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Annual Report
of the
All India
Co-ordinated Agronomic Experiments Scheme

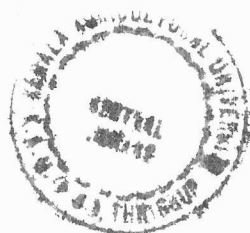
1972-'73



THE KERALA AGRICULTURAL UNIVERSITY,
MANNUTHY, TRICHUR.

206573

KAU/AICAES/OK 1972-73



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ANNUAL PROGRESS REPORT
OF
THE ALL INDIA CO-ORDINATED AGRONOMIC
EXPERIMENTS SCHEME
IN
KERALA STATE

- I. MODEL AGRONOMIC TRIALS
Experiments at the Model Agronomic Centre,
Karamana.
- II. SIMPLE FERTILIZER TRIALS (HYMP)
Experiments at Trichur and Quilon Districts.

1972-73

ALL INDIA CO-ORDINATED AGRONOMIC
EXPERIMENTS SCHEME

ANNUAL REPORT 1972-73

This report has been prepared
by the following:-

1. Dr.R.Gopalakrishnan, Rice Specialist,
2. Shri.N.Rajappan Nair, Officer-in-charge(AICAES),
3. Shri.C.A.Joseph, Statistical Officer,
4. Shri.N.N.Ramankutty, Assistant Chemist,
5. Dr.V.E.Alexander, Assistant Agronomist,Karamane,
6. Shri.A.I.Thomas, Research Officer, SFT(HYVP),
Trichur District,
7. Shri.P.K.Chellappan Nair, Research Officer,
SFT(HYVP), Quilon District.

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CONTENTS

	Page
INTRODUCTION 	1
EXPERIMENTAL 	2
i. Soil characteristics of the Model Agronomic Centre, Karamana	3
ii. Fertility status of soils of the different zones of the SFT districts. ...	3
<u>I. Model Agronomic Experiments.</u>	
i. Production potential experiment. (Experiment No.1a).	4
ii. Production potential under resource constraints (Experiment No.1b)	6
iii. Intensive farming system for small holders (Experiment No.1c)	6
iv. Manurial requirement of a fixed crop rotation (Experiment No.2)	7
v. Response of high yielding varieties of rice (IR8) to levels and times of application of Phosphorus and Potassium (Experiment No.3)	9
vi. Fertilizer requirement of new varieties/hybrids of cereals (Experiment No.4)	10
vii. Comparative study of complex fertilizers (Experiment No.10a).	11
viii. Weed control in transplanted rice in high intensity rotation (Experiment No.12b).	12

Contents contd..... iv.

Page

II. Simple Fertilizer Trials on cultivators' fields(HHYVP).

i.	A and B Type trials - <u>Virippu</u> (<u>Kharif</u>) Season.	)	13-20
ii.	A and B Type trials - <u>Mundakan</u> (<u>Rabi</u>) Season	)	20-26
iii.	C type trials - <u>Virippu</u> and <u>Mundakan</u> Seasons	)	27-30
iv.	Economic analysis.	)	30-32
	SUMMARY AND CONCLUSIONS:	)	32-35
	APPENDIX:		
i.	List of personnel.	)	36

INTRODUCTION

Simple fertiliser trials in cultivator's fields and fertiliser trials in the Model Agronomic Centre, Karamana have been in existence in Kerala since 1953 and 1955 under one project or other. Presently these trials are conducted under the All India-Co-ordinated Agronomic Experiments Scheme(AICAES). During earlier years these trials were confined to tall indicas but since the introduction of fertiliser responsive dwarf indicas the emphasis has been on these varieties. After the completion of 3 years' trial in Palghat and Alleppy districts the Simple Fertiliser Trials are being conducted in cultivators' fields in Trichur and Quilon districts since 1971 Mundakan season (Rabi).

<u>Model Agronomic Centre/ Simple Fertiliser Trial</u>	<u>Years of start- ing work.</u>
1) Model Agronomic Centre, Karamana.	1955
2) Simple Fertiliser Trial - Districts:	
Trichur	1971 (<u>Mundakan</u>)
Quilon.	1971 (<u>Mundakan</u>)

The technical programmes of these trials were discussed and finalised in the fifth annual workshop of the All India Co-ordinated Agronomic Experiments Scheme held at Bangalore in 1971.

The main objectives of the experiments conducted at the Model Agronomic Centre, Karamana were:-

1. to study the production potential of one year high intensity crop rotation;
2. to determine the production potential of rice in situations where one or more resources are limiting;

- 3) to develop intensive farming systems for small holders;
- 4) to study the direct, residual and cumulative effect of farm-yard-manure, phosphorus and potassium fertilisation in fixed single year two crop rice rotation;
- 5) to study the response of high yielding varieties of rice to P and K in relation to their time of application;
- 6) to study the response of new varieties of rice to N and P and their interaction;
- 7) to evaluate complex fertilisers as sources of N and P when applied at the time of planting for rice; and
- 8) to study the effectiveness and economics of chemical and cultural methods of weed control in transplanted rice and residual effect on the succeeding crop.

The main objectives of the Simple Fertilizer Trials (SFT, High Yielding Variety Programme) were:-

- 1) to study the response of high yielding varieties of rice to N, P, K and Zinc with a view to formulate fertiliser recommendations for different agro-climatic zones in the State, and
- 2) to study the relationship between soil test values and crop responses to fertilisers.

This report presents the results obtained from these experiments conducted under the All India Co-ordinated Agronomic Experiments Scheme in Kerala during 1972-73.

EXPERIMENTAL:-

The soil characteristics of the Model Agronomic Centre, Karamana are given in Table-1.

Table-I
Soil characteristics of Model Agronomic Centre
Karamana

Major soil group	Mechanical composition			Texture	pH	Chemical properties				
	Sand	Silt	Clay			Organic carbon %	Available P Kg/ha	Available K Kg/ha	CEC (me%)	E.C. mhos per cm
Laterite	70.50	5.15	20.20	Sandy clay loam	5.3	0.45	24	100	3.0	0.25

Details of fertility status of fields where Simple Fertiliser Trials were conducted are furnished along with the yield data in relevant summary tables. A brief summary of soil fertility status of the different zones of the STT districts are, however, presented in Table-II.

Table-II
Summary of soil fertility status of
the different zones of STT districts

District	Zone No.	Blocks	Available			pH
			N	P	K	
Trichur	I	Chowannur Chowghat	Medium	High	Low	Acidic
	II	Pazhayannur Wadakancherry	Medium	Medium	Medium	Acidic
	III	Irinjalakuda Chalakkudi	Low	Medium	Medium	Acidic
Quilon	I	Elanthur Konni	High	Medium	Medium	Acidic
	II	Sasthamcotta Vettikavala	Medium	High	Medium	Acidic
	IV	Karunagapally Chavara.	Low	High	Low	Acidic

A total rainfall of 1724.2 mm was received during the year at Karamana. During the Virippu season (Kharif, May to September) the mean monthly rainfall was 1004.6 mm and during Mundakan season (Rabi, October to March) it was 719.6 mm. The mean maximum and minimum temperatures during Virippu season were 32.4°C and 24.3°C respectively, while during the Mundakan season these were 34.7°C and 22.3°C. The annual rainfall and number of rainy days in Quilon district (recorded at Kayankulam) were 2406.5 mm and 122 days respectively, while the corresponding figures for Trichur district (recorded at Mannuthy) were 2727.4 mm and 138 days respectively. The weather in general was satisfactory.

RESULTS AND DISCUSSION:-

I. MODEL AGRONOMIC EXPERIMENTS.

Production potential experiment (Experiment No.1a)

The object of the experiment was to find out the production potential and economics of high intensity crop rotations. Six rotations involving a maximum of four crops were grown in a single year. Individual crops were raised according to local practices. The experiment with these rotations were started from the Virippu season of 1972-73. The results are given in table 1a.1.

Raising three crops of medium duration variety (Jaya) in an year appeared to be better than raising four crops of short duration variety (Annapurna). A maximum of 11.5 tonnes/ha of rice was obtained from the former crop sequence as against 9.1 tonnes/ha from the latter. From the economic view point two crops of medium duration variety of rice (Jaya) followed by a summer crop of Bhindi was better than all other crop sequences tried. The crop sequence of two crops of short duration variety (Annapurna) of rice followed by Tapioca (H165) was the next best.

Table No.1a.1

Yields and total production of different crop rotation sequences during 1972-73

Crop sequence				Yield in Kg/ha				Total yield in Kg/ha		Total number of noncropped days	Grain yield/day cropped (Kg/ha)	Grain yield per day over one calendar year (Kg/ha)
Viri- ppu I	Munda- kan II	III	IV	Viri- ppu I	Munda- kan. II	III	IV	Grain	Others			
Rice (Anna- purna)	Rice (Anna- purna)	Rice (Anna- purna)	Rice (Anna- purna)	4745	1701	1626	1099	9171	--	89	33.2	25.1
Rice (Jaya)	Rice (Jaya)	Rice (Jaya)		5592	3565	2410		11567	--	82	41	32
Rice (Jaga- nath)	Rice (Jaga- nath)	Fallow		3215	2294	--		5509	--	141	25	15
Rice (Anna- purna)	Rice (Anna- purna)	Tapioca		4833	1868	31275		6701	31275	57	48	18
Rice (Anna- purna)	Rice (Anna- purna)	Colocasia		4537	1460	23636		5997	23636	54	43	16
Rice (Jaya)	Rice (Jaya)	Bhindi		4975	3620	26855		8595	26855	76	46	24

Production potential under resource constraints
(Experiment No.1b)

The experiment was designed to determine the production potential of crop sequences in situations where one or more resources were limiting. The constraints adopted in this experiment were weed control and fertiliser. The treatments under weed control were W1-control of weeds by applying Machete granules, W2-controlling weeds by hand weeding i.e. 20 days and 40 days after transplanting, W3-unweeded and those under fertiliser were F1-recommended dose of N P K (90:45:45), F2-75% of the recommended dose (67.5:33.75:33.75) and F3-50% of the recommended dose (45:22.5:22.5). The experiment was started during the Virippu season 1972-73. The summary of annual production (Virippu and Mundakan season) are presented in table 1b.1.

Table 1b.1

Annual production of Rice (Kg/ha)
under various resource constraints

Crop sequence		Weed control / Fertiliser	Total yield in Kg/ha		
			F1	F2	F3
		W1	8150	7836	7827
Rice (IR8)	Rice (IR8)	W2	7044	7624	7667
		W3	6971	7882	8331

The result indicated that when the resources on weed control are limiting, maximum production is obtained when 50% of recommended dose of fertiliser is applied.

Intensive farming system for small holders
(Experiment No.1c)

This is a type experiment designed to find answers for some of the more immediate and pressing problems of intensive crop production on small labour intensive farms.

The experiment consisted of four plots of 2000 sq.m. each with following crops:-

1. Bananas,
2. Rice--Rice--Blackgram,
3. Rice--Rice--Tapioca, and
4. Rice--Rice--Colocasia.

Banana is yet to be harvested and hence complete analysis of the data was not possible.

Manurial requirement of a fixed crop rotation
(Experiment No.2)

The object of the experiment was to study the direct, residual and cumulative effect of phosphorus, potassium and farm-yard-manure on a fixed one year crop rotation with a high yielding variety of rice. Treatments included all combinations of three levels of phosphorus (0, 30, 60 Kg P₂O₅/ha), two levels of potassium (0, 30 Kg K₂O/ha) and two levels of farm-yard-manure (0, 1500 Kg/ha)² in three phases viz., manuring every season, manuring in alternate season starting from 1st season and manuring in alternate season starting from second season, applied over a basal dressing of 120 Kg N/ha to each crop.

Virippu season:-

The maximum grain yield was recorded in plots receiving farm-yard-manure. The direct response to 1500 Kg farm-yard-manure was 498 Kg/ha and this was found to be significant (table 2.1). There was no direct response to phosphorus and potassium during this season.

Table 2.1

Direct response of Rice (IR8) to Farm-yard-manure.
(Kg/ha) Virippu 1972-73.

Season	Variety.	Average yield without FYM (Kg/ha)	Direct response to 1500 Kg FYM/Kg. (Kg/ha)	CD (5%)	GM	CV
<u>Virippu</u>	IR8	5954	498	320	6203	8.79

Residual and cumulative effects of farm-yard-manure, phosphorus and potassium were not observed.

Mundakan season:-

During the Mundakan season also the direct effect of farm-yard-manure was significant. (Table 2.2). But the direct effects of phosphorus and potassium or their interaction were not observed.

Table 2.2
Direct response of Rice (IR8) to farm-yard-manure
(Mundakan 1972-73)

Season	Variety	Average yield		Direct response to		CD	GM	CV
		without FYM (Kg/ha)	with 1500 Kg/ha of FYM (Kg/ha)	Kg/ha	Kg/ha			
<u>Mundakan</u>	IR8	3118	307	239	3272		12.41	

Residual effect of phosphorus was significant. The maximum yield was recorded in the plots which did not receive phosphorus and there was decrease in yield in plots which received phosphorus. But the maximum depression in yield was in plots which received 30 Kg P_2O_5 /ha (Table 2.3).

Table 2.3
Residual response of rice (IR8) to phosphorus (Kg/ha)
Mundakan 1972-73.

Season	Variety	Average yield		Residual response to		CD	GM	CV
		without phosphorus (Kg/ha)	with 30 Kg P_2O_5 /ha	with 60 Kg P_2O_5 /ha	Kg/ha			
<u>Mundakan</u>	IR8	3414	-409	-178	246		3218	10.62

Residual effect of farm-yard-manure or potassium was not observed.

Residual interaction effect of phosphorus and potassium was significant. The maximum yield (3464 Kg/ha) was obtained from plots which received 60 Kg P_2O_5 /ha and 30 Kg K_2O /ha. The residual effect of a combination of 60 Kg P_2O_5 and 30 Kg K_2O was found to be positive and significant compared to that of 60 Kg P_2O_5 /ha alone (Table 2.4).

Table 2.4
Residual response of rice (IR8) to potassium
at different levels of phosphorus.

Season	Variety	Levels of phosphorus (Kg P_2O_5 /ha)	Average yield without potassium (Kg/ha)	Res- ponse to 30 Kg K_2O /ha (Kg/ha)	CD Kg/ha (5%)	GM Kg/ ha	CV
Mundakan	IR8	0	3443	-58	348	3218	10.62
		30	3080	-151			
		60	3008	+456			

Residual interaction effects of Farm-yard-manure with phosphorus or potassium were not observed. Cumulative effects of Farm-yard-manure, phosphorus and potassium or their interactions were not significant.

Response of high yielding varieties of rice
(IR8) to levels and times of application of
phosphorus and potassium
(Experiment No.3)

The experiment was conducted to find out the response of high yielding varieties of rice to phosphorus and potassium in relation to their time of application. The treatments consisted of all combinations of 4 levels of phosphorus viz., 90, 180 and 270 Kg P_2O_5 /ha, 3 levels of potassium viz., 0, 60 and 120 Kg K_2O /ha and 2 times of application--full dose at planting and in the other half at planting and half as top dressing. Nitrogen at the rate of 120 Kg/ha was applied to all treatments; half as basal and half in two equal split doses as top dressing. The experiment was conducted only during the Mundakan season.

There was no response to either phosphorus or potassium and times of application also did not show any significant increase in yield.

Fertiliser requirements of new varieties/hybrids of cereals.

(Experiment No. 4)

The objective of the experiment was to study the response of new high yielding varieties of rice to nitrogen and phosphorus and their interactions. The treatments consisted of 4 varieties of rice, namely, IR8 (standard), Vijaya, IR20 and Aswathy, all combinations of 4 levels of nitrogen (0, 60, 120 and 180 Kg N/ha) and 3 levels of phosphorus (0, 60 and 120 Kg P₂O₅/ha). Potassium at 60 Kg K₂O/ha was applied as basal dose to all the treatments. The experiment was conducted during the Mundakan season only.

All the three recently released varieties, namely, Vijaya, IR20 and Aswathy were found to be better than IR8 (Table 4.1). But these three varieties were on par.

Table 4.1
Increase in yield of new varieties of rice over IR8

Season	Average Increase over IR8 yield (Kg/ha)				CD Kg/ha (5%)	GM kg/ha	CV
	of IR8 (Kg/ha)	Vija-ya	IR20	Aswa- thy			
<u>Mundakan</u>	3685	448	422	250	206	3966	8.92

Response to nitrogen over control was significant upto 180 Kg N/ha. However, there was significant reduction in yield at 180 Kg N/ha compared to that obtained at 120 Kg N/ha (Table 4.2).

Table 4.2
Response to nitrogen

Season	Average yield without nitrogen (Kg/ha)	Response to nitrogen (Kg/ha)			CD Kg/ha (5%)	GM kg/ha	CV
		60 Kg N/ha	120 Kg N/ha	180 Kg N/ha			
<u>Mundakan</u>	2801	1287	1908	1465	206	3966	8.92

Response to phosphorus, interactions between nitrogen and varieties and phosphorus and varieties were not significant. But the interaction between nitrogen and phosphorus was significant. The response registered for the combined application of 120 Kg each of nitrogen and phosphorus/ha was 2210 Kg. At further higher levels of nitrogen the additional response was not significant (Table 4.3).

Table 4.3
Response of rice (IR8) to Nitrogen at
different levels of Phosphorus

Season	Levels of Phosphorus (Kg P ₂ O ₅ /ha)	Average yield without nitrogen (Kg/ha)	Response to nitrogen (Kg/ha)			CD (5%)
			60	120	180	
<u>Mundakan</u>	0	2637	1313	1947	1672	357
	60	3121	1047	1569	839	
	120	2643	1503	2210	1907	

Comparative study of complex fertilisers.
(Experiment No.10a)

The experiment was conducted to evaluate complex fertilisers as sources of nitrogen and phosphorus at sowing for rice. The treatments consisted of the following fertilisers (to supply 60 Kg/ha of each of nitrogen and phosphorus) T1 urea + super phosphate, T2 Ammonium sulphate + super phosphate, T3 Suphala (15:15:15), T4 Nitro-phosphate (50% water soluble phosphorus 20:20), T5 Urea ammonium phosphate, T6 Tactomphos (16:20), T7 Diammonium phosphate and T8 control. An additional dose of 60 Kg of nitrogen per ha, besides a basal dose of 60 Kg/ha of potassium was added to all the treatments except control. The experiment with these treatments was conducted during the Virippu season and the residual effect was studied during the Mundakan season by raising a bulk crop.

Virippu season:-

The results of the Virippu season showed that these fertilisers did not differ among themselves in increasing grain yield. However all of them gave positive and significant increase in yield compared to control (Table 10a.1).

Table 10a.1

Grain yield

Average yield of untreated plot (Kg/ha)	Yield in Kg/ha							
	Urea + super phosphate	Ammonium sulphate + phosphate	Suphala.	Nitrophosphate	Urea ammonium phosphate	Factomphos	Diammonium phosphate	GD Kg/ha (5%)
3740	5488	5697	5477	5527	5527	5668	5627	506

Weed control in transplanted rice in high intensity rotation.
(Experiment No.12b)

The objective of the experiment was to study the effectiveness and economics of chemical and cultural methods of weed control in transplanted rice (Virippu) and residual effect on succeeding crop in the rotation. The treatments were:

- 1) Stem T-34 1 Kg ai/ha,
- 2) Stem T-34 1.5 Kg ai/ha,
- 3) 2,4-D(Sodium salt) 0.5 Kg ai/ha,
- 4) 2,4-D(Sodium salt) 0.75 Kg ai/ha,
- 5) Machette 1 Kg ai/ha,
- 6) Machette 1.5 Kg ai/ha,
- 7) Hand weeding twice, and
- 8) Control.

Virippu season.

The treatment effects were not significant during the Virippu season.

Mundakan season.

The residual effects of the treatments were also not significant.

II. SIMPLE FERTILISER TRIALS:-

(High yielding variety programme)

The STC districts were divided into 3 agriculturally homogenous zones leaving the area earmarked for conducting the C type trials. From each zone, two blocks were randomly selected. The villages within the blocks and the cultivators' fields within the villages were also selected at random.

The crop was grown under rainfed condition in both the districts during the Virippu and Mundakan seasons. The source of nitrogen was urea in Trichur district; while it was ammonium sulphate in Quilon district. Super phosphate and muriate of potash were the sources of phosphorus and potassium respectively in both the districts. In Quilon district, ammonium sulphate was applied in 3 equal doses, the first as basal, and the remaining as top dressing at active tillering phase and at panicle initiation stage, whereas in Trichur district, urea was applied in two doses, two-third as basal and one-third as top dressing at maximum tillering phase. Super phosphate, muriate of potash and zinc sulphate were applied as basal in both the districts. All other cultural and manurial practices were as adopted by the cultivators of the locality.

Virippu season (Kharif):-

The data on the response to nitrogen in the different blocks and the mean response in the zones are presented in table A.K.1.

The response of 128 to 40 Kg N/ha over 60 Kg/ha of phosphorus and potassium was not significant in any of the blocks except Chowghat and Wadakancherry, while the response at 80 Kg N/ha was significant in all the blocks except Chowannur and Chalakuadi in Trichur district during the Virippu season. Although significant responses were obtained at 120 and 160 Kg level of nitrogen in all the blocks the additional increase due to the successive doses beyond 80 Kg N/ha was significant only in Irinjalakuda block where the response was showing a linear trend. The mean response in the zones also showed more or less the same trend except in Zone III comprising Irinjalakuda and Chalakuadi blocks

Table A.K.1
Response of Rice(Kg/ha) to Nitrogen in the presence of Phosphorus and Potassium

VIRIPPU 1972-73

District	Variety	Zone	Block	No. of trials.	Average yield(Kg/ha)		Response to Nitrogen over a basal dose of					Soil fertility(Nutrient under range)			S.E. (Kg/ha) of response.	C.D. (Kg/ha) (5%)
					Untreated plot	Treated plot	N40	N80	N120	N160	N160 P90 K90	OC	P	K		
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Trichur	IR8	I	Chowannur	8	3126	3568	306	306	599	772	1528	2.08	2.21	1.79	193	379
			Chowghat	6	3477	3814	536	687	904	1233	1521				261	511
				12	3278	3549	552	640	904	1074	1407				153	302
	Pazhayannur Wadakkan-cherry.	II	7	4068	4284	342	1044	1062	1386	1026	1.87	1.87	2.07	194	381	
			8	3275	3537	164	884	917	1278	1179				210	411	
			15	3652	3893	247	960	986	1330	1110				144	286	
	Irinjalakuda Chalakudi	III	5	4208	4838	454	630	1260	1649	2495	1.03	2.00	1.90	47	96	
			4	4071	4103	342	311	561	329	469				--	--	
			9	4146	4510	403	488	963	1085	1597				145	289	

Table A.K.1 contd.....

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Quilon	Jaya	I	Elanthur	8	2673	3354	465	854	1121	1128	2175	3.0	1.81	1.63	33	65
			Konni	8	2700	2865	228	293	428	690	1313				135	266
				14	2655	3110	396	773	892	987	1851				79	156
		II	Sasthamcotta	8	3024	3228	354	948	1299	1383	1609	1.93	2.22	1.86	89	174
			Vettikkavala	7	3384	3550	262	307	423	485	848				136	267
				14	3161	3344	314	738	996	1094	1319				62	122
		IV	Karunagappally	8	2772	3137	262	620	1079	1208	1645	1.38	2.06	1.50	55	107
			Oachira.	8	1866	1894	78	144	694	325	393				143	279
				16	2318	2515	170	382	886	767	1039				36	70

	N	P	K		N	P	K
T1	0	0	0	T5	120	60	60
T2	0	60	60	T6	160	60	60
T3	40	60	60	T7	120	60	60 + Zn
T4	80	60	60	T8	160	90	90

where the response at 120 Kg N/ha over that at 80 Kg N/ha was significant. Increasing the dose of phosphorus and potassium to 90 Kg/ha without changing the dose of nitrogen i.e. 160 Kg N/ha did not produce any significant increase in yield in any of the blocks or the zones. On the other hand in Pazhayannur block this has resulted in a significant reduction in yield of 576 Kg/ha. The reduction in yield was significant in zone III comprising this block and Wadakkancherry block.

In Elanthoor, Sasthamcottah and Karunagappally blocks of Quilon district, Jaya responded to the different levels of nitrogen but beyond 120 Kg N/ha, it was showing a declining trend. The additional yield due to the successive increment of nitrogen was significant only upto 120 Kg N/ha in Elanthoor and Sasthamcottah blocks, while it reached the significant level upto the highest dose i.e. 160 Kg N/ha in Karunagappally block. Application of 40 Kg N/ha over 60 Kg of phosphorus and potassium per ha. did not produce any significant increase in yield in Konni, Vettikkavala and Oachira blocks but at 80 Kg N/ha, the response was significant in Konni and Vettikkavala blocks. The additional increase due to 120 and 160 Kg N/ha were very meagre in the Vettikkavala block. In Oachira block the increase in yield even at 80 Kg N/ha was not significant. At 120 Kg N/ha the response was significant in this block but there was significant reduction in yield at 160 Kg N/ha. The mean responses at different levels were significant but the additional yield due to successive increment in nitrogen were significant only upto 80 Kg in zone-I and 120 Kg in zone II and IV. Significant increase in yield was observed only in Konni block when the level of P and K was increased from 60 Kg to 90 Kg/ha without changing the dose of nitrogen (160 Kg N/ha).

The data on the response to zinc sulphate are summarised in table A.K.2. In none of the blocks in the two districts, application of 25 Kg of zinc sulphate/ha along with 120 Kg of N, 60 Kg each of phosphorus and potassium/ha did not result in any significant increase in yield compared to that obtained from the treatment which contained the same dose of nitrogen, phosphorus and potassium without zinc sulphate.

Table A.K.2.

Response (Kg/ha) of Rice to Zinc in the presence of M120, P60, K60.

VIRIPPU 1972-73

District	Variety	Zone	Block	No. of trials	Average yield of untreated plot (Kg/ha)	Average yield of M120, P60, K60 (Kg/ha)	Response to 25 Kg/ha zinc sulphate over M120 P60K60 (Kg/ha)	S.E. (Kg/ha) of response.	C.D. (Kg/ha) (5%)	
Trichur	IR8	I	Chowannur	8	3126	4167	117	193	379	
			Chowghat	6	3477	4718	280	261	511	
				12	3278	4453	46	153	302	
		II	Pazhayannur	7	4068	5346	-234	194	381	
			Wadakkan-cherry.	8	3275	4454	61	210	411	
				15	3652	4879	-39	144	286	
	III	Trinjalakuda	Chalakudi		5	4208	6098	51	47	96
					4	4071	4664	281	-	-
					9	4146	5473	152	145	289
	Quilon	Jaya	I	Elanthoor	8	2673	4475	40	33	65
				Konni	8	2700	3293	228	135	266
					14	2655	4002	83	79	156
II			Sastham-cottach.	8	3024	4527	39	89	174	
			Vettikkavala	7	3384	3973	178	136	267	
				14	3161	4340	77	62	122	
IV		Karunaga-pally.	Oachira		8	2772	4216	7	55	107
					8	1866	2588	34	143	279
					16	2318	3401	21	36	70

The data on the response of rice to phosphorus and potassium are given in table B.K.1.

Table B.K.1

Response (Kg/ha) of rice to Phosphorus in the presence of Nitrogen and Potassium, and to potassium in the presence of Nitrogen and Phosphorus.

VIRIPPU 1972-73

District	Variety	Zone	Block	Mean yield				Response (Kg/ha) to						Fertility status/ Nutrient index.			SE Kg/ ha of res- pon- se.	CD Kg/ ha (5%)		
				No. of trials	N ₁₂₀	P ₀	P ₀	P ₀	Phosphorus			Potassium			T ₂	T ₁₀			O.C	P	K
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
Trichur	IR8	I	Chowannur	8	3444	4147	4169	351	166	427	137	-74	63	703	943	1.96	2.10	1.82	149	293
			Chowghat	6	3759	4162	4485	-91	287	269	464	103	273	403	1285				294	576
	II	Pazhayanur	14	3586	4161	4322	152	208	350	277	1	189	575	1082	152	302				
			7	3960	5706	5382	288	933	630	-72	267	-54	1740	2178	298	584				
			8	3439	4290	4552	-131	-32	-65	-64	-32	-97	851	982	140	274				
	III	Irinjalakuda.	15	3689	4960	4949	64	285	259	-68	-26	-78	1271	1543	158	313				
			8	4360	5216	5695	378	756	1411	504	731	1286	856	2998	133	261				
	III	Chalakkudi.	4	2738	3374	3172	159	189	-1	250	314	344	636	670	1.22	2.11	2.33	-	-	
			9	3639	4340	4532	281	462	715	307	433	741	701	1812	133	264				

Table B.K.1 contd.....

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	
Quilon	Jaya	I	Elan- thoor	8	2690	3223	3339	1084	1828	1912	23	74	197	533	2229	} 3.0 2.0 1.79	147	288			
			Konni	8	2497	2925	3038	425	581	681	244	25	444	428	1397				138	270	
				16	2593	3074	3188	754	1204	1296	212	36	327	481	1811				106	207	
		II	Sastham- cottah.	8	3021	3284	3529	234	508	743	720	325	1067	263	1540	} 1.87 2.33 1.93		76	149		
			Vetti- kkavala	7	3375	3676	3723	89	125	89	80	27	98	301	589				80	157	
				15	3186	3464	3611	176	330	479	439	195	632	278	1096				55	108	
		IV	Karuna- gappally.	8	2760	3015	3255	310	839	980	266	547	554	255	1528	} 1.13 2.18 1.38		122	240		
			Oachira	8	2156	2191	2173	103	228	162	47	144	125	35	75				-	-	
				16	2457	2593	2713	206	534	571	156	346	340	136	802				31	60	
						N	P	K				N	P	K							
				Q1	0	0	0				Q6	120	180	60							
				Q2	120	0	0				Q7	120	120	0							
				Q3	120	0	60				Q8	120	120	30							
				Q4	120	60	60				Q9	120	120	90							
				Q5	120	120	60				Q10	180	180	90							

In Trichur district IR8 responded to phosphorus at all the levels over a basal dose of 120 Kg of nitrogen and 60 Kg of potassium per hectare in Irinjalakuda block only. Here the response showed a linear trend, the response at 180 Kg/ha being 1411 Kg. Although there was increase in yield at different levels of phosphorus in Pazhayannur block it was significant only at 120 and 180 Kg levels only. The maximum response, however, was observed at 120 Kg level. Significant response was observed only at 60 and 180 Kg level in Chowannur block. Here the minimum response was observed at 120 Kg level. In the remaining blocks there was no response to phosphorus at any levels.

Jaya variety of rice responded to the different levels of phosphorus in all the blocks of Quilon district except Vettikkavala and Oachira. The maximum response at all the 3 levels were observed in Elanthoor block. The grain yield at 60, 120 and 180 Kg level of phosphorus over N₁₂₀ K₆₀ was 18, 15 and 10.6 Kg respectively per Kg of added P₂O₅ in this block. Although there was significant response upto the highest dose in Elanthoor, Konni, Sasthamcottah and Karunagappally blocks, the additional increase in yield due to successive doses was not significant beyond 60 Kg level in Konni block and 120 Kg level in Elanthoor and Karunagappally blocks.

Significant response to potash was observed at all the 3 levels of potassium viz., 30, 60 and 90 Kg/ha over N₁₂₀ P₁₂₀ in Irinjalakuda block of Trichur district and it was showing a linear trend. The additional yield due to the application of 90 Kg of potassium per ha was of the order of 1286 Kg/ha. In the remaining blocks in this district application of potassium did not result in any significant increase or decrease in yield.

The nature of response to different levels of potassium was not uniform in all the blocks in Quilon district. Significant response was observed in Konni block at 90 Kg level while in Sasthamcottah and Karunagappally blocks the responses were significant at all levels. The additional yield due to the application of 90 Kg potassium/ha over N₁₂₀ P₁₂₀ was 1067 Kg in Sasthamcottah whereas it was only 534 Kg. in Karunagappally block.

Mundakan season (Rabi):-

The data on the response to nitrogen in the different blocks of Trichur and Quilon districts during the Mundakan season are presented in table A.R.1.

Table A.R.1

Response of Rice (Kg/ha) to Nitrogen in the presence of Phosphorus and Potassium

Mundakan 1972-73

District	Variety	Zone	Block	No. of trials	Average yield of (Kg/ha)	Response to Nitrogen over a basal dose of P ₆₀ K ₆₀						Nutrient index			SE (Kg/ha) of response	C.D. (Kg/ha) (5%)	
						Untreated plot (T ₁)	P ₆₀ (T ₂)	N ₄₀ (T ₃ -T ₂)	N ₈₀ (T ₄ -T ₂)	N ₁₂₀ (T ₅ -T ₂)	N ₁₆₀ (T ₆ -T ₅)	P ₉₀ (T ₇ -T ₁)	00	P			K
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	
Trichur	IR8	I	Chowannur	8	3803	3998	471	575	759	902	1084	2.72	2.50	1.50	167	328	
			Chowghat	10	3845	4328	283	453	698	715	1043				147	288	
				17	3805	4130	390	564	752	829	1290				114	226	
		II	Pazhayannur		9	3630	3913	53	255	551	793	1069	2.41	1.88	1.59	121	236
				Wadakkancherry.	8	3425	3828	525	370	773	527	1239				234	458
					13	3540	3700	405	544	675	740	1054				127	252
		III	Irinjalakuda	Chalakuadi.	11	3190	3718	319	495	957	1254	2024	1.82	2.16	1.86	94	184
					11	2780	3012	74	439	402	262	445				154	302
					20	3091	3436	291	546	728	872	1278				83	163

Table A.R.1 contd.....

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	
Quilon	Jaya	I	Elanthoor	8	2694	3366	327	688	1048	1295	2189	}	3.0	1.86	2.07	140	274
			Konni	6	3200	3650	633	766	1100	533	1183					193	378
				14	2982	3487	458	722	1070	968	1686					124	245
		II	Saathamcotta	8	3447	3730	175	517	795	892	1628	2.38	2.5	1.88	61	120	
		IV	Karunaga- ppally.	5	3175	3526	428	841	1195	1222	1665	}	1.10	2.8	1.9	59	122
			Oachira	5	2541	2952	362	716	1076	1118	1755					52	108
				10	2858	3238	395	779	1135	1170	1709					40	80

	N	P	K		N	P	K
R1	0	0	0	R5	120	60	60
R2	0	60	60	R6	160	60	60
R3	40	60	60	R7	120	60	60 + Zn
R4	80	60	60	R8	160	90	90

206573



Significant response to nitrogen was observed in all the blocks of Erichur district at all the 4 levels viz., 40, 80, 120 and 160 Kg N/ha over a basal dose of 60 Kg/ha of phosphorus and potassium except at 40 Kg level in Pazhayannur and Chalakudi blocks and at 80 Kg level in Wadakkancherry block. However, the additional increase in grain yield due to the application of successive doses of nitrogen was significant only in Irinjalakuda block. Here the increase in yield due to 160 Kg N/ha was 1254 Kg. Although the response at 40 Kg N/ha was not significant in Pazhayannur block the increase due to application of successive doses beyond 80 Kg N/ha was significant in this block. Increasing the level of phosphorus and potassium from 60 Kg/ha to 90 Kg/ha without changing the level of nitrogen (160 Kg N/ha) produced significant increase in yield in Irinjalakuda and Chowghat blocks.

In Quilon district significant response to nitrogen was observed upto the highest level in all the blocks. However, the response beyond 120 Kg N/ha showed a declining trend. The additional increase due to successive application of nitrogen was significant only upto 120 Kg level in Elanthoor, Sasthamcottah, Karunagappally and Oachira blocks as the increase in yield due to the application of 160 Kg N/ha over that obtained at 120 Kg N/ha in these blocks was only marginal. But in Konni block there was significant reduction in yield at 160 Kg level compared to 120 Kg level. In Sasthamcottah and Oachira blocks significant increase in yield was obtained when the levels of phosphorus and potassium were changed from 60 to 90 Kg/ha without changing the dose of nitrogen (160 Kg N/ha).

The data on the response to zinc sulphate are given in table A.R.2.

Table A.R.2

Response (Kg/ha) of rice to Zinc in the presence of N120 P60 K60

MUNDAKAN 1972-73

District	Variety	Zone	Block	No. of trials	Average yield of untreated plots (Kg/ha)	Average yield of N120 P60 K60 (Kg/ha)	Response to 25 Kg per ha of Zinc sulphate over N120 P60 K60 (Kg/ha)	SE (Kg/ha)	CD (Kg/ha) (5%)
Erichur	IR8	I	Chowannur	8	3803	4757	90	167	321
			Chowghat	10	3845	5026	-49	147	285
				17	3805	4959	-35	114	225
		II	Pazhayannur	9	3630	4464	295	121	235
			Wadakkan-cherry.	8	3425	4601	-30	234	452
				13	3540	4440	184	127	252
		III	Irinjala-kuda.	11	3190	4675	66	94	184
			Chalakudi	11	2780	3414	-220	154	302
				20	3091	4308	-162	83	163
		Quilon	Jaya	I	Elanthoor	8	2694	4414	27	140	274
Konni	6				3200	4750	34	193	378
	14				2982	4455	3	123	245
II	Sastham-cottah.			8	3447	4525	72	61	120
IV	Karunaga-ppally.			5	3175	4721	45	59	122
	Oachira.			5	2541	4028	73	52	108
				10	2858	4408	25	40	80

The increase in yield due to 25 Kg of Zinc sulphate per hectare was only marginal and did not reach the level of significance in any of the blocks in both the districts except in Pazhayannur block of Trichur district. Here an additional increase of 295 Kg/ha was obtained due to the application of 25 Kg of Zinc sulphate per hectare. In some blocks a decrease in yield was observed which was also not significant.

The data on response to phosphorus and potassium are summarised in table B.R.1.

IR8 variety of rice responded to phosphorus significantly at all the three levels in Irinjalakuda block of Trichur district. Here the response showed a linear trend. In Chowghat block there was significant response at 120 and 180 Kg P_2O_5 /ha, but the maximum response was at 120 Kg level, while in Chowannur block, significant responses were observed at 60 and 180 Kg level and the minimum response was at 120 Kg level. In Pazhayannur block the response was significant only at the highest level (180 Kg P_2O_5 /ha) and in the remaining two blocks viz., Wadakancheery and Chalakudi, the response did not reach the level of significance at any of the three levels.

Very good response to phosphorus was observed in all the blocks of Quilon district. Maximum response to phosphorus over a basal dose of 120 Kg N/ha and 60 Kg K_2O /ha was obtained in Elanthoor block, the response at 180 Kg P_2O_5 /ha being 1519 Kg. However, the additional increase due to the application of 180 Kg P_2O_5 /ha over that obtained at 120 Kg P_2O_5 /ha was not significant in any of the blocks in this district. In Konni and Sasthamcottah blocks the response at the lowest level (60 Kg P_2O_5 /ha) did not reach the level of significance.

Significant response to potassium was observed at all the levels only in Irinjalakuda block in Trichur district during the Mundakan season. In Quilon district response to potassium was not observed at all the levels in any of the blocks. The response was significant and substantial only at 90 Kg level in Sasthamcottah and Oachira blocks, while in Karunagappally block, although it was significant at 60 and 90 Kg level, it was only of the order of 157 Kg/ha.

Table B.R.1

Response (Kg/ha) of rice to Phosphorus in the presence of Nitrogen and Potassium
in the presence of Nitrogen and Phosphorus.

MUNDAKAN 72-73

Dis- tri- ct.	Vari- ety.	Zo- ne.	Block	No. of tri- als.	Mean yield (Kg/ha)			Response (Kg/ha) to						Nutrient index			SE Kg/ ha of res- pon- se.	CD Kg/ ha (5%)		
					No P0 K0 (T1)	N120 P0 K0 (T2)	N120 P0 K60 (T3)	Phosphorus			Potassium			T2 (T2- T1)	T10 (T10- T1)	00			P	K
								1/2 b (T4- T3)	1b (T5- T3)	1 1/2 b (T6- T3)	1/2 b (T8- T7)	1b (T5- T7)	1 1/2 b (T9- T7)							
Tri- chur	IR8 I	I	Chowannur	8	3600	4194	4390	374	180	385	308	197	293	594	1220	2.44	2.50	1.56	156	306
				10	3580	4042	4310	304	479	462	193	340	310	462	1410				205	402
				18	3580	4099	4335	334	344	415	237	275	302	519	1315				133	260
	II	Pazhaya- nnur.	Wadakan- cherry.	9	3549	3754	4067	101	74	302	-27	-242	228	205	1049	2.59	1.65	1.67	86	170
				8	3720	4278	4495	341	403	434	31	124	62	558	1147				273	534
				17	3621	3991	4258	171	228	393	1	-70	150	370	1093				139	272
				11	3366	3982	4378	242	616	902	495	407	891	616	2398				109	214
	III	Irinjala- kuda.	Chalakudi	12	2994	3351	3473	-112	264	164	200	190	210	357	559	1.65	2.44	1.65	184	362
				21	3317	3790	4038	133	491	584	427	381	616	473	1521				116	227
				8	2743	3357	3486	889	1417	1519	32	96	106	614	2340				108	212
Quilon	Jaya I	Elanthoor	Konni	6	2991	3500	3883	358	717	917	400	367	550	509	1175	3.0	2.86	2.00	288	564
				14	2849	3417	3656	663	1116	1260	190	212	296	568	1840				137	271
				8	3513	3736	3953	182	483	655	198	-40	918	223	2010				119	234
	IV	Karunaga- ppally.	Oachira.	5	3207	3582	3861	317	636	636	74	157	156	375	1524	1.72	3.0	2.08	49	96
				5	2238	2406	2528	697	1228	1342	33	-79	613	168	2357				136	266
				10	2722	2993	3194	507	932	989	53	39	384	271	1940				72	143

C type trials:-

The response of rice to phosphorus and potassium obtained during the Virippu season in the different fertility classes are summarised in Table C.K.1.

Positive and significant increase in yield due to the application of 120 Kg N/ha alone was observed in all the fertility classes in Ollukkara area (Trichur district). Significant response to phosphorus was not observed in any of the fertility classes viz., LL, LM, ML, MM and HM. Different levels of potassium over a basal dose of 120 Kg of nitrogen and phosphorus did not influence the yield significantly irrespective of the fertility classes of the soil.

In Kottarakkara area in Quilon district, application of 120 Kg Nitrogen/ha without phosphorus and potassium did not give any significant increase in yield in any of the fertility classes. Significant increase in yield due to the different levels of phosphorus (75, 150 and 225 Kg P_2O_5 /ha) were observed irrespective of the P and K fertility status of the soil. However, the increase over the base level (150 Kg P_2O_5 /ha) was significant only in the soil testing low for P and K. In MM and HM fertility classes the increase over the base level was not significant. The response to potassium was erratic. In the LL and MH fertility classes the response was positive and significant at 30 and 90 Kg level over $N_{120}P_{120}$, but at 60 Kg level it was showing a negative trend. The response reached the level of significance only at the highest level i.e. 90 Kg K_2O /ha in the LM and MM fertility classes.

Mundakan season:-

The response to phosphorus and potassium obtained during the Mundakan season in the different fertility classes are presented in Table C.R.1.

Table C.K.1

Response (Kg/ha) of rice to Phosphorus in the presence of Nitrogen and Potassium and to Potassium in the presence of Nitrogen and Phosphorus in different fertility classes:

VIRIPPU 72-73

District	Variety	Fertility class	No. of trials	Mean yield in Kg/ha			Response to						T ₂	T ₁₀	S.E. (Kg/ha) of response	C.D. (Kg/ha) (5%)
				N0	N120	N120	Phosphorus			Potassium						
				P0 K0	P0 K0	P0 K60	$\frac{1}{2}b$	1b	1 $\frac{1}{2}b$	$\frac{1}{2}p$	1b	1 $\frac{1}{2}b$				
(T1)	(T2)	(T3)	(T4-T3)	(T5-T3)	(T6-T3)	(T8-T7)	(T5-T7)	(T9-T7)	(T2-T1)	(T10-T1)						
Trichur	IR8	LL	4	3577	4148	4496	45	190	380	12	-146	88	571	1489	179.2	367.8
		LM	3	4230	5525	5740	3	91	129	221	91	-125	1295	1471	184.1	386.9
		ML	3	4146	4956	5328	127	414	338	287	406	-76	810	1688	279.2	586.7
		MM	3	3598	4608	4947	-182	-124	120	291	84	320	1010	1729	345.6	726.1
		HM	1	3293	4560	4433	1647	1140	887	-315	-252	760	1267	2152	-	-
Quilon	Jaya	LL	2	3439	3626	3578	263	523	798	324	-243	643	187	729	93.6	211.9
		LM	4	2413	2593	2650	581	1124	1098	310	103	455	180	1429	168.1	345.0
		ML	2	3006	3148	3056	645	1253	1360	328	-6	463	142	1369	445.4	1007.5
		MM	4	2064	2157	2120	525	1006	1098	197	-13	444	93	1380	232.7	477.5
		MH	2	3009	3189	3074	457	632	976	746	-68	1111	180	785	97.2	220.0
		HL	1	3080	3210	3113	195	812	957	602	57	945	130	1025	-	-
		HM	3	2408	2610	2581	509	1050	1087	176	147	396	202	1527	233.3	490.2
		HH	1	1500	2125	2225	75	600	588	-3	7	2	625	1315	-	-

	N	P	K		N	P	K
T1	0	0	0	T6	120	1.5 b	60
T2	120	0	0	T7	120	b	0
T3	120	0	60	T8	120	b	30
T4	120	0.5 b	60	T9	120	b	90
T5	120	b	60	T10	180	1.5 b	90

Pb for Trichur district = 120 Kg/ha

Pb for Quilon district = 150 Kg/ha

Table C.R.1

Response (Kg/ha) of rice to phosphorus in the presence of Nitrogen and potassium and to potassium in the presence of Nitrogen and phosphorus in different fertility classes.

MUNDAKAN 72-73

District	Variety	Fertility class	No. of trials	Mean yield in Kg/ha			Response to (Kg/ha)						T ₂	T ₁₀	S.E. of response	C.D. (5%)
				N ₀	N ₁₂₀	N ₁₂₀	Phosphorus			Potassium						
				P ₀	P ₀	P ₀	1/2 b	1 b	1 1/2 b	1/2 b	1 b	1 1/2 b				
				K ₀	K ₀	K ₆₀	(T4-T3)	(T5-T3)	(T6-T3)	(T8-T7)	(T5-T7)	(T9-T7)					(T2-T1)	(T10-T1)
Erichur	IR8	LL	8	3648	4710	4744	-216	51	159	108	-359	381	1062	1125	208	411.9
			4	3670	4681	4895	91	31	244	58	-60	305	1011	944	237	486.4
			7	3804	4660	4978	96	202	122	69	141	-1	856	1358	168.5	337.0
			7	3656	4670	4967	-151	69	-19	489	298	341	1014	1185	164.6	329.2
Quilon	Jaya	LM	10	2879	3343	2984	581	920	1333	-277	435	294	464	856	151.4	299.8
			2	2436	2715	2529	536	955	1195	-26	-57	119	279	979	548.9	1241.7
			5	3100	3178	3210	525	1240	1240	140	75	100	78	1338	115	232.4
			2	2575	2500	2625	500	1375	1375	63	-125	63	-75	1825	301.9	682.9

	N	P	K		N	P	K	
T1	0	0	0	T6	120	1.5 b	60	P b for Erichur district :120 Kg/ha
T2	120	0	0	T7	120	b	0	
T3	120	0	60	T8	120	b	30	
T4	120	0.5 b	60	T9	120	b	90	P b for Quilon district :150 Kg/ha
T5	120	b	60	T10	180	1.5 b	90	

2065-73



During the mundakan season, IR8 responded positively and significantly to 120 Kg N/ha without phosphorus and potassium in all the fertility classes viz., LL, LM, ML and MM of Ollukkara area and in none of the fertility classes response to phosphorus was observed at any of the levels. As regards potassium significant response was observed only in the MM fertility class at 30 and 90 Kg levels.

Among the 4 fertility classes LM, ML, MM and HM of Kottarakkara area, application of 120 Kg of nitrogen/ha without phosphorus and potassium gave significant increase in yield only in the LM fertility class. Significant response to phosphorus was observed in all the fertility classes except ML class. The additional increase due to successive doses was significant upto 1.5 times the base level (225 Kg P_2O_5 /ha) in LM fertility class whereas it was only upto base level in the other two fertility classes viz., MM and HM. Response to potassium was not significant at any fertility class except at 60 Kg K_2O /ha in LM class.

Economic Analysis:-

The economic analysis of application of Nitrogen over a basal dose of 60 Kg each of phosphorus and potassium per hectare is given in Table E.A.1.

Table E.4.1

Economics of fertiliser application in A type
experiments conducted during 1972-73.

Season	District	Vari- ety.	Block	Return per rupee in- vested in fertilisers				
				N ₄₀ P ₆₀ K ₆₀	N ₈₀ P ₆₀ K ₆₀	N ₁₂₀ P ₆₀ K ₆₀	N ₁₆₀ P ₆₀ K ₆₀	
<u>Virippu</u>	Trichur	IR8	Chowannur	<u>1.53</u>	1.21	1.39	1.38	
			Chowghat	1.78	1.66	1.66	<u>1.79</u>	
			Pazhayannur	1.14	<u>2.03</u>	1.71	1.83	
			Wadakkan- cherry.	0.87	<u>1.85</u>	1.58	1.75	
			Irinjalakude	2.22	2.04	2.53	<u>2.60</u>	
			Chalakudi.	0.76	0.55	0.77	0.41	
	Quilon	Jaya	IR8	Elanthoor	2.23	<u>2.30</u>	2.19	1.85
				Konni	0.77	0.69	0.72	0.87
				Sasthamcotta	1.09	1.72	<u>1.83</u>	1.63
				Vettikkavala	0.83	0.71	0.72	0.67
				Karunaga- ppally.	1.22	1.50	<u>1.76</u>	1.61
				Oachira.	0.22	0.26	0.88	0.37
	<u>Mundakan</u>	Trichur	IR8	Chowannur	<u>1.36</u>	1.24	1.28	1.25
				Chowghat	1.57	1.51	<u>1.58</u>	1.37
Pazhayannur				0.69	0.87	1.12	1.22	
Wadakkan- cherry.				<u>2.33</u>	1.25	1.57	<u>1.12</u>	
Irinjalakude				1.73	1.65	1.99	2.05	
Chalakudi				0.63	<u>1.03</u>	0.85	0.52	
Quilon		Jaya	IR8	Elanthoor	1.94	2.04	<u>2.09</u>	2.02
				Konni	<u>2.05</u>	1.82	1.89	1.01
				Sasthamcotta	0.89	1.20	<u>1.31</u>	1.20
				Karunaga- ppally.	1.52	1.78	<u>1.88</u>	1.61
				Oachira.	1.50	1.69	<u>1.81</u>	1.57

Price of N/kg : 2.10 as Urea (Trichur district)
: 2.50 as Ammonium sulphate (Quilon district)
P/kg : 2.80 as super phosphate
K/kg : 1.10 as Muriate of potash
Price of Rice : 65/- rupees per quintal.

The most economic dose of nitrogen in combination with 60 Kg of phosphorus and potassium for IR8 was found to be 40 Kg/ha in Chowannur block, 80 Kg in Pazhayannur and Wadakancherry blocks and 160 Kg in Irinjalakuda block of Trichur district during the Virippu season. Java variety of rice gave the maximum return per rupee invested in fertilisers at 80 Kg of Nitrogen/ha in Elanthoor block, and 120 Kg N/ha in Sasthamcottah and Karunagappally blocks in Quilon district. In Chalakudi block of Trichur district and Konni, Vettikkavala and Oachira blocks of Quilon district, none of the levels of nitrogen in combination with phosphorus and potassium was found to be economic during the Virippu season.

During Mundakan season the economic dose of nitrogen to IR8 was found to be 40 Kg/ha in Chowannur and Wadakancherry blocks, 80 Kg/ha in Chalakudi block, 120 Kg/ha in Chowghat block and 160 Kg/ha in Pazhayannur and Irinjalakuda blocks of Trichur district. In Quilon district, the dose of nitrogen in combination with 60 Kg of phosphorus and potassium which yielded the maximum return per rupee was 40 Kg/ha in Konni block and 120 Kg/ha in Elanthoor, Sasthamcottah, Karunagappally and Oachira blocks.

SUMMARY AND CONCLUSION:-

I. Model Agronomic Experiments:

These were conducted in the Karamana Centre (Erivandrum district).

1. A maximum grain yield of 11.5 tonnes was obtained by raising three crops of medium duration varieties of rice and this was found to be better than raising four crops of short duration varieties. Among the six crop rotation sequence tried the sequential cultivation Rice--Rice--Bhindi yielded the maximum output and income.

2. The experiment (No.1b) conducted to study the production potential of crop sequences where one or more resources were limiting revealed that when there were constraints on the resources for weed control it was better to use limited quantities of fertilisers.

3. In the experiment (No.2) to study the direct, residual and commulative effect of phosphorus, potassium and farm-yard-manure direct response to farm-yard-manure was observed during both the Virippu and Mundakan seasons. Residual effect of phosphorus was negative during the Mundakan season but this trend was not observed during the Virippu season. The residual effect of a combination of 60 Kg P_2O_5 /ha and 30 Kg K_2O /ha was found to be positive and significant compared to that of phosphorus alone.

4. Experiment (No.3) conducted to determine the response of high yielding varieties of rice to phosphorus and potassium in relation to their time of application did not show any significant response to these during the Mundakan season.

5. Recently released varieties of rice viz., Vijaya, IR20 and Aswathy were found to be superior to IR8. Response to nitrogen was positive and significant upto 180 Kg N/ha. But beyond 120 Kg N/ha the response showed a declining trend resulting in significant reduction in yield at 180 Kg N/ha compared to that obtained at 120 Kg N/ha. Variety-nitrogen interaction was, however, not observed.

6. Complex fertilisers did not differ among themselves as regards direct or residual effect on yield of rice.

7. In the experiment (No.12b) to study the effectiveness and economics of chemical and cultural methods of weed control significant differences between treatments were not observed.

II. Simple Fertiliser Trials:-

Simple fertiliser trials in cultivators' fields were conducted in Trichur and Quilon districts to study the response of high yielding varieties of rice to nitrogen over an adequate level of phosphorus and potassium, to zinc over an adequate level of nitrogen, phosphorus and potassium and to phosphorus and potassium over an adequate level of nitrogen and potassium and nitrogen and phosphorus respectively.

a) Response to nitrogen:-

Positive and significant response to nitrogen was observed upto 160 Kg N/ha over P_{60} and K_{60} in all the blocks of Trichur district excepting

at 40 and 80 Kg N/ha in Chowannur block and 40 Kg N/ha in Pazhayannur and Wadakancherry blocks during the Virippu season. During the Mundakan season on the other hand, significant response to nitrogen was observed in all the 6 blocks. In Irinjalakuda block, the response to nitrogen was linear upto the highest level during both the seasons. In Quilon district during Virippu season the response upto 160 Kg N/ha was significant in all the blocks except at 40 Kg N/ha in Konni and Vettikavala blocks and at 40 and 80 kg N/ha in Oachira block. During Mundakan season response to nitrogen was positive and significant in all the blocks but the increase due to the application of 160 Kg N/ha over that obtained at 120 Kg N/ha in Elanthoor, Sasthamcottah, Karunageppally and Oachira blocks was negligible. In Konni block, there was reduction in yield compared to that obtained at 120 Kg N/ha.

b) Response to Zinc:-

During both seasons application of 25 Kg of Zinc sulphate over N₁₂₀ P₆₀ K₆₀ did not influence the yield of rice in any blocks in the two districts except at Pazhayannur (Trichur district) during Mundakan season.

c) Response to phosphorus:-

Very good response to phosphorus was observed in Irinjalakuda block of Trichur district during both the seasons. Response to phosphorus was significant in Chowannur block only at the highest and lowest levels while at Pazhayannur it was only at the highest level. In Wadakancherry and Chalakudi there was no response to phosphorus. The response to phosphorus was comparatively higher in Quilon district and there was very good response in all the blocks except in Vettikkavala and Oachira.

d) Response to potassium:-

During both the seasons significant response to potassium was observed in Irinjalakuda block of Trichur district. In the remaining blocks there was no response. Good response to potassium was observed in Sasthamcottah and Karunageppally blocks of Quilon district during Virippu season.

C type trials:-

Significant increase in yield due to the application of nitrogen (120 Kg N/ha) without phosphorus and potassium irrespective of P and K fertility status of the soil was observed in Ollukkara area during both the seasons. But in Kottarakkara area there was no response to nitrogen without phosphorus and potassium in any of the fertility classes during both the seasons.

Response to phosphorus was not observed irrespective of P and K status of the soil in Ollukkara in both seasons while in Kottarakkara irrespective of the fertility status there was response to phosphorus during both the seasons. However the response over the base level of phosphorus was significant only in soil testing low for phosphorus.

Consistent response to different levels of potassium was not observed in any of the fertility classes either in Ollukkara or Kottarakkara during Virippu or Mundakan seasons.

Economic analysis:-

The economic dose of nitrogen in combination with 60 Kg each of phosphorus and potassium per hectare was found to be 40 Kg/ha in Chowannur block, 120 Kg/ha in Sasthancottah and Karunagappally blocks and 160 Kg/ha in Irinjalakuda block. It was 160 Kg N/ha during Virippu and 120 Kg/ha during Mundakan season in Chowghat, 80 Kg/ha during Virippu and 160 Kg/ha during Mundakan in Pazhayanur block, 80 Kg/ha during Virippu and 40 Kg/ha during Mundakan season in Wadakancherry block, 80 Kg/ha during Virippu and 120 Kg during Mundakan season in Elanthoor block, 40 Kg/ha during Virippu in Konni block and 120 Kg/ha during Mundakan season in Oachira block.

APPENDIX IList of workers

Sl. No.	Designation	Name	Date	
			From	To
<u>Staff at Headquarters:-</u>				
1.	Officer-in-charge.	Shri.N.Rajappan Nair.	1--4-72	31--3-73
2.	Assistant Chemist.	Shri.N.N.Ramankutty)	1--4-72	31--3-73
3.	Statistical Officer.	Dr.C.C.Abraham)	1--4-72	30-11-72
		Shri.C.A.Joseph)	8--12-72	31-3--73
4.	Chemical Assistant	) Vacant.	1--4-72	1--5--72
		) Shri.V.Sukumara Pillai.	2--5-72	31-5--72
		) Vacant.	1--6-72	31-7--72
		) Shri.V.Sukumara Pillai.	1--8-72	30-9--72
		) Smt.P.Chandrika	1-10-72	31-3--73
<u>Model Agronomic Centre, Karamana.</u>				
1.	Assistant Agronomist	) Dr.V.E.Alexander)	1-4--72	31-3--73
<u>Simple Fertilizer Trials (HYVP):</u>				
<u>Trichur District:</u>				
	Research Officer.) Shri.A.I.Thomas)	1-4--72	31-3--73
<u>Quilon District:</u>				
	Research Officer.) Shri.P.K.Chellappan) Nair.	1-4--72	31-3--73

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