	12.5	12.5

- 7 Only P and K, no nitrogen.
- 8 No manure control.

The results indicated that maximum yield was recorded when 50% nitrogen was applied as basal + 25% at tillering and 25% at panicle initiation. It was statistically on par with 50% nitrogen applied 15 days after planting + 25% at tillering + 25% at panicle initiation.

Weedicidal Trial

A. 820 + 2-4-D was the best as pre-emergent and MCPA was the best as a post emergent weedicide.

Pre-emergent weedicides tried were, Butachlor, C. 288, O. 1949+2-4-D, A. 820+2-4-D, VSD 3153 +2-4-D, Sirmate 5 G, CRD 71-6388, MON-0385, Benthiocarb and O. M. 3432.

As post emergent weedicides Stam F-34, MCPA and 2-4. D were tried.

Chemical evaluation trial.

The effectiveness of various insecticides both sprays and granules were studied during the period. The results of the trial indicated that among the sprays Ekalux, Nuvacron, BHC, Folidol and Bidrin were better than the rest of the chemicals. Among the granular insecticides Galecron and Cytrolane were more effective.

Screening of Pre-release cultures.

A large number of pre-release cultures obtained from the various Rice Research Stations and from C. R. R. I., Cuttack were screened for their reaction to various rice pests especially brown plant hopper. One culture from Moncompu, viz. M. 11-57-5-1 and 6 cultures from C. R. R. I., Cuttack were found to withstand hopper burn while all the rest were badly affected.

Co-ordinated Trials for Blast and Sheath blight.

The object of the experiment was to evaluate the efficacy of different fungicides in the control of Rice blast and sheath blight. The trend of the results indicated that for the control of both blast and sheath blight Hinosan, Dithane, A uriofungin sol and Ziride were more effective.

Breeding

RICE RESEARCH SUB STATION, KAYAMKULAM.

F4 generation of 2 crosses viz. Thadukan x Jaya and Culture 16 x Triveni were studied and 34 cultures were selected for further studies and selection.

Permanent manurial trial.

The inference arrived from this trial was that under Onattukara conditions for a direct sown crop,

80 kg. nitrogen/ha. of which 60 kg. as ammonium sulphate and 20 kg. as cattle manure along with 40 kg. each of phosphorus and potash is the most suitable manurial schedule.

Moderate Nitrogen Tenchology.

The results from this trial indicate that split application of nitrogen (ie.) 50% as basal, 25% 45 days after sowing and 25% at panicle initiation gives highest grain yield.

Weed free condition trial

Trial with weed control at different stages of crop growth revealed that a dry sown crop under Onattukara conditions, needs weed free condition upto 45 days after seeding.

RICE RESEARCH SUB STATION, VYTTILA

Pure line selection of Cheruvirippu

Comparative yield trial with pure line selection cultures from the popular local strain Cheruvirippu was taken up but the crop was damaged by floods.

Trial with dwarf indica rice

Several varieties like Mala, Bhavani, Damodar, Mashuri, Culture 201-1, Jaya, T.442-57, IR8, etc. were tried. Among these Mashoori, IR5 and Culture 201-1, came up fairly well. The main limitation observed in the cultivation of these high yielding varieties was their short stature.

Observational trial of Pokkali x Jaya cultures

Seventy three cultures of the cross Pokkali x Jaya received from C.R.R.I., Cuttack were tried during the year. All of them came up very well under Pokkali conditions but their dwarf stature was the limiting factor for their cultivation in Pokkali lands.

Chemical evaluation trial

The major rice pests in Pokkali lands are stem borer and leaf roller. A trial with different insecticides were conducted to find out the most suitable insecticide for the control of these pests. But under flooded conditions the treatment effects did not reveal any difference on the control of pest attack and final grain yield.

Production potential experiment

MODEL AGRONOMIC RESEARCH STATION, KARAMANA.

To determine the production potential and to study the economics of high intensity cropping, six crop rotations were studied with 4 short duration crops of rice, 3 medium duration rice varieties, 2 long duration rice varieties, 2 short duration rice and tapioca and 2 medium duration rice and Bhindi. The

indications are, 3 crops of Jaya is better than 4 crops of Annapurna. So also 2 crops of Jaya cultivated after a summer crop of Bhindi recorded higher out-turn. The rotation Rice-Rice-Tapioca recorded the highest per hectare production during the period under report, but from the economic point of view, Rice-Rice-Bhindi is more profitable.

Production potential under resource constraints

The object of the experiment was to determine the production potential of a suitable crop sequence in situation when one or more resources such as fertilizer and weed control are limiting factors. The treatments were:

- Main Plot I Weed control by machete
 II Weed control by Hand weeding
 Sub Plot Dose of fertilizer.

	Ist crop	II crop
Tr. 1	100%	100%
2	75	100
3	75	75
4	75	100
5	50	75
6	50	50
7	25	100
8	25	75
9	25	50

The yield data revealed a gradual decrease in yield where the recommended dose of fertilizers were reduced to 75%, 50% and 20%. There was no difference between weed control by hand weeding and by weedicides.

Intensive Farming system for small holders.

The feasibility of adopting intensive crop production practices in small holdings was the object of this investigation. An area of 8000 sq. m. was divided into 4 equal parts and the following crop rotations were followed in each plot.

- Plot I Banana
 Plot II Rice (Jaya) - Rice (Jaya) - Blackgram.
 Plot III Rice (Annapurna) Rice (Annapurna) - Tapioca.
 Plot IV Rice (Annapurna) - Rice (Annapurna)- Colocasia.

The results indicated that rotation with Banana and Colocasia gave returns which were far below the cost of inputs. Maximum return was obtained from plot Jaya-Jaya with Blackgram.

Manurial requirement of a fixed crop rotation.

The direct, residual and cumulative effects of Phosphorus-potash and farm-yard manure on the yield of a 2 crop rotation (Rice-Rice) were studied

in this trial. The manures in the treatment were applied in 3 phases viz. manuring every season, manuring in alternate season starting from mundakan and manuring in alternate season starting from the first season. The cumulative direct and residual effects of applied phosphorus were not significant on grain yield during both the seasons. Application of farm-yard-manure produced significant cumulative response in grain production. The effect of potash was not significant.

Efficiency of potassium Schoenite.

Potassium schoenite a bye-product of salt industry is a cheaper source of K_2O . The study was taken up to know whether this is as efficient or superior to potassium chloride or potassium sulphate. From the direct as well as the residual effects studied it is seen that the source of potassium has no significant influence in grain yield.

Fertilizer requirement of new varieties of Rice.

IR8, Aswathi, Sabari, Jyothi and Bharathi were tried at 3 levels each of nitrogen (0, 60 and 120 kg. N/ha) and phosphorus (0, 30 and 60 kg P_2O_5 /ha.) The results showed that IR8 was superior to Aswathi and Sabari was superior to Jyothi and Bharathi. The effect due to nitrogen was almost linear. Regarding phosphorus, the highest yield was registered at 60 kg. P_2O_5 /ha. but the difference between this level and no phosphorus was negligible.

Weed control in low land rice.

Different weedicides along with hand weeding were tried in this experiment. Though the results were not statistically significant better yields were obtained from hand weeded plots. The treatments included propanil, 2-4-D. Butachlor and hand weeding.

AGRONOMIC RESEARCH STATION, CHALAKUDI.

Yield response of field crops in rotation under different fertility levels and under different water management practices:

The trial was laid out in a split plot design with the following treatments:-

Main plot: Rotations:

1	Rice	Rice	Sesamum	Green manure.
2	Rice	Rice	Blackgram	Green manure.
3	Rice	Rice	Rice	Green manure.
4	Rice	Rice	Rice	Samai.

Sub plot treatments — Irrigations.

- 1 5cm. continuous submergence.
- 2 5cm. irrigation at saturation point.
- 3 5cm. irrigation at hair cracking stage.

- 4 5cm. irrigation at hair cracking stage with protection irrigation to 5cm. level at critical stages of tillering, panicle initiation to booting and heading to milk stage.

Sub plot — Fertility levels for Rice.

- | | | |
|----|-----------|-----|
| 1. | 100—50—50 | NPK |
| 2. | 80—40—40 | " |
| 3. | 60—30—30 | " |
| 4. | 40—20—20 | " |

In all the 4 rotations, rice was grown. Jaya was grown in rotation 1 and 2 Jyothi in rotation 3 and 4. With regard to production potential Jaya a medium duration variety was significantly superior to the short duration variety Jyothi. Among irrigation practices, the highest yield was recorded in hair-crack stage irrigation with protective 5cm. submergence irrigation in critical stages, closely followed by 5cm. continuous submergence. The ground water level during the period ranged between 28cm. to 7 cm. Because of the high water table, it seems the crop could maintain the optimum moisture regimes in the root zone through capillary conductivity of ground water.

With regard to fertility level, the yield progressively increased with increase in fertilizer dose recording the highest yield with 100-50-50 N P K.

The rate of response to favourable moisture conditions was higher in Jaya when compared to Jyothi. Though Jyothi recorded a lower yield at limited fertilizer supply, the rate of response to fertilization was greater in Jyothi than in Jaya.

Yield response of new rice varieties to water management practices:-

The effect of moisture stress throughout the crop growth and in different growth stages on the yield were studied. The trial was conducted in a split plot design. The treatments were:-

Main Plot:-

	Stress period	5c m. irrigation at.
1	Seedling establishment to tillering	Saturation point.
2	- do -	Hair cracking stage.
3	Maximum tillering to booting.	Saturation point.
4	- do -	Hair cracking stage.
5	Bootling to ripening	Saturation point.
6	"	Hair cracking stage.
7	Transplanting to ripening	Maintenance of 5 cm. level daily.
8	"	Saturation point.
9	"	Hair cracking stage

Except in the period of moisture stress in each treatment submergence at 5 cm. level was maintained.

Sub-plot treatments: 1. Triveni. 2. Bharathi. 3. Aswathi. 4. Sabari. 5. IR. 20.

Highest yield was recorded in the irrigation level at 5 cm. continuous submergence throughout the season. Moisture stress given at maximum tillering to booting least affected the yield. Highest yield depression was observed when the moisture stress was during booting to maturity and also during transplanting to maximum tillering.

Among the varieties, the highest yield was recorded by Triveni followed by Bharathi. Aswathi, Sabari and IR. 20 were the other varieties tried.

Studies on puddling efficiency of different puddlers and its influence on percolation loss.

Jaya crop was grown during mundakan season for this study. The rate of water loss (percolation + evaporation) in the plots were measured daily with hook gauge. Eventhough the cumulative water use during the period is low in plots puddled with wet land puddler, the differences with other treatments were not significant.

The same trial repeated during third crop season with Rohini variety revealed that the water loss was low in plots puddled with, power tiller, but the difference between treatments was only marginal. It is inferred from the above experiment that in light sandy loam soils creation of an impervious layer to reduce percolation loss does not seem to be feasible. There is also no significant difference in the puddling efficiency of these different puddlers in relation to percolation loss from paddy fields.

Studies on factors affecting water requirement of rice.

Different forms of water loss and total water required for a medium duration rice crop was studied in the mundakan season. It was found that the total water requirement due to evapo-transpiration was 556.8 mm. and that due to percolation 1805.2 mm. This percolation loss of 76.4% of the total water requirement is due to the high permeability of the sandy loam nature of the soil of the tract.

Adaptability studies of Pulse varieties

Different varieties of green gram, blackgram and cowpea were grown and studied. Among the green gram varieties, the best yields were recorded by selection 414-1-1 and Pusa Baisakki. In the blackgram types T. 9 and H. T. 9 and in cowpea a variety "Brown Poded" were better.

Moderate Nitrogen Technology experiment

The treatment details are given below:

Treatments 8

Four levels of nitrogen, 4 stages of application and 2 methods of application.

Nitrogen applied in different stages (Kg./ha)

	S1	S2	S3	S4
Treatment 1	45	—	22.5	22.5
2	—	45	22.5	22.5
3	33.9	—	16.8	16.8
4	—	33.9	16.8	16.8
5	22.5	—	11.25	11.25
6	—	22.5	11.25	11.25
7	—	—	—	—
8	No manure.			

The results during the mundakan season revealed that in all the levels higher yields were recorded in plots where the entire fertilizer is applied in 3 top dressings. It is inferred that in plots having enough native fertility to meet the initial requirements during establishment period or on soils where leaching loss is high the practice of eliminating basal dressing of nitrogen and applying all the nitrogen in top dressing seems to be good.

Skipping trial of phosphorus and potash.

The experiment was conducted with 10 treatments and 3 replications in randomised block design. The treatments were.

1. P application in all seasons.
2. " in alternate seasons starting from first season.
3. " starting from second season
4. " once in 3 seasons starting from first season
5. " starting from second season.
6. K application in alternate seasons starting from first season.
7. " starting from second season.
8. " once in 3 seasons starting from first season.
9. " starting from second season.
10. " Nitrogen alone for all seasons.

The trial was conducted only during one Virippu and mundakan season and hence no inference could be drawn on the residual fertility effect. However the response to P and K application was assessed and it was found that there is significant increase in yield due to the application of potash. With regard to phosphorus application, no appreciable difference was seen between plots with and without phosphorus.

During the mundakan season plots receiving phosphorus in both the seasons have recorded the highest yield. Similarly in potash application, plots with no potash in the first season but with applied potash during the second season recorded higher yields.

Chemical evaluation trial

The trial was conducted for 2 consecutive seasons and it was observed that for the control of various rice pests Parathion, Sevin, Ekalux, Dimecron and Bidrin are very effective.

HORTICULTURAL RESEARCH STATION AMBALAVAYAL

Paddy

- 1) A pure line selection in Adukkam is in progress.
- 2) Progenies of the cross Wynad 2×Rohini and Dunganshali×Jaya were studied.
- 3) Varietal trial (short duration)

Among the five short duration varieties (Kavary, Ratna, Annapurna, Rohini and Triveni) Annapurna out yielded others significantly with 3007 kg grain/ha, during the first crop season.

4) In the 2nd crop season 2 cold tolerant varieties (pre-released cultures) received from Cuttack were compared with Annapurna. The yield data showed that Annapurna outyielded others with a yield of 6550 kg grain per ha.

5) Comparative yield trial of 10 advanced cultures of Japonica×Indica varieties received from Cuttack along with Annapurna revealed that all the cultures are superior to Annapurna.

Lime experiment

Application of 700 kg lime per hectare completely as basal gave the maximum yield.

ALL INDIA CO-ORDINATED AGRONOMIC RESEARCH PROJECT

CROP: RICE

Experiments in cultivators' fields.

The object of these trials was to ascertain the rate of response of rice to different levels of major plant nutrients and to formulate fertilizer recommend-

ations for different agro-climatic regions based on these data.

During the year 1974-75 the experiments were laid out in N. E. S. Blocks selected at Trivandrum, Trichur and Quilon districts.

A. Type trials: Fertiliser requirement of high yielding varieties of rice. Altogether 94 trials were conducted of which 44 were laid out in Trichur and 50 in Quilon district.

The treatments are:-

- | | | |
|------------------------|---------------------------|--|
| 1) $N_0 P_0 K_0$ | 5) $N_{90} P_{30} K_0$ | 9) $N_{120} P_0 K_{10}$ |
| 2) $N_{60} P_0 K_0$ | 6) $N_{60} P_{30} K_0$ | 20) $N_{120} P_{60} K_{60}$ |
| 3) $N_{90} P_{60} K_0$ | 7) $N_{60} P_{60} K_0$ | 11) $N_{120} P_{60} K_{60}$ |
| 4) $N_{120} P_0 K_0$ | 8) $N_{60} P_{30} K_{30}$ | 12) $N_{60} P_{30} K_{30} +$
lime 50 kg/ha. |

The results indicated moderate to good response to applied nitrogen upto 90 kg/ha in all the blocks.

B. Type trials

Comparative performance of dwarf and medium tall varieties in relation to low and medium levels of fertilizer application was studied. The treatments included 2 varieties and 6 fertilizer levels.

The fertiliser levels were:-

- | | |
|---------------------|---------------------------|
| 1) $N_0 P_0 K_0$ | 4) $N_{40} P_{40} K_0$ |
| 2) $N_{40} P_0 K_0$ | 5) $N_{40} P_{40} K_0$ |
| 3) $N_{80} P_0 K_0$ | 6) $N_{80} P_{80} K_{40}$ |

Thirty eight trials were conducted in Trichur District. The trend of the results showed that response to nitrogen was more pronounced when it was applied in combination with phosphorus. Response to potash was only slight to moderate.

C. Type Trials.

To study the response to phosphorus and potash to rice in relation to soil, fertility, 29 trials were conducted in Ollukkara block of Trichur district and 36 in Kottarakara block of Quilon district with the following treatments:-

- | | | |
|------------------|-------------------------------------|------------------------|
| 1) $N_0 P_0 K_0$ | 4) $N_B P_{0.5} P_B K_B$ | 7) $N_B P_B K_0$ |
| 2) $N_B P_0 K_0$ | 5) $N_B P_B X_B$ | 8) $N_B P_B K_{0.5} B$ |
| 3) $N_B P_0 K_B$ | 6) $N_B P_{1.5} B K_B$ | 9) $N_B P_B K_{1.5} B$ |
| | 10) $N_{1.5} B P_{1.5} B K_{1.5} B$ | |

O — No nutrient

N_B — Nitrogen at base level of 120 kg/ha.

P_B — $P_2 O_5$ at base level 120 kg/ha.

$P_{0.5} B$ and $1.5 B - P_2 O_5$ at 50% of the base level and $1\frac{1}{2}$ times the base level

K_B — $K_2 O$ at base level of 50 kg/ha.

$K_{0.5} B$ and $K_{1.5} B$ as for $P_2 O_5$

In Ollukkara block, the response to nitrogen was high even in the absence of applied phosphorus and potash. On the other hand in Kottarakara block, response to nitrogen was poor when it was applied alone. There the response to applied phosphorus and potash were high. In fact phosphorus and potash were the limiting factors in crop production in that block.

G. Type trials

Fertilizer requirement of a fixed single year two crop sequence under resource constraints were investigated in this trial with the following treatments:

Treatment	Virippu	Mundakan	Total nutrients
1	$N_0 P_0 K_0$	$N_0 P_0 K_0$	0
2	$N_{120} P_{10} K_{10}$	$N_{120} P_{60} K_{60}$	480
2	$N_{90} P_{45} K_{45}$	$N_{120} P_{60} K_{60}$	420
4	$N_{90} P_{90} K_0$	$N_{90} P_0 K_{90}$	360
5	$N_{90} P_0 K_{90}$	$N_{90} P_{90} K_0$	360
6	$D_{60} P_{60} K_{30}$	$N_{90} P_{15} K_{45}$	300
7	$N_{60} P_{60} K_0$	$N_{90} P_{45} K_{45}$	300
8	$N_{60} P_0 K_{60}$	$N_{60} P_{60} K_0$	240
9	$N_{60} P_{30} K_{30}$	$N_{60} P_{30} K_{30}$	240
10	$N_{60} P_0 K_0$	$N_{60} P_{90} K_{30}$	180

Altogether 75 trials were conducted - 34 in Trichur and 41 in Quilon District. The experiments were conducted on the same site during the Virippu and Mundakan seasons. The date of these complex trials are under scrutiny for arriving conclusion.

COCONUT

COCONUT RESEARCH STATION, NILESWARAM

BOTANY

Studies on second selves and sibmatic progenies in coconut.

Out of the 21 varieties studied Laccadive ordinary, Java, Philippines and Cochin China were found to be promising.

Variability in respect of vegetative characters was not significant. The palms have only started bearing and therefore the yield characters are yet to be studied.

Studies on Tail \times Gangabondam progenies of coconut.

All the progenies have exhibited hybrid vigour. The progenies of Laccadive ordinary \times Gangabondam were found to be superior with regard to yield (nuts as well as copra) followed by West Coast Tail \times Gangabondam.

Studies on Typica \times Spicata hybrids and reciprocals

In the progenies of typica \times spicata the typica character was found to be dominant where as in the reciprocal crosses 50 percent progenies have inherited typica characters.

Comparative studies on open pollinated progenies of T × D hybrids and their back cross progenies:-

The studies indicate that there is no harm in selecting seednuts (open pollinated) from T × D mother palms for large scale multiplication, provided strict selection is done in the nursery.

Studies on inheritance of spicata characters:

The data collected are being recorded.

Comparative studies on natural cross dwarf with line progenies of dwarf green and dwarf yellow.

The performance of natural cross dwarf in respect of bearing habit and characters was found to be better than dwarf green and dwarf yellow.

Comparative studies on different hybrids and West Coast Tall.

The hybrids involving 15 parental combinations along with West Coast tall were planted in 1973.

Studies on off types of different dwarf varieties.

Off types from six varieties were planted in the year 1973. Observations on various characters were continued.

Studies on inheritance of yield potential in cross, self and natural progenies of different yield groups.

Results obtained so far revealed that the cross and open pollinated progenies in higher yield groups (80 nuts and above) are superior.

Comparative studies on first generation hybrids of Tall × Dwarf with parental types.

The results revealed that the first generation hybrids obtained by crossing selected high yielding tall trees with dwarf green (male parent) exhibited hybrid vigour. The early bearing habit of the dwarf parent was found to be inherited by the hybrid. The nut characters were not as good as that of west coast tall (female parent). The copra yield was much higher than that of West Coast Tall.

Studies on prepotency in West Coast Tall:

Growth Characters did not show any significant variation within the progenies of T × D and progenies under study. Yield characters are yet to be studied.

Comparative studies on cross progenies of T × D and progenies of grand parent West Coast Tall.

(T × D) × (T × D) parent progenies have shown high precocity.

AGRONOMY

Varietal response to varying levels of potash with and without magnesium:

Ten varieties viz., New Guinea, Cochin China, Java, Fiji, Philippines, Laccadive small, Laccadive

ordinary, Straight Settlements (green) and Straight Settlement (apricot) and Andaman (ordinary) were tried with the following manurial treatments:

1)	N	P ₂ O ₅	K ₂ O	Mg	(gm. per plant)
	339	226	0	0	
2)	339	226	678	0	"
3)	339	226	1356	0	"
4)	339	226	678	500	"
5)	339	226	678	500	"
6)	339	226	1356	500	"

Results indicated that the higher dose of potash (1.356 kg/tree) along with 0.5 kg Mg SO₄ gave the highest yield even though the treatment differences were not statistically significant.

N P K requirement of coconut with and without additional dose of Mg.

The experiment was laid out in a split plot design. Treatments: Main Plot - Factorial combinations of 3 levels of N P K

N	—	0.50, 1.00 and 1.50 kg per tree/year.
P ₂ O ₅	—	0.25, 0.50 and 0.70 "
K ₂ O	—	0.75, 1.25 and 1.75 "

Sub Plot - Levels of Mg. 0 and 0.170 kg/tree/year.

The yield data showed no significant difference between treatments.

Effect of plant density and split application of fertilizers on the performance and yield of coconut :

The treatments were: Main Plot (plant density)

1. 100 trees per acre
2. 80 trees per acre
3. 60 trees per acre.

Sub Plot :- 4 Frequency of application :

Tr. 0 - Control - No fertilizer

Tr. 1 - 0.339 kg.N, 0.226 kg P₂O₅ & 0.678 kg K₂O applied in single dose.

Tr. 2 - 0.339 kg.N, 0.226 kg P₂O₅ & 0.678 kg K₂O applied in 2 equal split dose.

Tr. 3 - 0.339 kg.N, 0.226 kg P₂O₅ & 0.678 kg K₂O applied in 3 equal split dose.

There was no significant difference in yield either due to plant density or due to split application of fertilizers. Application of fertilizers, once in August-September recorded the highest yield.

Intercropping trial in coconut garden:

All the crops tried viz. Rice (PTB-28), Ragi, Tapioca, Colocasia and Sweet Potato were found to be suitable.

Varietal trial on paddy in the inter spaces of coconut palms

Among the paddy varieties tried IR-8 recorded the highest yield followed by PTB-28. The other

paddy varieties tried were Aswathy, Jaya, Triveni, Rohini and Annapurna.

Varietal trial on redgram in the inter spaces of coconut palms

Among the 4 varieties tried T.21 recorded the highest yield.

Varietal trial on maize in the inter space of coconut palms

The trial failed due to heavy rains.

Varietal trial Sorghum in the inter spaces of coconut palms

The trial failed due to heavy rains.

Effect of raising Cocoa as an inter crop in coconut garden:

The experiment was conducted with 3 treatment and 8 replications:

- Treatments:
1. Single row of cocoa
 2. Double "
 3. No cocoa

Growth and performance of cocoa was found to be good in coconut garden. Between the two treatments, two rows of cocoa in between two rows of coconut yielded better than single row of cocoa between two rows of coconut. Influence of cocoa on growth and yield of coconut palm is being studied.

Response of T x D hybrids to higher dose of N P and K

There were 27 combinations of NPK at 3 levels each

- 1) No - No nitrogen
- 2) N_1 - 0.35 kg N / tree / year
- 3) N_2 - 0.70 kg N/tree/year
- 4) P_0 - No $P_2 O_5$
- 5) P_1 - 0.175 kg $P_2 O_5$ /tree/year
- 6) P_2 - 0.375 "
- 7) K_0 - No $K_2 O$
- 8) K_1 - 0.70 kg $K_2 O$ /tree/year.
- 9) K_2 - 1.40

There was no significant difference between treatments.

Effect of NPK levels and frequency of application of yield and bearing habit of T x D hybrids.

The treatments were:

- 1) Tr 1 : 1 kg N, 0.64 kg $P_2 O_5$ and 2.4 kg $K_2 O$
- Single dose
- 2) Tr 2 : " " - Two split dose
- 3) Tr 3 : 0.5 " 0.32 " and 1.2 - Single dose
- 4) Tr 4 : " " " - Two split dose

The treatment differences were not significant. Application of 0.5 kg N, 0.32 kg $P_2 O_5$ and 1.2 kg $K_2 O$ per tree per year recorded the highest yield.

**COCONUT RESEARCH SUB STATION,
BALARAMAPURAM**

Progeny row trial with T x D and T x GB seedlings :

To make a comparative study of T x D and T x GB plants an experiment was laid out in compact family block design. The treatments were 5 progenies each of T x GB seedlings. All the trees have not yet flowered and therefore no conclusion could be drawn.

Observational trial on West Coast Tall and other exotic dwarf varieties:

This experiment was started during 1973 to study the comparative performance of West Coast tall and other exotic dwarf varieties such as Malayan dwarf, SS green and D x T. The seedlings were planted in a compact area and the plants were randomised within the plot. The crop has not yet started bearing.

NPK fertilizer trial starting from young seedlings

To study the performance of palms from the seedling stage to the application of N,P and K the trial was laid out in 3^3 factorial confound design. The treatments were all possible combinations of N, P and K at 3 levels - The levels were :-

N_0 - no nitrogen P_0 - No phosphorus K_0 - No potash
 N_1 - 340 gr N/tree P_1 - 225 gr $P_2 O_5$ /tree K_1 - 450 gr $K_2 O$ /tree
 N_2 - 680 " P_2 - 450 " K_2 - 900 gr $K_2 O$ /tree

No conclusive result is available since all the trees have not come to flowering stage. Among the trees flowered, early flowering was noticed in treatments $N_2 P_1 K_1$ and $N_2 P_1 K_2$ i. e. after 6½ years from the date of planting.

Observational Trial I

For assessing information about the response of old palms to the normal and enhanced dose of manuring, 8 young palms were selected for each plot and replicated twice. Treatments given were normal dose 340 gm. N + 225 gm $P_2 O_5$ + 450 gm. $K_2 O$ per tree enhanced dose 680 gm N + 450 gm $P_2 O_5$ + 900 gm $K_2 O$ per tree.

The average yields of trees in the two different treatments were as follows for the last 8 years.

Normal dose - 48 nuts/tree
 Enhanced dose - 53.7 "

Observational Trial II

To study the effect of normal and enhanced dose and single and split applications of manures on the

growth of young seedlings and to see whether earliness in bearing can be induced by the same. The trial was conducted with the following treatments.
Tr 1 : Normal dose of 340, 225 and 450 gm NPK applied in one dose.

Tr 2 : Normal dose in 2 split applications - half in August and the other half in february.

Tr 3 : Enhanced dose of 680, 450 and 900 gm NPK applied in one dose.

Tr 4: Enhanced dose applied in 2 split half in August and half in February.

Spacing - cum - manurial experiment:

All the trees in this experiment have not come to bearing stage.

The trial was initiated to investigate the interaction between spacing and manuring on the growth and productivity of the crop. All possible combinations of 3 levels of manures and 3 different spacings were adopted.

Levels of nutrients-3

M₀ - No manure

M₁ - 340 gm N + 225 gm P₂O₅ + 450 gm. K₂O/tree

M₂ - 680 gm " + 450 " + 900 "

Spacing - 3

S₀ - 5 × 5 M

S₁ - 7½ × 7½ M

S₂ - 10 × 10 M

All the trees in this experiment have not started bearing. But early bearing has been noticed after 4 years and 8 months in treatment M₁ S₁. In treatment M₀ S₀ none of the trees have flowered.

COCONUT RESEARCH STATION, KUMARAKOM

Manurial-cum-micronutrient trial:

The experiment was started during 1962 to study the effect of application of fertilizers with and without trace elements.

The Experiment was laid out in randomised block design with 4 replications. The treatments were:

- 1) NPK
- 2) N₁ P₁ K₁
- 3) NpK + Boron
- 4) NPK + Manganese
- 5) NPK + Copper
- 6) NPK + Molybdenum
- 7) NPK + Zinc
- 8) NPK + all the above elements
- 9) Control.

NEK = N250_g + P₂O₅ 350_g + K₂O 700g

N₁P₁K₁ = N500_g + P₂O₅ 700_g + K₂O — 1400_g.

The yield data showed that the treatment NPK + Boron is superior to other treatments.

Investigation on doses, frequency and method of application of fertilizers :

To determine the most economic dose, frequency and method of application of fertilizers for coconut, an experiment was laid out with 27 treatments and 4 replications. The treatments consisted of possible combinations of 3 levels of manuring, 3 frequencies of application and 3 methods of application.

M1 = N₀P₀K₀ — 250gr. N + 350gr.

P₂O₅ + 750gr. K₂O per plant.

M2 = N1 P1 K1 — 375gr. N + 475 +

P₂O₅ + 875

M3 = N2 P2 K2 — 500gr. N + 600 +

P₂O₅ + 1000 ;

E = Manuring every year

A1 = Manuring in alternate years starting with the first year.

A2 = Manuring in alternate years starting with the second year.

C1 = Applying fertilizer in Basins

C2 = Applying fertilizer in linear trenches

C3 = Applying fertilizer by broadcast

From the yield data, it is seen that 375 g N + 475 g P₂O₅ + 875 g K₂O per tree every year applied in linear trenches recorded the highest yield of 61.8 nuts per tree.

Pests & diseases

A collection of 23 hybrid varieties of coconut is being maintained and studied in the station to assess their resistance against root wilt.

PULSES

RICE RESEARCH STATION, PATTAMBI

Comparative yield trial of cowpea

Seven varieties of cowpea, viz. New era, Pusa-dofasli, Pusa - phalguni, Pusa - barsathi, P.118, Calicut-78 and Kunnamkulam were put under a comparative yield trial. Among these varieties Calicut-78 and Kunnamkulam are selections made at Pattambi. During the year flowering was very shy and the yield obtained was below normal.

Comparative yield trial of green gram varieties

Eight varieties of green gram viz., Philippines, NP 36, Madira, Pusa-baisakhi, T44, C.135, NP40 and NP. 51 were tried under a comparative yield trial. The highest yield was recorded by NP40 followed by NP36.

Comparative yield trial of blackgram

Four varieties of blackgram, T9, NP2, Sind-Kheda and PLV736 were tested. The variety T. 9.

recorded the highest yield followed by Sind-Kheda variety. T. 9 recorded double the yield of other varieties tried and seem to be a promising variety.

Maintenance of types

Eighty five varieties of cowpea, 45 varieties of blackgram, 48 greengram varieties and 25 varieties

of soyabeans were maintained in the type collection during the year.

Breeding programme in cow-pea

Promising lines from the progenies of the crosses Calicut-51 x New Era, Calicut-51 x Pusa Dofasli, Calicut-51 x Kolinji, New Era x Calicut-51, Manjeri x New Era and Manjeri x Pusa Dofasli have been made for further studies.

GINGELLY

OIL SEEDS RESEARCH SCHEME, KAYAMKULAM

HYBRIDIZATION

Study of F₅ generation

To evolve multipoded varieties with dehiscent nature and increased oil content, crosses were made between Pt 58-35 and Kayamkulam-1. From the F₅ progenies studied, 39 cultures were selected for further studies.

Varietal trial

There was no significant difference in yield between the different varieties tried. But the trend of the results indicated that the multipoded mutant is the highest yielder followed by Kalpetta, Kayamkulam-1 and Quilon.

Maintenance of Types and varieties

Nineteen different varieties of sesamum from different sources were grown and maintained.

AGRONOMY

Effect of different nitrogenous fertilizers and split application of potash

The experiment was conducted with 8 treatments and 3 replications.

The treatments were:

1. 15 kg N/ha (Am/sul) + 15 kg P₂O₅ + 30 kg K₂O (basal)
2. " " + 15 kg P₂O₅ + 15 kg K₂O (basal) + 15 kg K₂O (top dressing)
3. 30 kg N/ha Am.Sul + 30 kg K₂O (Basal) + 15 kg P₂O₅.
4. 30 kg N/ha (Am.Sul) + 15 kg K₂O (Basal) + 15 kg K₂O (top dressing) + 15 kg P₂O₅.
5. 15 kg N/ha (Urea) + 15 kg P₂O₅ + 30 kg K₂O (Basal)
6. 15 kg N/ha (Urea) + 15 kg K₂O (Basal) + 15 kg K₂O (top dressing) + 15 kg P₂O₅.
7. 30 kg N/ha (Urea) + 30 kg K₂O (basal) + 15 kg P₂O₅.
8. 30 kg N/ha (Urea) + 15 kg K₂O (basal) + 15 kg K₂O (top dressing) + 15 kg P₂O₅.

The indications were that the recommended dose of NPK (30 : 15 : 30) with nitrogen as urea and split application of Potash (Basal + top) recorded higher yields.

Fertilizer trial on Multipoded mutant of Kayamkulam-1.

The results revealed that the recommended dose of fertilizers combined with basal application of organic manure at 1000 kg/ha has given increased yields.

Methods of application of Urea.

The effect of different methods of application of urea was studied in this experiment.

The treatments were :-

1. 15 kg N/ha basal
2. 15 kg N/ha Foliar application 20 days after sowing (2% solution)
3. 15 kg N/ha Foliar application 20th, 30th and 40th day
4. 15 kg N/ha Half basal + Half foliar 20th day
5. 15 kg N/ha Half basal + Half foliar - 20th and 30th day
6. 15 kg N/ha Half basal + Half foliar - 20th, 30th and 40th
7. 30 kg N/ha basal
8. 30 kg N/ha Foliar (4% solution) 20th day
9. 30 kg N/ha Foliar (4% solution) 20th day and 30th day
10. 30 kg N/ha (4% foliar spray) 20th, 30th and 40th day
11. 30 kg N/ha $\frac{1}{2}$ basal + $\frac{1}{2}$ foliar (4% solution) 20th day
12. 30 kg N/ha 4% foliar $\frac{1}{2}$ basal + $\frac{1}{2}$ foliar (4% solution)
13. " " 20th and 30th day
14. 30 kg N/ha $\frac{1}{2}$ basal + $\frac{1}{2}$ foliar (4% solution)
15. " " 20th, 30th and 40th day
16. Control.

Uniform application of 30 kg K₂O and 15 kg P₂O₅/ha

Significant difference in yield were obtained due to various treatments tried in this experiment. The highest yield was recorded by the treatment in which 4% solution of urea (30 kg nitrogen/ha) was applied on the 20th and 30th day after sowing combine with the recommended dose phosphorus and potashd

CASHEW

CASHEW RESEARCH STATION, ANAKKAYAM.

BOTANY

Evolution of better varieties by selection.

A collection (indigenous and exotic) of 47 clonal types and 43 seedling types planted during 1963-64 are being studied for their performance. Fifteen promising types (11 clonal and 4 seedling) have been carried forward for comparative yield trial.

Hybridization :

Studies on the performance of hybrid progenies revealed that hybrids obtained from crosses between local and exotic parents are more vigorous and promising

Observations on hybrid progenies of 7 parental combinations planted earlier were continued. Based on the yield for the past 5 years, 5 progenies were found to be promising (with a mean yield of 1.84 to 3.66 kg of nuts per tree/year)

Comparative yield trial (Old)

Comparative yield trial of 6 promising types from Kottarakara and a local type (No. 186) of Cashew Research Station, Anakkayam showed that the local type from Cashew Research Station, Anakkayam was the highest yielder (2.75 kg of nuts per tree). In previous years also the same treatment recorded the maximum yield.

Comparative yield trial (New)

An experiment to study the performance of progenies (layers) of 16 selected parents has been laid out during the year under report.

Studies on hybrid vigour

In order to study the hybrid vigour in cashew, a trial was initiated in 1967. Crossed, selfed and open pollinated nuts from the same parentage were used for the studies.

Growth of trees indicated that hybrids were most vigorous followed by open pollinated trees. The hybrid trees also recorded the highest mean yield of 2.43 kg. of nuts per tree.

Studies on the effect of climate on the expression of sex and their effect on yield:

Studies were initiated during the year by tagging the panicles at weekly intervals at the time of emergence and observations on sex ratio were recorded.

Cultural trials:

Trial on planting materials:

To study the comparative performance of seedlings, layers and grafts a trial was laid out during '73.

From the results obtained so far it could be seen that flowering in layers are earlier than seedlings. In mean yield the layers were the highest (3.66 kg/tree) followed by grafts (2.76kg) and seedlings 2.56 kg).

ALL INDIA CO-ORDINATED SPICES AND CASHEWNUT IMPROVEMENT SCHEME

BOTANY

Germ plasm collection and selection:

A collection of 46 clonal types and 42 seedlings types planted at Cashew Research Station, Anakkayam have been evaluated for their economic characters during the past few years. Based on the data collected so far 7 types have been selected for their higher yield ability. These types have been carried forward for comparative yield trials

Another comparative yield trial with 16 high yielding types collected from Cashew Research Station, Anakkayam, Vridhachalam, Vengurla and Bapla laid out and planted in October 1973 at Vellanikkara campus is being continued and observation recorded.

Hybridization and selection:

Crosses have been made between trees selected for specific character viz. nut size, sex ratio, fruit set, shelling percentage, short flowering phase etc. and the F_1 progenies are under evaluation.

NPK trial

The trial was laid out in October, 1973 to determine the most effective and economical dose of NPK fertilizers for bearing cashew trees.

The treatments will be applied from 5th year onwards.

Hormonal application to increase fruit set :

Studies with grown regulators like Indole Acetic Acid and Naphthalene Acetic Acid at varying concentrations showed that spraying IAA 50 ppm or NAA 10 ppm significantly increased the fruit set and number of mature nuts harvested.

PEPPER

PEPPER RESEARCH STATION, PANNIYUR.

BOTANY

1. Germ plasm collection and screening :

Forty two varieties including two Indonesian varieties are available in the germplasm collection.

Data recorded during the year showed that the hybrid variety Panniyur-1 gave the highest yield of 3.96 kg. green pepper per vine followed by Kalluvally (0.87 kg). The performance of the exotic varieties was poor. There was great variation in size and weight of berries among different varieties. The size of berries of the exotic varieties in general were small

Inter-varietal hybridization :

Inter-varietal hybridization involving 9 parental combinations was done during 1974-75 and 470 hybrid seeds obtained. The seeds have been sown in the nursery for germination.

The crosses were :

- 1) Uthirankotta x Panniyur-1.
- 2) " x Karimunda
- 3) Uthirankotta x Kuthiravally
- 4) Panniyur-1 x Karimunda
- 5) " x Kuthiravally
- 6) Panniyur-1 x F1 of Kuthiravally x Balankotta
- 7) Panniyur-1 x F1 of Karuvilanchi x Kollaradan
- 8) Panniyur-1 x Karimunda
- 9) Karimunda x Kuthiravally

In order to exploit the locked up variability in pepper which is a vegetatively propagated heterozygous crop, 3740 seeds collected from from 37 varieties in the varietal collection were sown in the nursery for raising seedlings.

Studies on spike shedding :

The nature of spike shedding was studied in the 6 important pepper varieties (Panniyur-1, Narayakodi, Cheriyaaniyakkadan, Balankotta, Kalluvally and Karimunda). The lowest percentage of spike shedding was recorded in Panniyur-1 (26) and highest in cheriyaaniyakkadan (71).

AGRONOMY

Manurial trial :

The experiment was laid out in 1974 for fixing the optimum dose of N and lime for Panniyur-1.

The experiment was laid out in split plot design with 3 levels of nitrogen viz. 60, 120 and 180 gm. of nitrogen in main plots and 2 levels of lime, 0 and 500 gm of slaked lime per vine per tree in sub plots. Uniform dose of P_2O_5 and K_2O at 140 gm and 50 gm respectively was applied in all treatments. The vines have just started bearing.

Pests and diseases :

Field trial for the control of slow wilt

The experiment was laid out in 1974 in a private garden at Iritty where the incidence is endemic. Three fungicides (Ceresan 0.1%, Captan 0.3% and Thiride 0.3%) and a nematicide (Dasanit 5%) were tried as soil drench. Periodical observations on the performance of plants, population of pathogenic nematodes in the root zone etc. are being recorded. A large population of nematode (radopholus sp.) was detected in the soil and roots of affected plants. Slow wilt affected plants when treated with nematicide (dasanit) showed no symptoms later on. Thus it is suspected that nematodes are the preliminary cause of slow wilt. The experiment has to be continued for few more years for conclusive results.

Field trial for the control of quick wilt.

This trial was laid out during 1974, in a cultivators field at Alakode. Four fungicides (Bordaeux mixture, Fytalon, Dithane M-45 and Thiride) were tried singly and in combination with Ceresan 0.1%. Periodical observations are being recorded.

Combination trial for the control of fungal and insect pollu.

This experiment was laid out during 1974 to find out the best insecticidal and fungicidal combinations against fungal and insect pollu in pepper. Two insecticides Rogor and Ekalux and three fungicides viz. Dithane M. 45, Dithane Z-78 and Fytolan were used singly and in combination. Periodical observations are being recorded.

GINGER

Studies on optimum seed size and spacing

To find out the optimum size of rhizome and plant population for the variety rio-de janeiro per unit area for obtaining an economic yield a trial was laid out with the following treatments. Major treatments (spacing) Minor treatments (Rhizome size)

20 x 15 cm	10 gr.
25 x 20 cm	15 "
25 x 25	20 "
25 x 30	25 "

Seed weight of ginger gave a significant influence on yield. Rhizome pieces weighing 25g. recorded the maximum yield.



Among the spacing, 20 x 15 cm. recorded the maximum yield.

Trial with different sources of N

Different sources of N viz. Urea, Am-sulphate, Shellac coated urea and IBDU had no differential influence on yield.

Trial on method of application of manures

There was no significant difference in yield due to 5 methods of applying fertilizers. However broadcasting manures and fertilizers over the bed

after planting and covering pits gave the highest yield.

Studies on response of ginger to K_2O

Studies on the response of ginger to potash showed no significant effect due to potash (0, 20, 80, 120 and 160 kg. K_2O /ha. were tried in this trial)

Turmeric

1. Among the different varieties of turmeric tried kuchipudi and G. L. puram recorded the highest yield.

CARDAMOM

CARDAMON RESEARCH STATION PAMPADUMPARA.

BOTANY

Survey and collection of cardamom types and varieties have been continued.

Polycross seedling progenies (7 types) and clonal progenies (4 types) have been studied for their performance. The clonal progenies of type 17 produced the maximum yield of green capsules.

AGRONOMY

Manurial experiment

In order to study the NPK requirement of cardamom one experiment was laid out and planted during the year.

Liming experiment

Yield data on liming experiment with 0,300 and 600 gm. lime per plant indicated that lime application had no significant influence on yield.

Drip irrigation experiment

Studies on the efficacy of different types of irrigation in comparison with the Israel type of drip irrigation showed that irrigation had no favourable influence on yield.

PLANT PATHOLOGY

Testing parental lines for disease resistance

The different types of cardamom available in the station were found to be susceptible to Katte disease.

The 8 new selections were also susceptible to the disease on inoculation.

An experiment for mass screening of seedlings for resistance has been started.

Clumps reported to be resistant to the disease in the nearby estates have been brought to the station for artificial inoculation.

Field trials to study the nature of spread of 'Katte' disease

Observations on the number of Katte affected

plants in 'Katte' control-cum-demonstration plots are being recorded at regular intervals.

Studies on vectors of Katte virus.

Katte disease could be developed in healthy seedlings (1 month old) within a period of 30-45 days if inoculated with viruliferous banana aphid (*Pentalonia nigro nervosa*). Seedlings inoculated with *Aphis craccivora* and Jassid hopper (*Tetigoniella* sp.) did not develop disease symptoms. Nematodes had no role in the spread of disease.

Efficacy of systemic insecticides in checking the spread of 'Katte' disease.

Five systemic insecticides viz., Disyston, Furadan, Solvirex, Thimet were used in the studies. Observation on aphid population and extent of thrips infection were recorded at monthly intervals.

Studies on 'Azhukal' disease of cardamom

The fungus *Phytophthora palmivora* was found to be the causative organism of the disease. Laboratory evaluation of 11 fungicides revealed that 7 fungicides (cresan, Difoltan, Dithane C-90, Dithane M-45, Kocide, Miltox and Thiride) were capable of inhibiting the growth of the pathogen at 2000 ppm. concentration.

Effect of pre-sowing fungicidal treatment on the germination of cardamom seeds.

The results on germination were not statistically significant. However, the fungicides Difoltan, Miltox and Thiride recorded higher germination percentage.

ENTOMOLOGY

Testing insecticides for the control of Cardamom thrip.

An experiment was laid out during the year to study the efficacy of ten insecticides against cardamom thrips. The insecticides tried were Anthio, Deminun, Ekalux, Ekatin, Fish oil-insecticidal soap, Nuvacron, Phendal, Rogor and Solane.

B A N A N A

BANANA AND PINEAPPLE RESEARCH STATION, KANNARA.

Varietal collection.

A total of 137 varieties of banana are available in the varietal collection. Studies on the performance of these varieties continued during the year.

Varietal testing.

Studies on the comparative merits of 4 improved Dwarf Cavendish clones viz., Robusta, Monsmarie, Peddapacha and Giant Governor are in progress since 1973-74. The results obtained during 1974-75 were in conformity with the previous findings. Monsmarie recorded the highest yield followed by Giant Governor.

Nutritional requirement of banana.

Among the 3 nutrients (NPK), only the effect of 'K' was found to be positive and significant on fruit yield in banana variety Robusta. Chemical analysis of leaf samples also revealed that bunch weight is positively correlated with K_2O content in leaf.

Levels of nutrients (gm. per plant).

N = 100, 200 and 300 g. ; P_2O_5 = 0, 40 and 80 g.
and K_2O = 0, 200 and 400 g.

Trace element studies.

Results on the experiment on micronutrients (Cu, Mn, Zn, Mo & B) in banana revealed that the three nutrients B, Mn and Cu @ 12.5 kg/ha level had favourable influence on fruit yield.

Control of weeds in Banana with herbicides.

The results showed that weedicides were very effective and economical in controlling weeds in banana gardens. Combination of Diuron (2.5 kga.i./ha) + Gramoxone (1.5 kg.a.i./ha) was most effective.

Monthly planting trial

Studies on the influence of season on growth and yield of banana (Nendran & Robusta varieties) were in progress since July 1974. The trial is only in the early stages.

Varietal trial under rain fed conditions:-

A comparative yield trial with 5 promising varieties of banana viz. Robusta, Dwarf Cavendish, Poovan, Palayankodan and Gromichei is in progress

since May 1974. The experiment failed during 1974-75 season on account of severe drought.

Ratooning experiment:

Studies on the performance of 4 promising varieties (Robusta, Monsmarie, Giant Governor and Peddapacha) under ratooning are in progress since 1973-74. The results obtained so far showed that Monsmarie is the highest yielder in the plant crop as well as 1st ratoon followed by gaint governor.

Pest and disease investigation :

Results on the survey of banana disease showed that Bunchy Top disease was prevalent throughout the State. Kokkan diseases was noticed only in Trichur district and that too in Nendran and Palayan-kodan varieties.

Studies on bunchy top disease

a) Screening trial

Screening trial with 10 varieties of banana to study their resistance against bunchy top disease using infective aphids for inoculation revealed that Bodles Alta Fort has some tolerance against bunchy top disease.

Control of spread of bunchy top disease :

Twelve insecticides were used in the experiment. The test variety was Nendran. Data collected during the year showed that the population of banana aphid (the vector of bunchy top disease) was nil in Thimet treated plots. Aphid population in general was less in plots treated with insecticides when compared with control.

Control of leaf spot disease :

Fortnightly spraying with 6 fungicides for the control of leaf spot disease in banana showed that Bordeaux mixture was highly effective in reducing the intensity of infection and increasing the yield as compared to Bitox, difolatan, Fycol, Dithane Z-78 and Dithane M-45.

Studies on the control of Nematode parasites of banana.

Four systemic insecticides were used in the study, viz. Dasanit, Temic, Carbofuran and Thimet. The nematode population in soil roots were periodically assayed. The experiment was laid out and planted during September, 1974.

PINEAPPLE

PINEAPPLE RESEARCH SCHEME, VELLANIKARA

Population density trial

Data collected from the experiment planted in July 1974 indicate that planting pineapple in 2 or 3 row beds at 25cm between plants and 60cm between rows at a spacing of 95cm between trenches accommodating 57143 and 53333 plants/ha. would be optimum.

Nutritional studies in Pineapple.

The experiment to find out the optimum dose of urea as foliar spray in combination with soil application showed that 16gm of N per plant all applied through soil proved superior with regard to growth. The crop has not yet started yielding.

Studies on growth regulators :

The following experiments on growth regulators planted during June—July 1974 are in progress.

a) Studies on the concentration and stage of application of plamofix for increasing fruit size and delaying maturity.

b) Standardisation of time of application of growth regulators for getting optimum yield.

c) Studies on induction of flowering.

Depth of planting trial.

Results on number and weight of fruit obtained during the year showed that planting in trenches 45 cm. deep gave the maximum yield.

Control of weeds in pineapple with the aid of herbicides.

Application of herbicides was very effective and economical in controlling weeds in Pineapple. Diuron 3 kg/ha + Bromacil 2.5 kg./ha was found to be the best.

ESSENTIAL OIL

LEMONGRASS RESEARCH STATION, ODAKKALI.

Germplasm collection

A collection of 439 types of Lemongrass is being maintained at the Station. Thirty types have been added during the year under report.

Agronomical studies on OD. 19.

The agronomical studies conducted with OD-19 revealed the following:

- 1) The optimum spacing for planting is 15 X 10 cm.
- 2) Transplanting is superior to direct sowing.
- 3) Optimum stage of harvest is at 50 to 60 days intervals.
- 4) Oil yield will not be decreased by drying the harvested leaf upto 3 days.
- 5) Oil storage studies have shown that Aluminium container is the best. For distillation, providing a perforated false bottom in the country still just above water level will improve the recovery and quality of oil.

Preliminary yield trial of lemongrass types.

Two preliminary yield trials one with 16 OD types and another with 13 OD types were put along with OD-19 as control. In the first trial though grass yield was highest in OD 408 and OD 398, oil yield was maximum in OD 408. But percentage of oil recovery was maximum in OD-405. In the second trial, grass yield and oil yield were highest in OD-410. But the percentage of oil recovery was highest in OD-19.

Comparative yield trial of Lemongrass

Two comparative yield trials with promising types were conducted in randomised replicated plots. In the first trial OD types 290, 292, 293,

299, 300, 305, 307, 331 and 19 were compared. Among all the varieties, the better performance was given by OD-19. In the second trial, OD types 151, 156, 184, 359, 360, 362, 366, 367 and OD 19 were compared. It was found that though OD 367 gave the highest grass and oil yield, the highest recovery was given by OD. 19 and OD. 359.

Fertilizer trial on Lemongrass

A manurial trial with 4 levels of nitrogen and 3 methods of application were tried. The levels of nitrogen were 50, 100, 150 and 200 kg. N/ha with 3 methods of application. 1. Complete basal 2. In 2 equal split doses 3. In 4 split doses half basal and the rest after each cutting.

Highest grass and oil yield was recorded by 200 kg N/ha. applied half basal and half at mid season, but the percentage of oil recovery was highest with 50 kg. N/ha. applied half basal and half at mid season.

Comparative yield trial of OD. 148

OD 148 is a promising culture selected after conducting preliminary trials. A bulk trial was laid out with OD-19 and OD-148 in bigger plots to compare the yield characters and oil quality.

Fertilizer trial on Palmarosa (Motia)

The trial was started during 1973-74 with 4 treatments.

Treatments: 0 kg N/ha. No manure.
20 kg N/+ 30 kg. each P_2O_5 & K_2O per ha.
40 kg N + 30 kg. each P_2O_5 & K_2O perha.
60 kg N + 30 kg. each P_2O_5 & K_2O per ha.

The season was not favourable for a proper harvest and hence the flowers were permitted to set the seeds. The trial has to continue for getting confirmatory results.

COLLEGE OF AGRICULTURE, VELLAYANI.

OTHER EXPERIMENTS

DEPARTMENT OF AGRONOMY

Fertilizer-cum-interval of cutting trial in guinea grass under rainfed conditions

Results showed that Guinea grass production increased with increasing levels of N upto 200 kg per ha.

Harvesting guinea grass at 45 days interval recorded the maximum yield.

Spacing experiment on guinea grass in coconut garden under rainfed conditions

The optimum spacing for maximum grass yield was found to be 40×20 cm.

Intercropping pulses with guinea grass in coconut gardens under rainfed condition

Highest fodder yield was obtained by growing cowpea in the inter space of guinea grass during the south west monsoon season and horse gram during north-east monsoon season.

Comparative performance of different cowpea varieties.

Among 18 varieties of cowpea tried the variety Co-1 recorded the maximum green matter yield of 6.5 tons/ha followed by the variety No. 998.

Comparative performance of dianth grass (*Pennisetum pedicellatum*)

Among the 13 varieties tried the maximum green matter yield of 29.9 tons/ha. was recorded by the variety pp-15 followed by the varieties pusa-6 and pusa-1. (29.3 and 29.0 tons/ha respectively.)

Performance of velvet beans.

Growth and performance of velvet beans were satisfactory and it gave a green matter yield of 12.12 tons per ha.

DEPARTMENT OF AGRICULTURAL CHEMISTRY

Trial with agricultural liming materials

In this trial the effect of carbide-ash in the form of Geo lime on rice variety Thriveni was studied. In the first season no effect was noticed. From the 2nd season the trend of the results has shown that Geo lime has a favourable influence on yield.

Trial with indigenous source of magnesium silicate

In the field trial with magnesium silicate on rice, increased yield was obtained.

Effect of sagar on yield and quality of rice

Sagar a manure suppliment prepared from sea water was found to be benefical in increasing the yield and quality of rice.

Effect of zinc in combination with lime on growth, yield and absorption of nutrients in rice

In a pot culture experiment, the application of Zinc resulted in increased plant height, length of panicle, and number of grain per earhead. But there was no significant differences in grain and straw yield. Similar trend in results could be noticed in the case of lime also.

Fertility investigation in kole lands

Results of studies on 40 samples showed that all soils were acidic (pH 2.6 to 6.3) in reaction. Organic matter content ranged from 1.37 to 50.38% The variations in total N, P₂O₅ and K₂O contents were in the range of 0.14–1.25%, 0.02 to 0.24% and 0.09 to 0.57% respectively. The levels of CaO and MgO, in these soils ranged from 0.19 to 2.08% and 0.05 to 0.90% respectively.

DEPARTMENT OF ENTOMOLOGY

Scheme for Research on insect toxicology and chemical control of insect pests

Studies on the control of leaf roller pest of paddy showed that Phosvel, Dimecron, Ekalux Nuvacron, Lebaycid, Bidrin, Folithion and Parathion at 0.25 kg. ai/ha. were very effective. Sevin Labaycid and Foliithion gave good control of paddy jassids.

Thimet Solvirex 1 kg. ai/ha. were very effective against whorl maggot.

Gall fly could be successfully controlled by Thimet. Laboratory tests by feeding the brown hopper with different pesticides showed that Furadan is superior to Thimet, Solvirex and Cytrolane.

Scheme for Research on Parasitology, Insects Pathology and Biological control of insect pests :

An improved strain of *Bracon brevicornis* with consistantly favourable sex ratio of 1 male : 3 females was established by selective breeding.

Studies on seasonal occurrence of pests infesting vegetables and their natural enemies were continued.

The toxicity of 4 systemic insecticides i.e. Rogor, Ekatin, Dimecron, and Anthio and 4 non systemic (Dipterex, DDUP, DDIT and Thiodan) were evaluated with a view to integrate chemical and biological control of *Nephantis serinopa*.

Scheme for Non-insect Pests, Storage Pests and their control.

Out of the 20 varieties of tapioca tried, Elavan, H. 97, H. 226, Kalikalan, Kayyalachady and H. 165 were found to be relatively resistant to red spider mite (*Tetranychus telarius*).

Increase in protein content due to the application of higher doses of N to rice was associated with a similar trend in the susceptibility of the grain to storage pests.

In field trials, it was found that the field rat *Rattus-rattus* has less preference for H 226, M4 and a few local varieties of tapioca.

Application of 20% neem (powdered neem seed kernel) as a protectant of stored grains, outside and inside gunny bags were equally effective as malathion 0.01%.

Scheme for Research on Insect Biology, Ecology and Behavior.

Studies on the biology of crop pests *Scirpophaga innotata* on paddy, *Orthaga excinacea* on mango and *Azasia rubricans* on cowpea were conducted.

Castor was found to be the preferable host to *Prodenia litura*.

A common weed *Erocharia* sp. was noted as an alternate host for rice case worm *Nymphula depunctalis*.

As a part of the All India Co-ordinated Project on grain storage, samples of field and stored paddy were collected from Alleppey, Palghat and Wynad and studied for pest incidence, moisture content, germination etc.

Studies on plant parasitic nematodes

The following plant parasitic nematodes were recorded from soil samples collected from different tracts.

Betalvine	..	<i>Meloidogyne incognita</i>
Rice	..	<i>Aphlenchodis besseyi</i>
Sugarcane	..	<i>Hoplolaimus indicus</i>
		<i>Meloidogyne javarnica</i>

DEPARTMENT OF AGRICULTURAL EXTENSION

The following research projects were in progress:

- 1) Study of the attitude of the Agricultural extension personnel towards the high yielding varieties of paddy.
- 2) An exploratory investigation on the progressive attitude of the host farmers selected under the billeting programme towards improved farming practice.

- 3) Study of the attitude of the applied nutrition programme personnel and Village women towards the applied nutrition programme.

DEPARTMENT OF STATISTICS

The department of statistics continued to associate with the research activities of the other departments and research stations by assisting in planning experiments and analysis of data therefrom.

DEPARTMENT OF PLANT PATHOLOGY

1. Studies on sheath blight in rice showed that the intensity of infection could be reduced by spraying Hinosan. Soil amendments with oil cakes and industrial and agricultural waste products reduced the severity of the disease.

2. Amending the soil with organic materials reduced the intensity of bacterial wilt. None of the varieties screened was resistant to the disease.

3. Severity of *Alternaria* blight in sun flower crop could be reduced by spraying Dithane M-45 or Miltox.

Scheme for Biological Control of African Payal (*Salvinia*), Mannuthy

The scheme was started functioning in December 1972 with the following objectives:

1. To conduct survey for local insects which feed on *Salvinia*,
2. To import and use exotic insects in the biological control of *Salvinia*,
3. To work out biology, host range etc. of the exotic insects and to find out whether these insects can be effectively and safely used for the control.

Survey for local insects which feed on *Salvinia*

Detailed survey conducted has shown that 3 species of local insects are there which feed on the 'payal'. Out of these 3 species, two were found to be more common in occurrence. They are:

- 1) *Nymphula responsalis* a caterpillar defoliator and
- 2) *Bagous* sp. a leaf eating weevil.

The larvae of *Nymphula responsalis* is a good defoliator of the 'Payal'. *Bagous* sp. is seen cutting circular holes on the leaves of this water weed and this leads to the decaying of the cluster. Detailed studies showed that these insects were incapable of effectively controlling the African Payal.

Use of exotic insects

The following types of insects are programmed to be used for the control of this water weed.

1. *Cyrtobagous singularis* : a weevil
2. *Paulinia accuminata* : a grass hopper
3. *Samea multiplicalis* : a caterpillar

The Government of India has given permission to the Entomologist of the Commonwealth Institute to import *Paulinia accuminata* and the Kerala Agricultural University received a nucleus culture of the same from the Entomologist for studying the feasibility of utilising this insect for the biological control of this water weed. These insects were multiplied at Mannuthy and field releases were made at Moncompu and Vellayani.

C. I. B. C. has been contacted for the supply of *Samea* sp. another exotic pest of *Salvinia*.

So far 40 different types of important crops and 20 varieties of paddy were tried to find out the host range of *Paulinia*. The results of the trials were encouraging and the insects were seen not at all feeding on the crops tried. Moreover, the natural conditions prevailing here are found suitable for the fast multiplication of this insect.

Other items of work which do not come under the purview of the scheme.

a) Feeding trials.

Salvinia was fed to pigs to find out whether this can be included in the bulk diet of animals. The trial has to be given up, as the pigs were affected with diarrhoea.

b) Manurial trials.

Works conducted at the Agricultural College, Vellayani and Rice Research Sub Station, Moncompu have shown that the compost made out of the 'payal'

contains about 0.7% nitrogen and 1.5% phosphorus. Besides, it can be used as a mulch in coconut garden.

c) Chemical trials.

Apart from the biological methods of control, certain chemicals were also tried in the laboratory for the control of *Salvinia*. Fifty four chemicals were tried and a few of them were found promising under laboratory conditions. Field trials were conducted in tanks and a combination spray of two chemicals (Sodium Carbonate and sodium chloride) was found effective when used at 6% combined concentration. The spray fluid required is about 400 litres per acre on a single layer of *Salvinia* and the cost of the chemical works out to Rs.20/-per acre. Breaking of roots, withering of leaves, breaking of the stem at the nodal region and sinking of the material were the symptoms of damage observed. However the main limitation with the chemical control was that under field conditions, particularly where the weed form dense mats, the chemical kills only the upper layer and the dead upper layer prevents subsequent sprays reaching lower layers. The lower layers will therefore put forth fresh growth which will cover the surface again.

Conclusion:-

Biological control, though economical, is a slow process. It may take years to find out a suitable biological control measure.

Hence it may be advantageous to simultaneously investigate the mechanical and chemical control measures for immediate results. But a permanent control can be achieved only by biological means.

VETERINARY AND ANIMAL SCIENCES

ALL INDIA CO-ORDINATED RESEARCH PROJECT FOR INVESTIGATION ON AGRICULTURAL BY-PRODUCTS AND INDUSTRIAL WASTE MATERIALS FOR EVOLVING ECONOMIC RATION FOR LIVESTOCK, TRICHUR CENTRE.

The objectives of the scheme are :

- a) to assess the nutritive value of various agricultural by-products and industrial waste materials available in Kerala as possible sources of livestock feed with a view to finding out fresh feed resources and thereby augment productivity of livestock ;
- b) to explore the possibilities of improving the nutritive value of such by-products and waste materials by appropriate treatments and
- c) to evolve non-cereal economic ration for livestock.

Agricultural by-products and industrial waste materials initially allotted to the Trichur Centre for investigation are, tapioca leaves, starch waste, silk cotton seed cake, rubber seed cake and fruit waste. In addition to the above materials, studies on sal seed meal, coffee husk, frog meal, pineapple bran, glyricidia leaves, cashew bran, neem seed cake, L & P feed factory waste, etc. were also taken up under the project.

Tapioca Leaf Meal (*Manihot Utilissima*)

Tapioca leaf meal (leaves wilted, oven dried or sun dried and powdered, D. C. P. 8.3 and TDN 45.5) containing only 17.58mg. HCN per 100gm of material at an intake level of 0.5-0.8% of body weight of bullocks, 0.4% of lactating cows and 0.7% of calves,

on feeding does not bring about any adverse effects on the physiological well-being of animals, production performances or on growth response.

Studies on the HCN content of tapioca leaves and the effect of plucking leaves periodically from the plant on the yield of tuber, disclosed that the stage of maturity (minimum HCN content is at 5 months of age) as well as the type of soil influenced the HCN content and that plucking 25% of the leaves before harvest is detrimental to the yield of tuber (10% reduction)

Studies on the amino acid profile of the tapioca leaf protein isolated by the alkaline borate buffer extraction method revealed that the leaf protein is rich in essential amino acids like leucine, valine, isoleucine and lysine.

From a critical assessment of the above observations, it was concluded that tapioca leaf meal can be profitably incorporated in livestock rations.

Tapioca Starch Waste

Feeding trials carried out with tapioca waste (DC 2.0 and TDN 72) in pigs showed that the material can profitably replace maize or tapioca chips in the ration at 15% level without bringing about any noticeable changes in body weight, feed efficiency, nutritional status or carcase characteristics.

Results obtained in cattle with the incorporation of tapioca starch waste (DCP 2.0 and TDN 64) at 25% level, replacing the entire portion of maize or tapioca chips in the ration of growing or lactating animals revealed that the cost of feed required for supporting body weight, milk yield and butter fat production can be considerably reduced.

From an overall assessment of the observations outlined above, it was concluded that tapioca starch waste can profitably replace such costly ingredients as maize or tapioca chips in the rations of cattle and pigs as given below:-

Ration for cattle		Ration for pigs	
Tapioca starch waste	25%	Groundnut cake	10%
Groundnut cake	24%	Coconut cake	25%
Gingelly cake	20%	Wheat bran	15%

Ration for cattle		Ration for pigs	
Wheat bran	16%	Tapioca starch waste	15%
Rice bran	15%	Unsalted dried fish	10%
Salt extra		Rice bran	24%
Mineral mixture extra.		Mineral mixture	1%

Silk cotton seed/cake

Preliminary investigation with silk cotton seed on goats disclosed that the material can profitably replace gingelly cake for both growth and lactation at 10 percent level in the concentrate mixture.

Lactation studies conducted with silk cotton seed cake replacing 50% and 100% of the gingelly cake in the concentrate mixture (20% of the ration) showed that silk cotton seed cake can effectively replace half the gingelly cake in the ration of lactating cows.

Rubber seed cake

Growth studies with rubber seed cake replacing 10% of the coconut cake in the ration of pigs showed that the material can profitably be used without any deleterious effect on the rate of growth, feed efficiency and carcase characteristics of the animals.

Metabolism trials with rubber seed cake in bullocks indicated that the material possessed a DCP of 18.6 and a TDN of 54 with the animals maintaining positive nitrogen balance and manifesting no adverse effects.

Growth studies with rubber seed cake replacing the entire portion (20%) and fifty percent of the gingelly cake in the concentrate ration of calves, revealed that the material can profitably be incorporated upto 20% in the concentrate ration of growing calves.

Lactation studies with rubber seed cake replacing the entire portion (20%) of the gingelly cake in the concentrate ration of cows, revealed that the material can profitably be incorporated in dairy rations.

Coffee husk

Growth studies with coffee husk (DCP 3.1 and TDN 50) fed at 10% level replacing 50% of the rice bran in the concentrate ration of calves, revealed that the material can profitably be incorporated upto 10% in the concentrate ration of growing calves.

Neem seed cake

The material was found to be palatable only when mixed with other ingredients. Metabolism trials conducted on bullocks revealed that the material possesses a DCP of 6.5 and a TDN of 62.5.

Growth studies conducted on calves fed with neem seed cake at 10% and 20% levels in their concentrate mixtures revealed that the material failed to promote growth in calves. Urine of all animals fed with neem seed cake showed traces of albumin and bile salts. Animals on neem seed cake ration showed only a low nitrogen balance. The increminating factors in neem seed cake need further investigation.

Sal seed meal

Feeding trials in two groups of adult meal maintained on rations containing 20% and 30% de-oiled sal seed meal (crude protein 9.9% and tannic acid

8.5%) for a period of over fourteen months failed to indicate any deleterious effect either on the nutritive or on histopathological pattern of the internal organs of the animals. The DCP and TDN of sal seed meal in goats were assessed as 3.45 and 7.2 respectively. L & P Feed factory waste.

Growth studies on calves revealed that Feed Factory sweepings (12.9% crude protein) can be incorporated in the place of rice bran upto 10% level in their ration.

Frog Meal

Frog meal (crude protein 66.8) prepared from the leftover of the frog leg industry were incorporated at 10% level in poultry ration replacing dried fish. It was found that the material can profitably replace fish-meal for growth and egg production in poultry.

Cashew bran, glyricidia leaves and pineapple bran were not found suitable for feeding livestock because of low palatability, presence of increminating factors as tannins, etc.

Exploration of promising agricultural by-products and Industrial waste materials of local importance

a) Prawn waste

Two varieties of prawn waste collected from Fisheries Project at Neendakara (Quilon District) viz. shrimp waste dried (crude protein 82.8% on DMB costing Rs.10/kg) and shrimp shell powder (crude protein 39.7 and costing Rs.2/kg) were analysed for proximate composition. Based on the composition and cost, shrimp shell powder has been chosen for feeding trials in pigs and poultry.

b) Tea waste

Chemical analysis of tea waste showed that it is rich in crude protein (29.3%)

c) Brewery waste

Chemical analysis of samples of brewery waste obtained from a distillery in Palghat District revealed that the material contains 27.5% crude protein.

d) Fish protein concentrate

Chemical analysis of samples of fish protein concentrate received from Fisheries Technology Station, Calicut showed that the material is rich in crude protein (64.3%)

e) Pulippan grass

It was observed that the crude protein content of the plant at early stage (1 month old) was 12.4% as against 9.8% and 6.1% observed at the 3rd month and at flowering stage (5 months), respectively. The grass grows abundantly in Trivandrum district (Perinjannala and nearby places).

ALL INDIA CO-ORDINATED RESEARCH PROJECT ON GOATS FOR MILK PRODUCTION, MANNUTHY

The object of the scheme is to evolve new breeds of milch goats suitable for different climatic conditions and capable of yielding more milk.

a) Breeding Programme

The following is the mating plan:-

Male	Local (L)	Sanen (S)	Alpine
Female local (L)	LL	$\frac{1}{2}S, \frac{1}{2}L$	$\frac{1}{2}A, \frac{1}{2}L$
$\frac{1}{2}S + \frac{1}{2}L$	—	$\frac{3}{4}S, \frac{1}{4}L$	$\frac{1}{2}S, \frac{1}{4}A, \frac{1}{4}L$
$\frac{1}{2}A + \frac{1}{2}L$	—	$\frac{1}{2}S, \frac{1}{4}A, \frac{1}{4}L$	$\frac{3}{4}A, \frac{1}{4}L$

At each stage fifty females of breedable age of local breed would be bred with four native bucks of the same breed to produce a comparable native stock maintained under the same feeding and management regime.

The data on growth, breeding efficiency and production and mortality will be recorded on each animal.

Work Done

One hundred and twenty three adult females with their kids and two bucks of local Malabari breed were purchased from their tract in February 1974. Six Saanen and 2nd Alpine bucks were lifted from National Dairy Research Institute, Karnal during 1974. The two Alpine bucks were later disposed of as recommended by the Project Co-ordinator. The Saanen bucks were healthy and withstood two summer seasons very well.

Artificial insemination was resorted to because of the vast difference in size between the exotic bucks and the local does with good success.

Management

As stipulated in the technical programme, all the animals were stall-fed. Routine deworming and vaccinations as recommended in the workshop were also carried out.

Feeding

Individual feeding for milch goats and group feeding in respect of others is being practised. Jack leaves were fed as roughage.

In order to find out cheap and easily available alternative to jack leaves, various other tree leaves were subjected to palatability tests and their chemical composition analysed. It was observed that 'Loranthus' which is fairly consumed by goats has 40.8% dry matter, 8.5% crude protein, 3.1% ether extract, 28.6% crude fibre, 51.3% nitrogen free extract, 11.1% total ash, 1.5% calcium and 0.2% phosphorus on dry matter basis.

Results

Seven hundred and ninety artificial inseminations have been carried out till now using the semen of exotic bucks. Ninety-nine does have so far kidded giving rise to 143 cross bred kids.

Basic data of Malabari goats on weight at birth, growth rate, age at maturity, service period, inter-kidding interval, frequency of twinning, sex ratio and production performance have been collected.

Both in birth weight and growth rate the cross bred kids (Malabari x Saanen and Alpine x Malabari) were superior to the Malabari kids.

Among the cross bred kids born, three came to heat at an average age of 214 days which is much lower than the corresponding figure for Malabari goats.

Haemogram: Goat

Peculiarities observed during the investigation:-

- 1) Erythrocytes were smaller in size compared to other species of animals.
- 2) The diameter of RBC was higher at birth (average 5.2 microns). Size decreased and stabilised at the 3rd month in Malabari kids (2.6 M) and at the 5th month in cross bred kids (2.4 M). During this period of 0-3 months in Malabari and 0-5 months in cross breeds, the red cells were highly susceptible to even slight physiological and pathological alterations of the system and manifested severe Anisocytosis and Poikilocytosis.

The chemical composition of the goat milk was analysed and the average values obtained are given below:-

Chemical composition of goat milk

Specific gravity	1.02
Titrateable acidity	0.107%
Total solids	12.42%
Ash	0.728%
Protein	3.3 gram
Fat	5.42%
Calcium	0.176%
Phosphorus	0.114%
Magnesium	0.019%
Chloride	0.177%

The main target of evolving new breeds of goat for milk suited to the various agro-climatic conditions is expected to be achieved by the year 1985. The basic information on the first phase of various crosses will be available by 1979.

Scheme for Investigation of Microbial Etiology of Infectious Abortions in Livestock

The purpose of the scheme is to detect the occurrence and distribution of various microbial agents associated with the causation of abortions and still-births in divergent classes of livestock in organised herds and selected rural areas in Kerala and to formulate suitable measures, to limit their spread and ultimate eradication.

Investigations carried out so far have shown the presence of Brucellosis, Leptospirosis and Vibriosis in divergent species of livestock in Kerala. Further work is in progress.

COLLEGE OF VETERINARY AND ANIMAL SCIENCES

Studies on Necrosis of Extremities in Cattle

A preliminary study on gangrene of extremities of cattle is in progress.

Results indicated that incidence of the disease was seasonal. Clinical signs of gangrene of digits developed in one of the experimental animals after a period of 2 months. Work is in progress.

Experimental Studies On Weed Toxicity in Cattle

A number of cases of poisoning in cattle due to feeding certain plants were reported from the field. In order to reproduce the condition experimentally and to study the toxic manifestations and to suggest suitable antidote, investigations were carried out.

Feeding trials were carried out on three experimental animals (calves) keeping one as control. On the 13th day, signs of toxicity as seen in field de-

veloped. The therapeutic measures adopted were effective.

Clinical Trials In 'Gastina'

The object of the study is to find out the efficacy of antibiotic vitamin A combination in the treatment of calf scour.

Results obtained so far revealed that the drug was effective as an antibacterial and anti-infective agent for clinical cure of scour in calves.

Gram positive and Gram negative rods and streptococcal and staphylococcal organisms were found associated with enteric infection in calves.

Studies On The Structure Of Temporal Gland Of Indian Elephant

The object is to study the morphology of temporal gland of elephant.

The studies revealed that the gland was a paired organ situated on either side of the head above the zygomatic arch at a point about half way between the lateral canthus of the eye and the external opening of the auditory canal. The glands were oval disc shaped structures. Histologically the gland was found to be a tubuloalveolar gland.

Post-Natal Development of Testis and Epididymis in Cross-Bred Goat

The object is to establish the age of sexual maturity in cross-bred goats and to make a comparative study with Malabari goats. Studies are in progress.

Excretion Studies on Chloramphenicol in Goats

The object is to find out how far blood level of the drug will be maintained in goats, and how quick it would be excreted out of the system.

Results indicated that doses of 10 mg/kg of chloramphenicol in calves and goats was ineffective in maintaining therapeutic concentration, while doses of 20 and 30mg/kg maintained the therapeutic concentration for 24 hours. Such a dosage level did not also produce any side effect.

Corticosteroids, Neostigmine and Calcium in Cobra Venom Intoxication

In order to ascertain the usefulness of these agents as supportive measures in enhancing the survival time in experimental animals, the study was taken up.

Results showed that Corticosteroids (betamethazone) was definitely useful particularly when given early after the envenomation. Calcium was not of much use and neostigmine produced more side effects.

Betamethazone administered after envenomation can prolong survival time in experimental rats subjected to cobra venom envenomation.

Incidence and Pathology of Tumours in the Paranasal Sinuses in Domestic Animals.

The objective is to study the incidence, etiology and pathology of tumours of the paranasal sinuses and to evolve suitable preventive measures.

Results showed that (1) the neoplasm involved the paranasal sinuses with gradual infiltration into the cranial cavity. Metastasis had been found occasionally in the regional lymph nodes and lungs.

(2) histologically the tumours were mostly squamous cell carcinomas or adenocarcinomas. Transition between these two types were also seen.

3) nasal washings could be used for examination of exfoliated neoplastic cells for confirmatory clinical diagnosis.

4) no fungi could be isolated from the neoplastic tissue and

5) attempts to transplant the neoplasm in calves, rabbits and mice were not successful.

Studies on Bangkok Haemorrhagic Disease of Chicken

The objectives are (1) To study the etiology, pathogenesis and pathology of the disease syndrome and 2) to evolve suitable therapeutic and preventive measures to control the disease.

The observations indicated that the parasites noticed in the peripheral blood of sick birds passed through developmental stages in the blood. In morphology, location and distribution, the parasite resembled *Akiba caullergi*. The parasite passed through a phase of gametogony in the chicken host. The free coccid bodies encountered in birds immediately after the onset of clinical signs appeared to be merozoites which had been introduced by a vector or by rupture of Schizonts that had developed in the host itself. The haemorrhagic syndrome in chicken occurred during schizogony when the schizonts ruptured releasing the merozoites.

Pathology of the Endocrine Glands in Cattle, Goats & Pigs

The objectives are (1) to elucidate the etiopathology of endocrinological reproductive disorders in animals; 2) to study the endocrinological changes in Johne's disease in goats and to evaluate its influence in pathogenesis of the condition; and 3) to study the pathogenesis and pathology of auto-immunothyroiditis in pigs.

From the results it could be seen that the thyroid glands were atrophic and the adrenal glands hyperplastic in Johne's disease; 2) Auto-immune thyroiditis could be induced by infection of homologous thyroid extract with paraffin oil. No significant changes were seen in the haematology of the affected animals.

Studies of Etiology of Gastroenteritis in Pigs.

The object is to carry out a detailed study of bacterial species associated with digestive disturbances in pigs.

In these studies, a total of 20 strains of *E. coli* and 9 strains of *Salmonella* were isolated and studied in detail. Some of the isolates were proved to be pathogenic to primary (pig) as well as experimental hosts. Drug sensitivity studies revealed that both *Salmonella* and *E. coli* strains were uniformly sensitive to chloramphenicol.

Studies on Bacterial Species Associated with Pneumonia in Goats

The objectives are (a) isolation of bacterial species involved in pneumonia lesions in goats;

(b) detailed studies in the isolates based on their morphological, cultural, bio-chemical and biological characters; (c) typing of the species of bacterial organisms isolated by standard techniques; (d) studies on antibiotic sensitivity of the isolates; and (e) evaluation of remedial measures in the light of the above findings.

The results revealed that a variety of microbial agents like *Pasteurella*, *Corenybacterium* and *Escherichia* were involved in respiratory infections in goats. Drug sensitivity studies are in progress.

Studies on the Pathology of Testis and Epididymis in Bucks

The aim of the study is to know the incidences of various pathological conditions of the testis and epididymis in bucks as evidenced by gross and histopathological findings on abattoir specimens obtained from the municipal slaughter house, Trichur. The organs are being collected and their histopathology is being studied.

Effect of Early Weaning on the Reproductive Performance of Sows

The objective is to study how early a sow could be bred after farrowing.

The experiment has been designed and work is in progress.

Studies on the Preservation of Boar Semen in Various Extenders

The aim is to test the efficiency of various extenders for preservation of boar semen in order to evolve a suitable diluent for artificial insemination of sows.

The techniques of collection have been standardised. The physical and chemical characters of boar semen have been studied. Studies on preservation of boar semen are in progress.

Biometrics of Spermatozoa of Boars

The object is to study the effect of age, breed and season on the biometrics of spermatozoa of boars.

Semen of boars was collected at weekly intervals for one calendar year and the morphology and spermatozoan head were studied. Work is in progress.

Study on Sodium, Potassium and Calcium Contents in the Semen of Domestic Animals.

The object is to evaluate seasonal variation in the concentration of Na, K and Ca in the semen of domestic animals.

So far thirty samples each of bull, buffalo and buck semen were analysed for Na and K. Work is in progress.

Physical, Histological and Histochemical Studies on Corpus Luteum During Pregnancy in Sheep and Goat

The objective is to study the biometry, histology and histochemistry of Corpus luteum of pregnancy during 1st 2nd and 3rd trimester of gestation in sheep goat.

Organs from the slaughter house have been collected for the biometry. Studies on histology and histochemistry are in progress.

Statistical Problems in Growth Studies

The object is to develop methods for comparison of growth rates and also to establish functional relation between different parameters of growth.

Based on the pairwise differences of growth at various points of time a method was developed to test the difference in two rates of growth.

Most appropriate curve representing the growth of cattle during the first twelve months after birth was determined.

Study on the Sire Effect and Heritability of Birth Weight in Cross Bred Cattle of University Livestock Farm, Mannuthy

The object is to study certain genetic factors affecting the birth weight of calves in the University Dairy Farm. The parameters studied were (i) sire effect and (ii) h^2 .

In the studies, highest birth weight was obtained by sire 528 (21.87 kg.) and lowest by sire 243 (18.10 kg.) Sire effect was found to influence the birth weight significantly. The value of heritability was found to be high (0.527 ± 0.059).

Studies on the Factors Affecting Birth Weight in Pigs at the University Pig Breeding Farm

The object is to study certain genetic and non-genetic factors affecting the birth weight of pigs in the University Pig Farm. The study is in progress.

Studies on the Digestive physiology of Rumen in goats

The object is to study the normal functioning of rumen in goats and to assess the efficiency of goats in utilizing urea as a source of nitrogen in their ration.

Methods have been standardised for the estimation of volatile fatty acids.

Studies on the metabolic activity of the reproductive system of chicken

The objectives are :

- (1) to assess the activity of some of the more important enzymes in the reproductive system of chicken during the development.

and laying periods so as to get an insight and better understanding of the physiology of reproduction in them, and

- (2) to evaluate the influence of enzyme activity of the reproductive system, if any, and its influence on the plasma enzyme levels in the birds.

The preliminary studies included estimation of the content of alkaline and acid glucose 6-phosphatase and succinic dehydrogenase in the reproductive organs and plasma of White Leghorn chicks and pullets (1-2 months and 3-4 months old respectively). Among the enzymes identified only a-6-phosphatase could be estimated in detectable amounts in the reproductive organs and plasma of the birds. Work is in progress.

Effect of Choline Deficiency on the Chemical Composition of the Skeletal Muscles of Chicks

The object is to study alterations in the chemical composition of the gastrocnemius muscle of chicks subjected to perosis by dietary deficiency of choline, so as to evaluate metabolic derangements in the skeletal muscle in choline deficiency

Feed analysis was carried out for computing ration for control and experimental birds. The methods were standardised for the estimation of the enzymes i. e. alkaline phosphatase, acid phosphatase, succinic dehydrogenase, phosphorylase, lipase, glutamate oxalo acetic transaminase, glutamic pyruvic transaminase and protein, lipids, creatine phosphate, cholesterol, sodium, potassium, and calcium in the gastrocnemius muscle of chicken.

Studies on the amino acid pattern of mammalian globins and on the electrophoretic pattern of plasma proteins.

The objectives are: (1) to find out the amino acid pattern especially the isoleucine content of mammalian globins in different species of animals since the requirements vary with the physiological function in question and (2) to study the electrophoretic pattern of plasma proteins of different species.

Results showed that unlike other mammalian haemoglobin, rat haemoglobin contains isoleucine to the extent of 3.3%. Bovine haemoglobin was deficient in this amino acid. Analysis of goat haemoglobin and other mammalian haemoglobins and electrophoresis of plasma protein are being carried out.

Evaluation of the nutritive value of different pulse proteins

Object of the study is to assess the nutritive value of different varieties of pulses.

In the studies, cowpea was found to possess better nutritive value than tur dhal when fed at 18% protein level. Both cowpea and tur dhal failed to support blood formation in albino rats. At 10% protein level both cowpea and tur dhal, and their respective isolated proteins, did not support growth, but on supplementation with the limiting essential amino acid, methionine and typtophan, promoted growth and registered higher biological value than the raw pulses or their proteins. Autoclaving these two pulses at 15 lbs. pressure for 30 minutes improved the digestibility and enhanced their nutritive values. Supplementation of the autoclaved pulses further enhanced their nutritive value.

Utilisation of Neem Seed Cake as Cattle Feed

The object is to evolve an economic ration for cattle.

The overall evaluation of the results obtained during the study had indicated that, compared to other oil cakes, neem seed cake was inferior in nutritive value on account of its poor palatability and lower D. C. P. (6.5%) and T. D. N. (62.5%) values.

Studies on the Biology Pathogenecity and Treatment of Important Nematodes of Domestic Ducks

The objectives are:—

- 1) to investigate the incidence of nematode infection in domestic ducks of Kerala.
- 2) to confirm the life history of common nematodes of domestic ducks in order to evolve suitable measures to control nematodiasis in ducks.
- 3) to study the pathological changes produced by the nematodes within the final host,
- 4) to evaluate the efficacy of selected anthelmintics against nematodiasis in ducks, and
- 5) to study the intertransmissibility of certain nematodes between domestic fowls.

Results

1. Incidence of nematode infection

An aggregate total of 298 domestic ducks were screened and the results are furnished below:—

Spomidiostomum uncinatum	...	40-60%
Amidostomum skrjabini	...	33-55%
Capillaria globocaudata	...	11-74%
Capillaria contorta	...	10-74%
Echinuria uncinata	...	9-73%
Tetrameres anatis	...	7-38%
Eustrongylides sp.	...	1%
Strongyloides avium	...	0.67%

2. Life cycle studies

The life cycles of *Tetrameres anatis*, *Epomidiostomum uncinatum* and *Amidostomum skrjabini* were elucidated in detail.

3. Treatment trial

Tetramisole hydrochloride (50 mg/kg), Praziquantel (100 mg./kg.), Morantel tartrate (40 mg./kg.), Carbon tetra chloride (2 mg./kg.) and Thiabendazole (200 mg/ kg) were administered to infected ducklings against adult *Tetrameres anatis*, *Epomidiostomum uncinatum* and *Amidostomum skrjabini*. Tetramisole hydrochloride was found to be superior when compared to other drugs for eradication of worms.

Studies on Spirurids of Poultry

The objectives are: Pathogenicity, Treatment and control of spirurid infections of fowl.

The studies revealed that enterails obtained from hotels at Trichur showed infection with *T. mohtedai*, *G. induvicola* and *A. spiralis*. The rate of infection was maximum with *Tetrameres mohtedai* and least with *Acuaria spiralis* thus confirming the earlier survey.

Histopathological studies of lesions produced by the above three worms are in progress. The studies made so far indicated that mild infection with *G. ingluvicola* does not elicit much host response, but when several female worms were found embedded in the mucosa, thickening of the mucous membrane of the crop and haemorrhagic worm tracts were visible.

Infection with *Acuria spiralis* resulted in marked thickening of the proventriculus and narrowing of the lumen.

Studies on schistosoma Nasale

The objectives are:

1. to find out the incidence of infection in snail intermediate hosts in Kerala,
2. to study the transmissibility of *Schistosoma nasale* to some of the large animals and important laboratory animals,

3. to study the immunological aspects of *Schistosoma nasale* infection in cattle and buffaloes,

4. to assess quantitative changes in blood proteins in cattle and buffaloes infected with *S. nasale*, and

5. to conduct histochemical studies on the lesions produced by *S. nasale*.

Investigation made on the incidence of nasal Schistosomiasis in cattle and buffaloes in the Thiruvazhumkundu farm gave the following results:

Type of animal	No. examined	No. found positive
Milch cows	29	29 (100%)
Calves (below 1 year)	26	3 (12%)
Heifer and Dry cows	21	18 (90%)
Buffaloes	10	10 (100%)

University Veterinary Hospital, Kakkalai, Trichur.

Besides imparting practical training to students, research work on treatment of gapes (syngamosis) an important total helminthic disease of poultry was undertaken. Different drugs were tried and among them Methyridine was found to be 50 to 60% effective. Other drugs like Morantel tartrate and Thiabendazole were also tried.

University pig breeding farm, Mannuthy.

The farm, since its inception was functioning as a breeding centre for multiplication of improved varieties of exotic pigs for supply to the interested pig breeders.

During the year 720 piglets were produced with a litter size 8.1 and distributed among private breeders.

Improved varieties of Large White Yorkshire and Land race piglets were also supplied to interested breeders.

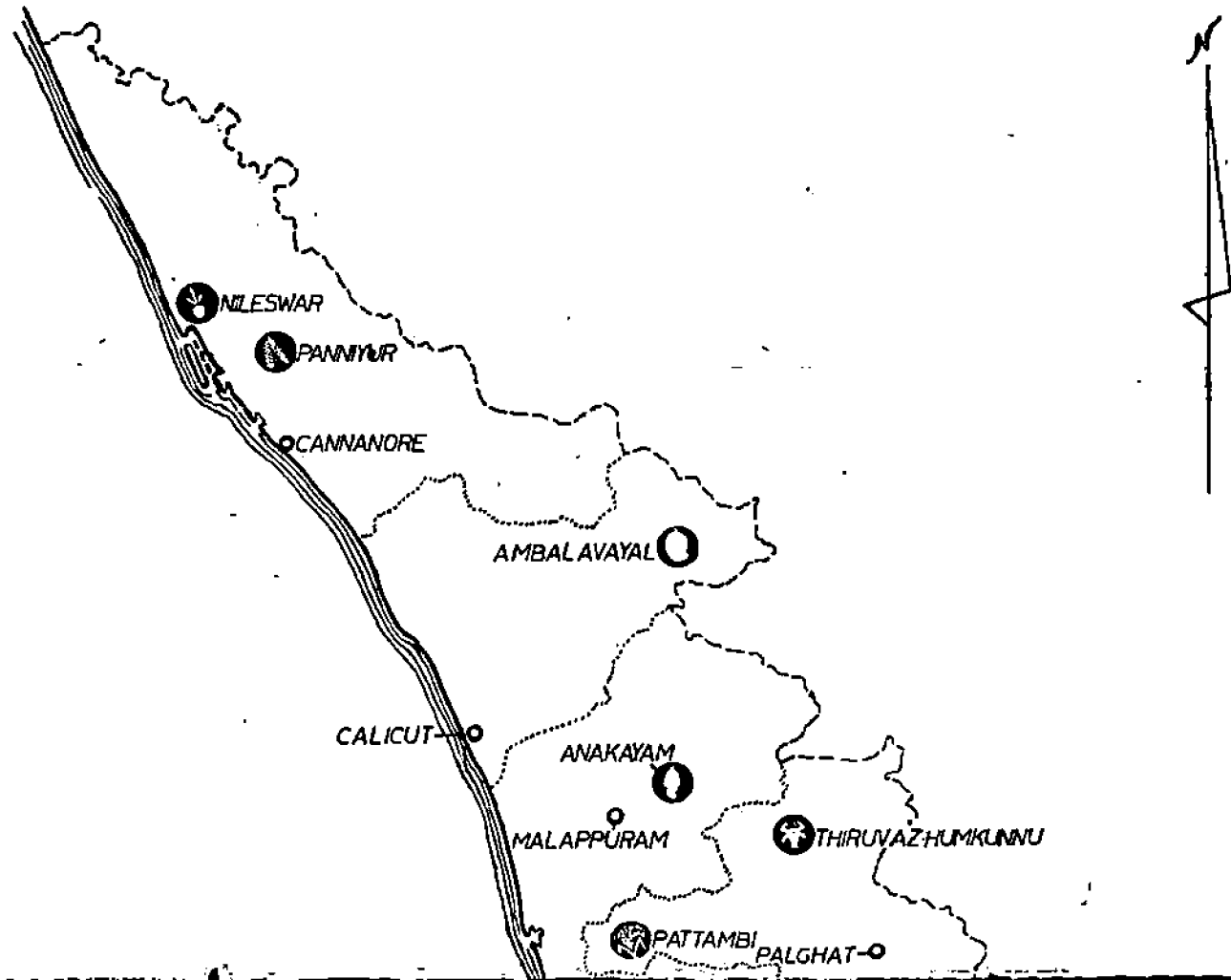
III. APPENDICES

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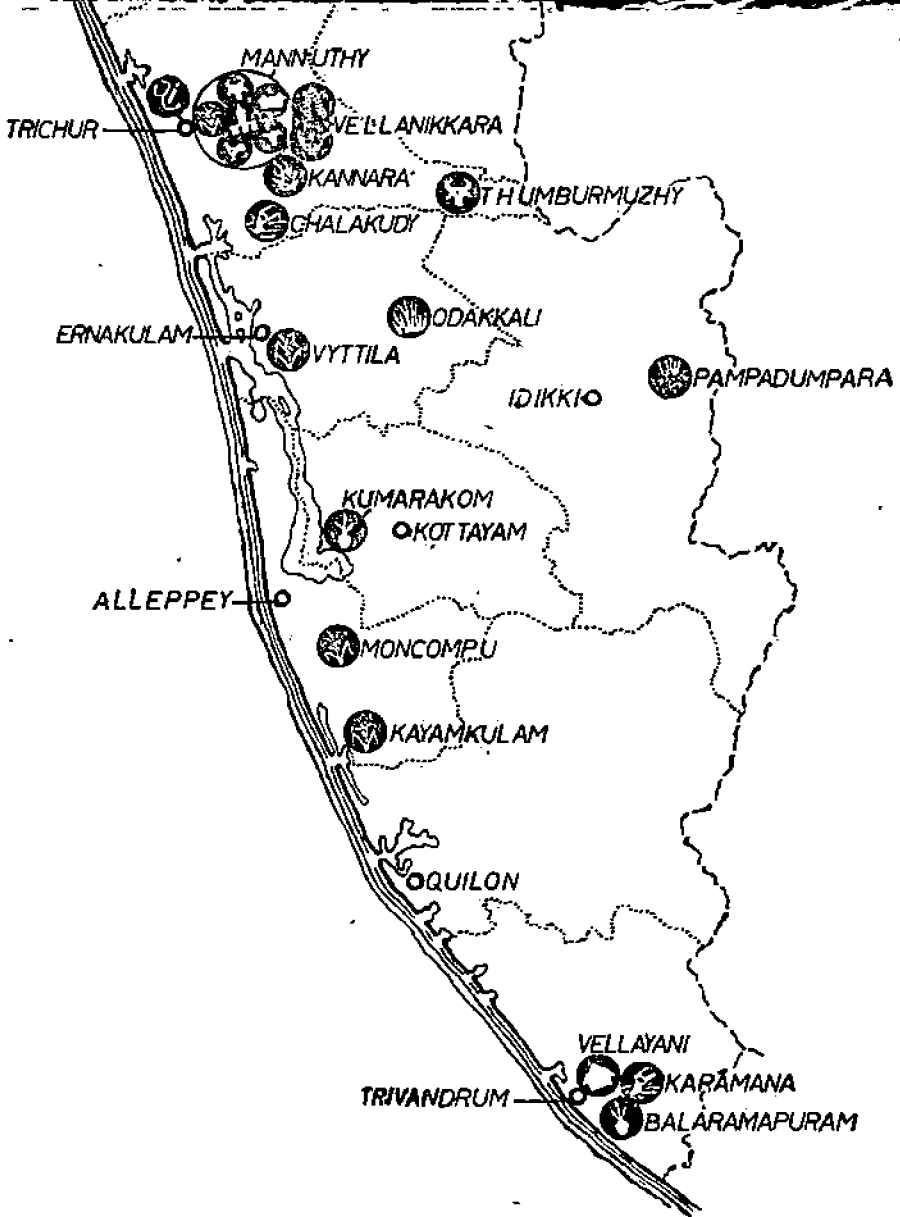
APPENDIX I

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.
-  DISTRICT HEADQUARTERS.



APPENDIX II

LIST OF RESEARCH STATIONS UNDER THE KERALA AGRICULTURAL UNIVERSITY.

Sl. No.	Name of the Experimental Station	Area in hectares
1	Coconut Research Station, Nileshwar - 1	27.65
2	-do- Nileshwar - 2	17.20
3	Coconut Research Sub Station, Balaramapuram	14.13
4	-do- Kumarakam	23.26
5	Rice Research Station, Pattambi	63.62
6	Rice Research Sub Station, Mannuthy	5.70
7	-do- Moncompu	8.67
8	-do- Kayamkulam	11.65
9	-do- Vyttila	8.70
10	Agronomic Research Station, Karamana	7.29
11	-do- Chalakudy	8.95
12	Horticultural Research Station, Ambalavayal	87.04
13	Pepper Research Station, Panniyur	12.97
14	Cashew Research Station, Anakkayam	10.10
15	Pineapple & Banana Research Station, Kannara	17.25
16	Lemongrass Research Station, Odakkali	12.74
17	Cardamom Research Station, Pampadumpara	46.44
18	Cattle Breeding Farm, Thumburmuzhi	25.00
19	Livestock Farm, Thiruvazhumkunnu	162.00
20	Poultry Farm, Mannuthy	0.50
21	Livestock Farm, Mannuthy	56.00
22	Pig Breeding Farm, Mannuthy	5.00
23	Veterinary Hospital, Trichur	0.50
		<u>632.36</u>
	Other lands	185.64
	Total :	<u>818.00</u>

APPENDIX III**List of Members of the General Council and Other Authorities of
Kerala Agricultural University****I. GENERAL COUNCIL****Ex-Officio Members**

- 1 His Excellency the Governor of Kerala,
Raj Bhavan,
Trivandrum.
- 2 Hon'ble Minister for Agriculture and Labour,
Trivandrum.
- 3 The Vice-Chancellor,
Kerala Agricultural University,
Mannuthy.
- 4 The Secretary (Agriculture),
Agriculture Department,
Government Secretariat, Trivandrum.
- 5 The Secretary (Development),
Government Secretariat,
Trivandrum.
- 6 The Special Secretary (Finance),
Government Secretariat,
Trivandrum.
- 7 The Director of Agriculture,
Trivandrum-1.
- 8 The Director of Animal Husbandry,
Trivandrum-3.
- 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 and Animal Sciences,
College of Veterinary and Animal Sciences,
Mannuthy.
- 14 The Dean,
Faculty of Agriculture,
College of Agriculture,
Vellayani, Trivandrum.

- 15 The Director of Extension Education,
Kerala Agricultural University,
Mannuthy.
- 16 The Director of Research,
Kerala Agricultural University,
Mannuthy.

Members nominated

- 1 Shri E. Gopalakrishna Menon, M. L. A. ,
Ayyanthole P. O.,
Trichur.
- 2 Shri R. Krishnan, M. L. A. ,
Kizhakkumpuram,
Kattassery (P. O.),
Alathur (Palghat District).
- 3 Shri N. I. Devassykutty, M. L. A. ,
Nadakkavukaran House,
Arimboor,
Kandassankadavu,
Trichur.
- 4 Shri K. Pankajakshan, M. L. A. ,
Indu Mahal,
Pettah,
Trivandrum.
- 5 Shri U. A. Beeran, M. L. A. ,
Kottakkal P. O.,
Malappuram District.
- 6 Shri E. John Jacob, M. L. A. ,
Elanjickal,
'Mancottah',
Veeyapuram, Alleppey District.
- 7 Shri K. A. Sivaramabharathy, M. L. A. ,
Karampotta,
Kozhinjampara P. O. ,
Palghat District.
- 8 Shri P. R. Francis M. L. A. ,
Porathur House,
Ollur P. O. , Trichur.
- 9 Shri P. K. Raghavan, M. L. A. ,
Genga Bhavan,
Sastamkotta, Quilon.

- 10 Shri K. I. Rajan, M. L. A. ,
Sujatha Bhavan,
Pambanat P. O. ,
Peermedu. (Upto December 1974.)
- 11 Shri M. D. Unnikrishnan,
M. V. Sc. Student,
College of Veterinary & Animal Sciences,
Mannuthy.
- 12 Shri M. Abdulsalam,
Ist year M. Sc. (Agri.) ,
College of Agriculture,
Vellayani, Trivandrum.
- 13 Shri K. S. Jayaraman,
Speaker,
Veterinary College Students Association,
College of Veterinary & Animal Sciences,
Mannuthy.
- 14 Shri N. K. Sasidharan,
IInd B. Sc. (Agri.) ,
College of Agriculture,
Vellayani,
Trivandrum.
- 15 Shri K. Sreenivasan,
Professor of Horticulture,
College of Agriculture,
Vellayani,
Trivandrum.
- 16 Dr. C. K. S. V. Raja,
Professor of Obstetrics & Gynaecology.
College of Veterinary & Animal Sciences,
Mannuthy.
- 17 Shri K. M. Neelakantan Kartha,
General Secretary,
Kerala Agricultural University Employees Union,
Mannuthy.
- 18 Dr. R. Gopaiakrishnan,
Rice Specialist,
Rice Research Station,
Pattambi.
- 19 Shri P. A. N. Menon,
President,
Thiruvillwamala Panchayat,
Thiruvillwamala,
Trichur District.
- 20 Shri E. R. Gopala Menon,
President,
Pattambi Panchayat,
Pattambi.
- 21 Shri R. Janardhanan Nair,
President,
Ottasekharamangalam Panchayat,
Neyyattinkara,
Trivandrum.
- 22 Shri V. Sankara Menon,
Municipal Chairman,
Trichur.
- 23 Shri P. C. Sahadevan,
Retd. Additional Director of Agriculture,
Glass Bungalow,
Artillery Road,
Cannanore.
- 24 Shri M. Janardhanan Nair,
Retd. Director of Agriculture,
'Lakshmi', Near Unnithan Lane,
Sasthamangalam,
Trivandrum-10.
- 25 Shri E. P. Madhavan Nair,
E. P. M. Industrial and Agricultural Estate,
Ottappalam,
Palghat District.
- 26 Shri V. S. Vijayaraghavan,
Erimayoor P. O.,
Palghat District.
- 27 Shri V. Gopalakrishna Kurup,
'Rashmi',
Alleppey-3.
- 28 Shri E. Chandrasekharan Nair,
Chairman,
State Co-operative Bank,
Trivandrum.
- 29 Shri P. K. Dewar,
Khadija Buildings,
Ernakulam,
Cochin-11.
- 30 Shri V. K. Ramakrishnan,
Thoppil House,
Okkal P. O.,
Ernakulam District.
- 31 Shri O. C. Mathew,
Secretary,
Association of Planters,
Mangalam, Kottayam-11.
- 32 Mrs. K. Maheswari Amma,
Chairman,
Block Development Council,
Ambalapuzha P. O., Alleppey District.

- | | | | |
|----|--|----|---|
| 33 | Shri. T. P. Kuttiammu,
Retired Chief Engineer,
'Nafeesath',
Calicut-6. | 36 | Dr. K. J. Joseph,
Professor of Zoology,
Calicut University,
Tehhipalam, Calicut. |
| 34 | Prof. K. M. Chandy,
Chairman,
Rubber Board,
Kottayam. | 37 | Dr. M. V. Pylee,
Dean, Faculty of Social Sciences,
University of Cochin,
Cochin-22. |
| 35 | Dr. C. A. Ninan,
Professor of Botany,
University of Kerala,
Trivandrum. | 38 | Dr. R. V. Nair,
Director, Central Marine Fisheries Institute,
Gopalaprabhu Road,
Ernakulam, Cochin-11. |

II LIST OF MEMBERS OF THE EXECUTIVE COMMITTEE

(Vide Section 14 of KAU Act 1971 (33 of 71))

Ex-officio Members.

- | | | | | | |
|---|--|---|----------|---|---|
| 1 | Vice-chancellor
(Dr. C. M. Jacob) | : | Chairman | 7 | One member elected from among teachers.
(Dr. M. R. G. K. Nair, Professor of Entomology,
Agriculture College, Upto December 1974.) |
| 2 | Secretary to Government
(Agriculture)
(Shri. P. G. Muraleedharan I.A.S.) | : | Member | | (Dr. C. K. S. V. Raja, Professor of Obstetrics &
Gynaecology, Veterinary College.) |
| 3 | Special Secretary to Government
(Finance)
(Shri. P. Velayudhan Nair, I.A.S.) | | | 8 | Four Non-official members.
Shri. E. Gopalakrishna Menon, M. L. A.,
Shri. N. I. Devassykutty, M. L. A. |
| 4 | Development Commissioner
(Shri M. S. K. Ramaswamy I.A.S.) | | | | Shri. K. Pankajakshan, M. L. A.
(Upto December 1974)
Shri. V. S. Vijaya Raghavan,
(From January, 1975 onwards) |

Other Members.

- | | | | | | |
|---|---|--|--|--|--|
| 5 | One Dean of Faculty (Not nominated/Elected) | | | | Shri. R. Krishnan, M. L. A.
(Upto December 1974) |
| 6 | One Nominee of I. C. A. R.
(Dr. K. V. Ahamed Bavappa, Director, C.P.C.R.I.,
Kasargode.) | | | | Dr. R. Gopalakrishnan, Rice Specialist
(January 1975 onwards) |

III LIST OF MEMBERS OF THE ACADEMIC COMMITTEE

- | | | | |
|---|--|---|---|
| 1 | Vice-Chancellor (Chairman) | : | Dr. C. M. Jacob. |
| 2 | Dean, Agriculture | : | Dr. J. Sam Raj upto 17.7.1974. |
| 3 | Dean, Vet. & Animal Sciences | : | Dr. C. T. Peter upto 31.5.1974.
Dr. A. Venugopalan
from 1. 6. '75 to 3. 2. '75.
Dr. P. G. Nair from 4. 2. '75. |
| 4 | Professor of Agricultural
Chemistry | : | Dr. N. S. Money
from 18. 5. '74 to 2. 3. '75. |
| 5 | Professor of Animal Husbandry | : | K. Chandra Menon
(Retired on 30. 4. '74) |
| | Professor of Surgery | : | Dr. A. Venugopalan
from 18. 5. '74. |
| 6 | Professor of Entomology | : | Dr. M. R. G. K. Nair |

7	Professor of Physiology	:	Dr. S. G. Nair from 11.6.'74 to 16. 10. '74.
	Professor of Pharmacology	:	Dr. K. P. D. Nair from 29. 10. '74.
8	Adviser	:	Vacant.
9	Director of Extension Education	:	Dr. V. S. S. Potti
10	Director of Research	:	Dr. R. Gopalakrishnan
11	Registrar (Convener)	:	Shri. K. Theyyanni Nair, I.A. S.

IV LIST OF MEMBERS OF THE FINANCE COMMITTEE

1	Vice-Chancellor	:	Chairman
2	Secretary to Government (Finance)	:	Member
3	Secretary to Government (Agriculture)	:	Member
4	E. Gopalakrishna Menon M. L. A.	:	Member
5	Comptroller, Kerala Agricultural University	:	Convener.

V LIST OF MEMBERS OF BOARD OF STUDIES IN AGRICULTURE

1	Dean, Faculty of Agriculture, College of Agriculture, Vellayani, Trivandrum.	:	Chairman
2	Junior Professor of Agronomy.		
3	Professor of Agricultural Botany.		
4	Professor of Agricultural Chemistry.		
5	Professor of Agricultural Entomology.		
6	Junior Professor of Agricultural Economics.		
7	Professor of Agricultural Extension.		
8	Lecturer in Agricultural Engineering.		
9	Junior Professor of Animal Husbandry.		
10	Professor of Agricultural Statistics.		
11	Professor of Horticulture.		
12	Junior Professor of Plant Pathology.		
13	Dr. K. K. Krishnamoorthy, Professor of Soil Sciences, Agriculture College, Coimbatore-3.		
14	Dr. K. Ramakrishnan, Dean, University of Agricultural Sciences, Hebbal, Bangalore-24.		
15	Dr. M. M. Koshy, Additional Professor of Agricultural Chemistry, College of Agriculture, Vellayani, Trivandrum.		
16	Shri N. Mohandas, Junior Professor of Entomology, College of Agriculture, Vellayani, Trivandrum.		

VI LIST OF MEMBERS OF BOARD OF STUDIES IN VETERINARY & ANIMAL SCIENCES

1	Dean, Faculty of Veterinary & Animal Sciences, College of Veterinary & Animal Sciences, Mannuthy, Trichur.	:	Chairman.
2	Professor of Anatomy		
3	Junior Professor in-charge Animal Husbandry		
4	Professor of Physiology & Biochemistry		
5	Professor of Extension		
6	Professor of Pathology and Meat Hygiene		
7	Professor of Bacteriology		
8	Professor of Obstetrics & Gynaecology		
9	Reader in-charge Medicine and Parasitology.		
10	Professor of Pharmacology and Toxicology		
11	Lecturer in-charge Therapeutics		
12	Junior Professor in-charge Poultry Science		
13	Professor of Statistics		
14	Professor of Surgery		
15	Lecturer in-charge Public Health.		
16	Dr. V. S. Alwar, Professor of Parasitology, Madras Veterinary College, Vepery, Madras-7.		
17	Dr. C. K. Abdulakhan, Professor of Obstetrics & Gynaecology, Veterinary College, University of Agricultural Sciences, Hebbal, Bangalore.		
18	Dr. G. Nirmalan, Reader, Dept. of Physiology & Biochemistry, College of Veterinary & Animal Sciences, Mannuthy.		
19	Shri C. P. Neelakanta Iyer, Reader, Dept. of Obstetrics & Gynaecology, College of Veterinary & Animal Sciences, Mannuthy.		

APPENDIX IV

List of Members of the Sub-Committees

I COMMITTEE FOR RICE.

1	Director of Research	Chairman
2	Rice Specialist, Pattambi	Convener
3	Professor of Agronomy, Agricultural College, Vellayani.	Member
4	Professor of Agricultural Chemistry, Agricultural College, Vellayani.	"
5	Professor of Agricultural Statistics, Agricultural College, Vellayani.	"
6	Professor of Botany, Agricultural College, Vellayani.	"
7	Professor of Plant Pathology, Agricultural College, Vellayani.	"
8	Professor of Entomology, Agricultural College, Vellayani.	"
9	Director of Extension Education,	"
10	All Officers (Deputy Directors & Research Officers of the Research Stations at Pattambi, Mannuthy, Moncompu, Kayamkulam, Karamana and Ambalavayal including officers in charge of Co-ordinated Research Projects)	"
11	A nominee of Director of Agriculture	"

II COMMITTEE FOR COCONUT.

1	Director of Research	Chairman
2	Coconut Specialist, Coconut Research Station, Nileshwar	Convener
3	Professor of Agronomy, Agricultural College Vellayani.	Member
4	Professor of Agricultural Chemistry,	"
5	Professor of Agricultural Statistics,	"
6	Professor of Botany,	"
7	Professor of Plant Pathology,	"
8	Professor of Horticulture,	"
9	Professor of Entomology,	"
10	A nominee of Central Plantation Crops Research Institute, Kasargod.	Member
11	A nominee of Director of Agriculture	"
12	Research Officer, Nileshwar	"
13	Research Officer, Kumarakom	"
14	Research Officer, Balaramapuram	"
15	Director of Extension Education	"

III COMMITTEE FOR HORTICULTURAL CROPS

1	Director of Research	Chairman
2	Horticulturist, Horticultural Research Station, Ambalavayal.	Convener
3	Professor of Agronomy, Agricultural College, Vellayani.	Member
4	Professor of Agricultural Chemistry	"
5	Professor of Agricultural Statistics	"
6	Professor of Botany	"
7	Professor of Plant Pathology	"
8	Professor of Horticulture	"
9	Professor of Entomology	"
10	Director of Extension Education	"
11	A nominee of Director, C. P. C. R. I., Kasargod	"
12	A nominee of Director of Agriculture	"

13	A nominee of Director, Central Tuber Crops Research Institute, Trivandrum	..
14	Pepper Research Officer, Panniyur, Taliparamba	..
15	Horticulturist, Co-ordinated Project on Research on Cashew, Mannuthy	..
16	Research Officer, Cashew Research Station, Anakkayam	..
17	Research Officer, Horticultural Research Station, Ambalavayal	..
18	Banana Research Officer, Kannara	..
19	Research Officer, Lemongrass Research Station, Odakkali	..
20	Biochemist, Lemongrass Research Station, Odakkali.	Member
21	Junior Botanist, Cardamom Research Station, Pampadumpara.	..
22	Plant Pathologist,	..
23	Research Officer	..

IV VARIETY EVALUATION COMMITTEE.

1	Director of Research	Chairman
2	Rice Specialist, Pattambi	Convener
3	Director of Agriculture or his nominee	Member
4	Professor of Agronomy, Agricultural College, Vellayani	..
5	Professor of Pathology	..
6	Professor of Horticulture	..
7	Coconut Specialist, Nileshwar	..
8	Director of Extension Education	..
9	Professor of Entomology	..
10	Professor of Agricultural Botany	..

V RESEARCH ADVISORY COMMITTEE.

1	Vice-Chancellor	Chairman
2	Agricultural Production Commissioner	Member
3	Deans of Faculties	..
4	Director of Research	..
5	Director of Extension Education	..
6	Dr. N. Hrishī, Director, Tuber Crops Research Institute, Trivandrum.	..
7	Dr. Ahmed Bavappa, Director, CPCRI, Kasaragod	..
8	Director of Agriculture	..
9	Director of Animal Husbandry	..
10	Dr. K. N. Syamasundaran Nair, Deputy Director of Agriculture, State Planning Board.	..

VI SPORTS BOARD.

1	Vice-Chancellor	Chairman
2	Registrar	Member
3	Director of Research	..
4	Director of Extension Education	Member
5	Dean, Agriculture	..
6	Dean, Veterinary & Animal Sciences	..
7	Comptroller	..
8	University Engineer (Director of Physical Plant)	..

9	Officer in charge of physical Education	..
10	Shri A. G. G. Menon, Professor of Extension, College of Agriculture, Vellayani.	..
11	Dr. K. P. D. Nair, Professor of Pharmacology.	..
12	Dr. K. M. Narayanan Namboodiri, Assistant Professor, College of Horticulture, Mannuthy	..
13	Shri Abraham C. T., III B. Sc. (Ag.) College of Agriculture, Vellayani	..
14	Shri T. Vilasachandran, III B. Sc., College of Horticulture, Mannuthy	..
15	Shri M. P. Thomas, IV B. V. Sc., College of Veterinary & Animal Sciences, Mannuthy	..

VII. EXTENSION ADVISORY COMMITTEE

1	Vice-Chancellor	Chairman
2	Dean of Faculties	Member
3	Director of Research	..
4	Director of Extension Education	Member
5	6 members nominated by Vice-Chancellor from outside the University	Secretary

VIII VETERINARY RESEARCH COUNCIL

1	Director of Research	Chairman
2	Professor of Pathology	Secretary to Council
3	Director of Extension Education	..
4	Professor of Pharmacology	..
5	Professor of Physiology	..
6	Professor of Animal Husbandry	..
7	Professor of Obstetrics & Gynaecology	..
8	Officer in charge of Livestock Farm, Mannuthy	..
9	Poultry Officer, University Poultry Farm, Mannuthy	..
10	Superintendent, Pig Breeding Farm, Mannuthy	Member
11	Officer-in charge of the Infectious-Abortion Scheme, Mannuthy	..

IX APPOINTMENT SUB-COMMITTEE

1	Shri N. I. Devassykutty, M. L. A.	Chairman
2	Secretary to Government (Agriculture)	Member
3	Registrar	Member
		Secretary.

X SELECTION COMMITTEE FOR UNDER-GRADUATE COURSES

1	Dean, Agriculture.	Chairman
2	Dean, Veterinary.	Member
3	Deputy Director in charge of Dean, Horticulture	..
4	Professor of Horticulture	..
5	Professor of Physiology	..
6	Registrar	Member
		Convener.

XI COMMITTEE FOR DEPUTATION OF ACADEMIC STAFF

1	Registrar	Convener
2	Dean, Agriculture	Member
3	Dean, Veterinary & Animal Sciences	"
4	Director of Research	"

XII SERVICE ADVISORY COMMITTEE

1	Shri N. I. Devassykutty, M. L. A.	Chairman
2	Dean, Faculty of Agriculture	Member
3	Dean, Faculty of Veterinary & Animal Sciences.	"
4	Director of Research	"
5	Director of Extension Education	"
6	Registrar	Member Secretary.

XIII CAMPUS PLANNING COMMITTEE

1	Vice-Chancellor	Chairman
2	University Architect	Member
3	Dean Faculty of Agriculture	"
4	Dean Faculty of Veterinary & Animal Sciences	"
5	Director of Research	"
6	Director of Extension Education	"
7	Shri N. I. Devassykutty, M. L. A.	"
8	Shri V. S. Vijayaraghavan	"
9	Registrar	"
10	Director of Physical Plant	Member Secretary.

APPENDIX V**List of Administrative Staff of the Kerala Agricultural University Office**

Sl. No.	Designation of posts	Number of posts	Scale of pay
1	Vice-Chancellor	1	2750
2	Adviser	1	2000-2750
3	Architect	1	2750
4	Deans	3	1200-1800
5	Director of Research	1	1200-1800
6	Director of Extension Education	1	1200-1800
7	Registrar	1	1100-1600
8	Comptroller	1	750-1250
9	Professor Instrumentation	1	1100-1600
10	Director of Students Welfare	1	750-1250
11	Estate Officer	1	710-1200
12	Special Assistant to Registrar	1	710-1200
13	Labour Officer	1	600-1200
14	Assistant Registrar	3	560-1100
15	Assistant Comptroller	3	560-1100
16	Public Relations Officer	1	710-1200

17	Senior Superintendent	3	495-835
18	Cashier/Senior Superintendent	1	495-835
19	Senior Accountant	1	495-835
20	Internal Audit Officer	2	495-835
21	Personal Assistant to Vice-Chancellor	1	465-775 + C. A. Rs. 50/-
22	Personal Assistant to Registrar	1	325-660 + C. A. Rs. 50/-
23	Personal Assistant to Comptroller	1	325-660 + C. A. Rs. 50/-
24	Junior Superintendent	10	405-660
25	Head Clerk	2	330-575
26	Fair Copy Superintendent	1	330-575
27	Senior Grade Typist	2	330-575
28	Stenographer grade I	2	325-660
29	Audit Assistant	6	285-550
30	Sergeant	1	285-550
31	U. D. Accountant	1	275-525
32	Assistant Grade I	5	275-525
33	Audit Assistants	6	275-525
34	Accounts Assistant	8	275-525
35	U. D. Clerk	11	275-525
36	U. D. Typists	3	275-525
37	U. D. Typist (Confidential)	1	275-525
38	Stenographer Grade II	2	240-540
39	Steno-typist	2	240-540
40	Assistant Grade II	5	230-385
41	L. D. Clerk	29	230-385
42	L. D. Typists	7	230-385
43	L. D. Typist (Malayalam)	1	230-385
44	Drivers	6	215-370
45	Duplicator Operator	2	200-285
46	Duffedar	1	200-285
47	Cook-cum-Caretaker	1	220-285 + Rs. 20/- as Spl. pay.
48	Peons	20	196-265
49	Hostel boy for teachers hostel	1	"
50	Watcher-cum-Gardener	1	"
51	Watch and Ward	12	"
52	Deputy Director of Agriculture	1	750-1250
53	U. D. Clerk	1	275-525
54	L. D. Clerk	2	230-385
55	L. D. Typist	1	230-385
56	Watchmen	12	196-265
57	Driver	1	215-370
58	Conductor	1	196-265 + Rs. 10/- as C. A.
59	Sweeper-cum-Scavenger	1	196-265
60	Special Officer (Forestry)	1	1300-1800
61	Special Officer (Fisheries)	1	1050-1550

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APPENDIX VI

COLLEGE OF AGRICULTURE, VELLAYANI

List of teachers and research staff members

I AGRONOMY

- 1 Professor : Vacant.
- 2 Additional Professor : Vacant.
- 3 Junior Professors : Dr. N. Sadanandan, B. Sc. (Hons.) Ag.,
Ph. D. Asscc. IARI
Shri C. Sreedharan B. Sc. (Ag.), M.Sc. (Ag.)
Shri N. Neelakantan Potty,
B. Sc. (Ag.), M. Sc. (Ag.)
- 4 Lecturers : Shri P. Chandrasekharan B. Sc., (Ag.),
M. Sc. (Ag)
Shri K. P. Madavan Nair, B. Sc.,
B. Sc. (Ag.), M. Sc. (Ag.)
Shri E. Tajudin, B. Sc. (Ag.), M. Sc. (Ag)
Shri U. Mohamed Kunju, B. Sc. (Ag.),
M. Sc. (Ag.)
Dr. P. Balakrishna Pillai, B. Sc. (Ag.),
M. Sc. (Ag.), Ph. D.
- 5 Assistant Lecturer : Vacant.
- 6 Agronomist : Shri T. F. Kuriakose B. Sc. (Ag.),
M. Sc. (Ag.).
- 7 Junior Research officer : Shri V. Muraleedharan Nair, B. Sc. (Ag.),
M. Sc. (Ag.)
Shri V. K. Sasidhar, B. Sc. (Ag.),
M. Sc. (Ag.) (undergoing Ph. D. course)
Shri G. Raghavan Pillai, B. Sc. (Ag.),
M. Sc. (Ag.)

II AGRICULTURAL BOTANY

- 1 Professor : Dr. (Mrs.) Mary K. George,
B. Sc., M. Sc., Ph. D.
- 2 Additional Professor : Vacant.
- 3 Junior Professor : Shri A. T. Abraham, B.Sc. (Ag.), M. Sc. (Ag.)
- 4 Lecturers : Shri G. Gopinathan Nair,
B. Sc. (Ag.), M. Sc. (Ag.)
Dr. V. Gopinathan Nair, B. Sc. Ag.)
M. Sc. (Ag.), Ph. D.
Dr. S. T. Mercy, B. Sc., M. Sc., Ph. D.
Shri Luckin C. Babu, B. Sc., M. Sc.
Shri K. Gopakumar, B.Sc. (Ag.) M.Sc. (Ag.)
- 5 Junior Research Officer : Smt. D. Chandramony, B. Sc. M. Sc. (Ag.)
Shri P. Sivan Pillai, B. Sc. (Ag.),
M. Sc. (Ag.)

III AGRICULTURAL CHEMISTRY

- 1 Professor : Vacant.
- 2 Additional Professor : Dr. M.M.Koshy, M. Sc., M.S. (Tenn) Ph. D.
- 3 Junior Professors : Dr. R. Subramonia Aiyer, M. Sc., Ph. D.
Shri P. R. Ramasubramonian, M. Sc.
Smt. T. Pankajakshi Amma, M. Sc.
- 4 Lectures : Dr. V. Gopaldaswamy, M. Sc., Ph. D. (O. D.)
Shri K.P. Rajaram, M.Sc. (Ag.) (Deputation)
Smt. P.Padmaja, M. Sc. (Ag.) (Deputation)
Shri Thomas Varghese, M. Sc. (Ag.)
(Deputation)
Smt. Alice Abraham, M. Sc.
Shri K. Babukutty, M. Sc. (Ag.)
- 5 Research Officer : Shri K. Pushpangadan, M. Sc. (Ag.)
- 6 Junior Research : Dr. Abraham Thomas, M. Sc. (Ag.),
M. Sc., Ph. D.
Smt. K. Santhakumari, M. Sc. (Ag.)

IV AGRICULTURAL ENTOMOLOGY

- 1 Professor : Dr. M. R. G. K. Nair, Ph. D. (Rejoined duty
as Professor of Entomology on 19-7-1974)
- 2 Junior Professor : Shri N. Mohan Das, M. Sc.
- 3 Lecturers : J. Johnson, M. Sc.
Shri P. A. Rajan Asari, M. Sc. (Ag.)
Vacant.
Dr. D. Dale, Ph. D.
- 4 Lecturer-cum-Assistant
Research Officer : Dr. K. V. Mammen, Ph. D.
- 5 Assistant : Dr. Abraham Jacob, Ph. D.
Entomologist
- 6 Research Officer : Shri S. P. Christudas, M. Sc.
Dr. C. C. Abraham, Ph. D.
- 7 Junior
Research Officers : Smt. S. Chandrika, M. Sc. (Ag.)
Smt. Kunjamma P. Mathew, M. Sc. (Ag.)
Smt. Susamma Mathai, M. Sc. (Ag.)
Smt. K. Saradamma, M. Sc. (Ag.)
Dr. John Kurian, Ph. D.

V PLANT PATHOLOGY

- 1 Professor : Vacant.
- 2 Junior Professor : Dr. M. Ramanatha Menon, M. Sc. (Ag.)
M. S., Ph. D.
- 3 Lecturers : Shri P. V. Paily, M. Sc. (Ag.)
Dr. K. M. Rajan, M. Sc. (Ag.), Ph. D.
- 4 Lecturer-cum
Assistant Virologist : Vacant.
- 5 Research Officer : Shri A. Sreedharan M. Sc. (Ag.)
- 6 Junior Research Officer
(Gazetted) : Shri N. J. Narayanan, M. Sc. (Ag.)

- 7 Junoir Research Officers : Shri P. K. Sathya Rajan, M. Sc. (A.g)
 Shri G. Indrasenan, M. Sc. (Ag.)
 Shri A. Sukumara Varma, M. Sc. (Ag.)
 Smt. J. Sreekumari Amma, M.Sc. (Ag.)
 Smt. K. J. Alice, M. Sc. (Ag.)
 Shri. P. Karunakaran, M. Sc. (Ag.)
 Dr. S. Balakrishnan, M. Sc. (Ag.) Ph D.

VI AGRICULTURAL ECONOMICS

- 1 Junior Professor : Shri K. S. Karayalar, B.Sc. (Ag.),
 M. Sc. (Ag.)
 2 Lecturer : Shri S. Venugopalan. B. Sc. (Ag.),
 M. Sc. (Ag.)
 3 Junior Research Officer : Shri. E. R. Narayanan Nair, B. Sc. (Ag.),
 M. Sc. (Ag.)

VII HORTICULTURE

- 1 Professor : Shri. K. Srinivasan, B. Sc.,
 B. Sc. (Ag.), M. Sc. (Ag.)
 2 Junior Professor : Shri. P. Sethumadhavan, B. Sc. (Ag.)
 M. Sc. (Ag.)
 3 Lecturers : Dr. N. Mohanakumaran, B. Sc. (Ag.)
 M. Sc. (Ag.), Ph. D.
 Vacant.

VIII AGRICULTURAL ENGINEERING

- 1 Junior Professor : Shri Jose Samuel
 2 Lecturers : Shri P. Jacob John, B. Sc. (Engg.)
 M. Sc. (Engg.)
 Shri M. S. Thomas, B. Sc. (Engg.)
 Smt. N. Rema Devi, B. Sc. (Engg.)
 Rejoined duty on 26-2-'75.

IX. STATISTICS

- 1 Professor : Shri E. J. Thomas, M. Sc., M. S.
 2 Junior Professor : Vacant
 3 Lecturers : Shri P. V. Prabhakaran, M. Sc.
 Smt. P. Saraswathy, M. Sc.
 4 Junior Research Officer : Shri R. Gopimony, M. Sc. (Ag.)

X. AGRICULTURAL EXTENSION

- 1 Professor : Shri A. G. G. Menon, B. Sc., (Ag.),
 M. Sc. (Ag.), M. S. (Extn. Edn.)
 2 Junior Professor : Dr. A. Muralidharan Thampi,
 B. Sc. (Ag.), M. Sc., (Extn. Edn.),
 Ph. D. (Agrl. Extn.) Diploma in Audio-
 visual Communication

- 3 Lecturers : Dr. G. T. Nair, B. Sc. (Ag.),
M. Sc. (Ag.), Ph. D. (Extn.)
Smt. L. Prema, B. Sc. (Home Science),
M. Sc. (Food & Nutrition)

XI. ANIMAL HUSBANDRY

- 1 Junior Professor : Shri J. B. Rose, B. Sc. (Ag.), M. Sc.
2 Lecturers : Dr. B. Skariah Oommen, B. Sc., (Ag.)
M. Sc. (A. H. of Dairying), Ph. D.
Dr. G. Morley Mohan Lal, B. Sc. (Ag.)
M. Sc. (Dairying), Ph. D.
Dr. B. R. Krishnan Nair, B. V. Sc.,
M. V. Sc.
3 Lecturer in Physical
Education : Vacant

APPENDIX VII

COLLEGE OF AGRICULTURE, VELLAYANI

LIST OF PUBLICATIONS

- I- **AGRONOMY**
- | | | |
|---|--------|--|
| 1. Alexander, K. M.,
Sadanandan, N., and
Sasidhar, V. K. | (1974) | Effect of graded doses of N and P on the available 'P' status of soil during various growth stages of rice.
<i>Agri. Res. J. Kerala.</i>
12 (1) : 11-13. |
| 2. Sadanandan, N. and
Mahapatra, I. C. | (1974) | Influence of multiple cropping on the water stable aggregates on up-land rice soils of Orissa State.
<i>Agri. Res. J. Kerala.</i>
12 (1) : 14-18. |
| 3. Alexander, K. M.,
Sadanandan, N. and
Sasidhar, V. K. | (1974) | Effect of different levels of N and P on the uptake of 'P' by rice variety Triveni.
<i>Agri. Res. J. Kerala.</i>
12 (2) : 140-144. |
| 4. Abraham, C.,
Sadanandan, N. and
Sasidhar, V. K. | (1974) | A note on the protein content of grain as effected by the application of urea and neem coated urea to rice.
<i>Agri. Res. J. Kerala.</i>
12 (2) : 202-204. |
| 5. Raghavan Pillai, G.,
Kuriakose, T. F. and
Sadanandan, N. | (1974) | Studies on the isolation of superior clover of guinea grass.
<i>Agri. Res. J. Kerala.</i>
12 (1) : 7-10. |
| 6. Sasidhar, V. K., and
Sadanandan, N. | (1974) | A note on the performance of tapioca after cowpea in multiple cropping.
<i>Agri. Res. J. Kerala.</i>
12 (2) : 197. |

7. Sadanandan, N., Sasidhar, V. K. and Mohammed Kunju, U. (1974) Rational use of scarce inputs; Technical Bulletin in Malayalam.
8. Kuriakose, T. F. (1974) Yield potential and nitrogen response at early rice culture 24-20. *Agri. Res. J. Kerala*. (2) : 158-163.

II. AGRICULTURAL BOTANY

1. Mercy, S. T. (1974) Studies on Pollen germination and tube germination of the incompatible pollination of the strain, Kanpur Lotin X Kanpur Lotin belonging to *Brassica campestris*. *Agri. Res. J. Kerala* 12 (2) : 74.
2. Nair, V. G. (1974) Types of induced mutants in rice *Mut. Br. News. letter* No. 3 : 5.

III. AGRICULTURAL CHEMISTRY

1. Sreedevi, S., and Aiyer, R. S. (1974) Potassium status of the acid rice soils of Kerala State. *J. Ind. Soc. Soil Sci.* 22 (4) : 321-328.

IV. AGRICULTURAL ENTOMOLOGY

1. Abraham C. C., & Mathew, K. P. (1974) New record of *Corjbus* sp. (Hymenoptera, Braconidae) as a parasite of the rice whorl maggot *Hydrilla Philippines* *Curr. Sci.* 43, 768-769.
2. Dale, D. and Saradamma K. (1974) Effect of continuous feeding of fentin acetate on the biology of the Indian meal worm, *Corcyra cephalonica* S (Pyralidae, Lepidopetera) *Bul. Grain Teach.* 12, 66-67.
3. Das, N. M. and Nair M. R. G. K. (1974) Studies on the chemical control of the rice leaf roller, *Cnaphalocrocis medinalis* Guenee. Contact toxicity of different insecticides to the moth. *Agri. Res. J. Kerala*, 12, 44-48.
4. Das, N. M. and Nair, M. R. G. K. (1974) Studies on the chemical control of the rice leaf roller, *Cnaphalocrocis medinalis*, *Agri. Res. J. Kerala*, 12, 106-107.
5. Das, N. M. and Nair, M. R. G. K. (1974) Relative susceptibility of rice varieties to infestation by the rice leaf roller *Cnaphalocrocis medinalis* Guenee. *Agri. Res. J. Kerala*, 12, 194-196.
6. Das, N. M. and Nair, M. R. G. K. (1974) Relative contact toxicity of insecticides to the caterpillars of *Cnaphalocrocis medinalis* Guenee. *Agri. Re. J. Kerala* 12, 209-212.

7. Das, N. M., Abraham, C. C., and Mathew, K. P. (1974) New record of Pheidole sp. (Hymenoptera, formicidae) as a predator of rice leaf folder, *Cnaphalocrosis medinalis* Guenee. *Curr. Sci.* 43, 767-768.
8. Jacob, A., and Thomas, M. J. (1974) Nature of inclusion bodies of a nuclear polyhedrosis virus of *Diacrisia obliqua* (walk) Agri. Res. J. Kerala 12, 82-83.
9. Lathika, P., and Jacob, A. (1974) Investigations on a nuclear polyhedrosis of *Spodoptera mauritia* (Boisduval) (Noctuidee, Lepidoptera) Agri. Res. J. Kerala, 12, 1-6.
10. Lathika, P. and Jacob, A. (1974) Charges in haemocyte content in larva of *Spodoptera mauritia* (Boisduval) Noctuidae, Lepidoptera, with a nuclear polyhedrosis virus *Agri. Res. J. Kerala*, 12, 91-93.
11. Lathika, P. and Jacob, A. (1974) Effect of temperature and sunlight on the infectivity of a nuclear polyhedrosis virus of *Spodoptera mauritia* (Boisduval). *Curr. Sci.* 43, 567-588.
12. Mammen, K. V. (1974) On a wilt disease of betelvine in Kerala caused by root knot nematode. *Agri. Res. J. Kerala*, 12, 76.
13. Mammen, K. V. (1974) *Meloidogyne javanica* (Truch, 1988) Chitwood, 1949 and *Hoplolaimers indicus* shor 1963, associated with sugarcane in Kerala. *Agri. Res. J. Kerala*, 12, 208.
14. Radhakrishnan Nair, C. P., and Nair, M. R. G. K. (1974) Studies on the biology of the lace-wing *Corythanna aygari* Darke, a pest of jasmine *Agri. Res. J. Kerala*, 12, 172-173.
15. Rajan Asari, P. A., and Thomas, M. J. (1974) On the use of lemongrass leaf infusion for the control of brinjal aphid. *Agri. Res. J. Kerala*, 12, 77.
16. Rajan Asari, P. A. and Das, N. M. (1974) Insect antifeedants against shail *Opease gracile* (Hutton) *Curr. Sci.* 43, 803.
17. Saradamma, K. and Das, N. M. (1974) Resistance of tapioca varieties to the red spider mite *Tetranychus telasius* L. *Agri. Res. J. Kerala*, 12, 108-110.
18. Saraswathy Ammal, L. and Dale, D. (1974) Evaluation of three antifeedants against Catterpillars of *Spodoptera litura* and *Achaea janeta*. *Agri. Res. J. Kerala*, 14, 36-40.

V. AGRICULTURAL EXTENSION

1. Tampi, A. M, and Menon, A. G. G. (1975) A study on the role of Panchayat members on the planning and extension of Agricultural production programmes in the Athiyanoor N.E.S. Block, Kerala. *Agri. Res. J. Kerala*.
2. Prema, L. and Menon, A. G. G., (1974) Study on the effectiveness of training for Farm women on their gain in knowledge in Human Nutrition. *Ind. J. H. Sc* 8, 52-57.

3. Nair, G. T. (1974) A multivariable study of adoption of high yielding paddy varieties. *Ind. J. Extn. 10 (1+0)* 30-35.
4. Nair, G. T. & Menon, A. G. G. (1974) Perception of inservice training needs as related to some selected factors. *Agri. Res. J. Kerala, 11, 23-26.*
5. Nair, G. T and Menon, A. G. G. (1975) Differential Preference of professional job areas and subject matter of undergraduates in Agriculture *Agri. Res. J. Kerala. 12 (2)* 164-167
6. Nair G. T. Characteristics of adopters and new adopters of high yielding varieties of paddy. *Agri. Res J. Kerala, '2 (1), 41-43.*

VI. AGRICULTURAL ECONOMICS NIL

VII AGRICULTURAL ENGINEERING NIL

VIII HORTICULTURE

- Nair, P. M., Mohanakumaran, N., and Nair, V. R. (1974) Effect of growth regulators on the yield of tomatos. *Agri. Res. J. Kerala, 12,; (1) 78-79*

IX. AGRICULTURAL STATISTICS

1. Prabhakaran, P. V., and Thomas, E. J. (1974) Optimum plot size for yield experiments with tapioca. *Agri. Res. J. Kerala, 13, (1) 19-23*

X ANIMAL HUSBANDRY

1. Krishnan Nair, B. R. (1974) A study on variation in litter size in large white yorkshire pigs. *Kerala Journal of Vet. Sc. Vol. V. No. 1*
2. Krishnan Nair, B. R. (1974) A study on the conception rate in cattle due to insemination with deep frozen semen. *I. V. J. 52*

XI PLANT PATHOLOGY

1. Susamma Philip (1973) *Corynespora cassicola* (Berk and curt) wei. causing leaf spot on *Ipomoea carnea* J acq. *Agri. Res. J. Kerala 1.1-161.*
 2. Susamma Philip and M. Ramanatha Menon (1974) Diplodia rot of *Dolichos Lab-lab* L. *Agri. Res. J. Kerala, 12: 200.*
 3. Jose, P. C. and Susamma Philip (1974) Leaf blight of *Marabilis Jalapa* L. *Agri. Res. J. Kerala. 12: 201*
 4. Mahendra Prabhat, C. A. (1974) Studies on the viability of sclerotia of *Corticium Sasakii* (Shirai) Matsumoto. *Agri. Res. J. Kerala 12: 96-98.*
- Ramadevi, L. and Ramakrishnan, C. K.

5. Mahendra Prabhat, C. A. (1973) Varietal susceptibility of rice to infection by *Corticium Sasakii* and its host range. *Agri. Res. J. Kerala*, 11 : 1972-73.
Ramanatha Menon, M.,
Rema Devi. L., and
Ramakrishnan C. K.
6. Sathya Rajan, P. K., (1974) An *Alternaria* leaf spot of tapioca.
Chandrasekharan
Nair, M., and
Ramanatha Menon, M.
Curr. Sci. 44 : 32.
7. Sreedharan, A., and (1974) Studies on the isolates of *Helminthosporium Oryzae*. *Indian Phytopath*
Menon, M. R.
27 : 131-33.
8. Sreedearan, A., and (1974) Effect of repeated culture and change
Menon, M. R.
in the cultural environment on the
circulence of *Helminthosporium Oryzae*.
Indian phytopath. 26 : 681-84.
9. Karunakaran, P. and (1973) The survival of *Cercospora personata*
Sam Raj., J.
(Berk and curt) Ell and Ev., *Cercospora*
hibisci Tracy and Earle., and *Cercospora*
henningsii Allesch in the soil. *Agri. Res.*
J. Kerala. 11 : 162-63.
10. Maheswari Amma, S. (1973) Observation on the changes in the
and Sam Raj, J.
atmospheric spore content of *Pirielaria*
oryzae Cav. and on the intensity of blast
incidence of rice. *Agri. Res. J. Kerala.*
11 : 155-58.
11. Kanakambaran, P. N. (1974) Effect of collar rot and ring barking on
and Sam Raj, J.
the rhizosphere microflora and certain
chemical constituents of sword bean
plants. *Agri. Res. J. Kerala.* 12 : 56-63.
12. Rahim, A., and (1974) Comparative resistance of certain varie-
Sam RaJ, J.
ties of chillies to the bacterial wilt
caused by *Pseudomonas solanacearum*
Smith. *Agri. Res. J. Kerala,* 12 : 105.
13. Potty, V. P., and (1973) Studies on the physiology of the virus
Wilson K. I.
diseases of bhindi plants. *Agri. Res.*
J. Kerala, 11 : 65-68.
14. Potty, V. P. and (1974) Effect of yellow vein mosaic virus in-
Wilson, K. I.
fection on the phyllosphere microflora
of bhindi. (*Abelmoschus esculentus*
W and A) plants.
Agri. Res. J. Kerala. 12 : 168-71.

APPENDIX - IX

COLLEGE OF VETERINARY AND ANIMAL SCIENCES, MANNUTHY

A. ACADEMIC STAFF - 1974 - 75.

1. Department of Anatomy

<i>Designation</i>	<i>Name</i>
Professor	K. Radhakrishnan
Lecturers	P. A. Ommer Mrs. Lucy Paily K. P. Surendranathan.

2. Department of Physiology and Biochemistry

Professor	S. Gopinathan Nayar
Junior Professor	G. Venugopal
Reader (Physiology)	G. Nirmalan
Lecturers	M. G. Ramakrishna Pillai Xavier Joseph (on leave for higher studies) K. P. Sadanandan (on deputation to N. D. R. I. for Ph. D. Programme) P. Marykutty

3. Department of Medicine and Parasitology

Professor	R. Kalyanasundaram
Reader (Parasitology)	Vacant.
Junior Professor	E. P. Paily
Lecturers	P. T. Georgekutty K. Rajamohan K. Madavan Pillai K. Chandrasekharan C. George Varghese

4. Department of Surgery

Professor	A. Venugopalan
Lecturers	P. J. Philip A. M. Jalaluddin K. N. Muraleedharan Nair

5. Department of Bacteriology

Professor	P. K. Abdulla
Lecturers	Mrs. S. Sulochana (on deputation to Canada for Ph. D. programme) K. T. Punnose.

6. Department of Pharmacology

Professor	K. P. Damodaran Nair
Reader	M. K. Rajagopalan
Junior Professor	Zacharias Cherian
Lecturer	Jacob V. Cheeran

- 7. Department of Therapeutics & Toxicology**
 Junior Professor Vacant.
 Lecturers K. M. Alikutty
 N. M. Aleyas
- 8. Department of Pathology and Meat Hygiene**
 Professor C. G. Sivadas
 Junior Professor M. Krishnan Nair
 Reader A. Rajan
 Lecturers Mrs. K. I. Maryamma
 P. Prabhakaran (on deputation to
 Denmark for higher studies)
- 9. Department of Animal Husbandry**
 Professor Vacant.
 Junior Professor (Dairy Science) M. Subrahmanyam
 Reader (Nutrition) E. Sivaraman
 Lecturers N. Kunjikutty
 T. G. Rajagopalan
 P. A. Devassia
 Kurian Thomas
 C. T. Thomas
 K. Pavithran
 M. N. Parameswaran
- 10. Department of Obstetrics and Gynaecology**
 Professor C. K. Surendravarma Raja
 Reader C. P. Neelakanta Iyer
 Junior Professor T. R. Bharathan Namboodiripad (on de-
 putation to IVRI for Ph. D. programme)
 Lecturers K. Prabhakaran Nair
 E. Mathai
- 11. Department of Extension**
 Professor G. Ramachandran Nair
 Lecturers T. Prabhakaran
 P. S. Pushkaran
- 12. Department of Poultry Science**
 Professor Vacant
 Junior Professor A. Ramakrishnan
 Lecturers A. K. Kochugovindan Unni
 C. K. Venugopalan
- 13. Department of Veterinary Public Health**
 Professor Vacant
 Junior Professor Vacant
 Lecturers R. Padmanabha Iyer
 M. Soman
 T. R. Sankunny
- 14. Department of Statistics**
 Professor P. U. Surendran
- 15. Physical Education Unit**
 Lecturer in Physical Education C. D. Jose

16. **Equitation Training Unit**
Riding Instructor R. Sabarinathan Nair
- 17 **Training and Refresher Course Unit.**
Officer-in-charge of Training Courses
(in the cadre of Junior Professor) P. O. George
Lecturer V. Sathianesan
Officer-in-charge of Small Animals
Breeding Station Santha E. George

B. ADMINISTRATIVE STAFF

- Dean and Warden ... Dr. P. G. Nair
Assistant Warden ... K. N. Muraleedharan Nair
Administrative Assistant ... P. M. Krishnankutty Nair
(Chief Accountant full additional charge)

C. OFFICE STAFF

- Chief Accountant P. M. Krishnankutty Nair
Senior Superintendent Philip K. Kurian
Junior Superintendent P. K. Ramachandran Nair
Librarian P. K. Chandrika
Assistant Librarian P. A. Parameswaran
Arist Photographer G. Gopinathan Nair

APPENDIX X

LIST OF PUBLICATIONS

COLLEGE OF VETERINARY AND ANIMAL SCIENCES, MANNUTHY

1 Animal Husbandry.

i A note on the Beneficial Role of Sulphur in the Prevention and Resolution of Urinary Calculi in Goats.

James, C. S., and Chandran, K. (1975). Indian Veterinary Journal: 52 (2): 152.

2 Anatomy

i Observations on the Morphology of Thymus in the Indian Buffalo (*Bos bubalis*)

Radhakrishnan, K. and Mariappa, D. Kerala J. Vet. Sc., 5 (2) 1974.

ii Studies on the structure and Involution of Thymus in the Indian Buffalo (*Bos bubalis*)

Radhakrishnan, K. and Mariappa, D. Kerala J. Vet. Sc. 5 (2) 1974)

3 Bacteriology

i A preliminary note on the Isolation of *Salmonella* Species from Piglets. Kerala Journal of Veterinary Science, 5 (1), June 1974.

4 Medicine and Parasitology

i Use of Morantel Tartrate (Banminth-II) in the Treatment of Ancylostomiasis in Dogs. Rajmohan, K., Alias, N. M. and Paily, E. P. Indian Vet. J. 51 (9 & 10): 638-641.

ii Efficiency of Parabendazole Against the Gastrointestinal Nematodes of Domestic Animals.

Chandrasekharan, K, Pythal, C., Sundaran R. K., and Peter, C. T., Kerala J. Vet. Sci., 5 (1): 26-31
Extension Bulletins and similar publications

i Ascariasis in calves (in Malayalam) K. Chandrasekharan 'Kalpadhenu' Vol. 1, No. 4

- ii Schistosomiasis in buffaloes (in Malayalam) K. Rajmohan 'Kalpadhenu' Vol. 1, No. 4
- iii *Ascaridia galli* in Poultry (in Malayalam) by K. Chandrasekharan 'Kalpadhenu' Vol. 2, No. 1
- 5 Obstetrics and Gynaecology**
- i A Comparative Study on the Birth Weight of Sindhi and Jersey-Sindhi Calves. Mathai, E., Francis, U. P. and Raja, C. K. S. V. Kerala J. Vet. Sci. 5 : 9.
- ii Cystic Persistent Mesonephric Tubules in Boars. Thomas U. P., & Raja, C. K. S. V., Kerala J. Vet. Sci. 5 : 35.
- iii Congenital Tail Abnormalities of Spermatozoa in a Jersey Bull. Raja, C. K. S. V., E. Mathai, Nair, K. P. and Bharathan Namboodiripad. Kerala J. Vet. Sci. 5:44.
- iv Study on the Pathological Conditions in the reproductive Organs of Cows.-1. Pathology of the ovaries. Nair, K. P., and Raja, C.K.S.V. Kerala J. Vet. Sci.5:82.
- 6 Pathology and Meat Hygiene**
- i Serum Vitamin-A Levels in Experimental Aflatoxicosis in Goat. Maryamma, K. I., and Sivadas, C. G., (1973). Kerala J. Vet. Sci., 4, 1:26.
- ii Cystadenocarcinoma of Ovary with Leiomyoma of Uterus in Jagaur. Maryamma, K. I., and Sivadas, C. G. Krishnan Nair, M., and Rajan, A. (1974). Indian Vet. J. 51 : 269.
- iii Mesothelioma [in a Dog (1973). Rajan, A Krishnan Nair, M. and Sivadas, C. G. Kerala J. Vet. Sci. 4:51
- iv Lymphoma in a Goat. Rajan, A., and Sivadas C. G., Kerala J. Vet. Sci., 4:56.
- v Incidence of Mycotic Infection in Domestic Animals and Poultry in Kerala (1973). Rajan, A and Sivadas, C. G.
- vi Comparative study of Experimental Aflatoxicosis in Cross-bred Jersey and Buffalo Calves, Rajan, A. Krishnan Nair, M., and Sivadas, C. G., Kerala J. Vet. Sci. 5:109.
- vii Blood-Serum Cholesterol Level in Hypothyroidism in Dogs. Rajan, A., and Syed Mohiyuddeen. (1973). Kerala J. Vet. Sci. 4:117.
- vii Incidence of Pathology of Peptic Ulcer in domestic animals (1973). Krishnan Nair, M. (1973). Kerala J. Vet. Sci. 4 : 120.
- ix Epidermoidcysts in Dogs. Rajan, A., Krishnan Nair, M., Maryamma, K. I., and Sivadas. C. G. Kerala J. Vet. Sci. 4 : 137.
- x Clinical and Experimental Studies on Bangkok Haemorrhagic Diseases in Chickens, Krishnan Nair, M., Rajan, A., and Sivadas, C. G. (1973). Kerala J. Vet. Sci., 4 : 181.
- xi Electronmicroscopic Structure of Myalinated Nerve Fibre in the chicken. Krishnan Nair, M. (1973). Kerala J. Vet. Sci. , 4 : 7.
- xii Epidermoid Cysts in a dog. Rajan, A., and Sivadas, C. G., (1973). Kerala J. Vet. Sci. 4 : 137.
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ii പാൽരൂപംകൊള്ളുന്നതെങ്ങിനെ-T. R. Sankunny, Kerala Karshakan 23 (1975)

iii കശാപ്പുശാലകൾ എങ്ങിനെവേണം-P. Prabhakaran. Kalpadhenu, 1 (1974)

iv T. R. Sankunny has contributed a chapter on 'Udder' (അകിട്) in the Malayalam Encyclopedea (Sarva Vijnana Kosh) published by the Government of Kerala.

APPENDIX VIII

List of members of the staff of the College of Horticulture

1. Dr. P. K. Gopalakrishnan (Research Wing)
2. Shri. V. Sukumara Pillai "
3. Shri. M. R. Chidananda Pillai "
4. Dr. M. Aravindakshan "
5. Shri. K. Chandrasekharan Nair "
6. Shri. P. D. Vijayagopal "
7. Dr. A. I. Jose "
8. Dr. James Mathew "
9. Shri. Lukins C. Babu, College of Agriculture.
10. Shri. E. R. Narayanan Nair "
11. Dr. P. U. Surendran, College of Animal Sciences.
12. Dr. T. Prabhakaran "
13. Dr. M. Aravindakshan, Associate Professor
14. Dr. P. K. Gopalakrishnan "
15. Shri. V. K. Damodaran "
16. Dr. P. C. Sivaraman Nair "
17. Dr. C. C. Abraham Assistant Professor
18. Smt. K. S. Ramamani "
19. Dr. K. M. Narayanan Namboodiri "
20. Dr. K. Kumaran "
21. Dr. M. Chandrasekharan Nair "
22. Smt. K. Leela "
23. G. Droupati Devi "
24. U. Muhammad Kunju "

APPENDIX XI

STAFF OF RESEARCH STATIONS

1 Coconut research station, nilcswar (I & II)		12 Lemongrass Research Station, Odakkali.	
1. Coconut Specialist	1	1. Research Officer	1
2. Research Officers	3	2. Biochemist	1
3. Junior Research Officers	4	3. Junior Research Officers	3
4. Supporting staff	32	4. Supporting staff	10
2 Coconut research sub station, Balaramapuram.		13 Banana Research Station, Kannara.	
1. Research Officer	1	1. Research Officer	1
2. Junior Research Officer	1	2. Junior Research Officer	4
3. Supporting staff	9	3. Supporting staff	9
3 Coconut research sub station, Kumarakom.		14 Cashew Research Station, Anakkayam'	
1. Research Officer	1	1. Research Officer	1
2. Junior Research Officer	1	2. Junior Research Officer	1
3. Supporting staff	9	3. Supporting staff	5
4 Rice research station, Pattambi.		15 Horticultural Research Station, Ambalavayal.	
1. Rice Specialist	1	1. Research Officer	1
2. Research Officer	5	2. Junior Research Officer	3
3. Junior Research Officers	7	3. Supporting staff	33
4. Supporting staff	25	16 Pepper Research Station, Panniyur.	
5 Rice research sub station, Moncompu.		1. Research Officer	1
1. Research Officer	1	2. Junior Research Officer	3
2. Junior Research Officers	3	3. Supporting staff	8
3. Supporting staff	7	17 Livestock Farm, Mannuthy.	
6 Rice research sub station, Kayamkulam.		1. Dairy Technologist	1
1. Research Officer	1	2. Veterinary Surgeon	1
2. Juoior Research Officers	3	3. Farm Supervisor	1
3. Supporting staff	10	4. Supporting staff	14
7 Rice research sub station, Mannuthy.		18 Poultry Farm, Mannuthy.	
1. Research Officer	1	1. Poultry Officer	1
2. Junior Research Officers	3	2. Supporting staff	6
3. Supporting staff	9	19 Pig Breeding Farm, Mannuthy.	
8 Model Agronomic Research Station, Karamana.		1. Superintendent	1
1. Research Officer (Agronomy)	1	2. Veterinary Surgeon	2
2. Junior Research Officers	2	3. Supporting staff	8
3. Supporting staff	9	20 Cattle Breeding Farm, Thum̄burmuzhi.	
9 Agronomic Research Station, Chalakudy.		1. Research Officer	1
1. Junior Research Officer	1	2. Farm Supervisor	1
2. Supporting staff	3	3. Supporting staff	11
10 Rice Research Sub Station, Vyttila.		21 Livestock Farm, Thiruvazhumkunnu.	
1. Junior Research Officer	1	1. Superintendent	1
2. Supporting staff	4	2. Veterinary Surgeon	1
11 Cardamom Research Station, Pampadumpara.		3. Farm Supervisor	1
1. Research Officer	1	4. Supporting staff	35
2. Junior Research Officer	1	22 University Veterinary Hospital, Trichur.	
3. Supporting staff	11	1. Superintendent	1
		2. Supporting staff	5

APPENDIX XII

LIST OF MEMBERS OF STAFF IN THE DIRECTORATE OF
PHYSICAL PLANT.

Sl. No.	Name of post	No. of post sanctioned	No. of post filled up	Vacants.
(1)	(2)	(3)	(4)	(5)
1	Director of Physical Plant (1200-1800)	1	1	—
2	Personal Assistant to Director of Physical Plant (560-1100)	1	1	—
3	Financial Assistant (560-1100)	1	1	—
4	Senior Superintendent (495-835)	1	1	—
5	Architect (850-1450)	1	1	—
6	Junior Architect (560-1100)	1	1	—
7	Junior Engineer (465-775)	1	1	—
8	Head Draftsman (465-775)	1	1	—
9	Draftsman Grade I (330-575)	4	4	—
10	Draftsman Grade II (255-455)	4	—	4
11	Head Clerk (330-575)	1	1	—
12	Stenographer (240-540)	1	1	—
13	U. D. Clerk (275-525)	4	4	—
14	U. D. Typist (275-525)	2	2	—
15	L. D. Clerk (230-385)	4	4	—
16	L. D. Typist (230-385)	1	1	—
17	Tracer (230-385)	1	—	1
18	Blue Printer-cum-Stereo Operator (210-340)	1	—	1
19	Driver (215-370)	1	1	—
20	Peon (196-265)	1	1	—

ENGINEERING DIVISION

1	Executive Engineer (850-1450)	3	1	2
2	Assistant Engineer (560-1100)	9	4	5
3	Junior Engineers (465-775)	27	10	17
4	Draftsman 1st Grade (330-575)	19	12	7
5	Draftsman 2nd Grade (255-455)	36	—	36
6	Tracer (230-385)	3	—	—
7	Ammonia Printer (210-340)	3	—	—
8	Divisional Accountants (495-855)	3	1	2
9	Junior Superintendents (405-660)	3	1	2
10	U. D. Clerk (275-525)	12	2	10
11	U. D. Typist (275-525)	3	—	—
12	L. D. Clerk (230-385)	19	9	10
13	L. D. Typist (230-385)	8	4	4
14	Peons (196-265)	42	13	29
15	Road Roller Driver (245-525)	1	—	1
16	Bull Dozer Driver (275-525)	1	1	—
17	Cleaners (196-265)	2	Nil	2



APPENDIX XIII

Annual statement of expenditure and receipts for 1974-75

RECEIPTS		EXPENDITURE	
I	Statutory grants from State Government.	I	Direction:
	a) Plan 3800000-00	a)	University administration. 2127087-16
	b) Non-Plan. 8000000-00	ii	Resident Teaching:
	Total of I. 11800000-00	a)	Agricultural College: 3171066-80
II	Grant from ICAR and other Agencies. } 5026642-00	b)	Veterinary College. 1745465-28 4916532-08
III	Income from fees, etc. 201971-91	III	Research:
IV	Income from University Properties: } 3188155-84	a)	Direction. — —
V	Interest on investment. — —	b)	Agri. Research. 2795270-55
VI	Interest free loan from State Government. } — —	c)	Vety. Research. 3070054-43 5865324-98
VII	Miscellaneous Income. 128952-76	IV	Vellanikkara Estate. 665711-75
	Total. 20345722-51		Total Non-Plan. 13574655-97
	Debt and Suspenses. 1643892-29	V	Plan Schemes. 2424731-07
	Add. opening balance. 2393312-69	VI	ICAR Schemes:
	Grand Total: 2,43,82,927-49	a)	Agri. Research. 1217520-66
		b)	Vety. Research. 428966-36
		c)	I. C. A. R. 4086893-89 5733380-91
		(c)	Pension Fund: 58829-48
		(d)	Debt & Suspense. 1649214-53
		Total Expendiure:	23440811-96
		Add. Closing Balance.	942115-53
			2,43,82,927-49