800897

CONTENTS

800897

KERALA AGRICULTURAL UNIVERSITY

FACULTY OF AGRICULTURE

Programme of Research work for Master's Degree

Department of Agronomy : College of Agriculture, Vellayani.

1. Name of the candidate : K.Viswambharan.

2. Date of admission & No. : 16-10-1978 78-11-52.

3. Name & Designation of the Chairman of Advisory Committee : Dr.V.K.Sasidhar, Associate Professor of Agronomy.

4. Topic of research for thesis:

Effect of Agro-Engineering measures on surface run off and sub soil moisture storage in hill slopes.

No. AG. 18. 19. Soil .C. 101.

5. Objectives of Research:

To study the effect of agro-engineering measures on surface run off and subsoil moisture storage in hill slopes cultivated with tapioca.

6. Brief review of previous work done on the topic:

The undulating topography of Kerala calls for urgent steps for soil and water conservation measures in the hill slopes. Tapioca which is grown extensively on the hill slopes makes the situtation still worse by keeping the subsoil loose and exposing it to the action of run off water. As the change of cropping in the hill slopes is a remote possibility suitable agro-engineering measures are to be devised to effectively prevent surface run off and to improve the subsoil moisture storage. As no work has been conducted in this line the present investigation is proposed.

7. Scientific and/or practical importance of the research:

The result of the investigation will be very useful in suggesting suitable water and soil conservation measures on hill slopes planted with tapioca throughout the state.

8. Technical Programme (Give: Treatments. outline)

1. Tapioca alone along the slopes in ridges.
2. Tapioca alone across the slope in ridges.
3. Tapioca alone along the slopes in ridges with contour bunds.
4. Tapioca alone across the slopes in ridges with contour bunds.
5. Treatment (1) + groundnut as inter-crop.
6. Treatment (2) + ,,
7. Treatment (3) + ,,
8. Treatment (4) + ,,
9. Treatment (1) + Cowpea as intercrop.
10. Treatment (2) + ,,
11. Treatment (3) + ,,
12. Treatment (4) + ,,

Replications : 3
Design : RBD
Plot size : 50 Sq. Meters.

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Observations to be recorded

1. Biometric characters of main as well as intercrop.
2. Yield and yield attributes of main as well as intercrops.
3. Moisture content of soil at weekly intervals.
4. Run off loss of water and soil during the occurrence of rainfall.
5. Nutrient losses through run off water during the occurrence of rainfall.
6. Aasessment of effective rainfall.

9. Estimate of expenditure and receipts if any:

1. Expenditure:

a) Fellowship @ Rs.500/- per trimester	Rs.3,000/-
b) Contingencies @ Rs.2000 per year	Rs.2,000/-
c) T.A.	Rs. 500/-
Total	Rs.5,500/-

2. Receipts — Rs. 500/-

10. Location of research (if outside the college campus):

College of Horticulture, Vellanikkara.

Signature of candidate.

Place : Vellanikkara,
Date: 16-3-1979.

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KERALA AGRICULTURAL UNIVERSITY

FACULTY OF AGRICULTURE

Department of Agrl. Engineering - College of Agriculture, Vellayani.

Programme of Research for Master's Degree

1. Name of candidate : M.R. Sankaranarayanan
2. Date of admission and admission No. : 10-10-1979 79-11-63.
3. Name and designation of Chairman of Advisory Committee : Dr. Jose Samuel, Prof. & Head, Dept. of Agrl. Engineering.
4. Topics of research for thesis:

   Mechanical control of the Floating type aquatic weed "Salvinia Molesta" (African Payal).

   No. AG. 19. 19. Eng. 202.

5. Objectives of the research:

The main objective of theproject is to carry out development studies towards the mechanical control of the floating type aquatic weed Salvinia Molesta (African Payal). The specific objectives are as follows:

i) To study the biological and mechanical properties of the weed with a view to evolve design parameters for mechanical control measures and utilization techniques.

ii) To obtain quantiative information on the performance of the device utilising a fluidization technique developed in the Kerala Agricultural University for mechanical Collection of the Weed.

iii) To effect improvement in the design of this salvinia harvesting devise to enhance performance economic viability and flexibility ofapplication.

iv) To investigate additional approaches for mechanical control as well as utilization of this weed.

6. Review of the previous works conducted on the topic

African Payal in general can be controlled by manual, mechanical, biological and chemical methods. Although all these methods have been successfully used in many locations, economic, physical and environmental aspects often eliminate most of the alternatives thereby limiting the technology that is feasible. Chemical herbicides have been tried by several investigators during the latter half of 1960's in Kerala. These chemicals provide effective destruction of the weed. But this was found to be expensive as well as making the water unsuitable for domesticconsumption and also toxic to fish life. Some biological control measures were initiated by Kerala Agricultural University by releasing host specific pests, but the infestation of the weed was so large that this method also was in sufficient. The Department of Agricultural Engineering in the College of Agriculture, Vellayani had initiated preliminary studies on mechanical control of the weed which revealed some interesting results. In the initial study, among the different methods that were attempted a technique in which the weed material was fluidized and pumped out by means of a jet device

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operated in turn by conventional water pumping unit, was found to be a promising method for mechanical control.

7. Practical Importance:

This project is an attempt to develop economically viable mechanical control measures utilising a fluidization technique. If the weed material can be economically collected it will overcome the present problems due to its infestation and may also open up new avenues for its utilisation.

8. Technical Programme:

a) Study of biological mechanical properties.

1) Extent of infestation and stages of growth of the weed in the state.

2) Spread density characteristics, regeneration and rate of growth compresibility, strength pressure-density relationship, moisture extraction and drying characteristics and other useful parameters if any.

b) Studies on the performance of the Salvinia harvesting device.

1) Performance characteristics of primary pumping unit.
2) Designing of a salvinia harvesting device to match this unit based on information already available and procedure already evolved.
3) Testing of this unit to asses its pumping performance including nature of collection liquid-solid ratio, head capacity characteristics, ease of handling and difficultries encounted and analysis of data.

c) Studies on design Improvement.

1) Analysis of data collected under (b) (3)
2) Redesign of the equipment based on the above analysis to enhance its utilization.
3) Further tests to asses improved performances.
4) Finalization of improved design.

d) Studies on additional approaches for control as well as utilisation.

1) Review of available literature and comparison of performance with the improved design.
2) Evolving new approaches if possible.
3) Carry out trials on other applications for the device if time permits.
4) Carry out trials on bio-gas production and other utilization possibilities if time permits.

9. Estimated expenditure: 1) Infrastructure facilities Rs.10,000
2) Special equipments & Instruments Rs. 5,000

10. Location of research : College of Horticulture, Vellanikkara.

Candidate: Sd/-

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KERALA AGRICULTURAL UNIVERSITY

Faculty of Agriculture Department of Agrl. Engineering.

1. Name of research centre : College of Horticulture, Vellanikkara.

2. Title of the Project : "Development of small scale paddy Threshen equipment".

3. No. AG. 19. 18. Eng. 602.

3. Name(s) and designation :

1) Project leader : Sri.Abraham K. George, Instructor in Agrl. Engineering, College of Horticulture, Vellanikkara.

2) Associates : Dr. Jose Samel, Head, Department of Agrl. Engineering College of Agriculture, Vellayani.

4. Objectives:

1. To assess the performance of Japanese type pedal threshers in threshing popular varieties of paddy produced in Kerala.

2. To identify the problems associated with its performance which may have contributed to its lack of popularity.

3. To motorise the thresher and obtain proper speed and moisture conditions for optimum threshing of popular varieties of paddy.

4. To determine the speed and load requirements for optimum threshing of promising varieties of paddy which suffer from the disadvantage of being difficult to thresh.

5. To develop additional designs to combine optimum out-put with labour efficiency for a small scale paddy threshing equipment for use in Kerala.

5. Practical utility:

The introduction of small scale threshing equipment alleviate many of the difficulties and moreparticularly reduce the drudgery of threshing operations.

The increase in labour efficiency obtained by the use of such equipment, would help threshing operation to be performed immediately after harvesting and thereby avoid losses due to delayed handling.

Further, being small scale units, these equipment can be purchased by the farmers or labour societies and operated on a custom basis without necessitating any drastic changes in the existing practices for harvesting operations.

A fourth advantage of availability of small scale threshing equipment is the possibility of introduction of certain high yielding varieties such as Dala and Mala which are at present not favoured by the cultivators on account of the poor threshability of the varieties by manual methods.

6. Literature Review:

The R.T.T. Centre, Vellayani, as well as a local innovator at Ottampalam are known to have introduced power operated paddy threshers into the state. In spite of the fact that these threshers

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have higher capacities and better threshing efficiencies than the Japanese type paddy threshers, they have not received much acceptance either among the farmers or the farm labour force. Their high cost of investiment and lack of portability are obvious disadvantages for these machines. At the same time in continuing to use the traditional manual methods our production efficiencies will only decline as more and more difficult to thresh varieties are chosen for other desirable characteristics in the future. It appears therefore, there is need for the development of a small scale threshing equipment which would hopefully combine the advantages of the Japanese type pedal threshers and the large power operated threshers that have been introduced into this state and hence the present project.

7. Technical programme:

In accordance with the objectives, the following technical programme is proposed.

1. Survey of additional literature on the introduction dissemination, and the present status of utilization of Japanese type pedal threshers in Kerala.

2. Testing representative units of the Japanese type pedal threshers that are available as unused equipment in various Research Stations to quantify their performance in regard to threshing out put, threshing efficiency, labour inputs, labour efficiency and chaff-grain ratio etc. as compared to manual methods under ideal moisture conditions for varieties of different threshability.

3. Study of the thresher performance for various moisture conditions at harvest for the above varieties.

4. Study the durability and reliability through endurance test and identify areas of improvement in the design and materials of construction.

5. Motorise sample units of Japanese type pedal threshers with provision to vary the speed of operation and determine the suitable drum speed ranges for popular varieties of paddy under different moisture conditions for optimum threshing performance in terms of out put, labour and threshing efficiency.

6. Evolving, fabricating, testing and modifying additional designs for improving threshing performance and finally developing a small scale power operated thresher suitable for use in Kerala.

7. Field testing and popularising the developed equipment.

8. Date of start: As soon as the project is approved and a sum of Rs.500/- is made available for preliminary work. Detailed testing work can be started only after the appointment of the apprentice agricultural mechanics proposed for the project.

9. Date of completion : Two years from the date of start.

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10. Additional facilities required:

a. Staff: Apprentice Agricultural Mechanics - 2 Nos.

(The assistance of the above mechanics are essential for conducting the performance test with the different varieties under diferent moisture conditions. Their services will also be utilised in fabricating the new designs and then field testing).

b. Equipment:

i. Unused Japanese type paddy threshers collected from Research Stations.

2. Variable speed motor - Rs. 3000/-
3. Weighing balance - Rs. 1500
4. Instruments and apparatus for moisture measurement - Rs. 1500/-
5. A laboratory winnowing unit - Rs. 2000/-
6. Laboratory space for conducting the test

11. Approximate cost:

1. Apprentice Agricultural mechanics @ Rs. 140/- p.m. for a period of two years for 2 persons.	Rs.6,720/-
2. Equipment	Rs.8,000/-
3. Labour and other contingencies	Rs.2,000/-
Total	Rs.16,720/-

Project Leader.

FRC - 9.

KERALA AGRICULTURAL UNIVERSITY

PROGRAMME OF RESEARCH FOR MASTER'S DEGREE.

1. Name of candidate : Sivaswami.M.

2. Date of Admission & Admission No. : 10-10-1979. 79-11-64.

3. Name and designation of Chairman of Advisory Committee : Dr. Jose Samuel, Professor & Head, Agrl. Engineering, College of Horticulture, Kerala Agrl. University.

4. Topics of research thesis : Development of a low-cost Garden Tractor.

No.AG. 19. 19. Eng. 802.

5. Objectives of the research:

The over-all objective of the project is to carry out adoptive design, fabrication testing and evaluation work towards the development of a low-cost Garden tractor.

The specific objectives are as follows:-

1) To evolve a design criteria for a low cost Garden tractor suited to the conditions of Kerala.

2) To select promising design concepts and primemover units which might meet the above requirements.

3) To carry out adaptive design for developing a prototype unit incorporating the selected power units and design concept.

4) To fabricate the prototypes unit and evaluate its performance.

5) Finally to suggest satisfactory design for a Low-cost Garden tractor suited for Kerala.

6. Brief review of previous work done on the topics:-

The International Rice Research Institute, Manila, in Philiphiense has been one of the pioneer institutions which recognised that the modernizations of Agriculture and indigenous design and manufacturing capability for farm equipment are complementary. This institution has accordingly developed designs for simple farm equipments. IRRI Low-cost power tillers and motorised carts are very popular in many of the South East Asian countries. Organisation such as the intermediate Technology group based in U.K. are also active in developing local designs for farm equipment. It is the intension of this project to draw upon these information and develop a low-cost light weight garden tractor for use in Kerala.

7. Practical utility:-

The project is an attempt to provide an intermediate equipment for the use of small and marginal farmers to have more power in their hands and to help them to change from the traditional farming practices to a more modern and dependable agricultural production programme.

8. Technical programme:

The technical Programme for the project will consist of the following.

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1. Review and analysis of literature, on the extent and nature of utilisation of power tillers in India and evolving a design criteria for a low-cost garden tractor suited for Kerala.

2. Review of literature on the nature and extent of utilisation of small stationery engines in India and selection of promising units for use as a prime moved for the proposed garden tractor.

3. Review of literature and selection of promissing design concept for adapative design work.

4. Carrying out adapative design work for development of a prototype unit its fabrication.

5. Conducting tests and evaluating the performance.

6. Modifying the design based on the results obtained, and carrying out further tests unit design is finalised.

7. Documention of the work.

9. Estimated expenditure:

i. Infrastructure facilities needed = Rs.10,000/-

ii. Special equipment and materials exclusively needed for the project = Rs. 7,500/-

Total expenditure = Rs.17,500/-

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10. Location of Research : College of Horticulture, Vellanikkara, Trichur Dist.

Signature

Candidate Sd/-

FRC - 12.

KERALA AGRICULTURAL UNIVERSITY

RESEARCH PROJECT

Faculty of Agriculture — Department of Agrl. Engineering.

1. Name of Research Centre : College of Agriculture, Vellayani.

2. Title of the project : Application of electrical energy for control of field rats in Kuttanad".

No. AG. 19. 19. Eng. 1301.

3. Name(s) and designation of a) Project Leader : Dr.Jose Samuel, Head, Department of Agrl. Engineering, College of Agriculture, Vellayani.

4. Objectives:

1. To develop alternative systems for rat control utilising electrical energy.
2. To test these systems under laboratory conditions.
3. To conduct field trials of promising systems in actual locations in Kuttanad.
4. To recommend and popularise suitable systems thus developed.

5. Practical utility:

The work is expected to benefit experimental plots immediately and if found economic could be extended to actual farming areas.

6. Literature review:

Electric fencing is a known method for rodent control and for preventing animals from trespassing into or out of a definite area of confinement. Conventional electric fencing is constructed to apply an intermittant current at high voltage between the fence wire and earth so that when a person or animal standing on the ground receives an electric shock on touching the wire. Inspite of the high voltage (in the range of 6000 to 15000 v) used, the pulsating nature and low value of current employed in (in the order of 0.005 amperes) the system while being sufficiently deterrent, is non/lethal to human and animal life.

Since the conventional system is designed to supply regularly a pulsating current, the accumulator runs down fairly fast, the National Diary Research Institute at Bangalore is reported to have developed an improved system wherein an electronic circuitory is employed which avoids a continuous supply of current, thereby increasing the life of ℓ the battery used. This apparatus does not supply regular pulses but delivers a pulse of high voltage only when an animal comes into contact with the wire.

The possibility of errors in the tapping of A.C. main and consequent danger to human life could be largely overcome by the use of storage batteries as the source of electrical energy. Rice Production Manual (1970) describes of a battery rat control system which is being successfully utilised in the experimental fields of International Rice Research Institute. This system however, uses a vibrator for converting the Direct Current into a pulsating current and then steps up the voltage by means of a transformer. Transistorised chopper circuits can now be built to perform the same functions which could be more compact, economic and durable than the I.RRI. designs. Thus there is a need to study this problem further and develop a rat control system utilising electrical energy which will combine the advantages of the afore-mentioned works, and hence the present project proposal.

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7. Technical Programme:

The technical programme will consist of the following:

i) Survey of the available information on available system of rat control using electrical energy will be taken up.

ii) Alternative circuit designs for field rat control in consultation with experts in electronics will be developed.

iii) Tests will be carried out on proper voltage, current combinations for optimum performance and promising safe system will be identified.

iv) These systems will be field tested in Kuttanad with the help of R.R.S. Moncompu in experimental plots as well as in farmers fields.

v) Reliable systems will be identified and popularised.

8. Date of start : As soon as the Research Assistants are appointed.

9. Date of completion : Two years from the date of start.

10. Additional facilities:

a) Staff

1. Research Associate in Engineering @ Rs.400/- p.m. for 2 years - Rs.9,600/-
2. Apprentice Agricultural Mechanic @ Rs.140 p.m. for 2 years - Rs.3,360/-.

b) Equipments

1. Testing instruments	Rs. 3,000
2. Electronic components for various systems	Rs. 2,000
3. Fencing material	Rs. 3,000
4. Other contingencies	Rs. 2,000
Total	Rs.10,000

11. Approximate cost:

i) Staff	Rs.12,960/-
ii Equipment and contingencies	10,000/-
Total	22,960/-

12. Signature of

Sd/-
Project Leader.

FRC - 9.

KERALA AGRICULTURAL UNIVERSITY

Faculty of Agriculture Department of Agrl. Engineering.

1. Name of research centre : College of Agriculture, Vellayani.

2. Title of the project:

"Survey of Agricultural Implements and Machinery for production and processing in Kerala".

No. AG. 19. 18. Eng. 1401.

3. Name(s) and designation(s)

i) Project leader : Dr.Jose Samuel, Head, Department of Agrl. Engineering.

ii) Associates : 1. E.R.Narayanan Nair, Asst. Prof. in Agrl. Economics.
2. Instructor in Agrl. Engineer (to be appointed).
3. Enumerators (Apprentice Agrl. Mechanics - 12 Nos.)

4. Objectives:

To conduct a detailed survey of the various implements and machinery used for agricultural production and small scale processing of crops in Kerala State, with a view to ascertain the existing position leading to further work, on improvement of these equipments for enhancing agricultural labour efficiency in the State.

5. Practical utility:

Kerala produces a vide variety of crops which are distinctive to th State. Consequently the traditional implements and equipments used for production and processing of these crops are quite different from the agricultural equipments used in other States. No comprehensive study has so far been undertaken on these equipments, and in most cases the traditional equipments continue to be used without handly improvement. A comprehensive survey of these equipments will enable the assessment of the present position, in regard to their construction, performance, and cost benefit ratio of utilization. More important than that, it will also enable us to identify areas which require improvement and initiate further work to enhance the labour efficiency of these equipments on production and processing in Kerala.

6. Literature review:

The only comprehensive publication on indigenous agrl. implements is that published by the Indian Council of Agricultural Research in 1960, which was the result of an All India Survey. As part of this survey a scheme for survey of agricultural implements in Travancore-Cochin area was undertaken from which only limited information was generated.

Although a subsequent survey on traditional implments in Kerala State was taken up during the second plan period due to limited staff and other difficulties the project could only accomplish to provide a description of some of the most common implements used in the State. Later in 1960-62 the Department of Agricultural Engineering of the College of Agriculture, Vellayani was able to prepare an Album of crop-production implements.

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These documents, valuable as they are, have not provided adequate inform tion on the exact use, materials of construction, performance features and **costbenefit** analysis of such equipments. These informations are not only needed in assessing the present status of agricultural mechanisation of the State, but also vital in identifying and initiating machinery development work; for the benefit of agriculture. This project is proposed to fill this gap of information.

7. Technical programme:

Information will be gathered from each district on the equipment used for the major crops-grown in the area by cultivators of different levels, and small scale processors. Emphasis will be given to go beyond verbal description of the equipment and to generate engineering drawings and material specification of the equipment including the special characteristics of the area, where the implement is used.

To this end enumerators will be stationed in different selected locations to interview individual farmers as well as prepare sketches and engineering drawings. These enumerators will be stationed in the offices attached to the Assistant Agricultural Engineer of the Department of Agriculture or Junior Agricultural Officer of IPD Units. The officer in charge of the project will make periodical visits to these stations for guiding and on the spot assessment.

The specific technical programme of the project will consists of:-

1) Preparation of plan of action.
2) Recruitment of staff and organisation of an orientation training of personnel.
3) Preparation of questionnaire for collection of data.
4) Collection of data as per questionnaire.
5) Preparation of sketches and detailed drawings and photograph.
6) Testing of selected equipments for additional data and for material specification.
7) Analysis and interpretation of data.

8. Date of start : As soon as the project staff are recruited.

9. Date of completion : 1 year from the date of commencement.

10. Additional facilities required:

(i) Staff

1. Instructor in Agrl. Engineering on Rs.510-995 - 1 No.

Qualifications: as per existing rules.

2. Clerk Typist on Rs.285-550 - 1 No.

Qualifications: as per existing rules.

3. Enumerators (Apprentice Agricultural Mechanics) on a stipend of Rs.140/- p.m. as per apprentice training act and an additional travelling and other allowances not exceeding Rs.110/- p.m.

Qualifications:- A pass in the Agricultural Mechanic Trade course offered by the Kerala Agricultural University.

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(ii) Equipment

1. Drafting Machine
2. Stationery items and office equipment.
3. Photographic assistance.
4. Transport facilities.
5. Testing equipment.

11. Approximate cost

		Amount
(a) Staff		
1. Instructor in Agrl. Engg. on Rs.510-995 (one)		6120
2. Clerk-Typist (Typist Gr.I) on Rs.285-550 (one)		3420
3. Enumerators (Apprentice Mechanics) on stipend of Rs.140/- p.m.	12 Nos.	20160
Allowances for 1 & 2 at 50% pay		4770
Allowances for enumerators not exceeding Rs.110/- p.m. for 12 persons		15840
Total pay and allowances		50310
(b) Equipment		
1. Drafting Maching		500
2. Stationery and Office equipment		5000
3. Photographic materials		1500
4. Testing equipment		10000
Total for equipment		17000
(c) Contingencies:		
1. T.A.		3000
2. Others		1690
		4690
Grand total (a, b and c)		72,000

Sd/-
Project Leader.

FRC - 9.

KERALA AGRICULTURAL UNIVERSITY

RESEARCH PROJECT

Faculty of Agriculture - Department of Agrl. Engineering.

1. Name of research centre : College of Agriculture, Vellayani.

2. Title of the project : "Small scale equipment for wet processing of coconut".

3. No. of G. 19. 18. Eng. 1501.

3. Name(s) and designation of
   a) Project leader : Dr.Jose Samuel, Head Department of Agrl. Engineering.

   b) Associates : 1. Research Associate in Engg. (to be appointed) - 1 No.
   2. Apprentice Agrl. Mechanic (to be appointed) - 1 No.

4. Objectives:

1. To assemble information and prototype equipment developed elsewhere for small scale wet processing of coconut.

2. To develop additional design concepts for various unit operations involved in this processing beginning from climbing to harvesting, husk grating, milk extraction, evaporating, boiling, separating and storing of the final product.

3. To fabricate, test and modify these equipment to satisfy the functional requirements.

4. To combine the unit operations into a processing system and assess its economic feasibility.

5. To improve the system thus developed and popularise the same.

5. Practical utility.

Wet processing of coconut for oil extraction is an age old domestic practice. In recent years wet processing has received renewed attention from researchers because of the advantage of the production of quality oil, simultaneous extraction of protein for human consumption, and suitability of the process for small scale operation. Introduction of such processing systems in our state will enable the establishment of small industries in the producing areas and enhance both rural income and employment.

7. Technical programme:

In accordance with the objectives the following technical programme will be adopted.

1. Information will be gathered on improved equipment developed elsewhere for the various unit operations involved in wet processing.

2. Prototype of these equipment will be collected and additional designs of small equipment for such operation will be developed and the equipment fabricated.

3. All the above equipment will be tested and modified to satisfy functional reauirements and economic considerations.

4. The equipment thus developed will then be combined into a small scale processing system and field tested for the economic viability and modified wherever necessary.

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5. Finally, the system thus developed will be popularised.

8. Date of start : As soon as the project is approved and Research Associates proposed are appointed.

9. Date of completion : Two years from the date of start.

10. Additional facilities:

(a) Staff:

1. Research Associate in Engineering/ 1 No. @ Rs.400/- p.m. for two years.

2. Apprentice Agricultural Mechanic - 1 No. @ Rs.140/- p.m. for 2 years

(b) Equipment: Total Rs.30,000/-.

11. Approximate cost : 1. Staff - Rs. 12,960/-

2. Equipment Rs. 30,000/-

Total Rs. 42,960/-

12. Signature of

Sd/-
Project Leader.

FRC - 9.

KERLA AGRICULTURAL UNIVERSITY

RESEARCH PROJECT

Faculty: Agriculture Department : Agronomy.

1. Name of Research Centre : SIDA assisted scheme for research on integrated water use, College of Horticulture, Vellanikkara.

2. Project No. : AG. 19. 19. Eng. 1601.

3. Title of the project : Assessment of Irrigation Efficiency in the River Basins.

4. Name of
(a) Project leader : Sri.T.P. George, Assoc. Prof. (Engg.) The Professor of Agronomy SIDA assisted scheme on integrated water use.

(b) Associates : Sri.Kumaran, Executive Engineer, Malampuzha Project.

R.R. Nair, Asst. Professor (Agrl. Engg.) i/c SIDA assisted scheme for research on integrated water use.

Objectives:

(i) To gather data on the inflow and outflow of water in fields with well defined boundaries.

(ii) To study the extent of loss of water in transmission in irrigated channels.

(iii) To work out the irrigation efficiency under the existing conditions in the basins as per Farmers' practices.

(iv) To find out ways and means for increasing irrigation efficiency.

6. Practical utility:

The data gathered will help to plan irrigation projects and also to findout ways and means for increasing irrigation efficiency.

7. A short review of literature:

No reliable data are available at present in Kerala on irrigation efficiency.

8. Technical programme:

The project will be implement in the Malampuzha irrigation system according to the following technical programme:

1. Assessment of seepage loss in the LB canal with the help of current meters.

2. Assessment of seepage loss in Kavilpad branch canal (17.38 cusecs) using veins and stage recorders.

3. Assessment of seepage loss in field channels in an adjucent plot of about 12 ha (Cultivators' holdings) to Kavilpad branch canal with thehelp of veins.

4. Estimation of inflow and outflow of water for the 12 ha plot under the existing conditions.

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Data to be gathered:

(i) Loss of water in seepage in canals and field channels periodically.

(ii) Inflow and outflow of water from the 12 ha plot (cultivators' holding).

(iii) Water use efficiency.

(iv) Irrigation efficiency.

Equipments required: Stage records V notches, current meters.

9. Date of start : October, 1978.

10. Date of completion : February 1979.

11. Approximate cost : Contingencies: Rs.15,000/- (The project is financed by the ISDA through the Central Ground Water Board).

Project Leader : Assistant Professor (Agrl. Engg.) i/c Professor of Agronomy (WM).

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KERALA AGRICULTURAL UNIVERSITY

RESEARCH PROJECT

FACULTY : AGRICULTURE DEPARTMENT: AGRONOMY

Name of Research centre : SIDA assisted scheme for research on Integrated Water use, College of Horticulture, Vellanikkara.

1. University project code No: AG. 19. 19. Eng. 1602.

2. Project code No.

3. Title of the project : Assessment of ground water recharge from rainfall and irrigation.

4. Name of
a) Project leader : Professor of Agronomy (WM) SIDA Project.

b) Associate : R.R.Nair Asst.Professor (Agrl.Engg.).

5. Objective:

To study the ground water fluctations with reference to irrigation schedules and hydro-meteorological data and to assess the ground water re-charge for different sources.

6. Practical Utility

Irrigation schedules and cropping patterns can be modified based on the data on ground water fluctuations. Ground water contribution will help to reduce irrigation requirement of crops grown.

7. A short review of literature:

No work in this line has been reported from Kerala.

8. Technical programme:

Piezometers will be installed at the different locations in the study centres and fluctuations in water level recorded daily. The number of piezometre to be installedare:

Kunnamkur	- 12.
Wandazhi	- 6
Erimayur	- 6

The data will be made to subjective analysis to ascertain as to what extent the cumulative rainfall is responsible for ground water recharge - Similarly, the effect of periodicity and depth of flow of water in the irrigation channel on the groundwater re-charge will also be assessed by subjective analysis of the fluctuations in water level in the piezometers.

The data will also be used for preparation of isobath for the basin.

Data to be gathered:

1. Groundwater level (daily) in the piezometer.
2. Water level in the canal.
3. Periodicity of water level in the canal. (Depth of flow and duration of flow of water)
4. Rainfall, intesnity, duration.

9. Date of start : June, 1978.
10. Date of completion : March, 1979.
11. Approximate amount : Rs.10,000/- (Fully financed by the SIDA through the Central Ground Water Board).

Sd/-
Asst. Professor (Agrl.Engg.) i/c.

FRC - X - Approved.

KERALA AGRICULTURAL UNIVERSITY

RESEARCH PROJECT

FACULTY OF AGRICULTURE - DEPARTMENT : AGRONOMY

Name of Research Centre : SIDA assisted scheme for Research on Integrated water use, College of Horticulture, Vellanikkara.

1. University Project code No: No.AG. 19. 19. Eng. 1603.

2. SIDA Project code No. :

3. Title of the project : Water use efficiency of crops under economic irrigation practices.

4. Name of
   (a) Project leader : Dr.U.P. Bhaskaran, Director of Research.
   (b) Associate : R.R. Nair, Asst. Prof. (Agrl. Engg.)

5. Objective : (i) To workout the most profitable irrigation schedules for field crops during the second and third crop seasons.

(ii) To study the effect of fertilizers on the water requirement of crops.

6. Practical utility:

Irrigation schedules which can take the best advantage of ground water and rainfall contributions can be popularised with considerable savings in water expenditure. Irrigation can also be extended to other areas by economizing the use of water.

7. A short review of literature:

Experiments conducted at various locations in India have revealed that shallow submergence throughout the growth of rice is conducive for higher yields (Dastane et al. 1967, Chandramohan, 1970, Pande and Mitra, 1972 etc.). The practice of shallow submergence also saves considerable amount of water compared to deep submergence.

Experimental results are also available to show that it is not always necessary to follow the practice of continuous submergence. Intermittent submergenceduring the critical stages of growth and saturation of soil during the other stages of growth have been observed to give yields comparable to those obtained under continuous submergence (Michael et al, 1977; Annual Report, ARS, Chalakudy, 1976-77).

8. Technical Programme:

Three experiments will be conducted under this project.

Experiment I. Irrigation scheduling for transplanted rice.

Objectives: To work out an economic irrigation schedule for transplanted rice

Treatments: 5 irrigation schedules x 2 fertility levels.

Irrigation schedule:

S1 Farmers' practice (continuous submergence)
S2 Continuous submergence, 3-5cm.
S3 Irrigating the crop with 5 cm water day after the disappearance of water (5 cm irrigated) in the field.

..... 2

S4 Irrigating the crop 5 days after the disappearance of water in the field.

Fertiliser schedule: D1-NPK at 90:45:45 (kg/ha)
D2 ,, 70:35:35 (,,)

Treatment combinations: 5x2 = 10.

Design : 10 x 3, RBD

Variety : Jaya - or any other dwarf variety (mid duration)

Plot size : 15-20 m^2

Locations : Kumamnur, Erimayur, Wandazhi.

Data to be collected:

1. Water use by the crop (daily)
2. Soil moisture characteristics (before every irrigation)
3. Number of tillers/m^2
4. Number of panicles/m^2
5. Days to 50%
6. Panicle height.
7. Grain yield.
8. Straw yield.
9. No. of irrigations given
10. Quantity of water irrigated.
11. Rainfall contribution.
12. Drainage given.

Note: This experiment will be conducted, during the second crop season only in the 3 study, centres.

Experiment II - Irrigation schedule for rice under limited water resources.

Objectives: - To study the effect of phasic stress irrigation for saving irrigation water without significant reduction in yield.

Treatments: 5 irrigation schedules x 2 fertilizer doses.

Design: (5x2) x 3, R.B.D.

Plot size : 15-20 m^2

Variety : Jaya or a mid duration rice.

Data to be collected: (as in Expt. I)

Experiment-III: Water Management of Cocoa.

Objectives:

To find out the effect of frequency of irrigation and fertilizer doses on the yield of cocoa.

Layout: Split plot.

Whole plot: Frequency of irrigation.

W1: The cultivators' present practice of irrigating 240 l water/plant once in 6 days ($\frac{I W}{CPE} = 1.0$)

W2: 240 l. water/plant once in 8 days ($\frac{IW}{CPE} = 0.75$)

W3: 240 l. water/plant once in 10 days ($\frac{I W}{CPE} = 0.60$)

W4: 240 l. water/plant once in 12 days ($\frac{IW}{CPE} = 0.50$)

.... 3/-

Sub plot: Fertilizer doses

N1 : ½ the present dose in 2 equal splits.
N2 : The present dose in 2 equal splits.
N3 : 1½ the present dose in 2 equal splits.

Present dose: 100:40:140 g/plant (N:P:K:)

No. of replications : 7

No. of plants per sub plot: 4

Location: Erimayur (2 sites)

Variety: Forestero

Data to be collected: 1) Fruit fall
2) Pod number and weight.
3) Water irrigated
4) Soil moisture characteristics before each irrigation.

9. Date of start : November 1978.

10. Date of completion : (to be continued for 2 years)

11. Finance : Rs. 12,000/-
Financed by the SIDA through the Central Groundwater Board till March, 1979.

Project Leader.

FRC - X - Approved.

KERALA AGRICULTURAL UNIVERSITY

RESEARCH PROJECT

FACULTY OF AGRICULTURE DEPARTMENT: AGRONOMY

Research Centre : SIDA assisted scheme for Research on Integrated water use, College of Horticulture, Vellanikkara.

1. University project code No: AG. 19. 19. Eng. 1604.

2. SIDA project code No. : 2.2

3. Project title : Water requirement of field crops other than rice.

4. Name of :
   a) Project leader : Professor of Agronomy (VM) SIDA Project.
   b) Associate : R.R. Nair, Asst. Professor.

5. Objective

To estimate the water requirement of pulses and oil seed crops grown during summer season.

6. Practical utility

The data will be useful for scheduling irrigation for these crops and also for working out water balance in river basins.

7. A short review of literature:

Surface irrigation given at 3 cm depth during the critical stages of 4-6 leaf, branching, flowering and pod formation has been found to increase sesamum yield by 35 to 52% (Annual report, Agronomic Research Station, Chalakudy, 1976-77) No research data are available on the irrigation requirement of annual crops like groundnut, gingelly (sesamum) and cowpea in Kerala.

8. Technical programme:

Under this project 4 experiments will be conducted, as detailed below:

SIDA 2.2.

Experiment-I: : Effect of irrigation at critical stages
Technical programme of growth on the yield of sesamum.

Objective:

To study the effect of irrigation at critical stages of growth on the yield.

Lay out : 5 x 4, R.B.D.

Treatment :
1) No irrigation.
2) Irrigation at 3-4 leaf stage and pod formation.
3) Irrigation at branching and flowering.
4) Irrigation at branching and pod formation.
5) Irrigation at flowering.

Variety: A locally popular variety.

Fertilizer schedule: As per package of practices recommendations.

Seed rate: (as above)

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Plot size : 2 x 10 m^2

Depth of irrigation : 4 cm per irrigation.

Method of irrigation : Border strip

Locations : Kunnamnur, Erimayur, Wandazhu.

Data to be gathered: 1) Height of plant.
2) Plant density/m^2
3) Number of branches/plant.
4) Days to 50% flowering.
5) Number of pods/plant
6) Seed yield.
7) Soil moisture characteristics.

SIDA : 2.2.

Experiment - II: Optimum time for irrigating groundnut.

Objectives:
To find out the optimum time for irrigating groundnut during the summer season.

Lay out : 5 x 4, R.B.D.

Treatments : 1) Irrigating the crop once in 7 days.
2) Irrigating the crop once in 14 days.
3) Irrigating the crop once in 21 days.
4) Irrigating the crop at critical stages of branching, flowering and and Kernal formation.
5) No irrigation.

Depth of irrigation : 4 c m/irrigation.

Method of irrigation : Border strip

Variety , TMV-2.

Plot size : 10 to 15 m^2

Fertilizer schedule : As per package of practices recommendations.

Locations K Kunnamnur, Erimayur, Wandazhi.

Data to be collected: 1) Plant population/m^2
2) Number of branches/plant
3)mDate of flowering.
4) Pod yield.
5) Haulm yield
6) Number of irrigations given
7) Quantity of water used.
8) Water productivity.

SIDA : 2.2.

Experiment-III : Effect of irrigation on the yield and yield attributes of cowpea.

Objective: To find out the best time of irrigation for cowpea during the summer season.

Lay out : 7 x 4, R.B.D.

Treatments:

..... 3

	Crop Stage			
Tr.No.	Branching	Flowering	Pod setting	No. of irrigation
1.	1	-	-	1
2.	-	1	-	1
3.	-	-	1	1
4.	1	1	-	2
5.	1	-	1	2
6.	1	1	1	3
7.	-	-	-	0

Depth of irrigation : 4 c m

Method of irrigation : Border strip

Variety : Ptb-1

Plot size : 12-15 m^2

Locations : Kunnamnur, Erimayur, Wandazhi.

Data to be collected:
1. Plant population/m^2
2. Number of fruiting branches/plant.
3. Days to flowering
4. Pod yield.
5. Haulm yield
6. Water productivity.
7. Soil moisture characteristics.

Experiment - III. Effect of irrigation on yield and yield attributes of cowpea.

Object: To find out the best time of irrigation scheduling for cowpea grown in summer.

Treatments (Irrigation schedule)

	Crop stage			
No.	Branching	Flowering	Pod setting	No. of irrigation
1	1	-	-	1
2	-	1	-	1
3	-	-	1	1
4	1	1	-	2
5	1	-	1	2
6	-	1	1	2
7	1	1	1	3
8	-	-	-	0

Depth of irrigation : 5 cm

Design : 8 x 3 RBD

Plot size : 15 - 20 m^2

Variety : Ptb 1

Data to be collected

1. No. of fruiting branches/plant.
2. Plant height.

..... 4

3. Days to first flowering.
4. Days to last flowering.
5. No. of pods/plant.
6. Seed yield.
7. Bhusa yield
8. Water productivity.
9. Water irrigated.
10. Soil moisture characteristics.

Centres : Kunnamnur, Wandazhi.

Experiment-4.: Utilization of residual moiture in the rice fields.

Objectives:

To study the feasibility of raising a summer crop immediately after the harvest of the second crop of rice, utilizing the residual moisture in the field.

Treatments:

The following crops will be grown imediately after the harvest of rice.

1. Fodder cowpea (Karnataka local).
2. Sorghum + Cowpea (fodder)
3. Maize + Cowpea (fodder)

Irrigation schedules

1. No irrigation.
2. With one irrigation
3. With two irrigations.

Method of sowing

Immediately after the harvest of rice, the crops will be sown in lines in plow furrows. Mixed crops will be sown in alternate rows.

Design: Observational trial.

Centres: Wandazhi, Kunnamnur.

Plot size 20 - 30 m^2

Data to be collected:

1. Crop sand per/m^2
2. Height of plants.
3. Yield
4. Soil moisture characteristics.
5. Irrigation water applied.

9. Date of start : Jan. 1978.

10. Date of completion : April 1979.

11. Finance : 20,000/-
(Fully financed by the SIDA through Central Ground Water Board).

Sd/-
Assistant Professor (Agrl. Engg.) i/c of Professor of Agronomy (WM)

FRC - X - Approved.

KERALA AGRICULTURAL UNIVERSITY

PROJECT REPORT

Faculty: Agriculture Department: Agronomy.

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Study centre : SIDA assisted scheme for research on integrated water use, College of Horticulture, Vellanikkara.

1. KAU Project code No. : AG. 19.19. Eng. 1605.

2. SIDA Project code No.

3. Title of the project: : Agro Engineering Measures for Increasing Sub soil Storages of Water and Recharge of Ground Water.

4. Name of
   a) Project Leader : Dr. U.P. Bhaskaran, Director of Research.
   b) Associates : 1. T.P.George, Assoc. Prof. (Agrl.Engg.)
   2. R.R.Nair, Asst. Prof.

5. Objective:

   1. to find out the magnitude of storage of moisture in the sub soil due to agro-engineering measures (cropping patterns and contour bunding).
   2. To study the extent of run off on slopes.
   3. To assess the effect of contour bunds and cropping patterns on the control of run off losses.
   4. To findout the optimum cross section of contour bunds.
   5. To workout the economics of contour bunding.

6. Practical utility:

The results will give useful information which can be passed on to cultivators at large. The data can also be used for planning soil conservation programmes.

7. A short review of literature:

No systematic research work has been done in Kerala on agro-engineering measures for increasing subsoil storage of moisture.

8. Technical programme:

Three experiments will be conducted under this project.

Experiment: I: Effect of methods of cultivation on run off and subsoil storage of moisture.

Treatments: Whole plot

T1 tapioca on ridges along the slope 1m apart.
T2 tapioca on ridges across the slope 1 m apart.
T3 Tapioca on mounds at 1m x 1 m spacing
T4 No cultivation.

Sub plot

S1 No contour bunding.
S2 Contour bunding at 3 m verticial drop.

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Design : Split plot.

Replications: 4

Plot size: 40 m x 3 m

Variety of tapioca : M4

Fertilizer schedule: (as in the package of practices).

Data to be gathered:

1. Infiltration rate of soil.
2. Soil profile characteristics.
3. Rainfall, intensity and amount.
4. Water soil lost by run off
5. Nutrients lost (Major) only)
6. Moisture characteristics at different depths of soil (10 cm, 20 cm, 30 cm. Measurement will be done with the help of Neutron probe and also gravimetically).
7. Growth characteristics of crop.
8. Crop yield.

Location of study: Main campus, Vellanikkara.

Experiment II : Optimum cross section of contour bunds (Earthern bunds)

Treatments: 3 height of bunds X soil stablizers.

Height : L1 - 45 cm
L2 - 60 cm
L3 - 75 cm

Soil stabilizer: S1 - No stabilizer
S2 - Grass as stabilizer
S3 - Pineapple as stabilizer.

Combination:

1. L1 S1	4. L2 S1	7. L3 S1
2. L1 S2	5. L2 S2	8. L3 S2
3. L1 S3	6. L2 S3	9. L3 S3

Design : Observational

Plot size : 150-200 m^2

Crop: Tapioca, variety M4 (will be planted in mounds 1m x 1m)

Data to be gathered:

1. Infiltration rate of soil
2. Extent of ponding near the bunds during rains.
3. Changes in cross section of bunds at the end of each season.
4. Extent of maintenance required at the beginning of each season.
5. Crop yield.

Experiment III: Cropping systems and soil conservation practices on sub soil storage of water and crop yield.

Treatments:
1. No cultivation; no conservation of soil
2. Sorghum with rows across the slope.
3. Stylosanthus.
4. Cowpeas a floor crop.
5. Groundnut.
6. Contour bunding with tapioca on mounds across the slope (early duration) (1 m apart).

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7. Tapioca across the slope (early) (1m apart); on contour bunds.

Design: 7 x 3 R.B.D.

Slope : about 16%

Plot size: 120 m^2

Data to be gathered:

1. Infiltration rate of soil.
2. Soil moisture at different depths.
3. Growth characteristics of annual crops.
4. Growth characteristics of coconut seedlings planted in each treatment.
5. Extent of run off of water and soil
6. Yield of crops.

Note: Coconut seedlings planted in the study site will also be used as a test crop.

Study centre: Main campus, Vellanikkara.

9. Date of start : Sept./October 1978.

10. Completion : 2 years from Sept./Oct. 1978.

11. Finance : Rs.25,000/- (fully financed by the SIDA through the Central Ground Water Board).

Sd/-
Asst. Professor AE/i/c
for Professor of Agronomy (WM)

FRC X - Approved.

KERALA AGRICULTURAL UNIVERSITY

PROJECT REPORT

Name of study centre : SIDA assisted scheme for research on integrated water use, College of Horticulture, Vellanikkara.

1. University project code No. AG. 19. 19. Eng. 1606.

2. SIDA project code No.

3. Project title : Tapping subsurface water for irrigation.

4. Objective

High ground water table within 30 cm from ground level is built up in rice fields situated in basins surrounded by hills. This shallow ground water resources can be tapped for irrigation profitably. The extent of area that can be irrigated by tapping subsurface under with the help of ttle drains is the object of the project.

5. Name of:
(a) Project leader : T.P. George, Assoc.Prof. (Agnl. Engg.)
(b) Associates : R.R.Nair, Asst. Prof.

6. Practical utility

Subsurface water can be used for irrigating additional area. Since the system of tapping water is designed to work on gradient flow, no recuring expenses are involved for collection and supply of water.

7. A brief review of literature:

A technique of tapping subsurface water from high water table in terraced, paddy fields has been developed at Chalakudy (George et al 1978).

It is reported that a flow rate of water through the underground tile drains is sufficient enough to irrigate ha of rice or ha of other crops. The system works on gradient flow and therefore, no external energy supply is needed.

8. Technical programme:

Installation of 2 tile drains of about 50 m length in fields having land terrain to permit gradient flow. Discharge of water through the drains will be measured daily with the help of oriface plates.

The water drained through the tile drains will be analysed for major nutrients at weekly intervals to study the extent of loss of nutrients.

Location of study: State seed Farm, Kannamnur.

9. Commencemtnt of the project: July, 1978

10. Completion : June, 1979.

11. Amount required : 7000/- (Fully financed by the SIDA through the Central Ground Water Board).

Sd/-
Asst. Professor (AE) i/c
Prof. of Agronomy (WM)

FRC - X - approved.

KERALA AGRICULTURAL UNIVERSITY

Faculty of Agriculture — Department of Agronomy, College of Agriculture.

Programme of Research for Doctorate Degree

1. Name of the candidate : Alexander D.
2. Date of admission and Admission No. : 1-2-1979 78-21-01.
3. Name and designation of Chairman: Dr.N.Sadasivan, Dean, Faculty of Agriculture.

   Advisory Committee : 1. Dr.U.P. Bhaskaran.
   2. Dr.C.Sreedharan
   3. Prof. E.J. Thomas.
   4. Dr.R.S. Iyer.

4. Topic of research for thesis: AG. 21. 18. Agron. 901.

   Evaluation of water productivity in relation to fertiliser use and cropping intensity.

5. Objectives of the research.
   1. To assess the water requirement of single and crop combinations grown in rice fallows during summer season.
   2. To find out the multiple productivity in respect of crop combinations.
   3. To assess the fertilizer requirement for crop combinations.
   4. To study the microflora and nutrient build up due to single crop and crop combinations.
   5. To find out the most economic crop combination and its irrigation scheduling in rice fallows during summer season.

6. A short review of literature:

Behl et al (1968) reported that when pea was given two irrigations (25 cm) i.e. one at flowering and the other at grain development stage yield was 17.7 q/ha as compared to 13.91 q/ha in the control plot. They further noticed that maintaining high water level during pod filling or flowering resulted in the highest seed yields.

Dziezyc (1976) noted that crop yield and the indices of the effects and effectiveness of irrigation and higher fertilizer rates were lowest with the lowest rate of NPK, increased with increasing rate of NPK and then decreased after passing the optimum fertilizer rate. Kuszelewski (1976) reported that irrigation in combination with application of NPK significantly increased the yields of potatos, fodder beet and fodder cabbage.

Practical utility:

Studies on the nutrient requirements of cropping systems are lacking. So the present trial will enable us to find out whether any reduction in the fertilizer does that is given to each crop separately of a combination can be reduced without affecting the yield. The study will also enable to find out the effect of crop combinations on the microclimate.

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Technical programme

Layout - split plot experiment with confounding for major treatments.

Main plot treatments:

Nine combinations of irrigation (I) at 3 levels and fertilizer doses (M) at 3 levels (IM and IM^2) partially confounded).

Fertilizer application for crop combinations:

Based on the area occupied by each crop in the combination the fertilizer requirement will be worked out.

Spacing:. Cowpea - 30 x 15 cm.
Bhindi - 60 x 45 cm.
Sweet potato - 60 x 20 cm.
Groundnut(TMV-2) 15 x 15 cm.

Spacing for crop combinations

Spacing for the main crop will be given as above. Other crops of the combination will be planted in the interspace without any over lapping to the main crop in the spacing recommended for them.

Season: December-March of 1979-80 and 1980-81.

Date of start	:	December, 1979.
Date of completion	:	March, 1981.
Approximate cost	:	Rs.8,000/-
Anticipated receipt	:	Rs.10,000/-
Location of research	:	Rice Research Station, Pattambi.

Sd/-
Signature of the candidate.

Vellayani,
Date: 1-9-1979.

FRC - 10.

KERALA AGRICULTURAL UNIVERSITY
RESEARCH PROJECT
Proposal

Faculty of Agriculture Department of Agronomy.

1. Name of research centre : College of Agriculture, Vellayani.

2. Project No. : AG. 21. 18. Agron. 1001.

3. Title of the project:

Investigations to reduce fertilizer imput costs and decrease the extent of erosion by intercropping tapioca with Stylosanthes gracilis.

4. Name and designation of
a) Project leader : G. Raghavan Pillai, Asst. Prof. of Agronomy.

b) Associates : Dr.R.Subramonia Iyer, Assoc. Prof. of Chemistry.
Sri.T.P. George, Assoc. Prof. in Agrl. Engineer, Agronomic Research Station, Chalakudy.

5. Objectives:

i) By intercropping tapioca with Stylosanthes, a leguminous fodder crop, the possibilities of reducing nitrogenous fertilizer dose for tapioca will be investigated.

ii) The total edible food materials for human and animal consumption will be worked out and the effect of intercropping will be assessed.

iii) The role of extensive root system of stylosanthes in preventing erosion will be assessed, so that, if beneficial the result can be extended to the forest areas where Fagyie cultivation of tapioca between planted forests of Eucalyptus is known to cause considerable soil erosion.

6. Practical utility:

Intercropping stylosanthes with tapioca is likely to reduce considerably the imput costs in the cultivation of tapioca besides providing fodder for maintaining of animals. The possibilities of intercropping stylosanthes with tapioca in planted forests of eucalyptus is likely to solve major problems of soil erosion and loss of soil wealth of the forest areas. This cropping system can be inteegrated with Farm Forestry Programmes.

7. A short review of literature:

A mixed crop system consisting of General legume or tuber-legume is known to benefit the non-nitrogen fixing crop in the system (spading and Deikmahus, 1972). Thus several cereal-legume combinations are known in India (Chatterjee, et al, 1972). Under Kerala conditions tapioca - groundnut and tapioca-pulses are being currently investigated under the Kerala Agricultural University.

Stylosanthes when grown with appreciable doses of Phosphorus increased the water stable eggregates and G.E.C. of the soil (Singh and Singh, 1975). Nitrogen fixation in substantial quantities

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by Stylosanthes gracilis. has been reported by Tuely. Intercropping stylosanthes according to Nitis and Sumatro (1976) under Indonesian conditions increased cassava tuber yields by 20% and top yields by 180% over cassava alone. Thus the twin benefits of increased Nitrogen fixation and reduced soil erosion are likely to accure as a result of such an intercropping.

8. Technical programme.

I. Experiment at Vellayani (Objectives 1 & 2)

Treatments (6)

		N P K
i)	Cassava alone at	50:50:50
ii)	Stylosanthes gracilis alone at	10:30:20
Iii)	Cassava at 50:50:50 + Stylosanthes	10:30:20
iv)	Cassava + Stylosanthes with	50:50:50
v)	Cassava + Stylosanthes with	35:50:50
vi)	Cassava+ Stylosanthes with	20:50:50

Design R B D

Replication : 4 (four)

Plot size 4.5 ms x 3 m.s.

Spacing: Tapioca - Variety M4 - 75 cm x 75 cm.

Stylosanthes - broadcasting - seed rate 2.5 kg.

Duration : One year.

N.B. A uniformdose of lime @ 500 kg/ha will be applied to all the plots.

Observations to be recorded:

i) Yield of tubers.
ii) Yield of stylosanthes fodder.
iii) No. of cuttings of stylosanthes
iv) Nitrogen fixation - Total N removal by tapioca and stylosanthes.
vi) Nitrogen enrichment of soil after the crop.

II. Experiment to be conducted in an area where Tangyiacultivation of Tapiocais done in Trivandrum District in one of the Adopted villages or Soil Conservation Research Centre, Kunni.

(This experiment will be commenced only by July-August, 1979 as the second part of the experiment)

Treatments: (4)

i) Eucalyptus alone
ii) Eucalyptus intercropped with Stylosanthes
iii) Eucalyptus + tapioca (as per the practice of tangyia cultivation)
iv) Eucalyptus + tapioca intercropped with Stylosanthes.

Design : R B D

No. of replications: 5 (five)

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Plot size: 50 sq. m.s

Duration: 2 years.

Observations:

i) Yield of tubers.
ii) Yield of stylosanthes fodder
iii) No. of cuttings and drymatter yield.
iv) Girth of Eucalyptus (after every year height and No. of branches).
v) Nitrogen enrichment of soil after every crop for 2 years.
vi) Run off losses of soil from each treatment.

9. Date of start - I Experiment 1978

10. Likely date of completion : 1980

11. Additional facilities required: Nil

12. Approximate cost : Rs.10,000/-

13. Signature of

Sd/-
Project Leader.

FRC - 10.

COLLEGE OF HORTICULTURE, VELLANIKKARA

Departmental Research Project Proposal

1. Institute code No. : AG. 21. 19. Che. 102.

2. ICAR Code No.

3. Name and address of the research centre : College of Horticulture, Vellanikkara.

4. Title of the project : Carbon-Nitrogen relationships in Kerala soils.

5. Name and designation of the principal investigator : K.C. Marykutty, Asst. Professor.

6. Name and designation of associates : Dr. A.I. Jose, Assoc. Prof.
Smt.G.Draupathi Devi, Asst. Prof.

7. Location of the research Project : College of Horticulture, Vellanikkara.

8. a) Objectives:

1. To work out regression equations for calculating the total and available nitrogen in different types of Kerala soils using soil test values for organic carbon.

2. Establishing the minimum requirement of organic matter in the soil for economic yield in the high rainfall soils of Kerala with varying textural composition.

b) Practical utility:

1. In the soil testing procedures, the nitrogen status of the soil is predicted from the organic carbon content by applying a C:N ratio of 10:1. This ratio is taken mainly based on the experiments conducted in other states. It is likely that this ratio may not perfectly suit the soils of Kerala which receive a very high rainfall under the warm, humid and tropical climate. More precise ratio or regression equation can be worked out for our soils based on this study.

2. It is known that soil organic matter markedly influences the physical and chemical properties of the soil. The critical values of organic matter for economic yield in the different textural soil classes of Kerala are however not established. This study will establish threshold values for organic matter that are to be maintained in soils for economic yield.

9. Technical programme:

1) A large No. of soil samples supplied from the soil testing laboratory will be utilized for this study. Available and total nitrogen will be estimated and correlated with the organic carbon content of the soil. Regression equations will be worked out between organic carbon and total nitrogen. For these purpose, the soils will be categorised based on the total organic matter, texture, and other soil properties and the relationships examined in each group of the soil separately.

2) For establishing the minimum requirement of the organic matter in the soil for economic yield, different levels of organic matter will be given to each type of soil in pot culture experiments. The

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influence of graded doses of organic carbon on the physico-chemical properties of the soil and finally on crop yield will be ploted to arrive at an economic level for each type of soil.

Review:

Thakur et al (1976) studied the relationship between organic carbon and available nitrogen in soils of Madhya Pradesh and reported that the percentage of organic carbon content can be used as an index of avail, N in soil for making fertilizer recommendations.

Mathan et al (1978) in their studies on the effect of continuous rotational cropping on the organic carbon and total nitrogen content in black soils revealed that carbon-nitrogen ratio of the soils vaied from 8.9 to 9.1 in the beginning, and after three years experimentation, it ranged between 6.4 and 9.4.

Palaniappen et al (1978) conducted the experiment on carbon-nitrogen relationship under varied environmental conditions in hill regions of Tamil Nadu. He reported that the org. C and total nitrogen and correlations there of with the environmental factors existed close relationship between the two constituents and the environmental factors **viz.** pH, altitude and rainfall.

11. Date of start : 1979

12. Date of completion : 5 years.

13. Estimated man months

14. Facilities required : Facilities available at the College of Horticulture, Vellanikkara.

15. If financed by any other organisation other Institute:

16. Approximate cost : Rs.3,000

Signature of

PROFORMA

KERALA AGRICULTURAL UNIVERSITY

Programme of research for Ph.D. course for approval of the University

Name of candidate	:	R.K. Mohan.
Date of admission	:	15-10-1979.
Name and designation of the Chairman of the Advisory Committee	:	Dr.M.M. Koshy, Professor (Res. Co-ordination).
Topic for research for thesis:		Soil test crop response studies for nitrogen in Kerala soils.

No. AG. 21. 18. Che. 302.

Objectives of the research :

In the soil testing laboratories in Kerala available nitrogen is now being determined by estimating the organic carbon by Colorimetric method and assuming that this organic carbon is directly related to the available nitrogen in the soil. But this method is not supported by experimental results obtained for Kerala Soils. Hence the object of this study is to evolve a suitable quick method for estimating the available nitrogen in the different soil groups of Kerala.

Review of previous work done:

The literature bearing on the subject is very extensive, but some of the recent works alone are reviewed below.

Meelu and Bhumbla (1969) found that organic carbon is not a suitable indicator to give a measure of available nitrogen in alkaline soils. But meelu (1979) showed that in areas relatively high temperature and low altitude organic carbon could be used for prediction of response to nitrogen.

Subbiah and Bajaj (1962) and Sims et al (1967) observed that the ammonia released after one week of incubation and 6 days of incubation respectively gave better index of available nitrogen. Lath well et al (1972) found that total nitrogen extracted by 0.01 M Ca Cl_2 and K_2SO_4 and the nitrogen produced during incubation are equally availability in soils.

Scientific and/or practical importance of the research:

It is expected that the present study will help to develop a reliable and quick method of estimating available nitrogen in soils for use in the soil testing laboratories.

Technical programme:

1. Collection of representative soil samples from the major soil groups of Kerala.

2. Determination of nitrogen by the kjeldahl method and organic carbon by Walkely & Blacks titration method and finding out for C/N ratios for different soil groups.

3. Determination of organic carbon by colourimetric method.

4. Working out correlations between organic carbon determined by litration method and by colorimetry.

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5. Determination of available nitrogen by the alkaline permanganate, incubation and hydrolysis methods and working out the correlations to organic carbon.

6. Pot culture experiments in this soils treated with different levels of nitrogen and planted to rice as the test crop.

7. Analysis of plants for uptake of nitrogen.

8. Working out correlations between the nitrogen determined by different methods and nitrogen absorbed by the plants.

Observations to be recorded:

1. Physical and chemical properties of soil.
2. Available N_2 content of the soil before planting and at harvest using various reagents.
3. Uptake of N_2 by the plants at the time of harvest.

Date of start : October 1979

Date of completion : October 1982

Approximate cost : Rs.33,000/-

This expenditure will be borne by the ICAR, as this study is part of the Ad hoc scheme "Soil Test crop response studies in Kerala.

Anticipated receipt : Nil

Location of research : College of Agriculture, Vellayani.

Place: College of Agriculture,
Vellayani.

Date: 30-11-'79.

Signature of the candidate.

FRC - 12.

KERALA AGRICULTURAL UNIVERSITY

FACULTY OF AGRICULTURE

Department of Agricultural Chemistry, College of Agriculture, Vellayani.

1. Name of candidate : Sumam George

2. Date of admission and admission No. : 16-10-1978
78-11-25

3. Name and designation of the chairman of the advisory committee : Smt.Alice Abraham, Asst. Professor, Dept. of Agricultural Chemistry.

4. Topic of research for thesis: Fertility investigation in the Poonthalpadam soils of Kerala.

No.G4. 21. 18. Che. 1102.

5. Objective of research for the thesis:

The present study is carried out with a view to investigate the extent of fixation suffered by the applied plant nutrients in these soils. This will be achieved by.

1. Determining the physical and chemical properties of about 50 surface and subsurface samples.
2. determining the ammonium fixing, P fixing and K fixing power of these soils.
3. Co-relating the extent of nutrient fixation with the physical and chemical properties of these soils.

6. Brief review of previous work done on the topic

The poonthalpadam soils which cover an area of about 2000 ha in Palghat district is recognised as a group of problem soils which require careful and detailed investigation. The soils are alkaline in reaction and contain high proportion of sodium and bicarbonate ions which may impart several direct and indirect influences on plant growth. Besides, the status of available nutrients was found low as against a high total content. The reasons for their low availability might be corelated with the physical and chemical properties of the soils and the present study is taken up to obtain more enlightenment on there problems study of the Physico-chemical characteristics of the poonthalpadam soils of Kerala appears to be the major work done on these soils (Krishnakumar, 1978).

7. Scientific and/or practical research.

A knowledge of the factors restricting the availability of major nutrients in these soils will help to plant out a better schedule of fertilizer recommendation and those areas which are left uncultivated due to very poor crop yield may be brought under cultivation.

8. Technical programme:

1. The surface and subsurface samples will be collect from different locations in the poonthalpadam tract.

2. The physical and chemical analysis of these samples will be carried out by standard analytical producers.

..... 2

3. The ammonium fixing, phosphorus fixing and potassium fixing capacities of these soils will be studied by standard analytical procedures.

4. To make corelation between soil physical and chemical properties with the nutrient fixing capacities of these soils.

9. Estimates of expenditure: Rs.3000/-

10. Location of research : College of Agriculture, Vellayani.

Place: Vellayani,

Date: 7-3-1979.

Sd/-
Signature of candidate.

FRC - 8.

KERALA AGRICULTURAL UNIVERSITY
FACULTY OF AGRICULTURE

College of Agriculture: Programme of research for M.Sc.(Ag.)

1. Name of student : Rajendran, P.

2. Date of admission and Admission No. : 16-10-1978
78-11-19.

3. Name and Designation of Chairman, Advisory Committee : Dr.R.S. Aiyer, Assoc. Prof. of Agrl.Chemistry & Soil Science (Professor i/c).

4. Topic of research for thesis: "Manganese and zinc status of rice soils of Kerala".

5. Objectives : NO. AG. 21. 18. Che. 1602.

a) To assess the forms and distribution of Mn and Zn in the rice soils of Kerala.

b) To study these two elements in relation to toxicity and deficiency in areas of occurrence.

c) To study the interrelationship between these elements.

d) To study the transformations of manganese and zinc due to submergence.

6. Brief review of previous work done on the topic.

Although our knowledge regarding the distribution of the major elements in Kerala soils is fairly comprehensive the information pertaining the occurrence, forms and distribution of the minor elements is scanty and meagre. Practically no work had been done in this direction until in 1965, when Pisharody first investigated the occurrence of different forms of iron and manganese in some rice soils of Kerala. This was followed by the investigation of Rajagopal in 1969 who reported the forms and distribution of manganese in 14 typical profiles of Kerala. Ravikumar Praseedom in 1970 studied the distribution of zinc in some soils of Kerala. Gopinath in 1973 investigated the distribution of zinc in acid peat soils of Kerala.

Rajagopal 1971 reported antagonistic effect between zinc and phosphorus in soils. It is also observed that correction of zinc deficiency in calcareous soils can result in deficiency of iron and manganese (Widdowson, 1960).

7. Scientific/or practical importance of research:

In rice soil continuous cultivation with high yielding varieties, high amounts of soluble iron and aluminium and continuous submergence have been reported to cause deficiency of zinc. Further there are locations in Kerala especially the sandy soils and soils rich in organic matter which are likely to be deficient in Manganese Such areas will be located and studied.

8. Technical programme.

1. Determination of total and available zinc and manganese status of the major rice soil types of the state using different extractants.

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The major rice soil types like kari, laterite, alluvium, kole, karapadam, kayal, coastal sandy alluvium and pokkali will be studied (10 samples for each soil type).

2. Effect of submergence on available zinc and manganese status of major rice soil types (Laboratory incubation studies).

3. Role of addition of organic matter in the rice soils in relation to available zinc and manganese status and different periods of submergence (Lab. incubation experiment).

4. Response to application of zinc and manganese in soils located to be deficient in these nutrients (Pot culture experiment).

An outline of the pot culture experiment will be as follows:-

1. Soils (2 or 3 according to the deficiency level).
2. The following levels of zn and mn will be tried, 0, 10, 20, 30 kg/ha as $ZnSO_4$ and $MnSO_4$
3. A high yielding variety like IR.8 which is known to be sensitive to Zn and Mn deficiency will be used for the study.

The experiment will be laid out in CRD (completely randomised design).

9. Approximate cost : Rs.3500/-

10. Location of research : College of Agriculture, Vellayani.

Sd/-
Signature of candidate.

Vellayani,
Date.

FRC- 8.

KERALA AGRICULTU AL UNIVERSITY

Programme of Research for M.Sc.(Ag.) Degree

Faculty of Agriculture : Department of Agrl. Chemistry.

1. Name of the candidate : N. Karunakara Panicker.

2. Date of admission and No.: 78-11-24.

3. Name and designation of the Chairman, Advisory Committee : Dr.V. Gopalaswami, Assoc. Prof. Dept. of Agrl. Chemistry and Soil Science.

4. Topic of research for thesis: NO. AG. 21. 18. Che. 1603.

"The utility of an indegenous source of Magnesium silicate for rice in Kuttanad soils".

5. Objective

To investigate and assess the effect of the application of Magnesium silicate in Kuttanad soils.

6. Brief review of work done:

Padmaja (1964) found that the grain and straw yields are significantly increased by applying Magnesium and silicon over and above the schedule of manuring in red loam soils of Kerala.

Sadasivan (1965) observed that Sodium Silicate as well as Calcium Silicate have the capacity to increase the grain out put an Protein content of paddy, as per the studies conducted in the rice soils of Kerala.

Nair and Aiyer (1966) observed that:

1. The low land rice soils in general have a higher available silica status than the upland soils.

2. Drying a wet land soils increases the water soluble silica by approximately 15 percent.

3. An average rice crop in Kerala removes about 250 kgs. of silica per hectare.

Vijayakumar and Koshy (1977) found that application of Magnessium silicate increased the number of spikelets per panicle, number of filled grains, and weight of thousand grains

Most of the above studies have been conducted as pot culture trials. No study under field conditions regarding the silicon application has been conducted in Kuttanad soils. Hence the present study.

7. Practical importance of the research:

Observational field studies in Kuttanad regions have shown that silicate application has some beneficial effects. Paddy straw contains about 8% silicon. A sizable portion of this is being incorporated into the soil. If the application of Magnesium silicate proves beneficial by way of improving yield, it can be extended to cultivators of this area.

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8. Technical programme:

A field experiment will be conducted in the Kuttanad area, near Moncompu, Rice Research Station as per the following details:

Treatments:

1. Control
2. Magnesium silicate 100 kgs/hect.
3. -do- 200 kgs/ ,,
4. -do- 300 kgs/h ,,
5. -do- 400 kgs/ ,,

Manurial schedule for the crop will be as per package of practices schedule.

Design	RBD
Variety	Jyoti
Plot size	6 Mts. x 5 M.

Observations:

Periodical recording of pH & E.C. before planting, at active tillering, Panicle emergence and after harvest.

Chemical analysis

Total available Nitrogen, P_2O_5, K_2O and $Si\ O_2$ before planting the crop and after and their total uptake.

Available silica in the soil and silica contained in grains and straw at harvest.

Yield data

Weight of grain, straw number of productive tillers, extent of shedding and other biometric data. Data on incidence of pests and diseases will also be collected.

Estimate of Expenditure: Rs.5,000/-

Place: Vellayani
Date: 18-4-1979.

Sd/-
Signature of student.

FRC - 9.

PROFORMA FOR RESEARCH PROJECT - PROPOSAL

KERALA AGRICULTURAL UNIVERSITY
RESEARCH PROJECT.

Faculty of Agriculture Department of Agronomy

1. Name of Research centre : Rice Research Station, Kayamkulam.
2. Project No. : No.AG. 21. 6. Che. 2102.
3. Title of the project (this should indicate the nature of work) : Utility of Azolla as a partial substitute to inorganic 'N' fertilizer for wet land rice culture.
4. Name(s) & Designation of
   a) Project leader : Asst. Professor (Agronomy)
   b) Associate

5. Objective:

Azolla a genus of water form fixes atmospheric N in association with a bulue green algae. It is found abundantly in the paddy fields of Onattukara. The objective of the experiment is to assess the possibilities of utilising azolla as a partial substitute to inorganic Nitrogen fertilizers.

6. Practical utility:

The result obtained will help to reduce the cost of cultivation of rice, as the inorganic intergenous fertilizer can be reduced.

7. A short review of literature:

Azolla is a genus of water form which fixes atmospheric nitrogen in association with blue green algae Anabeena azollae (I. Watanable et al 1977). The atmospheric nitrogen fixed by the algae, which lives in the leaf cavities of the upper lobes of azolla is available to the ferh and there by multiplies rapidly. This property of the Azolla - Anabeena association has drawn the attention of farmers for the utilization of azolla as a partial substitute to organic nitrogen fertilizer for rice crop (P.K. Singh 1977). Pot and field experiments showed that incorporation of 8 to 10 tons/ha. of fresh azolla before transplanting increased rice yield as much as did 30 to 40 kg. nitrogen from ammonium sulphate. Inoculation of field with azolla after rice transplanting, and the incerperation of azolla after its growth stimulated rice growth (P.K. Singh 1977).

8. Technical programmes:

Layout : 10 x 3 R B D
Replications : 3
Treatments : 10
Plot size : 6 x 4.95 M^2
Spacing : 15 x 15 cm
Variety : Jaya.

Treatments:

1. Control without N.

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2. Recomended dose of N.
3. Recommended dose of N + Azolla 5 toms/hact.
4. Recommended dose of N + FYM @ 5 tons/hact.
5. 50% of recommended dose of Nitrogen + Azolla 5 toms/ha.
6. 75% of recommended dose of Nitrogen + Azolla 5 toms/ha.
7. 50% recommended dose of Nitrogen without azolla.
8. 75% recomended dose of Nitrogen without Azolla.
9. Azolla floated at the time of planting (1000 kgm. innoculated at the time of planting) and incorporated at the time of first top dressing and N 50% basal 0% 1st top dressing and 25% at the time of 2nd top dressing).
10. Azolla floated at the tim of planting (1000 kgm/hact. innoculated at the time of planting) and incorporated at the time of 2nd top dressing - and N (50% basal, 25% N - 1st top dressing and 0% N at Second top dressing) P and K recomended dose in all the treatments.

Note: P and K recommended dose in all the treatments.

Observations to be recorded

1. Vegetative tiller counts 45 DAT
2. Productive tiller counts (one week prior to the harvest)
3. Grain and straw yield.

9. Date of start : September 1979
10. Likely date of completion: December 1981.
11. Additional facilities required: Nil
12. Approximate cost : Rs.1500/-

Sd/-
Project Leader.

FRC - 10.

PROFORMA FOR RESEARCH PROJECT PROPOSAL

1. Faculty of Agriculture : Department of Agrl. Chemistry.

2. Name of research centre : College of Agriculture, Vellayani.

3. Project No. : AG. 21. 18. Che. 2103.

4. Title of project

"Nitrogen economy in Rice through algal fertilisation in different soil types and soil physical conditions".

5. Name and designation
   a) Project leader : Dr.R.Subramonia Aiyer, Assoc. Professor.
   b) Associate : Professor of Agronomy and all Associate Professors i/c of the Research stations where the experiment is to be conducted.

6. Objective

Multilocational large scale trials to verify the efficacy of blue green algae for their adoption in various agro-climatic regions of the state. Standardization of the multiplication of blue green algae culture to suit the conditions existing in Kerala.

7. Practical utility of scheme:

Under the conditions existing in Kerala, any cost reducing innovation for rice cultivation will be highly valued and readily accepted by the farmers. The use of blue green algae has been shown to reduce the cost of nitrogen inputs by 30 percent and the algae themselves can be cultured by cultivators at marginal costs.

8. A short review of literature (Brief review of work done in Kerala and India)

Aiyer et al (1971) observed a significant reduction in total sulphides consequent to inoculation of blue green algae in the soils of Kuttanad. Aiyer et al (1971) (b) in another study showed that inoculation of blue green algae reduces significantly the content of oxidisable organic matter, total sulphides, ferrous iron etc. and shows an increasing trend in the organic matter content of the soil. These results are to be attributed to the increased oxygen tension in the soil water system due to algal photosynthesis. In a currently laid out Experiment at IARI these observations have been confirmed by direct measurements of oxygen tensions. These increased oxygen tensions are particularly useful in areas where problems of iron toxicity and sulphide injury are very often observed. Thus their beneficial effects accrue from increased nitrogen fixation and significant reduction in toxic conditions prevailing in continuously water-logged soils. The IARI has standardized the procedure for production of blue green algal culture and this method can be adopted by us with suitable modifications.

9. Technical programme:

1. Multiplications of the blue green algal culture in the College of Agriculture, Vellayani and supply of the culture to 7 centres in the Kerala Agrl. University for large scale trials.

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2. These large scale trials can be conducted in the experimental fields of Rice Research Stations at Pattambi, Kayamkulam Moncompu and Vyttila, Instructional Farm, Mannuthy, Agronomic Research Stations at Chalakudy and Karamana.

3. The experiments can be commenced from the first crop season of 1979-80.

4. High yielding varieties may be used for all the locations and in all seasons.

5. The following treatments can be used for conducting trials.

i) Full doses of Nitrogen + P, K and amendements as recommended for the variety.
ii) 2/3 dose of Nitrogen + do + Bule green algaeas soil culture @ 10kg/ha.
iii) 2/3 dose of Nitrogen + do
iv) 1/3 dose of nitrogen + do + Blugreen algae as soil culture @ 10/kg/ha.
v) 1/3 dose of nitrogen + do.
vi) If the trials are to be conducted as a large scale trial then a minimum area of 0.2 hectare per plot may be taken and the trial conducted as an unreplicated trial.
vii) As an alternative to (6) above if the experiment is to be conducted as a replicated trial a smaller plot of 5.8 x 3.6 m may be taken with 4 replications in the RBD.
viii) Observations to be recorded. Yield of grain and straw, No. of tillers, effective tillers, panicle length, No. of grains per panicle, 1000 grain weight etc. Soil samples will be collected before and after each crop for various chemical and physical studies.

10. Date of start : May 1979.

11. Likely date of completion : May 1981

12. Addl. facilities required : Nil.

13. Approximate cost : If this trial can be done with the regular allotment for the stations, no addl. expenditure would be involved.

FRC - 10.

KERALA AGRICULTURAL UNIVERSITY

RESEARCH PROJECT

Faculty of Agriculture Department of Agricultural Chemistry.

1. Name of Research Centre/ Location : Coconut Research Station, Pilicode.

2. Project Number : AG. 21. 8. Chem 2201.

3. Title of the Project :

Studies on the influence of raising cocoa as an intercrop in coconut garden, on the chemical and microbiological characteristics of laterite soil.

4. Name and designation of:
   a) Leader : Dr.P.K. Narayanan Nambiar, Assoc. Prof. (Agrl. Chemistry).
   b) Associate : 1. M.A. Hassan, Instructor (Agrl. Chem.)
   2. T.C.Radhakrishnan, Asst. Prof. (Plant Pathology).

5. Objective:

To find out the influence of raising cocoa as an intercrop in coconut garden on the chemical and microbiological characteristics of Laterite soil.

6. Practical utility:

Cocoa is now largely cultivated as an intercrop in coconut gardens. The effect of raising such an intercrop on the chemical and microbiological characteristics has not studied in detail so far. The study will help to cultivate both the crops now advantageously by knowing the changes undergoing in the rhizophere.

7. A short review of Literature:

The incidence of phosphate solubilizing micro organisms and available phosphorus in coconut and cocoa rhizophere soils were found directly related (S.K.Nair and N.S. Subba Rao 1977). The interplanting coconut garden with cocoa improved the general conditions of coconut palms is a very good means of augumenting the returns from a unit area of land. (K. Kannan and K. Sudhakara 1977).

8. Technical programme:

Two sets of rhizophere samples of coconut and cocoa will be collected from the experimental plot laid out in 1970 to study the effect of raising cocoa as an intercron in adult coconut plantation. The experiment has been laid in an R B D with 3 treatments (a) Single row of cocoa in between two palm rows (b) Double row of cocoa in between two palm rows and (c) Coconut alone without cocoa and 8 replications.

Soil samples will be analysed for PH, T.S.S., Organic Carbon and available nutrients and assessed for microbiological population.

9. Date of start : 1979
10. Likely date of completion: 1980
11. Additional facilities required: Nil
12. Approximate cost : Rs.2,000/-
13. Signature:

Sd/-
Project Leader.

FRC - 10.

KERALA AGRICULTURAL UNIVERSITY

FACULTY OF AGRICULTURE

Programme of Research work for Masters' Degree

1. Name of the student : Cyriac Mathew

2. Date of Admission and Admission No. : 16-10-1978
78-11-22.

3. Name and designation of Chairman, Advisory Committee : Sri.Abdul Hameed, Asst. Professor, Department of Soil Science & Agricultural Chemistry.

4. Topic of research for thesis: AG. 21. 18. Che. 2301.

"Changes in morphological physical and chemical characteristics due to monoculture of planted forests and plantation crops".

5. Objectives of research for the thesis:

1. To study the changes in physical properties of soil due to the replacement of the natural forests by different types of plantation crops and planted forests.

2. To evaluate the removal and migration of various mechanical fractions of soil especially clay due to clearfelling and monoculture.

3. To estimate the changes in contents of total nutrients and available nutrients in the surface soils of plantations and adjacent virgin forests.

4. To determine the most suitable type of vegetation for a deforested area, which causes least deterioment to soils.

6. Brief review of work done on the topic:

Thomas (1964) after his studies on some forest soils of Kerala, reported that deforestation caused marked changes in physical condition of the soil. The structure was deteriorated and the soil was subjected to severe erosion. Jose (1968) also supported this view and found that clay was translocated to lower horizons on clearefelling of forst trees and planting teak.

7. Scientific and/or practical importance of Research:

It is important to study the changes in physical, chemical and morphological properties, that take place in deforested soil and areas where cultivation has been started. The present study also aims at finding out the most suitable plantation which can replace natural forests with least determinent to soil.

8. Technical programme:

1. Morphological description of soil profiles of plantations of Rubber, Oil palm, Eucalyptus, Cardamom, Tea and Coffee at different stages of growth and their respective adjacent virgin forests.
2. Collection of soil samples from the three horizons of all profiles studied.
3. Aggregate analysis and Mechanical anaalysis of the soil samples.
4. Determination of physical properties of the soil such as single value constants, plasticity limits etc.
5. Estimation of the total and available nutrients in soils of each profile, pH conductivity etc.

9. Estimate of expenditure and receipts, if any.
Approximate cost Rs.3,500/-

10. Location of Research: College of Agriculture, Vellayani.

Sd/-
Signature of candidate.

FRC- 8.

PROFORMA FOR RESEARCH PROJECT PERSONAL

KERALA AGRICULTURAL UNIVERSITY
Research Project

Faculty of Agriculture Department of Agrl. Chemistry.

1. Name of the research centre: College of Agriculture, Vellayani.

2. Project No. : AG. 21. 18. Che. 2401.

3. Title of the project:

Studies on the available sulphur status and different forms of sulphur in the upland soils of Kerala.

4. Name(s) and designation of
a) Project leader : P.A. Korah, Asst. Prof.
b) Associates : Dr.R.S.Aiyer, Assoc. Prof. i/c of Professor.

5. Objective: To ascertain the sulphur status of upland soils of Kerala.

6. Practical utility:

Very little work has been done in this field. As a nutrient the importance of sulphur to plants is great and the study proposed will give a basis for the furtherence of studies of sulphur nitrition in upland soils.

7. A short review of literature:

Williams and steinberse (1958) (Jordan and Reisenouer (1957) and Reddy and Mehta (1970) have shown that sulphur is characterised into many pools, in order to relate them into some soil properties. The existence of organic and inorganic forms and their inter-relationship with one another for the response of crops to sulphur application was proved.

Shikomed (1957) Walker (1957) Freney (1958) Olivero (1960) Kanwar and Tekkir (1964) Confirmed that organic form of sulphur constitute themajor portion of sulphur in soils.

According to Kanwar (1963) the response to sulphur application was noticed when available sulphur content was below 15 ppm.

8. Technical programme:

1. Collection of laterite and red upland soils of Kerala .
2. Analysis of thesample for different forms of sulphur as
(i) Total sulphur (ii) Water soluble sulphate sulphur.
(iii) Total sulphate sulphur (iv) Sulphide sulphur
(v) Organic sulphur.
Also organic matter content and pH will be determined.

3. Available sulphur determination using different methods and correlation with forms to choose the best suitable available sulphur determination method.

9. Date of start - April 79
10. Date of completion : April 1980.
11. Additional facilities required : Nil

12. Approximate cost Rs. 2000/-

Signature:

FRC - 10.

KERALA AGRICULTURAL UNIVERSITY

FACULTY OF AGRICULTURE

DEPARTMENT OF SOIL SCIENCE & AGRL. CHEMISTRY

PROGRAMME OF RESEARCH WORK FOR MASTER'S DEGREE

1. Name of candidate : P.B. Usha.

2. Date of admission and admission No. : 10-10-1979
79-11-31.

3. Name and designation of Chairman of advisory committee. : G. Groupathi Devi, Asst. Prof. of Soil Science & Agrl. Chemistry.

4. Topic of research for thesis: "Characterisation of Soil organic matter in different soil types of Kerala".

No. AG. 21. 19. Che. 2501.

5. Objective of research:

1. To examine the composition of soil organic matter in the surface soils of the different soil types of Kerala.

2. To study the relationship between soil organic matter and soil nitrogen so as to establishmore precise regression equations for calculating the total and available nitrogen in soil based on organic matter and organic carbon content of soils.

5. Brief review of previous work done on the topic.

Singh & Singhal, (1976) conducted a study on the nature and composition of humus in some outer Himalayan soils of Utter Pradesh.

Takur et al (1976) studied the relationship between organic carbon and available nitrogen in soils of Madhya Pradesh and reported that the percentage of organic carbon content can be used as an index of available nitrogen in soil for making fertilizer recommendations.

Palaniappen et al (1978) conducted the experiment on carbon - nitrogen relationship under varied environmental conditions in hill regions of Tamil Nadu. He reported that the organic carbon and total nitrogen and the correlations thereof with the environmental factors existed close relationship between the two constituents on the environmental factors viz. pH, altitude and rainfall.

7. Scientific and practical importance of the research:

By establishing precise relationship between soil organic matter and soil nitrogen it is possible to modify the existing conversion factors for calculating soil nitrogen from organic carbon for different soil types of state.

8. Technical programme (give outline).

A large number of surface soils will be collected from typical soil types of Kerala. Relationship between organic carbon soil organic matter, soil nitrogen (Total and available) etc. will be established by performing standard chemical analysis and regression equations between carbon and nitrogen will be worked out for each soil type.

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A few soil samples will be selected from each soil type for fractionation analysis. Fractionation of soil organic matter will be carried out by adopting standard procedures and relationship between soil properties and each fraction of soil organic matter, will be established.

9. Estimate of expenditure and receipts if any:

1. Expenditure

a. Fellowship Rs.600/trimester	Rs.3600/-
b. Contingencies (for the collection and transportation of soil samples)	3000/-
Total	Rs.6600/-

2. Receipts : Nil.

10. Location of Research : College of Horticulture, Vellanikkara.

Place: Vellanikkara,
Date: 4-3-1980.

Signature of candidate : Sd/-

FRC - 12.

COLLEGE OF HORTICULTURE, VELLANIKKARA.

RESEARCH PROJECT PROPOSAL

1. Institute No. : AG. 21. 19. Che. 2502.

2. ICAR Code No. :

3. Name and address of the Research centre : Horticultural College, Vellanikkara, Mannuthy.

4. Title of the project :

Studies on Fractionation of organic matter in soils of Kerala-
1. Kari soil.

5. Name and designation of the principal investigator : Dr.S. Kabeerathumma, Asst. Prof. of Soil Science and Agrl. Chemistry, College of Horticulture.

6. Name and design tion of Associate and establishment : Dr.A.I. Jose, Assoc. Professor of Soil Science & Agrl. Chemistry, College of Horticulture.

7. Location of Research project : College of Horticulture, Vellanikkara, Mannuthy.

8. a) Objective

To fractionate the organic matter in different soils of Kerala and to study the contributions of each fraction to soil fertility.

b) Practical utility:

To find out the fraction which contribute much to the fertility of soil and to devise ways and means of increasing that fraction. The study may also help to find out the optimum dosage of organic manures to be applied to each category of soils for maximising yield.

9. Technical programme and observations:

As first phase of the experiment, soils of Kuttanad with special reference to Kari soil (which contains the highest amount of organic matter) will be taken up for studies. The organic matter of this soil will be separated and fractionated. The CEC of each fraction and its relative contribution to soil fertility will be studied. Subsequently the other soils of Kerala will also be subjected to similar studies.

10. Date of start : 1979

11. Likely date of completion : 1984

12. Estimated man months :

13. Facilities required : The work can be carried out at Chemistry Division of Horticultural College.

14. If financed by an organisation: other than the Institute

15. Approximate cost : Rs.2000/-

Sd/-
Project Leader.

FRC - 10.

KERALA AGRICULTURAL UNIVERSITY

FACULTY OF AGRICULTURE

Department of Soil Science and Agricultural Chemistry
College of Agriculture, Vellayani

1. Name of student : Kum. Sumam Susan Varghese

2. Date of admission and Register Number : 10-10-1979
79-11-28.

3. Name and Designation of Chairman, Student Advisory Comittee : Sri.Thomas varghese, Assoc. Professor of Soil Science and Agricultural Chemistry, College of Agriculture, Vellayani.

4. Fiel of research programme : Physico-chemical Investigations on the crop Hazards due to Industrial Pollution in the sandy soils of Trivandrum.

No.AG. 21. 18. Che. 2601.

5. Objective of the programme and practical utility:

With the advent of modern chemical industries, pollution hazards from the factory wastes have become a factor of serious consequence to agricultural crops. So far no data is available with regard to the impact of these pollutants on the principal agricultural crops in Kerala. Though cases of crop hazards have been reported from areas adjacent to chemical factories located at Mavur, Eloor, Punalur, Kundara, Veli etc. no attempt has been made to delineate the toxicity symptoms in crops, asses the extent and severity of hazards, determine the concentrations of the residual toxic elements in soils, irrigation water and ground water. Further the migration pattern of these residues in soil has also not been studied. Hence it is proposed to conduct detailed physico-chemical investigations on the effect of industrial polluants on the reported crop hazards in the premises of the Travancore Titanium Products and T.K. Chemical factories loc ted in the sandy belt of Trivandrum coast and the nature and severity of the pollution and related aspects with a view to suggest ameliorative measures.

6. Brief review of work done in the topic:

Since it is a new field of study no published work is available on the impact of industrial polluants on agricultural crops in Kerala.

7. Scientific and practical importance of the research:

The project when completed will throw light on the specific causes of reported damages to Coconut palms, paddy, cocoa and other cultivated crops in Veli areas. Further it may facilitate to find out suitable ameliorants to tackle the problem of polluants to crops.

8. Technical programme & Main observations:

The investigations on the nature of polluants and their impact on crop plants will be conducted on the following lines.

1. Studies on the nature and composition of the major factory residues of T.T.P. and T.K. Chemicals which get entry into the adjacent agricultural lands.

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2) Studies on the vertical and horizontal distance up to which the pollutants have migrated at the beginningand end of the study from the same sampling locations to bring out the effect of seasonal factors, soil physical factors and soil chemical factors that interact with the migration rate.

3) A description of the symptoms of toxicity and consequent nutrient im-balances caused to major crops of the area viz. Coconut and Rice, by an analysis of the different plant parts affected. Standard procedures and analytical techniques will be used.

4) The sampling of plant parts will be done at different seasons of the experimental period.

5) Preliminary trials on reclamation and amelioration methods will be conducted with the co-operation of the cultivators toward off the ingress of the polluant and to ameliorate the conditions of toxicity to crop plants.

10. Period of Experiment : 16 months.

11. Date of start : 1-4-1980

12. Date of completion : 31-7-1981

13. Estimate of Expenditure : Rs.2000/-

14. Anticipated Receipts : Nil.

15. Location of study : Premises of T.T.P. and T.K. Chemicals, Koch Veli, Trivandrum & College of Agriculture, Vellayani.

Sd/-
Signature of P.G. Student.

FRC - 12.

RESEARCH PROJECT - 1979.

1. Institute Code No. :
2. ICAR Code No. : AG. 21. 19. Che. 2701.
3. Name and address of the Research Centre : College of Horticulture, Vellanikkara.
4. Title of the project:

A preliminary study on the variation of soil moisture, and moisture retention characteristics of some typical soils of Kerala.

5. Name and Designation of Principle investigator : Smt.K. Leela, Asst. Professor, College of Horticulture, Vellanikkara.
6. Name and designation of Associates and establishment which borne : Smt.G. Droupathi Devi, Asst. Prof. 2. Dr.A.I. Jose, Assoc. Prof. College of Horticulture, Vellanikkara.
7. Location of the research project: College of Horticulture, Vellanikkara.

8. a) Objectives:

1. To have a fundamental idea of the soil moisture content and retention capacity of the soils during three major seasons of the year viz. Hot weather period (Feb. - June); South West monsoon period (June-Sept.) and North East monsoon period (Sept.-January).

2. As the moisture retention characteristics are related to soil physical conditions particle size analysis of the soils will be carried out and its relationship to soil moisture characteristics studied.

b) Practical utility:

A knowledge of moisture retntion characteristics of soil and their relationship with other soil properties is important from the stand point of water availability to crops, both under irrigated and rainfed conditions. Such details are not available for our soils and hence the study has been proposed. As we have research stations spread out all over Kerala representing various soil types under varying agroclimatic situations soils will be collected from all these stations and their characteristics studied. This will be useful as basic data in crop planning for individual stations.

c) Review of literature:

Subba Rao et al (1965) determined pore size distribution in a Delhi soil and Jammu sand from their pF-moisture retntion curves. Subba Rao and Ramacharlu (1958) reported the moisture retention characteristics of some typical Indian soils ie. red, laterite, black alluvial, forest, desert and saline alkali soils.

Moisture retntion characteristics of several normal and saline soils of Punjab. were studied by Sekhon and Arora (1967) and a few profiles from Hissar district of Haryana state by Abrol and Bhumbla (1966) and Abrol et al (1968)

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9. Technical programme:

As a first step study will be taken up on soils of Vellanikkara and Mannuthy campus. Profiles will be dug and soil samples collected from 4 depths viz. 0.15 cm; 15-30 cm; 30 cm-45 cm. and 45 cm-60 cm. These samples will be analysed in the laboratory for practical size distribution, physical constants and moisture retntion characteristics. Field measurements will also be carried out by installing gympsum blocks and Tensiometers at various depths.

Observations:

1. Description of profiles.
2. Analysis of soil samples from various depths for particle size distribution and Physical constants.
3. Determination of moisture contents and moisture retntion characteristics.

10. Date of start : February, 1979.

11. Likely date of completion : January 1980

12. Estimated man months

13. Facilities required : Facilities available in the College of Horticulture will be utilised.

14. If financed by an organisation other than the institute

15. Approximate cost : Rs.2000/-

Sd/-
Principal Investigator.

FRC - 10.

RESEARCH PROJECT - 1979

1. Institute code No.
2. ICAR Code No. : AG. 21. 19. Che. 2801.
3. Name and address of the research centre : College of Horticulture, Vellanikkara.
4. Title of the project : Aggregate size distribution and its relationship to Physical and chemical properties for some typical soils of Kerala.
5. Name and designation of principal investigator : Smt.K.Leela, Asst. Prof. College of Horticulture, Vellanikkara.
6. Name and designation of Associates and establishment on which borne : Smt.G.Droupathi Devi, Asst. Prof. Dr.A.I.Jose, Assoc. Prof. College of Horticulture, Vellanikkara.
7. Location of research Project : College of Horticulture, Vellanikkara.

8. a) Objective:

To have an idea of the structural status of the typical soils of Kerala and its relation ship to Physical and Chemical properties.

b) Practical utility:

Structural status of soils play an important role in deciding crop growth. Such basic information are not available as far as the soils of our state are concerned-such basic data are useful in studying crop growth and behvariour. Hence the study is proposed.

c) Review of literature:

The work on soil structure was mainly confined to the evaluation of soil structure and its improvement by cultural and management practices. The evaluation of structure has been made in terms of size distribution of aggregates, aggregate stability and such soil properties as synonymous with soil structure. The quantitative indices of soil structure are based either on the quantities of aggregates above a particular size limit or the weighted average of all the aggregates. Percentage of aggregates greater than 0.25 mm in diameter provides a fair estimate of such indices of structural status of soils (Biswas et al 1961, 67, 69; Sandhu & Bhumbla (1968).

Following the wet seiving technique; structural status of few soils has been reported. In soils containing higher contents of clay, clay is a major constitutent in soil aggregation. (Biswas et al 1961; Tamhane & Datta 1965). Yadav and Banerjee (1968), on the other hand did not find any such relation in the case of forest soils, which contained significant amounts of organic matter. The positive correlation obtained with organic matter and soil aggregation did not held good in the case of lateritic soils (Ghildyal 1969).

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9. Technical programme: Soil samples will be collected from all the major research stations of the state and their structure evaluated. The physical and chemical properties related to structure will also be studied, and their relationship worked out.

Observations:

i. Measurement of stability of aggregates.
ii. Measurement of soil properties related to soil structure.

10. Date of start	:	February 1979.
11. Date of completion	:	January 1980.
12. Estimated man months	:	
13. Facilities required	:	Facilities available in the College of Horticulture will be utilised.
14. If financed by an organisation other than the institution:		
15. Approximate cost	:	Rs.2000/-

Sd/-
Head of division.

FRC - 10.

PERSONAL PROJECT NO. II.

1. Institution code no. : AG. 21. 19. Che. 2901.

2. Name and address of the Research project : College of Horticulture, Vellanikkara.

3. Division/Department to which the project is attached : Dept. of Agrl. Chemistry.

4. Title of the project : Fertilizer retention in soil in relation to soil characteristics.

Title of problem : 1st phase teaching loss of ammonium sulphate at different levels of organic matter.

5. Location of the research project : Vellanikkara.

6. Name and address of
a) Project leader : Smt.G. Droupathi Devi, Asst. Prof. College of Horticulture.

b) Project Associate : Dr.A.I. Jose,
Smt. K. Leela
Smt. K.C.Marykutty.

7. Objective/Practical utility/ justification of the research Project:

Object: To study the leaching loss of amm9nium sulphate at different levels of organic matter application.

Practical utility:

1. To state how the leaching loss of ammonium sulphate can be prevented by controlling draining of water from the field.

2. To state how for the organic matter application is effective in controlling the loss of nitrogenous fertilizers from the field.

3. To assess the period taken for complete adsorption of amonium, after application of fertilizer and the safety time for draining the field after fertilizer application.

8. Review of literature:

Padmaja and Koshy (1978) conducted studies on the run-off loss of nutrients in water-logged rice soils of Vellayani and reported that 70% of applied N and 26% of applied K lost on the same day of fertilizer application. The rate of loss was considerably reduced after 48 hours and was negligible after 5th and 2nd day of application for N and K, respectively. There is no appreciable loss of applied P.

Viswanath et al (1978) has conducted studies on the relative leaching losses of nitrogenous fertilizers and their influence on the yield of ragi in red sandy loam soil of Bangalore.

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Not much work has been carried out in fertilizer retension in soils of Kerala in relation to soil characteristics. Hence the present study can be taken up to supplement morevaluable information in this line.

9. Detailed technical programme:

Ammonium sulphate @ 90 kg/ha will be applied to different small containers having known weight of soil. Organic matter will be supplied at different levels to each container. The leaching loss at every 6 hours has to be studied by collecting leachate after application of ammonium sulphate.

No. of Treatments - 6
No. of Replication- 3

Treatments:

1. Control - Ammonium sulphate @ 90 kg/ha.
2. Tr. 1 - Ammonium sulphate @ 90 kg/ha + Organic matter @ 2T/ha.
3. Tr. 2 - -do- + Organic matter @ 3T/ha.
4. Tr. 3 - Amm. sulphate @ 90 kgpha + Organic matter @ 4T per ha.
5. Tr.4 - Amm. sulphate @ 90 kg/ha + Organic matter @ 5T/ha.
6. Tr.5 - Amm. sulphate @ 90 kg + ha + Organic matter @ 6T/ha.

10. Observations to be recorded:

1. Initial analysis of the soil for organic matter content and nitrogen.
2. Analysis of leachate collected at different intervals for the ammonical nitrogen content.
3. Final analysis of soil from all the treatments for organic matter and nitrogen content.

11. Date of start : Feb. 1979.

12. Likely date of completion : 1982

13. Estimated man days

14. Facilities required : Facilities available in the College of Horticulture.

15. Approximate cost : Rs.1000/- (lumpsum)

Signature of Project leader Sd/-

FRC - 10.

KERALA AGRICULTURAL UNIVERSITY

RICE RESEARCH STATION - MONCOMPU.

Proforma for Research Project Proposal

Faculty of Agriculture — Department of Entomology.

1. Name of Research Centre : Rice Research Station, Moncompu.
2. Project No. : AG. 22.5. Agr. 4.01.
3. Title of the Project : Compatibility of 2-4,D with insecticides.
4. Names and designation of
   a) Project leader : Dr M.J. Thomas, Associate Professor (Ent.)
   b) Associates : P.S. John, Junior Assistant Professor.
5. Location of Research Project : Rice Research Station, Moncompu.
6. Objective of the project:

To test whether 2-4,D the popular weedicide can be combined with the common insecticides to get combined action against weeds as well as insect pests at the same time.

7. Practical utility:

2-4,D is widely used against broad leaved weeds in the paddy fields and the critical time of application is 20-25 days after transplanting/sowing. In this younger stage of crop, usually there is severe attack of thrips, army worm and gall fly. The farmers are compelled to undertake insecticide & weedicide sprayings separately. If these chemicals can be applied in a single spraying without phytotoxicity and at the same time keeping the weedicidal and insecticidal effects, the application charges of one spraying (about Rs. 40/- per hectare) can be saved.

8. Short review of the literature:

At present our recommendation is that the insecticide and weedicide should not be mixed. No work is seen done in this line. An observation trial conducted at this station showed that 2-4,D can be safely mixed with BHC and Sevin without any phytotoxicity and also without loss of weedicidal action. Hence this experiment is proposed.

9. Technical programme:

Design : 10 x 3 R.B.D.
Plot size : 5 x 4 m.

Treatments - 10.

1. BHC 50% @ 2.5 kg/ha + 2,4-D Sodium salt @ 1 kg/ha.

Contd.....2/-

2. Sevin 50% @ 2.5 kg/ha + 2,4-D Sodium salt @ 1 kg/ha.
3. Ekalux 1000 ml/ha + 2,4-D Sodium salt @ 1 kg/ha.
4. Demecron 250 ml/ha + 2,4-D Sodium salt @ 1 kg/ha.
5. 2,4-D Sodium salt and 1 kg/ha alone.
6. BHC 50% @ 2.5 kg/ha alone.
7. Seven 50% 2.5 kg/ha alone.
8. Ekalux @ 1000 ml/ha alone.
9. Dimecron @ 250 ml/ha alone.
10. Control - No insecticides or weedicide spray. All the treatments are sprayed during 20-25 days after transplanting.

10. Observations to be taken:

1. Weed population/unit area at regular interval (20 days).
2. Dry weight of weeds prior to application of treatments and after weeds at 20 days interval (3 times).
3. Vegetative tiller and height.
4. Insect count prior to application of treatments 2 days and 1 a week after application of treatments (3 times).
5. Observations on phytotoxical effects, if any
6. Productive tiller and height.
7. Grain yield and straw yield.

Note: Standard evaluation scale developed by IRRI will be followed for registering the observations.

11. Date of start : October 1979.

12. Likely date of completion : January 1982.

13. Additional facilities required : Existing facilities in the Station.

14. Approximate cost : Rs. 2,250/- per season.

15. Signature of:

Sd/-

Project Leader. Head of Department. Director of Research.

FRC - 11.

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P R O F O R M A

KERALA AGRICULTURAL UNIVERSITY

FACULTY OF AGRICULTURE

DEPARTMENT OF AGRL. BOTANY, COLLEGE OF HORTICULTURE, VELLANIKKARA.

PROGRAMME OF RESEARCH FOR MASTER'S DEGREE

(For approval of University)

AG. 22.19. Bot. 1.01.

1. Name of candidate : Miss. Nandini, K.
2. Date of Admission and Admission No. : 10-10-1979. 79-11-19.
3. Name and designation of Chairman of Advisory Committee : Luckins C. Babu, Assistant Professor of Agrl. Botany.
4. Topic of Research for thesis : Seed biology and Seedling characteristics of important weeds in Kerala.
5. Objective of the research

To study the various aspects of seed biology of weeds and the seedling characteristics of weeds.

6. Brief review of previous work done on the topic (give reference important publications):

N. Zinger (1909) introduced the violar concept which was modified into voilure co-efficient (k) by Hotrovo (1912). According to this concept the value of K is higher in small sized seeds and so they are widely dispersed. The compositae member have the K value as high as 670. Work of King (1974) showed that weeds like portulaca oleraceae, Amaranthus retroflexus, plantago major etc. could remain viable for 40 years. According to went (1954) germination is a major factor in the establishment of weed for weeds which can germinate along with the crop cause very great damage. Studies conducted by King (1974) also showed that the root system is also an important factor in the establishment of weed. The root system of Medicago Sativa may penetrate the soil to a depth from 10 to 20 feet.

In India especially with reference to Kerala not much work has been done on the above said factors. So there is wide scope for conducting studies on these aspects under Kerala conditions.

7. Scientific and/or practical importance of the research:

1. As a part of this, a weed seed herbarium is proposed to be maintained.
2. To serve as a ready reference foridentification of weed seeds in seed technology.

Contd.....2/-

3. By studying the Violar Co-efficient of weed seeds we can predict the potential danger of any new introduced weed for example weeds like Parthenium, Eupatorium.

4. The control of weed is a formidable task. In the present set up chemical control is not economically feasible. Mechanical control is the only possible method under Kerala conditions. The study of seedling characteristics of weeds will help us to identify the weeds before they reproduce and spread widely and in this way it may help us to evolve methods of erradication of the weeds in the most effective manner.

8. Technical programme:

   1. Collection and identification All available weed seeds will be collected and maintained, after identifying, as a weed seed herbarium.
   2. Morphological aspects of weed seeds like no. of seeds per fruit, size shape and wt. of seeds, special features, dispersal mechanisms, etc. will be studied.
   3. Studies will be carried out on the different aspects of germination of weed seeds like time taken, percentage of germination etc.
   4. The seedling characteristics of weeds like height, no. of leaves, extent of development of root system, etc. will be undertaken.

9. Expenditure : Rs. 5,000/-

10. Location of the experiment : College of Horticulture, Vellanikkara.

Sd/-
Signature of the candidate.

FRC - 12.

KERALA AGRICULTURAL UNIVERSITY

FACULTY OF AGRICULTURE

Programme of Research for Master's Degree

DEPT. OF ENTOMOLOGY COLLEGE OF AGRICULTURE, VELLAYANI.

AG. 22.19. Ent. 1.01.

1. Name of Candidate : Smt. Lyla, K.R.
2. Date of admission and No. : 16-10-1978. 78-11-60.
3. Name and designation of Chairman of Advisory Committee : Dr Joy, P.J., Assistant Professor.
4. Topic of Research for thesis:

"Studies on the pests of Eupatorium odoratum and Lantana camera"

5. Objective of Research:

To gather information about the pests attacking the notorious weeds Euratorium and Lantana. This basic information will be needed for future formulation of biological control programmes against the weeds.

6. Brief review of previous work done on the topic:

Joy (1977) conducted some preliminary survey on the insects attacking Lantana and reported the lantana bug Teleonemia sorupulosa Stal. (Hemiptera: Tingidae) for the first time from Kerala. This bug is reported very useful for the biological control of Lantana and hence further studies on its spread and efficiency will be useful.

Similar studies on Eupatorium is at present wanting in the State.

7. Scientific and/or practical importance of the research:

The study will be most useful for formulating future biological control programmes against the weeds.

8. Technical Programme:

a) Detailed survey of the pests of Eupatorium and Lantana in Trichur District. Random Survey of the pests of these weeds in selected districts of Kerala.
b) Seasonal occurrence of these pests will be studied by periodical inspection of selected spots in Trichur District.
c) Relative efficiency of these organisms will be studied by taking population counts, measuring the intensity of damage etc.
d) Simultaneously the biology and morphology of the most promising pests will be studied under laboratory condition.

9. Estimate of Expenditure and receipts if any : Rs. 9,500/-
10. Location of Research : Department of Entomology, College of Horticulture.

Place: Vellanikkara.
Date : 16-3-1979.

Signature of Candidate.

FRC - 9.

KERALA AGRICULTURAL UNIVERSITY

FACULTY OF AGRICULTURE

DEPARTMENT OF PLANT PATHOLOGY

College of Agriculture.

Programme of Research for M.Sc.(Ag.)

(For approval of University)

AG. 22.18. Path. 1.01.

1. Name of the student : MATHEW, A.V.
2. Date of admission & Admission No. : 16-10-1978. 78-11-35.
3. Name & Designation of Chairman, Advisory Committee : Dr M.R. Menon, Professor of Plant Pathology.
4. Topic of Research for thesis:

"Role of Weeds in the perpetuation of virus diseases of vegetables and ornamental crop plants.

5. Objectives:

The role of weeds in the epiphytotic ~~xxdix~~ incidence of certain virus diseases affecting economic crop plants has been well established. Disease symptoms caused by whitefly transmitted and aphid transmitted viruses are often noticed on a number of weed plants in different parts of Kerala. Yellow vein mosaic of Bhindi is a whitefly transmitted virus disease. Similar yellow vein mosaic symptoms are noticed on a number of weeds like Ageratum conyzoides. But only a few weeds are identified as collateral hosts of viruses affecting crop plants in Kerala. Hence it is necessary to identify the viruses infecting the weeds and to know whether these weeds act the viruses as collateral hosts of plant pathogenic viruses affecting crop plants.

6. Brief review of previous work done on the topic:

Mariappan and Narayanaswamy (1977) reported that Achanthospermum hispidum acts as the collateral host of tomato leaf curl virus in India. The weeds Amaranthus viridis and Trianthema decandra have been reported as the collateral hosts of Amaranthus mosaic virus and the virus was transmitted by the aphids Myzus persieae, Aphis gossypii and A. craccivora (Mariappan and Narayanaswamy, 1977). The weeds Solanum nigrum and Trianthema portulacastrum harboured the chilli mosaic virus and the aphids A. gossypii, A. craccivora, A. evonymii and Myzus persieae were able to transmit the virus. (Mariappan and Narayanaswamy, 1977).

7. Scientific and/or practical importance of research:

It is highly essential to identify the host range of viruses infecting crops in order to have information

Contd.....2/-

on the mode of perpetuation of the viruses. This information is absolutely essential in the formulation of control measures. So the result of the studies will throw more light on collateral hosts of viruses of plants on which they survive in the absence of the main economic hosts. By the eradication of the collateral hosts, the source of inoculum of the virus can be reduced and thereby prevent the spread of the disease to a great extent. Hence, the study has much practical importance.

8. Technical programme:

1. Survey of the virus diseases affecting garden land weeds.
2. Establishment of the viral nature of the disease.
3. Maintenance of the culture of the viruses.
4. Determination of the vector of the viruses.
5. Host range of the viruses.
6. Assessment of the inter relationship of the viruses occurring on weed plants with those affecting crop plants, particularly vegetables like bhindi, chillies, brinjal, tomato, cowpea etc.

7. Approximate cost : Rs. 3,500/-

8. Location of research : College of Agriculture, Vellayani.

Vellayani,
Date: 7-2-1979.

Sd/-
Signature of the candidate.

FRC - 8.

KERALA AGRICULTURAL UNIVERSITY

RESEARCH PROJECT

1. Faculty of Agriculture : Entomology.
2. Name of Research Centre : College of Horticulture, Vellanikkara.
3. Project No. : AG. 23.19. Ent. 1.02.
4. Title of the project : Management of Bandicota Bengalensis.
5. Name and Designation of
   a) Project leader : C.M. George, Jr. Asst.Professor.
   b) Associates : 1. C.C. Abraham, Professor(Ent.).
      2. P.J. Joy, Asst. Professor (Ent.).
6. Objectives:

In Kerala B. bengalensis is ~~ø~~ the most serious rodent pest damaging tuber crops such as Tapioca and Colocasia. This project is aimed to find out efficient methods of managing populations of B. bengalensis.

7. Practical utility:

The result will be useful to the cultivators for controlling B. bengalensis populations in garden lands.

8. Review of literature:

Barnett and Iswar Prakash (1975) indicated that the nature of bait base in a poisoning operation determines the intake of lethal dose by rats. Acceptance and relative preference of different foods by Rattus rattus and Bandicota bengalensis were studied by Nair and Pillai (1978). Chandy Kurian et al (1977) reported the efficiency of Bamboo noose trap in controlling B. bengalensis.

9. Technical Programme:

1. Burrows of B. bengalensis are very extensive and usually only one adult rat will be found in a burrow system. Major portions of burrow system will be at a depth of 10 to 20 cm. below the soil surface. The burrows of B. bengalensis will be first located. Burrow will be opened at a point, the different types of traps will be set and kept inside the burrow. The burrow is then closed without disturbing the trap using twigs, banana leaves and soil to provide a camouflage effect externally.

2. The bait preference of these rats will be ascertained by opening the burrows at certain points and offering bait materials. The burrows will be examined subsequently for the acceptance of the bait. In order to ascertain whether the rat/rats have succumbed to poisoning, burrow net work will be opened up at a particular

Contd.....2/-

point. If the burrows are subsequently closed the indication will be that the burrow still contain live rats.

Bait carriers: 1. Tapioca tuber bits
2. Coconut meat
3. Dry fish
4. Onion
5. Partially ground rice with 2% veg. oil.
6. Partially ground wheat with 2%veg. oil.
7. Combination of cement + rice + dry fish.
8. Paddy seed soaked in systemic and non systemic insecticides.

Note: Zinc phosphide will be used as the toxicant in the present studies.

Different types of traps to be used : 1. Saw toothed metallic scissor type trap.
2. Bamboo noose trap.
3. 'Adivil' trap.

10. Date of start : December 1979.

11. Date of completion : December 1981.

12. Approximate expenditure : Rs. 1,000/-

Sd/-
PROFESSOR OF
ENTOMOLOGY & ENTOMOLOGIST.

Sd/-
Signature of Project Leader.

FRC - 11.

KERALA AGRICULTURAL UNIVERSITY

RESEARCH PROJECT

1. Faculty of Agriculture : Entomology.
2. Name of Research Centre : Research Station & Instructional Farm, Mannuthy.
3. Project No. : AG. 23.2. Ent. 2.02.
4. Title of the project : Field and laboratory tests on the acceptability of paraffin-rice mixed baits to rodents in Kerala.
5. Name and designation of
   a) Project leader : C.M. George, Jr. Asst. Professor.
   b) Associates : 1. V.K. Sasidhar, Associate Professor.
      2. C.C. Abraham, Professor.
      3. K. Pushkaran, Junior Asst. Professor.
6. Objectives : To find out the optimum percentage of paraffin in baits to be used in Kerala conditio n.

7. Practical utility:

This project may give a better method of control of rats in Kerala both in the cultivators' fields and store and also in the live stock farms.

Review of literature:

The trials conducted in Taiwan indicated that PR bait's (Paraffin baits) were very suitable for use in field rodent control. (Te-Yeh Ku (79). The success recorded in Taiwan, Clearly illustrates its possibility in our State also.

9. Technical programme:

A Laboratory tests

Rodents of economic importance such as Rattus norvegicus, Bandicota bengalensis B. Indica and Rattus rattus will be caught in live traps using suitable bait materials. They will be kept in individual cages (50 x 35 x 23 cm) with water and food provided. After three weeks the animals will be considered as acclimatized to laboratory conditions and preference tests will be started.

The paraffin wax-rice mixed (PR) baits to be used in the tests are of five different combinations: 100% rice, 70% rice + 30% paraffin wax (70:30), 50% rice + 50% paraffin wax (50:50), 30% rice + 70% paraffin wax (30:70) and 100% paraffin wax. The PR bait is formed by mixing unpolished rice with method paraffin wax which binds the rice grains together and enables the bait to be moulded into various shapes and sizes.

Contd.....2/-

B. Field tests

Field preference tests of PR baits and unpolished rice are to be conducted in various crops at different stations in the state. The places of field tests to be carried out will be selected according to the severity of the rat problem. Rattus norvegicus is a severe threat to the Rice growers of Kuttanadu, Rattus rattus is a permanent problem in the coconut plantation at Kumarakom, Rattus rattus and squirrels cause serious damage to cocoa pods in the State. B. Benqualensis damages paddy in Palghat and Quilon districts and tuber crops especially tapioca, through out the state and B. Indica and R.Rattus causing considerable damage in poultry farms eating chicken feed and eggs and also acting as vectors for various chicken diseases. So in order to suggest a better device to control these rats, field tests are to be conducted in all the above conditions.

Total no. of places where field tests are to be carried out : 8

10. Date of start : September 1979.

11. Date of completion : December, 1983.

12. Approximate expenditure : Rs. 5,000/-

Sd/-
SIGNATURE OF PROJECT LEADER.

FRC - 11.

KERALA AGRICULTURAL UNIVERSITY

FACULTY OF AGRICULTURE

PROGRAMME OF RESEARCH FOR MASTER'S DEGREE

AG. 23.18. Ent. 19.02.

1. Name of candidate : NANDA KUMAR, C.
2. Date of admission and Admission No. : 16--10--1978. 78-11-28.
3. Name and designation of the Chairman of Advisory Committee : Dr A. Visalakshi, Associate Professor of Agrl. Entomology.
4. Topic of research for thesis:

Studies on the movement and placement of systemic granular insecticides in soil in relation to control of pests of pulses.

5. Objective of research:

Pulses are subject to infestation by a number of insects in the early stages of growth. These include the pea aphid and stem fly and these insects very often affect the normal growth of the crop. Systemic insecticides applied as granules in soil are known to be effective in controlling these early infestations. These insecticides have the capacity to move in the soil medium to varying extent. But precise information on such movement is not available in relation to the soils of Kerala. This information will be useful in deciding the placement of the insecticide and thereby minimise the quantity used for application. The present project is hence proposed to study the movement and placement of three common granular insecticides in the soils of Kerala with reference to the control of the early stage pests of pulses. Follow up protection of the crop will be done using a standard contact insecticide.

6. Brief review of previous research work done on the topic:

Movement of phorate applied in soil has been studied by Bardher and Burt (1962), Etheridge and Burt (1963) and Schulz et al (1973) outside India. Similar studies in Kerala soils have been made by Visalakshi et al (1979). No other information about the movement of the different systemic insecticides in soil is available in India. The present studies have hence been proposed.

7. Scientific and/or practical importance of research:

The results of the studies will indicate the correct placement of the granular insecticides in different soil types and the dosage of chemical can be adjusted in such a way as to minimise the loss by excess use. The results may thus be useful in reducing the investment for plant protection on pulses.

Contd.....2/--

8. Technical programme:

(1) Movement of the systemic insecticides in different soil types.

(a) Insecticides : Phorate, Carbofuran and Disulfoton
(b) Doses : 2
(c) Soil types : 5
(d) Procedure : Soils will be filled in trays of 1.5 M x 1.5 M x .25 M size and watered to the level of field capacity. Insecticide will be applied at a fixed point and their movement observed in terms of the absorption by pulse seedlings, planted at different distances from the point of application. The absorptions will be measured by mortality of aphids confined on them.

(ii) Field experiment on placement of insecticide granules in soil for control of pulse insects.

The details are as follows:-

(a) Insecticide : Phorate, Carbofuran and Disulfoton
(b) Doses : 2
(c) Placement : 4 types, 1) In between rows
2) In between alternate rows
3) At plant base
4) Broadcast
(d) Design : R.B.D.
(e) Replication : 3
(f) Plot size : 3 M x 3 M

The results will be assessed by observing the mortality of pea aphid released on the plant at regular intervals after insecticide placement. Follow up protection of the crop will be accomplished by foliar application of sevin.

(iii) Residue estimation in pods of plants under various treatments.

The residues will be estimated by bioassay and/or by colorimetry.

9. Duration of research project : 1 year.

10. Estimate of expenditure & Receipts : Rs. 6,000/-

11. Location of research of project : College of Agriculture, Vellayani.

Place : Vellayani.
Date : 8--3--1979.

Sd/-
Signature of the student.

Sd/-
Signature of the Chairman,
Advisory Committee.

FRC - 8.

KERALA AGRICULTURAL UNIVERSITY

RESEARCH PROJECT

Faculty of Agriculture : Department of Entomology.

1. Name of Research Centre : College of Agriculture, Vellayani.
2. Project No. : AG. 23.18. Ent. 22.01.
3. Title of the Project : Survey of microbial pathogens associated with major insects pests of bhindi.
4. Name & Designation of
   a) Project Leader : Dr P.B. Gopinathan, Assistant Professor.
   b) Associate : Smt. S. Nazeema Beevi, J.A.P.
   Dr Abraham Jacob, Associate Professor.
   Sri. P. Sivaprasad, J.A.P.

5. Objectives:-

To study the natural incidence of pathogenic agents infecting the major insect pests of bhindi and to evaluate the relative importance.

6. Practical Utility:-

If the survey leads to the identification of promising insect pathogens these can be utilised as a component of the pest management programme for bhindi.

7. Technical Programme:

1. Survey on disease incidence among the major pests of bhindi will be carried out by drawing out periodical samples from the natural population. The survey will be restricted to the microbial pathogens associated with the following major pests.

Bhindi: Leaf roller, Sylepta derogata shoot and fruit borer Earias vitella, Leaf hopper, Amrasca biguttula and Aphis gossypii.

2. The field collected population will be reared under laboratory conditions to observe mortality due to microbial agents.

3. The infected hosts will be preserved and subjected to microbial analysis.

4. The microbial agents will be identified by referring both the isolated pure pathogen and infected hosts to the Dept. of Insect Pathology, University of California, Berkeley, or some other suitable laboratories.

9. Date of start : February, 1980.
10. Likely date of completion : 1982.
11. Approximate cost : Rs. 5,000/-

Sd/-

Project Leader. Head of Department. Director of Research.

FRC - 11.

Programme of Research work for Ph.D.

AG. 23.18. Ent. 22.02.

1. Name of candidate : Miss. SUMA KURUVILLA.
2. Date of admission and admission No. : 10--10--1979.
3. Name and designation of Chairman of Advisory Committee : Dr Abraham Jacob, Associate Professor, Dept. of Entomology.
4. Topic of research for thesis:

Insect mycosis caused by Paecilomyces farinosus (Dickson ex Fries) and the scope for utilising the pathogen in pest control.

5. Objectives of the research:

Residue hazards and instance of phytotoxicity reduce the choice of chemicals for insect control. Microbial control of insect has already proved, in many instances, as an alternative or supplement to chemical control. Recent studies at the College of Agriculture, Vellayani have revealed that the entomogenous fungus Paecilomyces farinosus has a wide host spectrum including important crop pests like Nilaparvata lugens, Sylepta derogata, Antoba olivaceae, Diacrisia obliqua, Margaronia indica, Plusia peponis, Hymenia recurvalis and Dysdercus cingulatus. The present project is aimed at making detailed studies on this pathogen so as to assess its suitability in practical pest management programme.s

6. Brief review of previous work done on the topic:

Paecilomyces farinosus has been reported from abroad on Heliothis armigera (Alma, 1975), potato beetle Leptinotarsa decimlineata (Bajan and Kmitowa, 1969; Ramisch, 1976) and Cydia pomonells (Lappa, 1975). From India it has been recorded on white fly Bemisia tabaci (Nene, 1973) and mango leafhopper Orthaga exvinaceae (Asari et al., 1977).

7. Scientific and/or practical importance of the research:

The study will reveal the practical utility of this pathogenic fungus in pest control.

8. Technical Programme:

1. Cultural characteristics of the pathogen.
2. Effect of physical factors viz., temperature, humidity, p^H and light on the pathogen.
3. Host range of the pathogen.

Contd.....2/-

4. Mechanism of infection of the pathogen.
5. Physiological changes in the infected insects.
6. Isolation of mycotoxin if any.
7. Histological and ultrastructural studies on the infected insects.
8. Compatibility with chemical insecticides.
9. Techniques of easy and economic mass culturing of the pathogen.
10. Field/pot culture experiments using the pathogen alone/and in combination with insecticides for the control of susceptible crop pests.
11. Savety of the pathogen to crop plants and vertebrates.

9. Estimate of expenditure if any : Rs. 10,000/-

10. Location of research if outside College Campus : NIL.

Sd/-
Signature of the Candidate.

Place: Vellayani.
Date : 30-1-1980.

FRC - 11.

P R O F O R M A

KERALA AGRICULTURAL UNIVERSITY

Department of Agrl. Entomology, College of Agriculture, Vellayani.

PROFORMA FOR RESEARCH FOR MASTER'S DEGREE

(For Approval of University)

AG. 23.18. Ent. 22.03.

1. Name of the candidate : Maicykutty P.Mathew.
2. Date of admission & admission number : 16-10-1978. 78-11-27.
3. Name and designation of the Chairman of the Advisory Committee : Dr Abraham Jacob, Assoc. Professor, Department of Entomology.
4. Topic of Research for thesis:

Survey of the microbial diseases of important vegetable pests of Kerala and detailed study of the snake gourd semiloopers, Phytometra spp.

5. Objectives of Research for the thesis:

1. To identify the indegenous microbial pathogens of Phytometra spp. in Kerala.

2. To gather basic information on these pathogens so as to assess the suitability of these pathogens in the microbial control of the pest.

6. Brief review of previous work done on the topic. (give reference to important publication/thesis):

The semi looper caterpillars, Phytometra peponis, P. Orichalceae and P. Chalcytes cause severe defoliation of snake gourd in all cultivated tracts of Kerala. Being a vegetable crop biological methods, if any, will be more suitable compared to chemical methods for the control of these pests. In this contest, microbial control offers good prospects. However, practically no information is available on the indigenous microbial pathogens of these insects in Kerala. Diseases recorded from other parts of India include nuclear polyhedrosis on Phytometra chalcytes and P. Peponis (Rabindra et al., 1975 and Rabindra & Subramaniam, 1975) and nosemosis on P. peppnis (Narayan & Subramaniam, 1976).

7. Scientific and/or practical importance of the research:

These studies will bring out basic information necessary to assess the utility of pathogens in the microbial control of the snake gourd semilooper.

Contd.....2/-

8. Technical programme:

1. Survey and identification of microbial diseases of Snake gourd semi loopers in and around Vellayani.
2. Nature of the pathogens.
3. Susceptibility of different larval stages to the pathogens.
4. In the case of efficient pathogens further studies on cross transmission, mass culture, field persistence and other related aspects will be studied.

9. Estimate of expenditure/ Receipts : Rs. 4,000/-

10. Location of Research if outside College Campus : NIL

Sd/-
Signature of Candidate.

Place: Vellayani.
Date : 5-3-1979.

FRC - 8.

KERALA AGRICULTURAL UNIVERSITY

RESEARCH PROJECT

Faculty of Agriculture Department of Entomology.

1. Name of Research Centre : College of Agriculture, Vellayani.
2. Project No. : AG. 23.18. Ent. 22.04.
3. Title of the Project : Studies on the use of Bacillus cereus Frankland & Frankland for the management of lepidopterous crop pests.
4. Name & Designation of
   a) Project Leader : Dr P.B. Gopinathan, Assistant Professor.
   b) Associate(s) : Dr Abraham Jacob, Associate Professor.
   Sri. Babu M. Philip, Junior Assistant Professor.
   Smt. Nazeema Beevi, Junior Assistant Professor.
   Dr James Mathews, Associate Professor.

5. Objectives :-

This project is proposed for undertaking studies on the use of Bacillus cereus for the control of important caterpillar pests of Kerala such as Spodoptera litura, S. mauritia, Cnaphalocrocis medinalis, Anadenidia peponis (Plusia peponis), Hymenia recurvalis, Nephantis serinopa etc.

6. Practical Utility:-

These studies will be helpful to ascertain the possibility of using B. cereus for the control of caterpillar pests.

7. A short review of literature:-

Bacillus cereus Frankland & Frankland is known as an efficient controlling factor of lepidopterous larvae in nature. In India, various species of caterpillars such as Papilio demoleus, Pericyma glaucinans and Mythimna separata have been reported to be infected by the bacterium. This is a spore forming bacterium which can be formulated into dust or wet table powders. It can also be combined with insecticides for exploring joint action.

In a survey on disease incidence of insect fauna of South India, Rangaswamy and Ramamurthy (1963) recorded 90-100 per cent mortality of Papilio demoleus and pericyma glaucinans by Bacillus cereus. Kunshwa

Contd.....2/-

and Gopinathan (1972) reported occurrence of natural epizootic of Mythimna separata caused by B. cereus. They isolated the different strains of the bacterium in pure culture and established their pathogenicity on the host larvae.

8. Technical Programme:-

(1) Testing the infectivity of the bacterium to different caterpillar pests, Spodoptera litura, S. mauritia, Plusia peponis Nephantis serinopa, Hymenia recurvalis. The most susceptible stage of (instar) of the caterpillar will be ascertained in each case.

(2) Lethal dose required for the desired control of the caterpillar will be fixed in the laboratory.

(3) The bacterium will be tested against the susceptible caterpillars under field conditions.

(4) Compatability of insecticides bacterium mixtures will be studied and the possibility of reducing the dosage of insecticides by mixing with bacterium will be examined.

9. Date of start : February 1980.

10. Likely date of completion : .1982.

11. Approximate cost : Rs. 7,000/-

Sd/- Sd/-
Project Leader. Head of Department. Director of Research.

FRC - 11.

RESEARCH PROJECT

Faculty of Agriculture — Department of Entomology.

1. Name of Research Centre : College of Agriculture, Vellayani.
2. Project No. : AG. 23.18. Ent. 22.05.
3. Title of the Project : Bacterial disease incidence in Oryctes rhinoceres grubs.
4. Name(s) and designation of
   a) Project Leader : Dr P.B. Gopinathan, Assistant Professor.
   b) Associate(s) : Dr Abraham Jacob, Associate Professor.
   Sri. Babu M. Philip, Junior Asst. Professor.
   Smt. S. Nazeema Beevi, Junior Asst. Professor.
   Dr James Mathew, Associate Professor.

5. Objectives:-

The present project is aimed to study the potent cause of bacterial pathogen of Rhinoceros beetle of coconut crop of Kerala.

6. Practical Utility:-

The project will help in probing the possibilities of utilizing bacterial pathogen for managing population of the Rhinoceros beetle infesting coconut palms and to ascertain the feasibility of microbial control in an integrated management strategy.

7. A short review of literature:-

Nirula (1955) recorded the green muscardine fungus, Metarrhizium anisopliae infecting Oryctes rhinoceros. The Rhabdion virus was isolated from O. rhinoceros and found to be very effective in controlling the pest in Fiji (Bedford, 1976).

8. Technical Programme:-

1. Studies to find out suitable media for large scale multiplication of the entomogenous bacteria in the laboratory.

2. Testing infectivity of bacterial pathogen on different instars of the pest and the most vulnerable stage (of pest) will be ascertained.

3. Determination of the lethal dose required against the pest.

4. The bacterium will be tested in the field conditions in manure pits to ascertain the practical use

Contd.....2/-

in regulating the rhinoceros beetle. The observation will be on the replicated number of manure pits treated with the bacterium.

5. The persistence of the bacterium in insect in the laboratory and field conditions will be determined.

9. Date of start : February 1980.

10. Likely date of completion : 1981.

11. Approximate cost : Rs. 7,000/-

Sd/-
Project Leader. Head of Department. Director of Research.

FRC - 11.

KERALA AGRICULTURAL UNIVERSITY

RESEARCH PROJECT

Faculty of Agriculture. Department of Entomology.

1. Name of Research Centre : College of Agriculture, Vellayani.
2. Project No. : AG. 23.18. Ent. 22.06.
3. Title of the Project

Microbial diseases of stored products insects of Kerala and their utilization in pest control.

4. Name s) and designation of

a) Project Leader : Babu M. Philip, Jr. Assistant Professor.

b) Associate(s) : 1. Dr Abraham Jacob, Associate Professor.
2. Mr. Sivaprasad, Junior Assistant Professor (Path.)

5. Objectives -

To make investigations on the microbial diseases of important insect pests of stored rice, tapioca and stored cashew kernels, copra.

6. Practical Utility:-

The studies will bring out efficient microbial agents useful in stored product pest control.

7. A short review of literature:-

Many species of insect affecting stored products have been reported to be susceptible to diseases caused by micro-organism. Burkholder and Boush (1974) reported a protozoan parasite Mattesia granarium on Torgoderma granarium and its use in biological insect pest suppression has reached in pilet stage.

8. Technical Programme:-

(i) Investigations of micro-organisms infecting important pests stored rice tapioca, copra and cashew kernels. Collection of infested samples of FCI and other godowns at monthly intervals and maintenance and observation of these samples in the laboratory (3 samples of each the material will be collected) for disease incidence.

(ii) Identification of pathogens from each godown if any detected.

(iii) Studies and nature of pathogen.

(iv) Fixing the optimum effective dose of promising pathogens.

(v) Mass culturing of the promising pathogens of cheaper media.

Contd.....2/-

(vi) Testing the efficacy of pathogen in statistically designed experiments.

10. Date of start : 1--1--1980.

11. Likely date of completion : 31--12--1981.

12. Approximate cost : Rs. 5,000/-

13. Signature of

Sd/-	Sd/-	
Project Leader.	Head of Department.	Director of Research.

KERALA AGRICULTURAL UNIVERSITY

RESEARCH PROJECT

Faculty of Agriculture — Department of Entomology

1. Name of Research Centre : College of Agriculture, Vellayani.
2. Project No. : AG. 23.18. Ent. 23.01.
3. Title of the Project : Studies on the biological effect of juvenile hormone analogues on some important crop pests and the associated natural enemy complex.
4. Name and designation of
   a) Project Leader : K. Saradamma, Asst. Professor.
   b) Associate(s) : Dr N. Mohandas, Professor.
   Dr D. Dale, Assoc. Professor.

5. Objectives:-

To find out the feasibility of using juvenile hormone analogues in substituting or supplementing conventional insecticides.

6. Practical Utility:-

Studies conducted in the College of Agriculture, Vellayani have indicated that synthetic juvenile hormone analogues and some plant extracts containing such principles produce adverse morphogenetic changes in insects ultimately leading to their death. These compounds are needed in very low concentrations only and are safer than synthetic insecticides to non-target organisms. Hence they can utlimately be utilised as safe components of a pest management system.

Black headed caterpillar of coconut, Nephantis serinopa has been proved to be controlled successfully by biological agents i.e. with the larval and pupal parasites. The Epilachna beetle on vegetables is also controlled to some extent in nature by a large number of parasites and predators. Hence studies on the effect of juvenile hormone analogues on the coconut caterpillar and Epilachna beetle and their natural enemy complex will be much useful for suggesting these compounds in the integrated control programme.

7. Review of literature:-

Synthetic juvenile hormone analogues like ZR. 515, ZR. 485 and JR. 619 5 E were found to have adverse morphogentic effects on various crop pests (Sheila, 1976) Devaraj Urs and Ramamurthy, 1976; Krishna Das, 1975).

Application of a chemical Difluron with moulting

Contd.....2/-

inhibiting properties have been found effective in controlling coconut caterpillar, Nephantis serinopa (Report on 'Hindu' dated 20-12-'78).

8. Technical Programme:-

Various graded concentrations of sysnthetic JHA's and plant extracts having hormonal activities will be topically applied on the last instar larvae of the black headed caterpillar of coconut N. serinopa and Epilachna beetle H. viginctioctopunctata. The morphogenetic changes induced by the compounds on the test insect will be observed and recorded.

Parasites and predators of the host insects will be liberated on the treated larvae and their survival, sex-ratio, fecundity, abnormalities etc. will be assessed.

9. Date of start : March, 1979.

10. Likely date of completion : March, 1980.

11. Approximate cost : Rs. 3,000/-

12. Signature of

Sd/- Sd/-
PROJECT LEADER. HEAD OF DEPARTMENT. DIRECTOR OF RESEARCH.

FRC - 11.

KERALA AGRICULTURAL UNIVERSITY

FACULTY OF AGRICULTURE

Programme of Research for Master's Degree

AG. 23.19. Ent. 24.01.

1. Name of the candidate : RANJITH, A.M.
2. Date of admission & No. : 16-10-1978. 78-11-58.
3. Name and designation of Chairman, Advisory Committee : Dr D. Dale, Assoc. Professor.
4. Topic for research for thesis:

"Studies on the consumption, digestion and utilization of food plants by the Caterpillar Pericallia ricini (Arctiidae; Lepidoptera)".

5. Objective of research:

To work out the indices relating to the consumption, digestion and utilization of eight important host plants by the larvae of Pericallia ricini.

6. Brief review of the previous work done on the topic:

Shyamala et al. (1956), Sharada and Bhat (1957) and Shyamala et al. (1940) have studied the consumption, digestion and utilization of food plants by some polyphagers Indian insects. In Kerala such studies have been carried out by Dale and Chandrika, 1971 and by Premkumar et al. 1977.

7. Scientific and or practical importance of the research:

The results of the study would throw light on the economic losses caused by Pericallia ricini to the various host plants. Whether phago-deterrent principles are present among the least preferred host plants can also be ascertained. The Phago-deterrents are of considerable significance in the protection of crop varieties against specific pests.

8. Technical programme:

Eight host plants - sweet potato, castor, banana, pumpkin, sesamum, brinjal, cotton and colocasia - will be used for the experiments. Ten caterpillars of the test insect will be used for each treatment which be replicated thrice. The following indices relating to nutrition will be arrived at from the experimental data.

(a) Consumption index. (b) Growth rate of the test insect on different host plants. (c) Digestibility of different food plants. (d) Efficiency of conversion of infested food to body substances of gross efficiency. (e) Efficiency with which digested food is converted to body matter or net efficiency. (f) Utilisation of total

Contd.....2/-

nitrogen. (g) Estimation of total lipids at various stages.

9. Estimate of expenditure and receipts if any:

Expenditure: Contingencies: Rs. 2,000/-

Receipts: NIL

10. Location of research : Dept. of Entomology, College of Horticulture, Vellanikkara.

Vellanikkara,
16--5--1979.

Signature of the Candidate.

FRC - 9.

P R O F O R M A

KERALA AGRICULTURAL UNIVERSITY

FACULTY OF AGRICULTURE

Department of Agrl. Entomology, College of Agriculture, Vellayani

PROGRAMME OF RESEARCH FOR MASTER'S DEGREE
(For approval of the University)

AG. 23.18. Ento. 25.01.

1. Name : AMBIKA DEVI, D.
2. Date of admission : 16-10-1978.
   Admission No. : 78-11-32.
3. Name and designation of Chairman of Advisory Committee : Sri. J. Johnson, Associate Professor of Agrl Entomology.
4. Topic of Research for the thesis : Control of pests of stored paddy with antifeedants and newer insecticides.
5. Objectives of Research for the thesis:

   To determine the comparative effect of some of the newer antifeedents and contact insecticides in controlling the important pests of stored paddy in Kerala with special reference to the Lesser Grain Borer - Rhyzopertha dominica (F) and Angoumois grain moth - Sitotroga cerealella.

6. Brief review of the previous work done on the topic:

   Karl J.Kramer and Harrison.E. McGregor reported in 1978 that pyridyl and phenyl ether analogues of juvenile hormone suppressed adult progeny of Rhyzopertha Dominica F). P.A. Rajan Asari and D. Dale reported in 1977 of the efficacy of four commercial antifeedents - Brestan, Brestanol, plictran and AC - 24055 in protecting stored paddy grains against Sitotroga cerealella and all were found to be effective. The chemosterilant effect of fentin compounds is evident by the decreased fecundity in treated Corcyra Cephalonica on rice grains (D. Dale and Saradamma - 1974).

7. Scientific and/or practical importance of research:

   Paddy stored for consumption as well as for seed purposes are very often seen attacked severely by the Lesser Grain Borer, Rhyzopertha dominica (F) and the Angoumois grain moth, Sitotroga cerealella. Availability of a suitable method for controlling these pests with less hazard will save heavy loss incurred by the farmers due to the incidence of these pests. The project aims at this end.

8. Technical Programme:

   First experiment.

   The antifeedants Brestan, Brestanol, Plictran and

Contd.....2/-

AC-24055 at 0.05, 0.1 and 0.2 per cent concentrations and the insecticides viz. Malathion 0.1% and 0.2%, Phaxim 0.1% and 0.2%, Iso Fenphos 0.1% & 0.2%, Quinalphos 0.05% and 0.1% will be applied on gunny bags, containing pest free paddy grains (unhusked).

(2) Treated grains (gunny bags) will be placed in enclosures and artificially infested with laboratory reared insects at regular intervals.

(3) Intensity of infestation will be assessed at regular intervals by counting the attached grains in random samples and on the basis of the insect population.

Second experiment.

Paddy seed (unhusked) will be mixed with the following repellents at different doses.

1. Paddy husk charcoal
2. Marotty cake
3. Rubber seed oil
4. Neem cake
5. Punnaika cake
6. Rubber seed cake

The experiment will be conducted and observations will be recorded as described above.

9. Estimate of expenditure/Receipts. Rs. 6,000/-

10. Location of Research : College of Agriculture, Vellayani.

Sd/-
Signature of Student.

Place: Vellayani.
Date 7-3-1979.

FRC - 8.

KERALA AGRICULTURAL UNIVERSITY

FACULTY OF AGRICULTURE

Programme of Research for Master's Degree

AG. 23.18. Ent. 25.02.

1. Name of candidate : Gouse Mohammed.
2. Date of admission and Admission No. : 10--10--1979. 79-11-35.
3. Name and designation of the Chairman of Advisory Committee : Dr A. Visalakshi, Associate Professor of Agrl. Entomology.
4. Topic of Research for thesis:

"Studies on the use of aluminium phosphide for the control of storage pests".

5. Objective of research:

Aluminium phosphide is a solid fumigant which can be used for the control of all types of pests in the post harvest storage of various commodities. Before making recommendations on the use of these materials it is necessary to undertake detailed studies on such factors as dosage, duration of exposure, fumigation period and time required for getting the material after fumigation to rid of the fumigant residues and the residues of the chemical in the commodities. The present project is proposed for undertaking such studies in different commodities.

6. Brief review of previous research work done on the topic:

Relative toxicity of hydrogen phosphide to various stored product insects was worked out by Lindgren and Vincent (1966). Hydrogen phosphide as a fumigant for foods, feeds and processessed food products and the problems of determination of residual phosphide in fumigated food stuffs has been reviewed by Dieterich et al. (1967). Not much of extensive studies have been done on the control of the storage pests under Indian conditions.

7. Scientific and/or practical importance of research:

Results of these studies will help in evolving a handy method of control of storage pests of various products. These methods thus evolved will be of use in preventing the storage loss which is very high especially for materials which are stored under unscientific conditions for prolonged periods.

8. Technical programme:

i. Determination of the bioefficacy of fumigating with aluminium phosphide on the control of pests of/some /of

Contd.....2/-

stored materials. Stored products and the insects proposed to be studied :-

1. Rice :- Sitophilus oryzae, Rhizopertha dominica, Sitotroga carealella, Tribolium castaneum, Corcyra cephalonica.
2. Dried Tapioca chips : Araecerus fasciculatus.
3. Dried ginger : Lasioderma serricorne
4. Dry cashew : Necrobia rufipes.
5. Stored sweet potato Cylas formicarius

Procedure :- The insects concerned will be reared in the and the effect of the fumigant on the various stages of each insect. viz. egg, larva and adult will be ascertained separately. The fumigation will be done in a fumigatorium. The fumigant will be used at 3 doses viz. 45, 90 and 135 gm/1000 cu.ft with 3 durations of exposure viz. 3 days, 4 days and 5 days.

(ii) Determination of residues of Phosphide in the fumigated materials.

Residues of the fumigant in the different stored products under study will be assessed.

9. Duration of research project 1 year.

10. Estimate of expenditure and receipts Rs. 5,000/-

11. Location of research project : College of Agriculture, Vellayani.

Place : Vellayani.
Date : 21--2--1980.

Sd/-
SIGNATURE OF STUDENT.

FRC - 12.

KERALA AGRICULTURAL UNIVERSITY

FACULTY OF AGRICULTURE

Programme of Research for Master's Degree

AG. 23.18. Ento. 26.01.

1. Name of Candidate : THOMAS BIJU MATHEW
2. Date of Admission and Admission No. : 10--10--1979. 79-11-36.
3. Name and designation of the Chairman of Advisory Committee : Dr N. Mohandas, Professor of Agrl. Entomology, College of Agriculture, Vellayani.
4. Topic of research for thesis:

"Insecticide deposits and residues on paddy with reference to the volume of spray fluid applied at different growth stages of the crop".

5. Objective of research:

At present, the volume of spray fluid required to cover 1 ha. of paddy with high volume sprayer is recommended as 500 litres irrespective of the crops' growth stage. Obviously during a spraying operation in the early stages, the crop is actually getting excess quantity of spray fluid than that is required for optimum coverage, thereby resulting in mere wastage of chemical. To minimise this loss, the recommendation should be made more specific with respect to the stage of the crop. The ultimate objective of the experiment is to find out the minimum volume of spray fluid required for attaining specified deposit depending on the stage of the crop as measured by the leaf area.

6. A brief review of literature:

Ripper (1955) calculated that the high volume sprayers deposit 3 - 190 droplets/sq.cm. of size 100 - 400 microns, on a horizontal surface at a spray volume of 10 litres/ha. Generally a coverage of 15 - 20 droplets/sq. cm. is considered adequate for controlling most insect pests. The conventional high volume sprayers may required 450 - 1000 litres of spray fluid for covering 1 ha. in the case of field crops. No reference is available on the spray fluid requirement to spray paddy at different growth stages.

7. Practical Utility:

The result from the studies will help to find out the optimum volume of spray fluid to be sprayed at different growth stages of paddy, which will considerably reduce the cost of plant protection in paddy cultivation.

8. Technical programme:

(i) Treatments.

Insecticide will be applied at 4 levels viz. 300, 400,

Contd.....2/-

500 and 600 litres/ha. and at 4 growth stages viz. 30th, 45th, 60th and 75th days after sowing.

b) Insecticide : Carbaryl

c) Variety : Jyothi

d) Spacing : 20 cm. x 15 cm.

e) Total No. of plots : 16

f) Gross plot size : 5 m. x 4.5 m.

g) Net plot size : 4.2 m. x 3.9 m.

h) Buffer space between plots : 1 meter.

(ii) Observations

1. Leaf area at the various growth stages will be estimated adopting proper techniques.
2. Deposits of insecticide on leaf and stalk will be estimated at different intervals after spraying so as to evaluate the efficacy of spraying varying quantity of the insecticide.

(iii) A statistical model will be evolved for the optimum deposits and residue, in terms of total leaf area and volume of spray fluid.

(iv) The volumes of spray for obtaining the required deposits at different growth stages will be estimated based on the total leaf area at the respective stage.

9. Duration of research project : 1 year.
10. Estimate of expenditure : Rs. 18,000/-
11. Receipts : Rs. 500/-
12. Location of the experiment : College of Agriculture, Vellayani.

Place : Vellayani.

Date :

Sd/-
Signature of the Student.

Sd/-
Signature of the Chairman, Advisory Committee

Sd/-
Signature of the Head of the Dept.

SIGNATURE OF DEAN.

FRC - 11.

KERALA AGRICULTURAL UNIVERSITY

FACULTY OF AGRICULTURE

PROGRAMME OF RESEARCH WORK FOR MASTER'S DEGREE

AG. 23.18. Ent. 27.01.

1. Name of candidate : JIM THOMAS
2. Date of Admission & Admission No. : 21-10-1978. 78-11-29.
3. Name and designation of Chairman, Advisory Committee : Dr N. Mohan Das, Professor of Agrl. Entomology.
4. Topic of research for thesis : Effect of levels of pesticides on control of paddy pests and water pollution in Kuttanad.
5. Objective of the research:

To ascertain the lowest doses of insecticides (which are being commonly used in Kuttanad area), effective against different pests of paddy and which cause the least disturbance to the ecosystem.

6. Brief review of previous work done on the topic:

Fenthion, quinalphos, Fenitrothion, phosphamidon, monocrotophos, carbofuran, methyl parathion, phosalone and BHC have been recommended each at single dose for the control of various pests affecting rice in Kerala. Studies conducted at Rice Research Station, Pattambi have shown that carbaryl at 1 and 0.5 kg a.i/ha did not vary significantly with reference to their relative efficacy against the pests. There is no earlier work on the effect of insecticidal application on the ecosystem of the locality.

7. Scientific and/or practical importance of the research:

There are indications that the doses of insecticides now being recommended for the control of paddy pests can be reduced without significant reduction in efficiency. Findings of this project will throw light on the feasibility of this idea and may ultimately reduce the cost and hazard of insecticides in plant protection operations significantly.

8. Technical programme:

1. The experiment will be laid out in field/or in cages adopting suitable statistical techniques.

2. BHC, carbaryl, quinalphos, monocrotophos, fenitrothion phosalon and phosphamidon will be applied at 3 different doses each.

3. The application of insecticides will be done

Contd.....2/-

using high volume and low volume sprayers on need basis.

Observations to be made

1) Incidence of pests under different treatments will be recorded regularly.

2) The population of natural enemies of the pests under different treatments will be recorded.

3) Occurrence of fish and amphibian fauna in the experimental plots, if any, will be noted.

4) The contamination of irrigation water in field and drains at different intervals after each insecticidal application will be assessed in laboratory with bioassay using some sensitive species of fishes/amphibians as test organisms.

5) Weeds in the field will be collected at different intervals following insecticidal applications and residues, if any, will be assessed with suitable bioassary techniques.

9. Estimate of expenditure and receipts if any : Expenditure Rs. 9,000/-
Receipts Rs.

10. Location of Research : Rice Research Station, Moncompu.

Sd/-
Signature of Candidate.

FRC - 8.

KERALA AGRICULTURAL UNIVERSITY

FACULTY OF AGRICULTURE

PROGRAMME OF RESEARCH WORK FOR MASTER'S DEGREE

AG. 25.18. Agron. 1.01.

1. Name of candidate : JOHNKUTTY, I.
2. Date of admission & Admission No. : 14--10--1978. 78-11-01.
3. Name and designation of Chairman, Advisory Committee : Sri. P. Chandrasekharan, Associate Professor of Agronomy.
4. Topic of research for thesis : Response of ragi (Eleusine coracana - Gaertn) to different levels of Nitrogen, Phosphorus and Potassium under rainfed conditions.
5. Objective of the research

i) To determine the economic doses of N, P and K for ragi under rainfed conditions.

ii) To study the influence of the fertilizers on yield contributing characters.

iii) To study the effect of the fertilizer on quality of the grain and straw.

6. Brief review of previous work done on the topic:

Krishnamurthy (1972) reported that a dose of 67.5 kg. N/ha is suitable for rainfed ragi. Lobo (1973) reported that the grain and straw yield of ragi increased with increasing rate of K, the optimum rate being 50 kg K_2O/ha.

Kumaraswamy and Venkataraman (1974) found that maximum grain and straw yield was recorded at 39 kg - P_2O_5/ha. It advanced maturity of the crop by one week over control and increased threshing percentage. Balasubramanian and Venkataraman (1974) found that the PLR-1 variety gave the highest yield of 5.05 t/ha with application of 110 kg N + 55 kg P_2O_5 + 55 kg K_2O/ha.

Kavalappa (1977) reported that there was an increase in protein content of the grain with an increase in Nitrogen levels.

Determination of fertilizer requirements of the crop under Kerala conditions will help in the maximisation of grain and straw yield effectively and economically and also in the improvement of the quality. Hence conduct of this trail is justified.

7. Scientific and/or practical importance of the research

In Kerala so far no trial has been conducted to

Contd.....2/-

determine the fertilizer requirement of the crop. This study aims at determining the optimum levels of N, P and K for better yield of the crop and also their effect on quality.

8. Technical programme:

Number of treatment Combination	:	27
Replication	:	2
Spacing	:	25 x 15 c.m.
Design	:	3^3 partially confounded factorial design in R.B.D.
Plot size	:	5 x 4.5 M.
Variety	:	PR.202

Fertilizer levels

Nitrogen - 3 levels (30-60-90 kg N/ha).
Phosphorus - 3 levels (20-40-60 kg P_2O_5/ha)
Potassium - 3 levels (20-40-60 kg K_2O/ha)

Treatment combinations: 3 x 3 x 3 = 27

Note: Half of the N and full of P and K will be applied as basal. Other half of the N will be applied 21 days after planting.

Observation to be taken:-

a) Biometric:

1. Plant height
2. Number of tillers
3. Total number of leaves
4. Number of functional leaves
5. Date of flowering
6. Number of panicles
7. Length of panicle
8. Number of fingers in an ear
9. Test grain weight
10. Leaf Area Index (LAI)

Note: The observations will be taken at 14 days interval.

b) Chemical analysis:-

1. Pre and post chemical analysis of soil for N, P and K.
2. Chemical analysis of grain and straw for nutrient uptake and quality.

9. Estimate of expenditure : Expenditure (including fellowship) Rs. 6,000/-

Receipts Rs. 400/-

10. Location of research : Rice Research Station, Pattambi.

Signature of candidate: Sd/-

FRC - 8.

KERALA AGRICULTURAL UNIVERSITY

Proforma for Research Projects

1. Name of Research Centre : Rice Research Station, Kayamkulam.
2. Project No. : AG. 25.6. Bot. 1.01.
3. Title of the project : Trials on the possibility of cultivating jute for seed production in Onattukara regions.
4. Names and designation of
   a) Project leader : S. Sukumaran Nair, Assistant Professor.
   b) Associates : A.E. Sreedharakurup, Associate Professor.
   S. Santhakumari, Asst.Professor.
5. Objectives -

   To explore the possibilities of cultivating jute as a seed crop on the Onattukara regions during the summer month.

6. Practical utility:

   In the Onattukara regions of Alleppey and Quilon Dists. during the summer season Gingelly is gron in the rice fields. It is possible that jute may come up well in these areas and produce abundant quantities of seed which is in great demand in the jute growing areas. If the cultivators can produce as much jute seed as Gingelly, they can get additional profit since the jute seed fetches almost double the price of Gingelly. Since the crop continues to grow even beyond the flowering and seed setting, it is possible that fibre can also be produced which may fetch some price and thereby earn more income. In the coastal areas and saline tracts where the land is kept fallow jute can be tried as a summer crop.

7. Short review of literature:

   No studies have been conducted in the state on the possibilities of cultivating jute in the Onattukara region. Studies conducted in Kuttanadu have shown that jute sets seed freely during summer months of Jan.-April-May.

8. Technical programme:

   The two predominantly cultivated varieties viz. 747 and 878 will be cultivated as an observational trial on 100 sq. m. each. Any other available variety of jute will also be cultivated to ascertain its performance.

9. Observations :
   1. Height of plants.
   2. Flowering duration.
   3. Quantity of seeds.
   4. Quantity and quality of fibre.

Contd.....2/-

10. Date of start : Jan.-Feb. 1979.

11. Likely date of completion : May 1981.

12. Facilities required : Facilities at R.R.S. Kayamkulam.

13. Approximate cost : Rs. 750/-

Sd/- Sd/-
Project Leader. Project Co-ordinator. Director of Research.

FRC IX - Approved.

KERALA AGRICULTURAL UNIVERSITY

Proforma for Research Project

1. Name of Research Centre : Rice Research Station, Moncompu.

2. Project No. : AG. 25.6. Bot. 1.02.

3. Title of the project : Screening of Jute varieties for seed production.

4. Names and designation of

   a) Project leader : S. Sukumaran Nair, Assistant Professor.

   b) Associates : 1. Sri. P.J. Ittyaverah, Asst. Professor (Agr.).

   2. Smt. N. Remabhai, Junior Instructor (Bot.).

5. Objectives:

To identify the best variety of jute suitable for Kuttanadu region for economic seed production.

6. Practical utility:

The rice fields of Kuttanadu which comprise about 55000 hectares are kept fallow after the harvest of the punja crop. In the lower Kuttanadu and upper Kuttanadu about 10,000 ha. are put under an additional crop of rice from April, May to Aug.-Sept. It is possible that jute could be cultivated in these areas between Jan.-May. for seed production and in other areas from Feb. to Aug. as the seeds of jute are in great demand in the jute growing areas of North East India. If a variety of Jute that will produce abundant quantity of seed under conditions prevailing in this part of the State is identified, it can be recommended for general cultivation in Kuttanadu and the cultivators can make an additional income from their paddy fields.

7. Short review of literature:

Preliminary observations made at the Rice Research Station, Moncompu during the summer months of 77-78 have shown that even though the crop comes to flowering within 30 - 40 days when sown during February and when allowed to continue its growth seeds are produced in abundance, but the fibre quality is not good.

8. Technical programme:

The available varieties of jute will be collected from the Co-ordinator, All India Co-ordinated Project for Jute and allied projects, Banadepore and studied under the conditions prevailing in our State. Exploratory trials will also be made with varieties 747 and 878 as suggested by the Co-ordinator. Each variety will be cultivated in

Contd.....2/-

100 sq. m. plots and replicated according to the number of varieties supplied.

Fertilizer dose : 40 : 20 : 40 NPK/ha.

9. Observations to be taken : 1. Germinability.
   2. Height of plants at time of flowering and harvest.
   3. Time taken for flowering.
   4. -do- for seed setting.
   5. Yield of seed.
   6. Yield of fibre.
   7. Quality of fibre.

10. Date of start : February 1979.

11. Likely date of completion : May 1981.

12. Facilities required : Facilities are required at R.R.S., Moncompu.

13. Approximate cost : Rs. 2,500/-

Sd/- Sd/-

Project Leader. Project Co-ordinator. Director of Research.

FRC IX - Approved.

KERALA AGRICULTURAL UNIVERSITY
Proforma for Research Project

1. Name of Research Centre : State Farming Corporation, Punalur.

2. Project No. : AG. 25.6. Bot. 1.03.

3. Title of the project : Exploring the possibilities of cultivating Mesta as a fibre crop and as a mixed crop in pine apple and tapioca growing regions.

4. Name and designation of

a) Project leader : S. Sukumaran Nair, Assistant Professor, Sugarcane Research Station, Thiruvalla.

b) Associates : K. Raveendran Nair, Assistant Professor, Sugarcane Research Station, Punalur.

5. Objectives:

To explore the possibilities of growing Mesta (Hebiscus cannabinus) as fibre crop in pine apple/tapioca/ cashew growing areas of the hilly regions.

6. Practical utility:

The State Farming Corporation at Punalur has extensive areas under pineapple, tapioca and cashew cultivation. It may be possible that Mesta, a ℔ fibre yielding crop just like jute, could be cultivated as a companion crop in these areas. If the results come in to be fruitful, large scale cultivation could be recommended to the Farming Corporation as also to the cultivators who are interested in growing the crop, thereby getting additional income.

7. Short review of literature:

Mesta grows well in dry conditions as a mixed crop in jowar and maize fields in Andhra Pradesh and Karnataka State. About 29,000 ha. of land are put under cultivation with this crop as mixed cropping in Karnataka State alone. The mesta Research Station of Andhra Pradesh has released two high yielding varieties of mesta viz. HS 4288 and AMV.1, which according to Scientists of that station, may perform well under our conditions also.

8. Technical programme:

An observational trial is proposed in an area of 10 cents each (400 sq. m) with the two varieties viz. HS. 4288 and AMVI in two locations of the farm possessed by the State Farming Corporation. The crop will be raised with the receipt of the 1st summer showers. The required seeds will be obtained from the Co-ordinator, All India Co-ordinated Project for jute and allied fibre.

Contd.....2/-

9. Observations to be recorded	:	1. Height of plants. 2. Duration for maturity. 3. Yield of fibre. 4. Quality of fibre.
10. Date of start	:	April 1979.
11. Likely date of completion	:	August 1981.
12. Approximate cost	:	Rs. 1,000/-
13. Facilities required	:	Facilities are required at State Farming Corporation, Punalur.

Sd/- Sd/-
Project Leader. Project Co-ordinator. Director of Research.

FRC IX - Approved.

KERALA AGRICULTURAL UNIVERSITY

FACULTY OF AGRICULTURE

Department of Agrl. Botany, College of Agriculture, Vellayani.

PROGRAMME OF RESEARCH FOR DOCTORATE DEGREE

(For approval of the University)

No. 25.18. Bot. 6.01.

1. Name of the candidate : V.C. MARKOSE.
2. Date of admission and Admission Number : 15-10-1979. 79-21-05.
3. Name and Designation of the Chairman. : Dr S.T. Mercy, Associate Professor of Agrl. Botany.
4. Topic of Research work for thesis:

Biometrical analysis of yield and yield attributes in Para rubber. Hevea brasiliensis Muell. Arg.

5. Object of the Research:

i) To estimate variability among clones in yield and certain yield attributes.

ii) Correlation and path coefficient studies to ascertain the relative contribution of the yield attributes.

iii) Evaluation and identification of superior clones for breeding purpose.

6. Brief review of previous work done on the topic:

Polliniere (1966) suggested various morphological, anatomical, physiological and biochemical characters of the tree associated with the rubber production. Ho (1975) considered girth, latex vessel number and plugging index as principal yield determinants and susceptibility to wind, dryness and girth rate as secondary determinants.

Simple correlations of yield with girth, bark thickness and number of latex vessel rings were reported by many workers (Whiteby 1913, La Rae 1921, Bobiloff 1920, Gilbert 1973 etc.). In mature trees more than half of the variation in yield within clones is accounted for by the difference in girth (Pardekooper 1970).

7. Practical utility:

The envisaged study is to elucidate the variability available among different clones for the important characters and their mutual relationship. The study is expected to provide valuable information to improve the selection procedures in early evaluation for higher rubber yield. This will also help in identifying better genotypes for use in future breeding programmes.

Contd.....2/-

8. Technical programme:

The proposed study is for a period of two years on mature trees available at the Central Experiment Station of the Rubber Research Institute, Chethakal, planted during the year 1971.

1. Study of clonal characters. About 20 clones will be taken and the following characters will be recorded at appropriate periods.

   a. Volume of latex per tap per tree.
   b. The dry rubber per tap per tree.
   c. Length of the tapping cut.
   d. Girth of the tree.
   e. Girth increment.
   f. Bark thickness.
   g. Number of latex vessel rows.
   h. Pattern of branching and the height at which branching starts.
   i. Wintering and flowering behaviour.

2. Open pollinated progeny analysis of selected clones for the following characters on ten months growth, which is the usual time of transplanting.

   a. Height b. Girth at collar
   c. Total number of leaves d. Number of leaves in top whorl.

3. Estimation of genotypic, pehnotypic and environmental components of variance and coefficient of variation.

4. Correlation and path coefficient analysis of yield and yield attributes for ascertaining the important factors contributing towards yield.

5. Estimation of heritability and genetic advance due to selection.

6. Evaluation of clones based on genotypic value.

7. Estimation of annual yield and relative contribution during various months/seasons.

9. Estimate of expenditure:

	Rs.
i. Labour charges	10,000.00
ii. Chemicals & other items	3,000.00
iii. Miscellaneous items	2,000.00
TOTAL	15,000.00

10. Location of Research: 1. College of Agriculture, Vellayani (Laboratory work).
2. Rubber Research Institute, Kottayam (Laboratory work).
3. Central Experiment Station, Rubber Research Institute, Chethakal (Field work).

Vellayani.

Sd/-
SIGNATURE OF CANDIDATE.

FRC - 12.

KERALA AGRICULTURAL UNIVERSITY

FACULTY OF AGRICULTURE

PROGRAMME OF RESEARCH FOR Ph. D. (Hort.)

AG. 25.19. Hort. 1.01.

1. Name of candidate : K. Rajmohan.
2. Date of admission and admission number : 10-10-1979. 79-22-03.
3. Name and designation of Chairman of Advisory Committee : Dr N. Mohanakumaran, Professor and Head, Department of Plantation Crops and Spices, College of Horticulture, Vellanikkara.

4. Topic of research for thesis:

Standardisation of tissue/meristem culture techniques in important horticultural crops.

5. Objective of research:

1. To assess the potential of tissue culture techniques as aids in propagation of important horticultural crops.
2. To select the ideal tissue for each crop.
3. To standardise the conditions like culture media, duration of culture, environmental factors (temperature, Relative humidity, light).
4. To observe the somatic changes, if any, during the process.
5. To study the economics of the tissue culture methods.
6. To draw useful guidelines for the widespread use of tissue culture techniques in the commercial propagation of important horticultural crops.

6. Brief review of previous work done in the topic (Give reference to important publications of thesis):

The applicability of micro-propagation techniques reflects the combined contribution by many. Nevertheless, the late Georges Morel should be credited for the pioneering effort. First he demonstrated that virus free plants can be recovered from infected plants through shoot-tip cultures (Morel and Martin, 1952). Subsequently, in extending the demonstration to the orchids, he revealed a novel method of clonal multiplication (Morel, 1960). The method quickly became a standard technique in the orchid industry. The current interest in tissue culture with other crops is an outgrowth of the success with orchids. Tissue culture techniques have been effectively standardised to get com-

Contd.....2/-

plete plants in the case of a number of crops like cauliflower, cabbage, tomato, chilli, tobacco (Murashige, 1974 a), asparagus (Hasegawa et al., 1973), gerbera (Murashige et al., 1974) etc. Also there are a large number of plants like sugarcane, maize, citrus, potato, begonia, sweet potato, banana, coffee, chrysanthemum, peaches, carnation, gladiolus, pineapple etc. with demonstrated potential for clonal multiplication through tissue culture (Murashige, 1974 b).

7. Scientific and/or practical importance of the research:

In Kerala, at present, much stress is being given to the importance of horticultural crops. Massive efforts are being made to the establishment of the improved varieties of the same. The major hurdles in this respect are the lack of enough propagating materials and the costly and cumbersome vegetative propagation methods. This is especially felt in the case of plantation crops. Adoption of tissue culture techniques can go a long way in solving these problems. In the case of fruits, vegetables and ornamentals also clonal propagation through tissue can ensure rapid establishment of improved varieties.

8. Technical programme in brief:

The following crops will be utilized for the study. Nutmeg, Cashew, Bread fruit and Orchids.

The following cultural media will be used for the study (vide, Table 1) (1) Whites, (2) Morel's (3) Kassani's (4) Murashige and skoog (5) Nielson's and (6) Jap. cont. Ag. Ext. Stn's in combination with growth regulators like auxins, cytokinins, gibberellins etc. and natural complexes like coconut milk, orange juice, tomato juice, malt extract, yeast extracts etc.

The following tissues will be used for the study. (1) Root tissue (2) Shoot tip (3) Pith and (4) callus tissue.

Observations will be made on the following aspects.

1. Callus production
2. Tissue differentiation
3. Shoot growth
4. Root growth
5. Development of the plant let
6. Somatic changes, if any.

The above observations will be made with different media maintained at varying levels of temperature, humidity and light conditions.

The role of the various ingredients in the culture media on induction of callus, root and shoot will be investigated.

Contd.....3/-

9. Estimate (including fellowship) : Cost of laboratory chemicals: Rs. 10,000/-

Cost of cotton and other laboratory materials	Rs. 1,500/-
Cost of glasswares	Rs. 8,000/-
Stipend	Rs. 5,100/-
Total:	Rs. 24,600/-

10. Receipts : Nil.

11. Location of research : College of Horticulture, Vellanikkara.

Vellanikkara,
Date: 19-2-1980.

FRC - 12.

KERALA AGRICULTURAL UNIVERSITY

Rice Research Station, Moncompu

Proforma for Research Project Proposal

Faculty of Agriculture Department of Statistics

1. Name of Research Centre : Rice Research Station, Moncompu.
2. Project Number : AG. 25.5. Stat. 11.01.
3. Title of the Project:

   Influence of missing hills in increasing the vigour of the surrounding hills in paddy.

4. Name(s) and designation of

   a) Project Leader : P.R. Krishnakumari Amma, Junior Statistician.

   b) Associate : P.J. Ittyaverah, Assistant Professor (Agronomy).

5. Objective:

   To find out the influence of missing hills on the general vigour of the surrounding hills.

6. Practical utility:

   The information will be useful for rice research worker for conducting field experiments efficiently.

7. A short review of literature:

   Gomez (1972), has pointed out that the occurrence of missing hills in a plot causes variation in surrounding hills and the variation depends on many factors like variety, spacing, fertilizer level, crop season etc., He has suggested not to measure grain yield, yield component any other agronomic characters from the four hills immediately adjacent to the missing hill. He has also advised if more than 20% of the total number of hills to be harvested in a plot is missing, then to treat it as missing data in the statistical analysis.

8. Technical Programme: Lay out 9 x 5 RBD

   An experiment on equal plot size of 2 x 2 sq. m. area will be conducted with missing 0 hills 1 hill, two hills etc. up to eight hills.

   Replications : 5

   Recommended cultivation methods will be practiced.

   Variety : Jyothi.

   Spacing : 15 x 15 cm.

Observation

Mean grain yield and straw yield surrounding four to ten hills of missing hill will be recorded in each plot.

Contd.....2/-

9. Date of start	:	April 1979.
10. Likely date of completion	:	October 1980.
11. Additional facilities required	:	Existing facilities in the Station will be utilized.
12. Approximate cost	:	Rs. 500/- per season. Total Rs. 1,500/-

Sd/-
Project Leader. Head of Department. Director of Research.

FRC IX - Approved.

KERALA AGRICULTURAL UNIVERSITY

Rice Research Station, Moncompu

Proforma for Research Project Proposal

Faculty of Agriculture. Department of Agrl. Statistics.

1. Name of the Research Centre : Rice Research Station, Moncompu.
2. Project No. : AG. 25.5. Stat. 12.01.
3. Title of the project:

   Analysis of Socio Economic status of cultivators in the areas where the programmes of operational research project on integrated control of rice pest is implemented.

4. Name(s) and designation of

   a) Project Leader : P.R. Krishnakumari Amma, Junior Statistician.

   b) Associates :

5. Objective:

   For studying the internal structure of socio and economic status of cultivators in the project area and to see whether it is unidimensional or multi-dimensional.

6. Practical utility:

   The information will be useful for the effective implementation of the programmes of the project and the necessary changes to be adopted in the present methodology.

7. A short review literature:

   A study in the field was conducted in the Community Development Block, Kanjhawala in the Union Territory of Delhi on the "measurement and analysis of socio economic status of Rural Families". This showed the results that socio economic status is a multidimensional concept namely of education, occupation and income.

8. Technical programme:

   A sample of household of cultivators in the Operational area will be selected for the study. Important items relating to the socio-economic status will be selected with a scale rating from 0-9. Method of factor analysis will be used to study the internal structure of socio-economic status.

Observations : The survey report on socio economic conditions will be utilized.

9. Date of start : As soon as the project is approved.
10. Likely date of completion : One year.
11. Approximate cost : Nil
12. Signature of:

Sd/- Sd/-

Project Leader. Head of Department. Director of Research.

FRC IX - Approved.

KERALA AGRICULTURAL UNIVERSITY

RESEARCH PROJECT

Faculty of Agriculture. Department of Plant Pathology (Microbiology unit)

1. Name of Research Centre : Department of Plant Pathology (Microbiology Unit), College of Agriculture.
2. Project No. : AG. 25.18. Microbiol. 3.02.
3. Title of project:

Studies on rhizobia - isolation and mass production of efficient cultures of Rhizobium

4. Names and designations of
   a) Project Leader : Dr S.K. Nair, Associate Professor (Microbiology).
   b) Associates : Sri. P. Sivaprasad, Junior Assistant Professor - Microbiology.
5. Objectives:

   1. Isolation of efficient strains of Rhizobium cultures for different grain and fodder legumes commonly cultivated in Kerala.
   2. Mass production of such cultures distribution to local farmers.
   3. Standardisation of conditions for optimum nodulation in acid soils.

6. Practical utility:

The use of fertilizer nitrogen for obtaining maximum yield in grain and fodder legumes can be reduced or completely avoided using efficient strains of Rhizobium culture.

7. A short review of literature:

The beneficial effect of Rhizobium inoculation on the yield of pulses in normal soils is well established by different workers. The primary problem pertaining to the State is the establishment of strains of Rhizobium in acid soil conditions. It has been observed by many workers that infection and nodulation of many legumes is reduced by an acid root medium.

8. Technical Programme:

   1. Isolation of efficient strains of rhizobium from different localities in Kerala State.
   2. Evaluating the efficiency of different cultures

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under laboratory and field conditions.

3. Mass production of rhizobium for distribution among local farmers.

4. Study of the suitability of locally available peat as carrier.

9. Date of start : 1980.

10. Likely date of completion : Production and distribution of rhizobia will be a continuous programme.

11. Approximate cost : Rs. 86,500/-

12. Signature of

Sd/-	Sd/-	
Project Leader.	Head of Department.	Director of Research.

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KERALA AGRICULTURAL UNIVERSITY

FACULTY OF AGRICULTURE

Department of Plant Pathology, College of Agriculture.

Programme of Research for the Ph.D. Programme in Plant Pathology

(For approval of University)

AG. 25.18. Microbiol. 5.02.

1. Name of Candidate : M. Suharban.
2. Date of admission with register number : 16-10-1978. 78-21-07.
3. Name and designation of Chairman, Advisory Committee : Dr M. Ramanatha Menon, Professor of Plant Pathology.
4. Topics of research for thesis:

Survey of the edible species of Pleurotus and standardisation of techniques for large scale cultivation.

5. Objective of Research:

The present project envisages identification of species of Pleurotus suitable for Kerala conditions and also ~~xxx~~ aims to develop technology for its large scale cultivation and processing of the products.

6. Brief review of previous work done on the topic:

Attention was focussed on this fungus in India only after it has been brought into pure culture by Jandaik and Kapoor (1975). P. Sajor caju is known at present to be cultivated on such farm wastes like banana pseudostem, soft wood pieces, sawdust, sawdust etc. (Jandaik, 1974; 1976 and Rangaswamy et al. (1975). In Kerala, species of Pleurotus are found utilised by local people for edible purposes. The preliminary studies carried out in the Plant Pathology Department of College of Agriculture, Vellayani have P. sajor-caju are suitable for cultivation under Kerala conditions.

7. Scientific and/or practical importance of research:

The results of the studies will be enable to popularise the cultivation of suitable strain of Pleurotus in Kerala utilizing the various locally available raw materials.

8. Technical programme:

1. Survey of various parts of Kerala during different periods of the year for the collection of different species of Pleurotus.
2. A critical study of the natural substrate on which native Pleurotus flora occur in different parts of the State.

Contd.....2/-

3. Morphological studies of the various species, their identification and preservation.
4. Detailed monographic study of the genus, utilising all the local collections and also with the help of known species obtained from various Herbaria, so as to precisely define the genus and providing a key for the identification of the species.
5. Physiological studies on the different edible species of Pleurotus for determining their exact nutritional requirements.
6. Comparative study of various containers and substrate for production of spawns.
7. Development of techniques, for artificial cultivation utilising various raw materials like saw dust, bran, coir pith, waste papers, banana pseudostem, vegetable waste, straw, salvini etc.
8. Development of techniques for cultivation as a perennial crop utilising logs of different local trees.
9. Comparative studies on the nutritive value of different edible species of Pleurotus.
10. Development of preservation methods suitable for various edible species of Pleurotus.

9. Estimate of expenditure : Rs. 10,000/-

10. Location of research : College of Agriculture, Vellayani.

Place: Vellayani.

Date :

Sd/-

Signature of candidate.

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