

***NATIONAL AGRICULTURAL  
RESEARCH PROJECT***



***Kerala Agricultural University***



206765



**Kerala Agricultural University**

**National Agricultural Research Project**

**DIRECTORATE OF RESEARCH  
KERALA AGRICULTURAL UNIVERSITY  
VELLANIKKARA 680 654**

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NATIONAL AGRICULTURAL RESEARCH PROJECT

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## P R E F A C E

During 1960, introduction of first Agricultural University in India was an important land mark in the history of Agriculture in the Country. This paved the way for a strong Agricultural Education and Research System in the country. But such institutions often centred around the cities and concentrated mainly at the main campuses. In a country like ours with varying agroclimatic and soil conditions, such institutions are found to be insufficient to tackle location specific problems in different agroclimatic zones within each State.

The introduction of the National Agricultural Research Project (NARP) during late seventies in India bridges this gap and it will be another important land mark in the history of Agriculture in India. The strengthening of the Research capabilities of different agroclimatic zones with necessary scientists and infrastructural facilities will definitely go a long way in solving location specific problems and also to take the research findings to the field with least time lag. I am sure that if the programme is implemented properly it will enhance the production and increase the net income of our farmers in addition to generation of the employment in agricultural sector.

The eligibility of Kerala Agricultural University to participate in the NARP was approved by the PFC in May, 1980. Anand Rao Committee conducted the research review and submitted its report by September, 1980. Based on the recommendations, Kerala Agricultural University submitted its proposal. So far, six sub projects (Directorate, Northern, Central, Southern, Special and High Range Regions) with a total outlay of Rs. 489.01 lakhs for five years were sanctioned.

This booklet contains a brief note on the Agroclimatic conditions, farming situations, location specific constraints and programmes for solving them as envisaged in the sub-projects.

I sincerely hope that this material will be useful to all concerned with NARP in the State and in different Agricultural Universities in the Country.

P. C. S. NAIR  
Director of Research.

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# KERALA AGRICULTURAL UNIVERSITY

## NATIONAL AGRICULTURAL RESEARCH PROJECT

### 1. Introduction

1.1 The National Agricultural Research Project (NARP) has been formulated by the Indian Council of Agricultural Research (ICAR) to strengthen the regional research capability of the State Agricultural Universities (SAU). The project is funded by the ICAR and is supported by the International Development Association (IDA), an affiliate of the World Bank to the extent of \$ 27.0 million (about 50% of the total expenditure). The agreements were signed in December, 1978 and the project was launched on January 1, 1979. The project is being administered by the ICAR through a Project Funding Committee (PFC). An Inter-Disciplinary Scientific Panel (IDSP) of eminent scientists in different fields provides the technical assistance to the PFC.

1.2 The eligibility of the Kerala Agricultural University to participate in the NARP was approved by the PFC in May, 1980 on the basis of the background paper submitted by the KAU. Pending the completion of the review of research as contemplated in the terms and conditions of the NARP, the PFC sanctioned two sub-projects, one for strengthening the Directorate of Research and the other for establishing a Regional Research Station at Pilicode for the Northern Region. The Anant Rao Committee conducted the research review and submitted its report by September 1980, based on the recommendation of which, the KAU submitted its proposals for the consideration of the ICAR.

### 3. Agro-climatic Zones

3.1 Taking the composite view of Physiography, climate, soils, sea water incursion, irrigation facilities, land use pattern and the recommendations of the 'Committee on Agro-climatic Zones and Cropping Patterns' constituted by the Government of Kerala in 1974, the Research Review Committee recommended that Kerala State be divided into five agro-climatic regions viz. the Northern Region, the Central Region, the Southern Region, the High Ranges and the Region with problem Areas which include *Onattukara, Kuttanad, Pokkali* and *Kole* areas (Fig. 1). Based on the detailed research needs of each agro-climatic region, the committee recommended a three-tier system for carrying out research as well as verification functions as indicated below:

#### 3.2 Agricultural Research Stations

<i>Regional Station</i>	<i>Sub-station/ Special Station</i>	<i>Lead function(s)</i>	<i>Verification function (s)</i>
<i>Northern Region</i>			
Piicode, Nileswar		Coconut	Rice, Tubers, Pulses
	Panniyur	Pepper	
	Anakkayam*	Cashew	
	Tavanur		Rice, Coconut
<i>Central Region</i>			
Pattambi		Rice	Rice, Pulses
	Eruthiampathy	Groundnut	Coconut
	Mannuthy		Rice, Groundnut, Pulses,
			Rice, Groundnut, Tubers
	Chalakydy	Water Management	
	Kannara*	Banana & Pineapple	
	Odakkali*	Medicinal & Aromatic Plants	
	Thiruvazhamkunnu	Mixed Farming	
<i>Region of Problem Areas</i>			
	Kumarakom	Coconut disease, Integrated farming system (Crop-live-stock fish farming)	Rice in Kayal areas
	Moncompu	Rice in Kayal lands	-do-

1	2	3	4
	Kayankulam	Oil seeds and pulses	Rice in Onattukara
	Vyttila	Crop-fish farming systems	Rice in Pokkali
	Kole		Rice in Kole areas
	Thiruvalla*	Sugarcane	
<i>High range Region</i>	Ambalavayal	Horticultural crops, Tribal area Development	Rice, Pepper Coffee
	Pampadumpara	Cardamom, Tribal area development	Rice and Pepper

\* Not covered under NARP

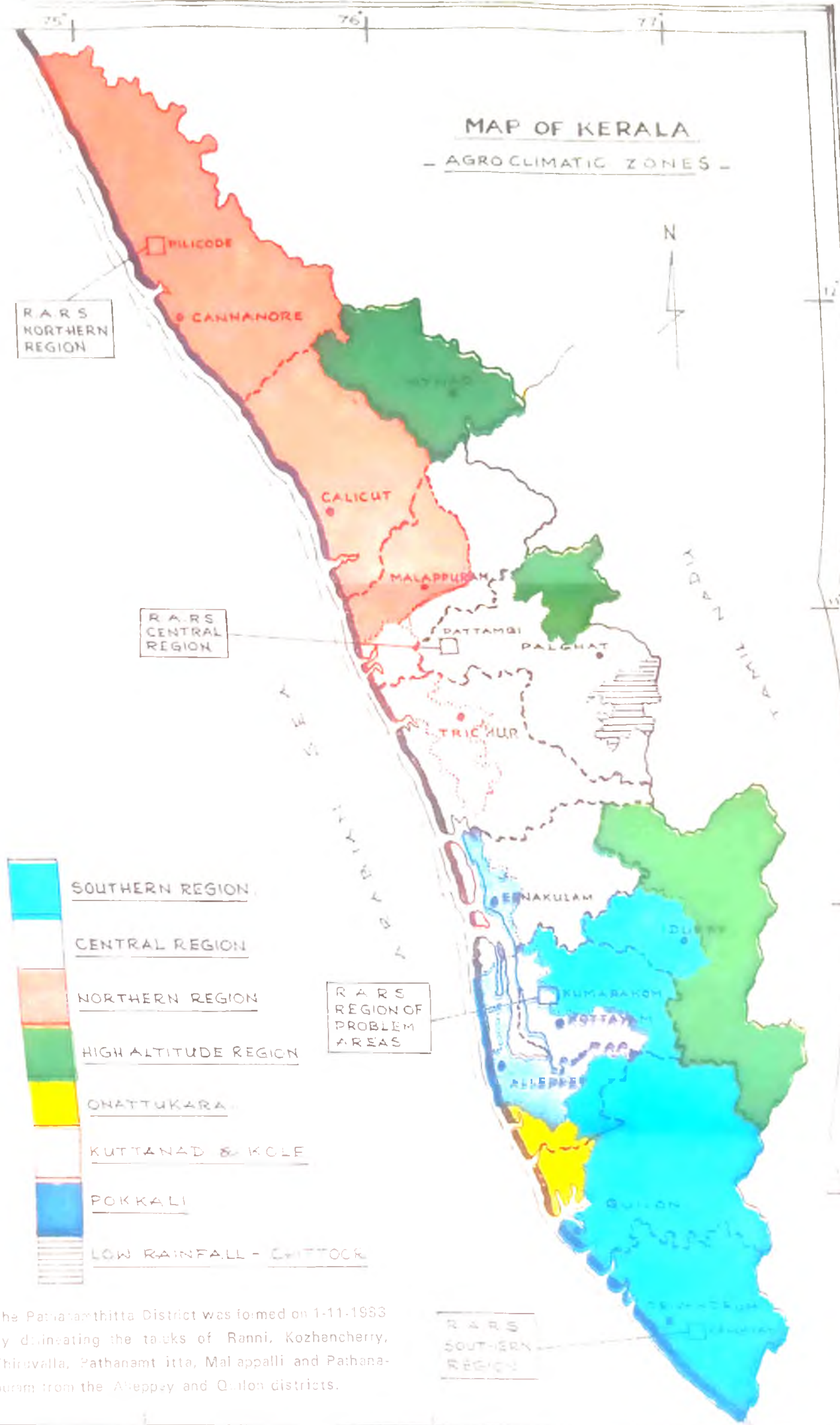
3.3 Based on the recommendation of the Research Review Committee, sub-projects were submitted by the University and the following sub-projects have been sanctioned as detailed below.

Sub Projects	Outlay in lakhs			Date of sanction
	ICAR share	University/ State	Total	
(i) <i>Northern Region</i> Regional Research Station at Pilicode with Centres at Panniyur and Tavanur	86.98	23.45	110.43	1-6-1980
(ii) <i>Central Region</i>				
a) Regional Research Station at Pattambi with Centres at Mannuthy and Eruthiampathy	84.46	1.75	86.21	1-9-1981
b) Water Management Studies in the Central Region	21.72	8.34	30.06	1-4-1983
c) Coconut based mixed Farming systems at Thiruvazhamkundu		Appraisal completed. Sanction awaited from the ICAR		



# MAP OF KERALA

## - AGROCLIMATIC ZONES -



The Pathanamthitta District was formed on 1-11-1983 by delineating the teaks of Ranni, Kozhencherry, Thiruvalla, Pathanamthitta, Malappalli and Pathanapuram from the Alleppey and Quilon districts.

R.A.R.S. SOUTHERN REGION

1	2	3	4	5	6
(iii)	<i>Southern Region</i> Regional Research Station at Vellayani and Special Station at Kottarakara	81.77	13.94	95.71	1-9-1981
(iv)	<i>Region of Problem Areas</i> Research Station at Kumarakom with Centres at Moncompu, Kayamkulam, Vyttila and Kole area	113.91	4.50	118.41	1-9-1981
(v)	<i>High Ranges</i> Regional Station at Ambalavayal and a Special Station at Pampadumpara	33.37	3.99	37.36	1-9-1983
(vi)	Strengthening of the Directorate	10.83	—	10.83	31-7-1980
	Total	433.04	55.97	489.01	

### 3.4 Kerala Agriculture

Agriculture in Kerala has certain distinguishing features in the systems and practices of crop production. This is due to varied soil, land and physiographic conditions and climatological factors. The main features of the farming systems are: (i) The homestead system of cultivation with a combination of perennial and annual crops and / or mixed farming of crops-livestock, crop-livestock-fish farming systems and (ii) Rice cultivation of extensive nature in areas of utmost adverse conditions viz., lands lying below the sea level and subjected to inundation by sea water and extreme salinity as witnessed in Kuttanad, Kole and Pokkali lands of the State.

The cropping systems can be largely grouped into three major groups as given below:-

- i) Coconut based farming system
- ii) Rice based farming system
- iii) Homestead farming system.

i) In the coconut based cropping system with coconut as the pivotal crop is in vogue in uplands and hill slopes of the midlands. This cropping system includes a number of intercrops like pepper, arecanut,

## 2. Objectives and approaches

2.1 The main objective of the NARP is to strengthen permanently the regional research capabilities of the State Agricultural Universities. This strengthening is considered to be an important means of finding solutions to the location specific problems in the different agro-climatic zones in the service area. For this purpose, intensification of research efforts is promoted in respect of (i) food-grains (cereals and millets), pulses and oil seeds, particularly those that are grown under rainfed conditions; (ii) farming systems involving crop-livestock-fish and horticultural production systems; (iii) agronomic practices; (iv) soil and water conservation techniques and (v) land use patterns for more efficient use of natural resources and ecological potential. These objectives are achieved through rationalisation of the research programmes and the research set-up of the University as well as by strengthening the capability of the SAU to undertake research on location specific problems. The main approach for this would comprise of:

i) Development of at least one main station in each selected agro-climatic zone in the service area of the University supported by sub-stations wherever it is necessary by providing resources for staff, equipment and infrastructure needed for the on-going research as well as to pursue new applied research problems,

ii) Provision of resources including infrastructure for verification of research results both at the main station as well as the sub-stations,

iii) Provision of resources to initiate, strengthen and accelerate basic research on topics which are crucial for the long-term agricultural development of the State

cocoa, banana, turmeric, ginger, small tubers, fodder and in some areas upland rice, pulses and oil seeds. The selection of annual crops are made depending on the age of the coconut palms so as to make the best use of the sun shine for maximum out-turn from unit area.

ii) The rice based cropping systems are prevalent in the low lands. A single crop or two crops of paddy are grown depending on the availability of water as in the central region or after dewatering of impounded water as in the kayal lands. Annual crops like vegetables, pulses and oil seeds are grown in rice fallows or as a summer crop. Fish farming or prawn culture is often practiced, after the rice crop, in the areas of sea water inundation.

iii) Homestead farming system has been in vogue in the State since long as the agro-climatic conditions of Kerala favour the raising of a wide variety of crops. The pressure on land and fragmentation of holdings also encouraged the homestead system of farming in Kerala. The farmers choose their crop combinations and livestock-fish farming according to the suitability conditions available in their tracts.

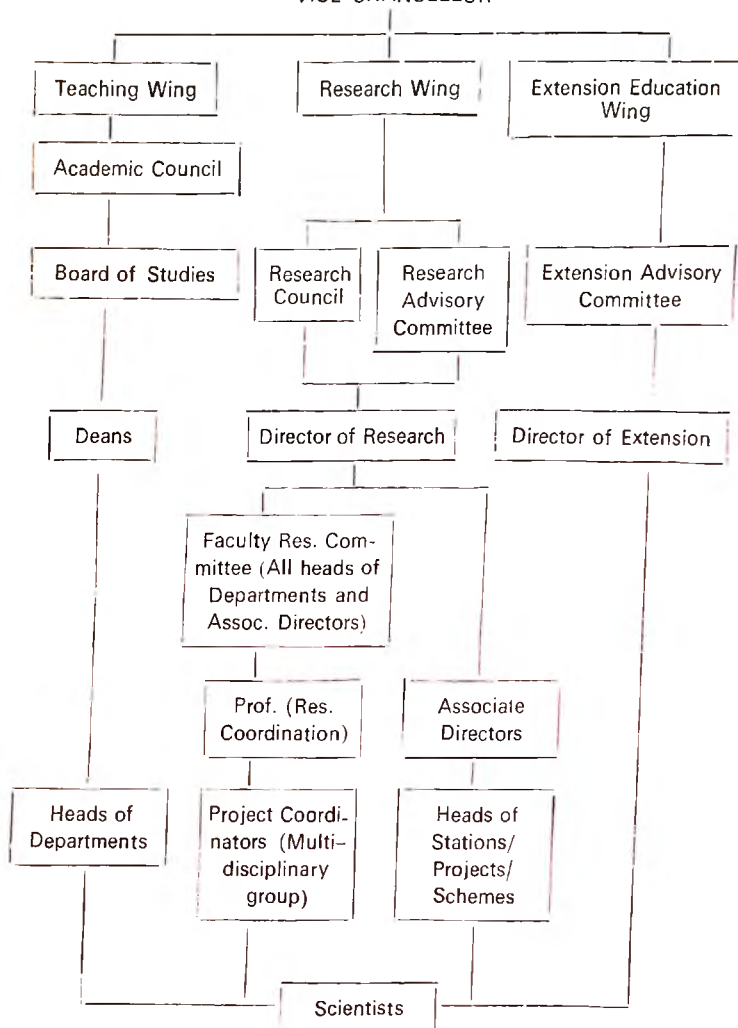
## 4. Research organisation

### 4.1 Organisational set up

The organisational set up of the Research Wing of the University is schematically presented below:-

#### RESEARCH ADMINISTRATION

VICE CHANCELLOR



4.2. The University has at present the following 30 project co-ordination Committees, 17 in the Faculty of Agriculture, 7 in the Faculty of Veterinary & Animal Sciences and 6 in the Faculty of Fisheries.

PROJECT CO-ORDINATION GROUPS

Agriculture	Vety. & Animal Sciences	Fisheries
1 Rice*	1 Cattle & Buffaloes	1 Aquaculture
2 Coconut, Arecanut and Oil palm	2 Goat Improvement	2 Fishery Biology
3 Cashew	3 Poultry & ducks	3 Fish processing technology
4 Fruits & Floriculture	4 Pig, Elephant, Dog and other species	4 Fishery Hydrography
5 Spices	5 Artificial insemination & animal reproduction	5 Fishery Engineering
6 Cocoa & other beverage crops	6 Animal diseases	6 Management studies
7 Vegetable & tuber crops	7 Miscellaneous	
8 Pulses & Oil seeds		
9 Essential oil & Medicinal Plants		
10 Sugarcane and Miscellaneous crops		
11 Fodder crops		
12 Plant Protection		
13 Soils & Agronomy*		
14 Farm Economics & Extension		
15 Soil conservation & Farm Mechanisation		
16 Cropping pattern & Farming systems		
17 Post-harvest technology		

\*Full time co-ordinators are available

It has already been possible for these Project Co-ordination Committees to prepare status papers for each of their groups identifying the research gaps and the efforts needed to bridge these gaps. These status papers are periodically revised or updated to serve as the background papers for re-orientation of research efforts. A 'Project Bank' has also been prepared based on the problems identified.

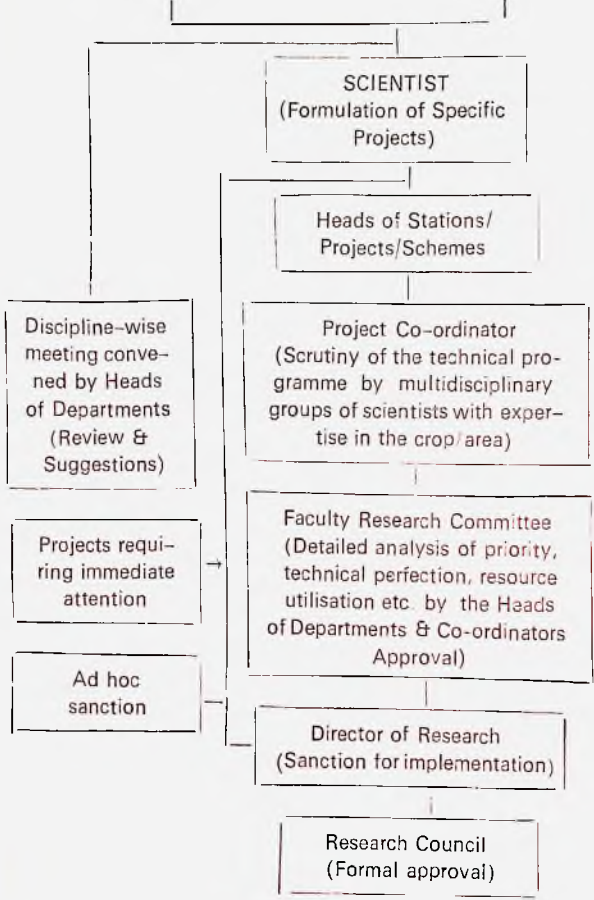
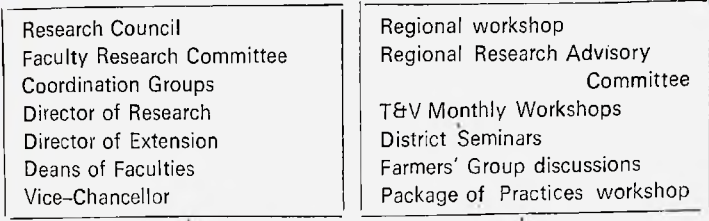
## 5. Formulation and approval of research programmes

The various steps involved in the formulation and approval of research programmes are schematically presented below:-

### FORMULATION & APPROVAL OF RESEARCH PROJECTS

Suggestions from

Suggestions from



## 4.4 Monitoring the Progress and Evaluation of the Results

### SCIENTIST

Monthly Reports

Director of Research (Monitoring the progress of work)

Discipline-wise meeting convened by the Heads of Departments

(Overall review of projects in the discipline & suggestions)

Annual and conclusion Reports

Heads of Stations/Projects/Schemes (Scrutiny of data Assessing the Contribution by individual scientists)

Project Co-ordination Groups (Discussion & Evaluation of the results by the multidisciplinary group of scientists with expertise in the crop/area)

Faculty Research Committee (Evaluation of results. Suggestions for further work. Recommendation for inclusion in the Package of Practices)

Director of Research (Publication of Annual Research Reports. Presentation of the report to the Govt and General Council. For-warding the findings to the Director of Extension for inclusion in the Package of Practices workshop)

Research Council

(Formal approval. Review of priorities. Issue of broad guidelines)



## 6. Linkages with State Extension Departments

The Kerala Agricultural University maintains an effective and cordial linkage with the State Departments of Agriculture, Animal Husbandry, Fisheries, Forestry etc. and organisations like ICAR institutions, Cardamom Board, Rubber Board, Coconut Board etc., and with the farming community. The Extension Education activities include organisation of seminars, training programmes, conduct of correspondence courses, farmers' melas and exhibitions, publication of popular literatures, contributing to Rural radio programmes etc. The University has adopted villages near the teaching campuses and Research Stations which serve as field laboratories for the researchers for testing their results, evaluation and for identifying field constraints.

The Agricultural Production Commissioner and the Heads of Departments of Agriculture, Animal Husbandry, Dairy development, Fisheries, Forestry etc. are members of the General Council, Academic Council, Research Council and Extension Advisory Committee. With the implementation of NARP by the University and the T & V programme of the State Department of Agriculture, the linkage has become very tight and mutually beneficial. The monthly workshops, the meetings of District Technical Committee, the Regional (Zonal) Workshops, the State level Technical Committee and the Package of Practices Workshops helped the Scientists and the Officers of the Development Departments to interact in a way mutually beneficial.

Participation of the scientists in the programmes organised by the Extension Departments is much sought after and the University has always given due importance to such programmes.

The KVK's at Pattambi (sponsored by the ICAR) and Ambalavayal (sponsored by the KAU) fulfil the role of training farmers and youth in agricultural operations.

### Transfer of Technology

The University takes initiative in organising "State Level Workshops on Package of Practices" for crop production and livestock productions. The Extension Departments are very well represented in these workshops, wherein the research results are received and taken into account for moulding the Package of Practices. This forms the base for the process of "Transfer of Technology". Consequent of the implementation of the T & V programme throughout the State the University Scientists and the Exten-

sion personnel review the Package critically in the light of the existing agro-climatic and socio-economic situation every month, district-wise and formulate specific recommendation for transfer to the farmers. One of the objectives of the University is to formulate regional Package of Practices taking into account the location specific problems and agro-climatic and socio-economic situation of the region.

Specialised training programmes are organised for the farmers, extension personnel, etc. by the University to impart the skill and to develop confidence among them.

## SPECIFIC PROBLEMS OF EACH ZONE

### 7. Northern Region

#### General Agricultural Characters of the zone

The region comprises of the three northern districts of Kerala viz. Cannanore, Kozhikode and Malappuram. The total area of this region is 10921 sq. kms. The most important crops of this region are coconut and paddy. Cashewnut, arecanut, banana, pepper and rubber are the other important crops. Pepper forms an important companion crop with coconut in homesteads while other crops like cocoa, cardamom, ginger, banana, turmeric, pulses and grasses are grown according to altitude and soil conditions.

#### Area under crops

The different crops covered in the districts are given in the tables.

Table 1 : Area (in ha.) under crops (1980-'81)

Crop	Malappuram	Kozhikode	Cannanore	Total
Rice - Kharif	38603	9826	37425	85854
Winter	36012	28461	28746	93219
Summer	5407	7164	7294	19865
Total	80022	45451	73465	198938
Jowar	—	—	—	—
Ragi	8	28	16	52
Other cereals & Millets	45	3	108	156
Pulses including Turmeric	834	340	50	1224
Winter	344	69	3103	3516
Summer	990	956	1149	3095
Total	2168	1365	4302	7835
Sugarcane	6	3	35	44
Palmyrah	1415	431	239	2085
Pepper	4030	20184	26578	50792
Chillies	83	75	826	984
Ginger	451	2132	1226	3801
Turmeric	108	348	569	1025
Cardamom	184	3783	1266	5233
Tamarind	1180	693	650	2523
Arecanut	8801	6771	15102	30674
Spices	148	153	892	1193

1	2	3	4	5
Mango	6211	7198	8008	21417
Banana	2598	1204	1505	5307
Other plantains	1929	2298	3056	7283
Pineapple	239	435	1272	1946
Papaya	1495	1144	1043	3682
Jack	5623	9435	8833	23891
Other fruits	802	1620	2120	4542
Cashewnut	21257	5213	68917	95387
Tapioca	18111	7756	18765	44632
Sweet Potato	1464	89	1104	2657
Tubers	2435	3105	1342	6882
Other tubers	1524	384	1995	3903
Drumstick	885	3164	714	4763
Sesamum	1587	70	410	2067
Coconut	59670	94466	72980	227123
Other oil seeds	35	122	62	219
Betal leaves	416	56	31	503
Tobacco	—	—	551	551
Lemongrass	109	913	3070	4092
Coffee	10	30304	18741	49055
Tea	174	3899	1455	5528
Cocoa	422	2103	1468	3993
Rubber	19281	18171	23934	61386
Fodder crop	31	178	245	454
Green manure	3527	1383	1421	6331

Table 2 : Production of crops during 1980-81 (in tonnes)

Crop	Kerala	Mala-ppuram	Kozhi-kode	Canna-nore	Total
Rice					
Kharif	553748	48128	8372	49670	106170
Winter	548500	50547	35549	37052	123148
Summer	169714	8813	10223	10640	29676
Jowar	845	—	—	—	—
Ragi	1131	7	3626	24	57
Other cereals and millets	1768	29	2	69	100
Pulses	22179	1609	1039	3356	6004
Sugarcane (gur)	48178	38	19	122	179
Black pepper	28519	1108	7529	7654	16291
Dry chillies	1064	73	60	768	901

1	2	3	4	5	6
Dry ginger	32039	810	5341	3295	9446
Cured turmeric	6141	163	802	1148	2113
Processed cardamom	3244	11	261	93	365
Arecanut (Nos. in millions)	10805	1544	1817	2443	5804
Banana	176683	35580	13882	11789	61251
Other plantains	140722	6188	7834	13987	28009
Jack (Nos. in thousands)	261764	27761	43118	42169	113048
Raw Cashewnut	81900	6887	2925	50516	60328
Tapioca	4060911	228742	99277	349967	676986
Sweet potato	32967	9951	567	7472	17990
Groundnut	8225	3	—	71	74
Sesamum	3833	540	22	234	796
Coconut (Nos. in millions)	3008	264	456	311	1031
Cotton (Bales of 170 kg)	9847	—	—	—	—
Tobacco	1015	—	—	1015	1015
Tea	50716	92	6953	1854	8899
Coffee	23540	3	11768	7302	19073
Rubber	140333	10571	10730	12298	33599
Mango	281873	53856	5164	42659	101679

The comparatively low productivity of rice in the zone is attributed to the low spread of improved varieties of paddy, low level of management, lack of adequate irrigation facilities, difficulty in controlling water during monsoon season and poor drainage. Increasing the irrigation potential and scientific management of irrigation water complied with suitable agronomic practices will pave the way for a substantial increase in the productivity of rice in the zone.

The spread of high yielding varieties is declining year by year. In Cannanore district, while the area under high yielding varieties in 1970-71 was 9023ha in 1980-81 5543, 2103 and 1377ha in autumn, winter and summer respectively. In Kozhikode district the spread of high yielding varieties is limited to about 18.27 per cent of the area under rice. The percentage of high yielding varieties to the total paddy area in Cannanore district is 12.28, in Kozhikode district 18.27 and in Malappuram district it is only 6.75. Lack of assured water supply during first crop season, high cost of cultivation, very high pests and disease incidence etc. are the factors which inhibit the spread of high yielding varieties. Low yield and high cost of cultivation and unremunerative returns made paddy cultivation

unattractive. Paddy lands afford large scope for crops like banana, tapioca, vegetables, pulses etc. Therefore, the most economical cropping systems suitable for specific localities will have to be evolved by undertaking large scale trials in the cultivators' fields. Evolving rice based farming systems in different localities, taking into consideration the suitability of the crop, availability of moisture, susceptibility of the crop to excess moisture and moisture stress etc is another important area requiring immediate attention.

Next to rice, coconut occupies the largest area in the zone. The low yielding declining trend in the yield of coconut in the zone and also declining trend in yield from year to year is attributed mainly to the non adoption of elite planting materials, the lack of proper manuring and agronomical practices. The need for improving the productivity of coconut by an all embracing effort involving use of HYV, scientific agronomic practices, adequate plant protection measures and scientific multiple cropping is recognised. Since coconut is grown in diverse soils and topographical conditions, a blanket recommendation for all these areas is not sufficient. So, areas having identical conditions will be evolved for increased production of coconut for different agroclimatic specific situations even within the agro-climatic zone.

Other constraints of production in coconut in this zone are poor genetic stock, lack of facilities for summer irrigation, non-manuring, inadequate and imbalanced manuring, lack of scientific replanting system etc. Production and distribution of high yielding planting materials of coconut both for replanting and new planting will have to be undertaken. The water resources should be tapped to the maximum extent possible.

Coconut based mixed farming systems should be developed scientifically and the interspaces of coconut gardens should be fully utilised. Suitable crop combinations should be developed to suit diverse conditions of coconut gardens.

Cashewnut is another important crop in the zone. Productivity of the crop is gradually decreasing. Research findings have shown that considerable yield increase can be achieved by planting improved varieties and regular fertilizer and management practices.

Pepper is one of the important components of the homestead garden. Varieties suitable for homesteads will have to be evolved. Appropriate cultural and manurial practices for pepper as a companion crop of coconut, arecanut and other perennial crops in the homesteads should be evolved. Wide spread incidence of slow wilt and quick wilt diseases is another important factor adversely affecting the yield of pepper. To increase the productivity, it is necessary to replace them with high yielding varieties like Panniyur, Karimunda, Kalluvally and Kottanadan.

in the case of arecanut the problem is introduction of improved varieties, provision for irrigation and remedial measures against diseases like Mahali and Yellow leaf.

Tapioca and sweet potato are two tuber crops with great potential for development.

Pulses like black gram, horse gram, red gram, green gram and cowpea and oil seed crops like groundnut and sesamum are other important crops with potential for development in the coconut interspaces and in the rice fallows. Suitable shade loving tolerant varieties will have to be identified for growing in the coconut gardens.

## 8. Central Region

### General Agricultural Characters of the Zone

The Central Region consists of three central districts of the State of Kerala viz. Palghat, Trichur and Ernakulam. Total area of the Central Region is 9000 sq. km. Crops raised are mainly rainfed even though this zone has more than 60 percent of the total area under irrigation in Kerala.

This is the major rice growing tract of the State. Rice tops the list of crops grown, followed by coconut and tapioca. Pulses, tubers, areca-nut, vegetables, oil seeds, pineapple, banana etc. are other important crops grown. Eastern part of Palghat comprising of Attappady hills and valleys falls under this zone, which gets severe dry spell requiring special attention.

### Constraints limiting Agricultural production

#### *Water management*

Sixty per cent of the total irrigated area in the State falls within this region. In view of the irrigation water that would be available, the most important research that will be needed in this region relates to the formulation of water management schedules and efficient utilization of water available for taking more than one crop in this region. Potentialities of recycling drainage water and tapping subsurface water also to be taken up.

#### *Cropping pattern*

Important cropping pattern of the region are:-

- a) Rice based cropping system
  - i) Rice-Rice-Rice
  - ii) Rice-Rice-Fallow or vegetables/pulses
  - iii) Rice (Broadcast)-Vegetable-pulses like cowpea
  - iv) Rice-Horsegram-Sesamum
- b) Coconut based cropping system
  - i) Coconut alone
  - ii) Coconut-Pepper
  - iii) Coconut-Nutmeg/Clove
  - iv) Coconut-Tapioca/Banana
  - v) Coconut-Tapioca-Banana-fruit trees like Mango, Jack, Tamerind and miscellaneous trees (Homesteads).

#### *Varietal improvement*

Rice is grown in 3.7 lakh ha which covers 68 per cent of the area of the region. This region accounts for about 50 per cent of rice produced in Kerala State. Rice cultivation is confronted with serious problems of pests



**and diseases.** Although high yielding varieties are available, the need for varieties with built in resistance to some of the important diseases and pests like brown plant hopper stemborer, sheath blight and bacterial blight are yet to become available. Since paddy straw is one of the important cattle feed of this region the farmer at the moment is in need of some tall varieties with keeping quality. Drought resistant varieties suitable for rain shadow areas in Chittoor and for kharif upland conditions are also in need.

#### *Pests and diseases:*

Introduction of the high yielding varieties and the high plant density recommended for cultivation have changed the micro-climate in the crops making them more vulnerable to pest and disease epidemic. The brown plant hopper which was unknown has become the most serious pest in this area. Control measures which include cultural, biological and chemical will have to be evolved. The dependence on chemicals alone which tends to upset the ecological balance of the region is to be tackled with an integrated strategy.

Pest surveillance should be undertaken and arrangements made for giving timely warning to the rice farmers through various agencies regarding the impending attack of a pest or disease.

#### **Programmes of Research:**

##### *Varietal improvement.*

- 1 Evolving high yielding rice varieties with built in resistance to diseases like sheath blight, blast, bacterial blight and grassy stunt virus and pests like stem borer and BPH. Evolving multiple resistant varieties with higher productivity.
- 2 Breeding semi-tall or tall photosensitive, high yielding varieties of rice for the Rabi season
- 3 Evolving rice varieties to withstand temporary flooded and ill drained conditions.
- 4 Development of rice varieties suitable for dry sown kharif and upland modan areas.
- 5 Screening and selection of shade tolerant pulses for homestead and long podded cowpea for growing in rice fallows, red gram for dry lands and blackgram and groundnut for rice fallows
- 6 Evolution of medium duration drought resistant sesame with multiple pods and bunch varieties of groundnut suitable for intercropping in coconut gardens and for pure crop.
- 7 Evolution of high yielding short duration varieties/hybrids of tubers like tapioca, sweet potato etc, suited for homestead and rice fallows.

### **Soil management:**

- 1 Studies on slow release nitrogen sources and nitrification inhibitors as well as the frequency of application of such fertilizers to obtain maximum fertilizer use efficiency.
- 2 Causes for lack of response for P and K in rice.
- 3 Survey of the micro nutrient status of soils in the region and to initiate projects for the study of the micro-nutrients.
- 4 Evolving fertilizer recommendation specific to varieties, seasons and cropping systems.
- 5 Determine the optimum time of planting for each variety during different seasons.
- 6 Working out herbicide cum cultural methods of weed control for upland and wet land conditions.
- 7 Study of physiological aspects of poor yield of HYV during Rabi crop season.
- 8 Study of stress physiology in rice
- 9 Detailed studies on the application of insecticides along with fertilizers in the root zone and consequent influence on the pesticide efficiency and mineralization of nutrients including its cost benefit ratio.
- 10 Standardisation of management practices for better utilization of applied nutrients.
- 11 Standardisation of economical methods of production and utilisation of bio-fertilizers.

### **Water management:**

- 1 Water management studies for irrigated, rainfed, single cropped and double cropped rice areas. Potentialities of recycling drainage water and tapping of sub-surface water.
- 2 Majority of the cultivated area is rainfed and acute shortage of water is experienced at critical stages of crop growth. Studies on moisture requirement at critical stages of plant growth needs immediate attention.
- 3 Conservation studies on surface run-off-water.
- 4 Studies on the physico-chemical properties on impeded drainage (Poonthalpadoom) and measures to improve drainage in such areas.
- 5 Methods of application of water.
- 6 Standardisation of water management on watershed basis.

### **Post harvest technology:**

- 1 Processing of paddy in relation to quality of rice.
- 2 Physiological changes in tubers and measures to prolong the shelf life of tapioca and sweet potato tubers.
- 3 Storage studies on pests of dried products of tubers.
- 4 Storage studies on seeds of cereals and vegetables.
- 5 Storage studies of tapioca planting materials.
- 6 Utilization of bye-products of rice viz. rice husk, bran, and straw.

### **Horticultural improvement:**

- 1 Work out the economics of intercropping cocoa and pepper in coconut gardens and standardise the agro-techniques for the region.
- 2 Screening varieties of vegetables like bhindi, brinjal, chillies, amaranthus and cucurbits for the rainfed garden lands and for the summer rice fallows.
- 3 Residual toxicity of insecticides on vegetables.
- 4 Testing the suitability of different fruit crops and their economics for the garden/dry lands of the region.

### **Plant Protection:**

- 1 Control of diseases like blast, bacterial blight, tungro and sheath blight in rice, bunchy top of banana and phyllody in sesamum. A survey has to be conducted to ascertain the extent of spread of the disease in this zone.
- 2 Control of pests like brown plant hopper, pod borer of pulses and groundnut.

### **Eruthiampathy Centre:**

- 1 Evolving suitable & economical cropping patterns for the rain shadow area for different seasons.
- 2 Standardisation of different agro-techniques including moisture conservation for the different cropping system as a whole.

### **Centre for studies on laterite and laterite management**

Systematic classification of upland and low land laterites in the country has not been attempted. Many workers engaged in soil classification however, point out the inadequacy of the soil taxonomy (USDA) in the classification of laterites. The USDA systems is essentially based on the laterites of Hawaii which are different from those found in India and Brazil. In recent years, Brazilian workers have established a system of classification which appears to be more suitable to Indian Situations. In 1979 and 1982, two international symposia on laterites were held, one in Trivandrum and another in Sao paulo, Brazil. On the basis of the recommendations of these symposia, data already accumulated on classification in Kerala Agricultural University and morphological and chemical studies available with soil survey wing of the Department of Agriculture, a system of classification for upland and low land laterites in the state will be attempted. Since the centre is to develop recommendations not only for catering to the needs of the State but for the country as well, the differences due to the parent material in the laterisation process and its effect on the sub-systems, will form a major aspect of study in effecting this classification. For this, initially, comparisons will be made between the laterites of granitic origin in the Southern region of Western Ghats (Kerala & South

Kanara) and the laterites of Basaltic Origin in the Northern region of Western Ghats (N. Karnataka and Maharashtra). In support of the above programme, collection of micro and macro monoliths will be an important item of work. The ultimate aim will be to establish a soil museum for laterites.

Considerable work has been done on the mechanism of hardening the laterites, which becomes a problem when the laterite subsurface horizons get exposed due to erosion and run off and consequently get irreversibly hardened. For a centre devoted to the study of laterites from the management point of view, the investigations on hardening of laterites is important with a view to evolve suitable methods/systems of management involving softening and powdering of hardened laterite in surface horizons.

In most of the lateritic areas, physical properties of soils such as infiltration rate, hydraulic conductivity, permeability etc., are quite conducive for crop growth. But surface crushing, poor moisture retention etc., are problems affecting cropping. Simple management techniques for various ranges of crops from annuals to perennials will have to be standardised in addition to fundamental studies on physical parameters *per se*.

A study of the organic matter status in relation to the extent of laterisation and the depth at which laterisation occurs, is essential to evaluate the criticality or otherwise of the role of organic matter in the process of laterisation.

Phosphorus management practice in laterite soils with low cost rock phosphates requires basic data from studies on the factors favouring phosphorus availability and extent of fixation of P from sucaae-cheap sources of P.

Investigations on the potash management for annuals and perennial crops in laterite soils is of importance in view of the low lime status coupled with low CEC of laterite soils.

Liming in lateritic alluvium for rice based cropping systems with applications starting from the non rice crops as well as from first crop (Kharif) seasons of rice and its response pattern needs further study. Monitoring of residual effects and responses of sequential crops is also essential. This has much relevance, since raising of summer fallow pulses and oil seeds is a major development strategy in Kerala Agriculture.

Studies are necessary on critical levels of P and Al in soils and soil water systems of lateritic alluvium in low lands as well as in uplands. Emphasis in screening rice varieties pulses and oil seeds in rice based cropping systems will pay greater dividends in identifying varieties tolerant to toxic factors in laterite soils to develop low level amendments and high yield cropping systems.

Micronutrient status of lateritic upland and low land soils are to be assessed and catalogued so as to evolve special management practices to overcome deficiencies and toxicities.

Leaching and movement of nutrients in soils under various crop cultures, drainage conditions and rainfall require a continuous monitoring by developing appropriate 'Block' or 'insitu' lysimeters.

Studies on growing deep rooted crops with strong tap roots which are capable of breaking the hard pan are warranted.

In depth studies on the changes in the "structure" of the soil materials in laterite soils brought about by various cultivation practices in vogue in the region.

Fundamental studies on the nature of iron oxide materials associated with laterites are to be undertaken.

## 9. Special Region

### General Characteristics of the Area

The Special Zone of the problem areas consists of four regions viz. Onattukara, Kuttanad, Pokkali and Kole lands. The Onattukara region falls into Quilon and Alleppey districts of Kerala. The total geographical area of this agricultural region is estimated to about 725.7 sq kms. The region was considered to be the rice granary of the erstwhile Travancore. But recently due to various reasons, it has become a problem area with low level of production and productivity.

The Kuttanad region represents low-lying lands measuring about 25 km east-west and 60 km north-south of the west-coast of Kerala State. The Kuttanad region fields into two districts of Alleppey and Kottayam. The rice fields in Kuttanad region are divided into contiguous blocks called 'Padasekharam'. The area of each padasekharam ranges from few hectares to above 1000 ha owned by several cultivators.

The Pokkali type of cultivation is a unique feature of Ernakulam district in the State. The pokkali lands comprise of the marshy area of Ernakulam districts where salt water incursion is the problem. Total area of pokkali region is estimated to about 9,000 ha

The term 'Kole cultivation' is peculiar to the type of cultivation carried out during December to April, in 11000 ha of Karivannur and Kecheri basins. The kole region lies in Trichur and Malappuram districts extending partly along Trichur, Chowghat, Mukundapuram and Ponnani taluks of Malappuram district. The Kole area forms a substantial portion of the area under paddy cultivation in Trichur and Malappuram districts.

### Identification of specific farming situations

Identification of specific farming situations based on the soil, climate, irrigation facilities and cropping pattern has been done.

#### 1. Onattukara

##### 1.1 Farming situation low level

The whole of Onattukara except coastal salinity affected area, the uplands and the 'Thara lands' covers an area of 28,340 ha. The area is distributed over Quilon and Alleppey districts. The soil is sandy to sandy loam, very porous, poor in water holding capacity, very poor in organic matter and available plant nutrients and acidic in reaction with an average pH of 5.6.

##### *Cropping pattern*

- (i) Paddy—Paddy—Sesamum
- (ii) Paddy—Paddy—Pulses/Groundnut/Vegetables.

## 1.2 Low lands

About 8000 ha. of land in Onattukkara situated on the coastal sides of Karthikappilly and Karunagappilly taluks comprise under this. These areas are subjected to salt water incursion. Soil is sandy to sandy loam, very porous, poor in water holding capacity, very poor in organic matter and available plant nutrients and acidic in reaction with an average pH of 5.6.

### *Cropping pattern:*

Only one crop of rice is taken during the second crop season (August–September to December–January). During the remaining period, some of the fields will be utilised for prawn culture. Generally, long duration salt resistant varieties of paddy are grown.

## 1.3 'Thara' lands:

These lands are scattered in small beds throughout the Onattukara region. These lands are at a level higher than the wet lands and lower than the uplands. The total area is around 5,000 ha. Soil is sandy to sandy loam, very porous, poor water holding capacity, very poor in organic matter and available nutrients and acidic in reaction with an average pH of 5.6.

### *Cropping pattern:*

The common crops grown in this type of land are short duration tapioca, sweet potato, pulses and vegetables. These lands are also utilised as nursery for the second crop.

## 1.4 Uplands:

About 35000 ha distributed throughout the Onattukara region as uplands. Soil is sandy to sandy loam, porous, poor in water holding capacity, very poor in organic matter and available nutrients. They are acidic in reaction with an average pH of 5.6.

### *Cropping pattern:*

Coconut based cropping system is prevalent in this region. Mixed cropping is also practiced. The main intercrops grown in coconut gardens are tapioca, banana, cocoa, nutmeg, clove, pulses, fodder grasses, vegetables and minor tubers.

## 2. Kuttanad

The region can be divided into Karapadam, Kayal land, Kari land and uplands.

### 2.1 Karapadam

This area lies along with inland water ways and rivers and are spread over a large part of upper Kuttanad in the district of Alleppey and Kottayam. The area is estimated to about 41,000 ha. The soil is river-borne alluvial. The fields lie about 1 to 2 meters below the Main Sea Level. The soils are characterised by high acidity, high salt content and fair amount of decomposing organic matter.

*Cropping pattern*

One or two crops of paddy are taken in this area as detailed below:-

Season	Period	Crop	Remarks
Puncha	September-October to February-March	Paddy	Main crop
Additional crop	April-May to August-September	Paddy	Additional crop

*2.2 Kayal land*

This area is found in the reclaimed lake beds of Kottayam and Alleppey districts and occupies an area of about 8000ha. The land is situated two to three metres below sea level. Soil is silty clay loam, slightly acidic in reaction, poor in plant nutrients and fairly rich in calcium. Only one crop of paddy (Puncha) is taken. During the remaining period, it will be under submerged condition. The crop is raised between September-October to February-March.

*2.3 Kari land*

These are found in large isolated patches in Ambalapuzha, Shertallai, Vaikom, and Kunnathunad taluks of Alleppey and Kottayam districts covering an area of 20,000 ha. The soil is peaty clay in texture. They exhibit characters of submerged forest area but are silted up. Deep black in colour, heavy in texture poor in aeration and drainage, low in available, plant nutrients but rich in organic matter are the characteristics. In the soil, free sulphuric acid is formed by the sulphur compound present in the wood fossils found in the soil. Large amount of woody matter at various stages of decomposition occurs in these soils.

*Cropping pattern*

Only one crop of paddy (Puncha) is taken. The rest of the year, the field will be under submerged condition.

*2.4 Upland*

It includes upland area of the entire Kuttanad region in Kottayam and Alleppey districts. The soil is alluvial clay loam.

*Cropping pattern:-*

Coconut based cropping pattern is followed. The intercrops grown are vegetables, tuber crops, cocoa and banana.

**3 Pokkali**

Pokkali region is located in Ernakulam and Alleppey district of the State. In Ernakulam district, it is distributed over Edappally, Vyttila, Palluruthy, and Vyppin blocks of Kanayannoor, Cochin and Paravur taluks.



In Alleppey district the area is scattered over Thaikattussery at Pattanakkad blocks of Shertallai Taluk. The total area under pokkali is estimated to about 10 000 ha.

The soil is river borne alluvium loam to clay in texture. They are highly acidic and fairly rich in nitrogen possessing high conductivity. These soils are subjected to periodical inundation of salt water and are highly acidic in reaction.

#### *Cropping pattern:*

Only one crop of paddy generally called Pokkali is taken during the first crop season. During the rest of the period, the fields are submerged and people are engaged in fishing activity. Long duration salt resistant varieties are grown.

### **4 Kole land**

The kole land is divided into low land and upland. The kole region lies in Trichur and Malappuram districts extending partly along Trichur, Chawghat, Mukundapuram and Ponnani taluks (8000 ha).

#### *4.1 Low land*

The soil in general is clayey sand containing sufficient quantity of organic matter and silt. The flood water deposits silts and organic matter every year.

#### *Cropping pattern:*

Generally one crop during summer (Puncha) is taken. However, in some areas a second crop of paddy is also taken. During the first crop season the entire area will be under water.

#### *4.2 Uplands*

Uplands are situated along the entire kole region in Trichur and Malappuram districts. The soil is laterite with lesser amount of silt and clay.

#### *Cropping pattern*

A coconut based cropping pattern is followed. The common intercrops grown are banana, cocoa, tapioca, pulses, vegetables and other tuber crops.

## CONSTRAINTS

### **Onattukara Region:**

Untimely and irregular pre monsoon showers and monsoon, delay the time of sowing of the first crop lack of moisture affects the third crop. Hence, the failure of sesamum crops is found in certain areas. Very poor organic matter content of the soil leading to poor water holding capacity and other physical conditions are other difficulties. Incidence of pests like mealy bug, rice gall midge, stem borer, leaf roller, rice case worm, are

also frequently noticed. *Salvinia* and perennial weeds like *Ischeemum* are also problematic. *Striga* is another important weed in specific locations in this region. Lack of proper technology for manuring the first crop of dry sown paddy and for combating incidence of diseases like sheath blight and sheath rot are other important constraints. Lack of suitable varieties for different cropping systems and iron toxicity are other important problems met within the low land situations in the Onattukara region.

In 'Thara lands, lack of suitable cropping pattern and suitable varieties are important constraints. These lands are mainly utilised for raising paddy nursery. Therefore, suitable short duration varieties of tapioca can be identified for this specific location. The possibilities of growing vegetables in this region also requires exploration. In the uplands, the main problems are the incidence and spread of root (wilt) disease of Coconut. Lack of suitable shade tolerant varieties of annual crops like tapioca, banana, pulses, vegetables etc., are the important constraints. A proper manurial schedule for the coconut based cropping system with annual and perennial intercrops also has to be standardised.

#### **Kuttanad:**

In Karapadoms, the infestation of weeds in the wet direct sown rice fields and problems of *salvinia* are quite important. Lack of standardised tillage practices, problems of nutrient losses due to frequent washing, acidity, incidence of pests like BPH, leaf roller, rice case worm, rice stem borer, leaf thrips, ear-head cut worm, gall midge and rice bug are important constraints. The incidence of diseases like sheath blight, blast, sheath rot, stack burn, leaf scald, bacterial leaf blight, are also common. The problem of pollution of river water due to application of plant protection chemicals are also quite important.

In the Kayal lands of Kuttanad region, the important constraints are the salinity, infestation of weeds in the wet direct sown rice, infestation of *salvinia*, lack of standardised tillage practices, losses of applied nutrients, high acidity and incidence of pest and diseases as in the case of Karapadom.

In Kari lands, in addition to the problems in Kayal lands, the important constraint is the high acidity. In uplands, lack of scientific knowledge on the suitable intercrops to be grown in coconut gardens, lack of standardised integrated farming system incorporating crop, fish, cattle pig and lack of standardised agro-techniques for vegetables banana and tapioca are important problems for which solutions have to be found out.

In pokkali area, lack of suitable varieties, time and method of application of fertilisers for paddy crop, problems due to the tidal effects on soil properties, problems associated with the application of fertiliser

and insecticides to paddy crop and their ill-effects on the subsequent prawn culture lack of cheap cultivation practices, difficulties associated with germination of seeds and problems of pest infestation like stem borer are confronted with at present. In the pookali uplands, the main crops grown are arecanut, coconut, tapioca, banana, nutmeg and clove, proper manurial schedule and agro-techniques for the above crops are to be found out.

In the low fields of kole area, the problems of submergence and floods are often met with. At the same time lack of irrigation water for summer crops is also experienced. Suitable short duration varieties for the kole region has to be evolved so as to fit in the cropping pattern. Similarly suitable varietal combinations for the tuber crop of kole land has to be evolved. The problem of low germination of paddy seed and infestation of weeds and lack of knowledge on the loss of applied nutrients are other important constraints in this area. In the uplands of kole lands, coconut and arecanut are grown as main crops and inter-crops like banana, cocoa, pulses etc. are often grown. Suitable varieties of these intercrops have to be evolved or identified and suitable agro-techniques standardised.

## 10. Southern Region

The Southern Region comprises of the four southern districts viz., Trivandrum, Quilon, Alleppey and Kottayam. The sandy soils of Onattukara the coastal saline tract, the problem soils of Kuttanad and the high ranges that fall in some of these districts are, however, excluded from this region.

The data on the area, production and productivity of important crops of the region are, furnished in tables 3 to 5.

The following table analyses the comparative productivity in the component districts of the region.

Table 3 Productivity of important crops (kg/ha)

Sl. No.	Crop	Trivandrum	Quilon	State average
1	Paddy	1064	1778	1541
2	Tapioca	14050	12650	14457
3	Coconut (number)	4221	4077	4533
4	Pulses	506	444	438
5	Pepper	223	267	200
6	Cashew	727	949	771
7	Banana and other plantains	12132	18295	12280
8	Rubber	641	654	664
9	Arecanut (number)	121609	121293	168965
10	Tea	1046	424	1152
11	Coffee	375	373	525

(Source: 1 District Planning Office, Status paper, Quilon district.

2 District Planning Office, Status paper, Trivandrum district.)

The data revealed that the productivity of the two major crops viz., coconut and tapioca is low considering the State average. The productivity of rice in Quilon district is fair.

Table 4  
Area under important crops in Southern Region districts (in ha.) (1980-81)

Sl. No.	Land use pattern	Kerala (actual)	Trivandrum	% to state	Quilon	% to state	Alleppay	% to state	Kottayam	% to state
<b>1.</b>	<b>RICE</b>									
	Autumn (kharif)	349,243	15,361	4.40	24,142	6.91	33,019	9.45	13,485	3.86
	Winter (Rabi)	354,132	16,115	4.55	25,090	7.08	25,372	7.16	10,799	3.05
	Summer	98,324	1,107	1.13	823	0.84	24,075	24.49	7,664	7.79
	Total	801,699	32,583	4.06	50,055	6.24	82,466	10.29	31,948	3.99
2	Tapioca	244,990	56,545	23.08	54,097	22.08	19,592	8.00	23,003	9.39
3	Coconut	651,370	73,771	11.33	81,765	12.55	63,114	9.69	51,115	7.85
4	Pulses including turmeric	33,859	3,240	9.57	2,168	6.40	1,034	3.05	2,116	6.25
5	Pepper	108,073	5,362	4.96	9,832	9.10	4,843	4.48	12,786	11.83
6	Areca nut	61,242	3,292	5.38	4,250	6.94	2,865	4.68	2,525	4.12
7	Ginger	12,662	183	1.45	1,278	10.09	276	2.18	3,418	26.99
8	Rubber	237,769	8,735	3.67	38,890	16.36	4,273	1.80	63,232	26.59
9	Cashewnut	141,277	6,403	4.53	8,673	6.14	3,863	2.73	1,337	0.95
10	Banana and other plantains	49,262	6,533	13.26	4,909	9.97	4,337	8.80	4,559	9.25
11	Sugarcane + Palmyra	20,990	719	3.43	384	1.83	2,437	11.61	748	3.56

[Source: Farm Guide, Government of Kerala, 1983]

The table shows that the major crops, according to area under cultivation, are coconut, tapioca, rice, rubber, cashew, pepper and pulses. Coconut and tapioca are the main crops grown in the homesteads with different polycrop combinations.

The table given below presents the production of important crops in the region.

Table 5 Production of important crops (in tonnes)

Sl. No	Crop	Kerala	Trivandrum	% to State	Quilon	% to State	Alleppey	% to State	Kottayam	% to State
1	Rice									
	Autumn (Kharif)	553,748	22,685	4.10	39,743	7.18	56,167	10.14	23,301	4.21
	Winter (Ravi)	543,500	22,352	4.08	41,863	7.63	36,741	6.70	19,324	3.52
	Summer	1,97,714	949	0.56	583	0.34	51,950	30.61	15,853	9.34
	Total	1,271,962	45,986	3.62	82,189	6.46	144,858	11.39	58,478	4.60
2	Pulses	2,479	774	3.44	1,724	7.67	843	3.75	1,516	6.74
3	Tapioca	4,060,911	965,789	23.78	989,875	24.38	272,917	6.72	408,993	10.07
4	Coconut (million nuts)	3,008	354	11.77	344	11.44	294	9.77	188	6.25
5	Pepper (black)	28,519	2,027	7.11	3,441	12.07	1,007	3.53	1,777	6.23
6	Areca nut (million nuts)	10,805	327	3.03	541	5.01	366	3.39	370	3.42
7	Ginger (dry)	32,039	447	1.40	3,474	10.84	680	2.12	9,608	29.99
8	Rubber	140,333	5,933	4.23	25,561	18.21	2,771	1.97	36,145	25.76
9	Cashew (Raw)	81,900	3,025	3.69	6,982	8.53	2,013	2.46	727	0.89
10	Banana and other plantains	317,405	40,819	12.86	28,846	9.09	10,140	6.35	35,528	11.19
11	Sugarcane (gur)	48,178	104	0.22	1,443	3.00	12,498	25.94	1,504	3.12

[Source: Farm Guide, Government of Kerala, 1983]

The production figures highlight the importance of coconut, tapioca, pepper, cashew and rice in the southern region. Rubber is an important crop in Quilon and Kottayam districts. Sugarcane is grown extensively at Pandalam-Thiruvalla area in Alleppey district.

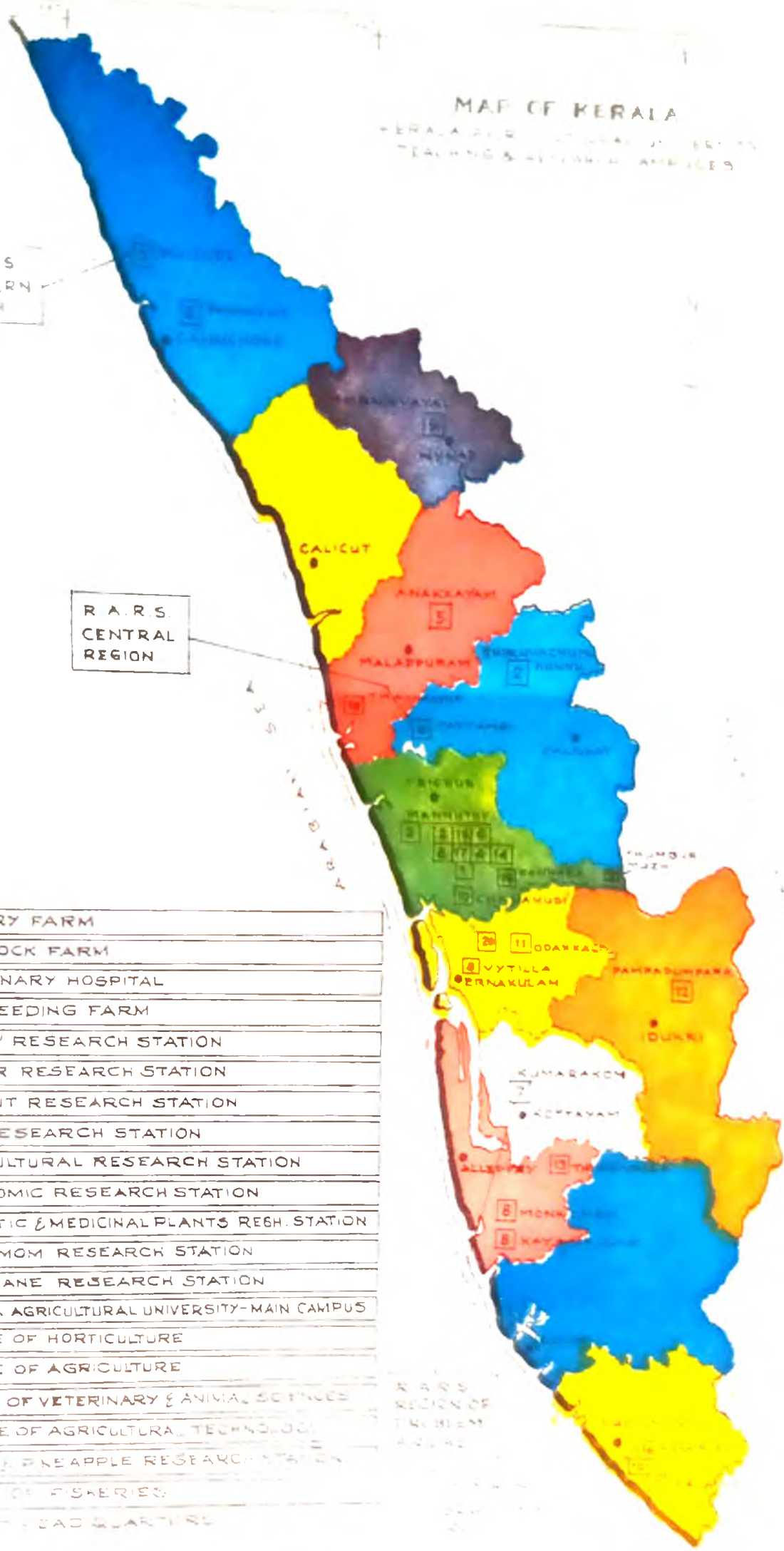
MAP OF KERALA  
KERALA AGRICULTURAL UNIVERSITY  
TRAINING & RESEARCH AMBLES

R.A.R.S.  
NORTHERN  
REGION

R.A.R.S.  
CENTRAL  
REGION

- 1 POULTRY FARM
- 2 LIVESTOCK FARM
- 3 VETERINARY HOSPITAL
- 4 PIG BREEDING FARM
- 5 CASHEW RESEARCH STATION
- 6 PEPPER RESEARCH STATION
- 7 COCONUT RESEARCH STATION
- 8 RICE RESEARCH STATION
- 9 HORTICULTURAL RESEARCH STATION
- 10 AGRONOMIC RESEARCH STATION
- 11 AROMATIC & MEDICINAL PLANTS RESH. STATION
- 12 CARDAMOM RESEARCH STATION
- 13 SUGARCANE RESEARCH STATION
- 14 KERALA AGRICULTURAL UNIVERSITY—MAIN CAMPUS
- 15 COLLEGE OF HORTICULTURE
- 16 COLLEGE OF AGRICULTURE
- 17 COLLEGE OF VETERINARY & ANIMAL SCIENCES
- 18 INSTITUTE OF AGRICULTURAL TECHNOLOGY
- 19 MALAYA BANANA & PINEAPPLE RESEARCH STATION
- 20 COLLEGE OF FISHERIES
- 21 OFFICE OF HEAD QUARTERS

R.A.R.S.  
REGION OF  
THE GREAT  
CANAL



## **Approaches to solve the location specific constraints limiting production**

A detailed Status Report has been prepared wherein the constraints limiting production have been identified. A broad categorisation of the problems and the approaches attempted to solve the problems are narrated.

### **Homestead farming:**

In more than 55% of the area where coconut or tapioca is the main crop, the existing crop combinations in the homestead are based on trial and error by the cultivators themselves rather than based on any scientific findings. In this area, the research stress will be:

Evolving suitable polycrop combination for coconut-based homesteads for maximisation of production, productivity and net return per unit area per unit time.

Evolving farming systems to utilise the space available in cassava crop to help maximisation of net output per annum, minimising soil erosion hazards etc.

### **Rice based farming systems:**

The area cropped to low land rice exists as ribbon valleys. At present, rice-rice-vegetables, rice-rice-oil seeds, rice-banana, rice-rice-fallow and rice-rice-rice are the prevalent cropping patterns. Introduction of other crops such as pulses, groundnut, sweet potato and sesamum will be attempted. Suitable areas will be demarked and concentrated extension efforts made to increase the net return per unit area.

### **Banana and vegetables:**

As the benefits of both the South-West and the North-East monsoons are available in the region, banana (Nendran and other varieties) is grown as a rainfed crop. The general recommendations are to be modified to suit the situations. Being a long duration high value variety, Red banana (a specialised variety of the region) needs extensive scientific investigations.

Vegetables are assuming importance as export crops (to Gulf areas). Evolution of high yielding varieties, formulation of the package of practices to be adopted to get high yield and quality, standardisation of packaging and transport requirements etc. are some of the areas of study.

### **Mixed farming**

Areas surrounding Ashtamudi and paravar lakes in Quilon district, Neyyar dam reservoir at Puravimala and Amboori in Trivandrum district offer scope for mixed farming involving crop-livestock-fish production system where the waste from one can be recycled as nutrient for the other.



### **Crop suitability and cropping pattern maps:**

Working out the critical requirements of water for the different crops of the region as well as selection of best suited crops for the different situations will be attempted. Based on the soil survey and soil resource appraisal, crop suitability and cropping pattern maps will be prepared.

### **Farming situations in the region:**

Nine specific farming situations have been recognised in the region for which suitable farming systems and practices are to be developed.

- |  |   |
|--|---|
| Farming situation 1<br>(Approx. 10sq. km)    | Wetland areas of corporation of Trivandrum and municipalities Quilon, Kottayam, Chengannur and Shertallai and the suburban areas in the vicinity. The cropping patterns are rice-rice-fallow or rice-vegetables. Pulses or vegetables are raised in the third crop season, if water is available.                                   |
| Farming situation 2<br>(Approx. 105 sq. km)  | Dry lands (uplands) of Trivandrum Corporation and Quilon, Kottayam, Chengannur and Shertallai Municipalities and the suburban areas in the vicinity. Coconuts are intercropped with tapioca, miscellaneous fruit trees, plantation crops, banana, tuber crops etc. with small to very small holdings.                               |
| Farming situation 3<br>(Approx. 110 sq. km)  | Wetlands of the coastal areas in Trivandrum, Quilon and Alleppey districts where rice-rice-fallow or rice-rice-pulses/oil seeds/ sweet potato/vegetables, rice-banana pattern are prevalent.  |
| Farming situation 4<br>(Approx. 1500 sq. km) | Drylands of the coastal areas in Trivandrum Quilon and Alleppey districts. Coconuts are intercropped with tapioca, miscellaneous fruit trees, banana or tuber crops in the homesteads. Rice or tapioca is raised in the coconut gardens with the onset of pre-monsoon (South-West) showers in May in some parts of Quilon districts |
| Farming situation 5<br>(Approx. 60 sq. km.)  | Coastal back water areas of Trivandrum, Quilon, Kottayam and Alleppey districts. Coconuts are intercropped with tapioca, cocoa or miscellaneous fruit trees and Rice in low lying areas.  |

Farming situation 6  
(Approx. 600 sq. km.)

Wetlands of the mid-land sub-zone in Trivandrum, Quilon, Alleppey and Kottayam districts. The rice fields are at different levels resembling terraced lands. The prevalent cropping pattern are Rice-rice-fallow Rice-rice-pulses/oilseeds/vegetables/Rice-banana/Rice-tapioca and Sugarcane in wetlands in north-eastern parts of Quilon district. Intercropping banana with elephant foot-yam, colocasia, vegetables or tapioca.

Farming situation 7  
(Approx. 2800 sq. km)

Dryland of the mid land subzone in Trivandrum, Quilon and Kottayam districts. Coconuts are intercropped with a variety of crops, tapioca being the most predominant one. Miscellaneous fruit trees such as mango, jack etc are mixed in coconut gardens. Perennials like pepper, cocoa, clove, nutmeg, fodder etc. are common in homesteads with coconut as the main crop. In isolated pockets, cashew plantation exist. Rubber is cultivated on plantation scale in the eastern parts of this subzone. Arecanut is grown as the main crop in Nedumangad, Palode area.

Farming situation 8  
(Approx. 80 sq. km)

Wetland area of mid upland subzone covering eastern parts of Nedumangad, Neyyattinkara, Pathanapuram, Pathanamthitta, Kanjirappally and Meenachil taluks. The prevalent cropping patterns are: Rice-rice-fallow, Rice-rice-pulses/vegetables, Rice-banana, Rice-tapioca. A crop cafeteria of banana, yams, colocasia, tubers, and vegetables in wetlands is seen.

Farming situation 9  
(Approx. 1700 sq km)

The gardenlands and drylands of the mid upland subzone of Trivandrum, Quilon and Kottayam districts.

Coconut, arecanut, rubber, pepper and cashew are the major perennial crops. Important intercrops are cocoa, clove, nutmeg and fruit trees. Roots and tubers are grown in open and shaded conditions.

## 11. High Range Region

### General characterisation of the High Range Zone

The High Ranges include hills and hillocks of different altitudes. The high ranges fall into Wynad, Palghat, Idukki, Quilon and Trivandrum districts. The Wynad and Idukki ranges are more important in respect of agricultural production especially spices.

The Wynad hill ranges extend upto 974 meters above the sea level. The altitude of the Idukki range vary from 800-1100 meters above sea level.

The major crops of the region are tea, coffee, cardamom, pepper and other spices. Rice is grown over 33,000 ha in the region. Pulses, vegetables and tapioca are the other annual crops of this area.

Area coverage of important food crops, beverages and plantation crops in Wynad and Idukki are given below:-

Taluk	Paddy	Tapioca	Coffee	Tea	Rubber	Fruits
Wynad District						
Sultan's Battery	9946	3815	16382	178	560	40035
Vythiri	7128	162	14038	3693	492	17419
Mannanthody	7408	890	18420	1640	666	23632
Total	24482	4867	48840	5511	1715	81086
Idukki Dist.	9261	10824	24156	5134	17449	10958
Grand Total	33743	15691	72996	10645	19164	92044

#### Area under spices and essential oils (ha)

Taluk	Pepper	Cardamom	Lemongrass	Ginger	Turmeric
Wynad Dist.					
Sultan's Battery	8516	28	1068	1631	16
Vythiri	5310	2205	1139	830	87
Mannanthody	3418	110	2630	—	—
Total	17244	2343	4837	2461	103
Idukki Dist.	12264	45997	1020	958	189
Grand Total	29508	50680	5857	3419	292

### Research Programme suggested

#### AMBALAVAYAL

#### Rice and rice-based system

- 1 Research on cold tolerant rice cultures and rice-based cropping systems including pulses (like cowpea) oil-seeds and vegetables in the high valleys of the region.

- 2 Identification of rice cultures with cold tolerance and built-in resistance to paddy blast, Udbatta and stem borer.
- 3 Control of disease like blast, Udbatta and insect pests like stem borer and case worms in rice.
- 4 Identification of suitable strains of pulses, oil seeds and vegetables for the rice based cropping system.

## Horticulture

### Citrus

- 1 All the available mandarin cultivars should be assembled and studied.
- 2 Since the climatic conditions are tending to be more 'tropical' in character, it may be worthwhile introducing Sathgudi (*C. sinensis*) on Troyer citrange Rough lemon, Rangpur lime on Cleopatra mandarin stocks.
- 3 Acid lime and lemons are two other crops which should be attempted. Working out the package of practices including growing of cross-protected plants, nutrition, irrigation and plant protection aspects.
- 4 Collection of as many citrus species as possibly available in the area either in a wild or cultivated form. Some of them may prove useful as root-stocks for cultivated varieties which are susceptible to many diseases and pests.
- 5 Standardisation of mixed cropping for coffee plantation. The possible combinations are coffee-pepper-mandarin orange.

### Mango

Kerala State is abundant in seedling mangoes of polyembryonic varieties such as Olour, Bapakkai, Kurukkan, Muvandan, Mylepelian, Bellaray, Pahutan, Chandrakaran etc., which though not ideal for dessert purposes, are of value because of the nucellar embryony. These are much sought after all over India for experimental purposes, for use as rootstocks where genetic uniformity of the rootstock material is required. Many of the All India Coordinated Projects all over the country have been designed to test performance of cultivated varieties on polyembryonic stocks. These studies have not been carried out in many centres for want of rootstocks of polyembryonic varieties.

- 1 Ambalavayal Station could be a repository of these varieties and should have a separate plot for raising these varieties for supply of seed material and also grafts, if called for. There is a possibility of these varieties being lost if not assembled now.
- 2 Kerala State is well known for some of the superior varieties such as Badami (Alfonso type), Mundappa, Neelum, Bangalore (Totapuri) Prior etc. These could be assessed and multiplied.

- 3 The Horticultural Research Station could also take up studies relating to vegetative propagation of mango on a large scale adopting methods such as side grafting (already found successful), stone or epicotyl grafting, venter grafting etc. Research can be taken up on these methods to standardise the technique for commercial adoption consistent with the local conditions.
- 4 Standardisation of rejuvenation technique of old mango trees by pruning.
- 5 One of the important requirements in mango for Kerala State is to develop early maturing varieties especially under the hill ranges where maturity coincides with the onset of the monsoon. It is necessary in this context to state that so far no survey of the thousands of seedlings mangoes of Kerala State has been conducted. It is time that such a survey is done with special emphasis on selection of types exhibiting earliness in maturity, superior dessert quality, pest and disease resistance and other useful commercial attributes.

#### **Banana**

Standardisation of agro-techniques for the hill region.

#### **Pomegranate:**

Introduction of Pomegranate varieties and standardisation of agro-techniques for the same.

#### **Pineapple**

Wynad hill region is an area which was once cultivating pineapple on a commercial scale in the valleys of citrus and coffee plantations. A few varieties from Trichur area may be tried in the first instance with an emphasis on the cultural practices including nutrition.

#### **Coffee :**

Mealy bug in coffee seems to be a major pest for which no remedy is known. Biological control and use of systemic insecticides are reported to be under investigation. This again calls for a co-ordinated effort between the Coffee Board and the Kerala Agricultural University.

#### **Pepper :**

- i) Selection of suitable varieties.
- ii) Standardisation of nutritional requirements.
- iii) Selection of suitable standard for a mixed crop in coffee and orange plantation.

#### **Nursery studies :**

Basic information is lacking on the 'nursery techniques' for large scale propagation of planting materials including elementary practices such as (i) preparation of suitable pot mixtures for different kinds of plants (ii) developing nutrient mixtures (iii) evolving suitable containers

for local use and transport (iv) developing methods for successful establishment in the field (v) prevention of diseases in the nursery (vi) evolving cheaper propagation chambers utilising locally available materials (vii) creating artificial 'humid' conditions and recycling irrigation water through use of polythene chambers (viii) incorporating nutrient and growth regulation treatments. Work needs to be taken up on the above aspects.

- 2 It seems worthwhile introducing *Jasminum grandiflorum* and testing its performance along with other ornamental commercial flowers like tuberose from which essential oil can be produced for an All India market or even for export.
- 3 Similarly this station can work on medicinal and aromatic plants, which are used in Ayurvedic and Unani systems of medicine.

## PAMPADUMPARA

### Cardamom

- 1 Establishment of an exhaustive germplasm and its evaluation for identifying an ideal geno-type.
- 2 Evolving strains resistant to 'azhukal' disease and plant thrips.
- 3 Study of variability in the yield potential of cultivars and attempts to stabilise the yield levels.
- 4 Research on quicker and simpler methods of vegetative propagation.
- 5 Studies on germination of Cardamom seeds with various treatments including growth regulators.
- 6 Etiology and control of leaf blight disease
- 7 Control of Plant thrips
- 8 Post harvest processing of cardamom

Adaptive trials of suitable crop varieties and technologies will be undertaken in Idukki district based on the technology developed at Ambalavayal so as to develop suitable technology for different crops of the district.



## Appendix I

Address & telephones Name & Addresses of officers	Telegraphic Address	Telephones	
		Office	Residence
Sri T. Madhava Menon Vice-Chancellor Kerala Agrl. University, Vellanikkara, Trichur-680 654	AGRIVARSITY	23034	23439
Dr. P. C. S. Nair Director of Research Kerala Agrl. University, Vellanikkara, Trichur-680 654	AGRIVARSITY	22497	21347
Prof. A. G. G. Menon Director of Extension Kerala Agrl. University, Mannuthy, Trichur-680 651	AGRIVARSITY	21086	20745
Krishna Pillai Director of Physical Plant Kerala Agrl. University, Vellanikkara, Trichur-680 654	AGRIVARSITY	21513	23433
Thomas. C. George Registrar Kerala Agrl. University, Vellanikkara Trichur-680 654	AGRIVARSITY	23432	23598
NM Abdul Kadir Comptroller Kerala Agrl. University Vellanikkara, Trichur-680 654	AGRIVARSITY	20574	21127
Dr. N. Sadanandan, Dean (Agri) College of Agriculture, Vellayani, Trivandrum-695 522	—	2804	61227
Dr. M. Krishnan Nair Dean (Vety.) Kerala Agrl. University, Mannuthy, Trichur-680 651	—	22344	21808
Dr. M. J. Sebastian Dean (Fish.) College of Fisheries, Panangad, Cochin.	—	31570	35473

Dr. P. K. Gopalakrishnan Assoc. Dean (Hort.) College of Horticulture, Vellanikkara, Trichur-680 654	—	21822	21259
Dr. R. R. Nair Assoc. Director, RARS, Pilicode	—	232	—
Prof. N. Rajappan Nair, Assoc. Director RARS, Pattambi	—	28	—
Prof. U. Mohammed Kunju Assoc. Director i/c RARS, Kumarakom	—	—	—
Dr. N. Mohanakumaran Assoc Director NARP (SR) College of Agriculture, Vellayani, Tirivandrum-695 522	—	3021	—
Prof. K. Kannan Assoc. Director Regional Agricultural Research Station Ambalavayal-673 593 Wynad (Dt)	—	21	—
Dr. C. C. Abraham Assoc. Director of Research (M&E) Kerala Agrl. University, Vellanikkara, Trichur-680 654	—	22497	—
Prof. P. N. Pisharody Assoc. Director of Research (AR&T) Kerala Agrl. University, Vellanikkara, Trichur-680 654	—	22497	—
Dr. R. Kalyanasundaram Assoc. Director of Research (Vet&AS) Kerala Agrl. University, Vellanikkara, Trichur-680 654	—	22497	—
Dr. Mrs. Mary K George Assoc. Director of Research (Plg) i/c Kerala Agrl. University, Vellanikkara, Trichur-680 654	—	22497	—