INFORMATION ON AICRIP CENTRE- MONCOMPU

1. Name of the University / Department

Kerala Agricultural University

2. Name of the Centre with postal address, tel. & fax e-mail

Rice Research Station, Moncompu, Thekkekkara P.O., Alappuzha District – 688503
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3. Name of the person in charge with e-mail ID & mobile phone no.

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4. Next contact person with e-mail ID & mobile no.

Dr. LeenaKumary. S, professor(Plant Breeding)
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5. Year of establishment as AICRIP centre

1940

6. List of scientist currently on AICRIP roll-discipline wise

Dr. LeenaKumary. S – Plant Breeding
Dr. Reena Mathew – Agronomy
Sri. N. V. Satheesan – Entomology
Sri. M. Surendran – Plant pathology

7. List of other AICRIP staff

Sri.P.V.Reghunadhan –Technical Assistant
Sri.K.Gopalakrishnan Nair – Technical Assistant

8. Region of the state represented by the centre

Kuttanad Agro climatic zone

9. Rice ecologies represented

Single crop wet lands water fallowed for the rest of the year.

10.Districts of the state covered

Alappuzha, Kottayam, Pathanamthitta

11.Rice area in each of these districts-ecology wise

Districts	Area in ha		
	Double crop wetlands		Single crop wetlands
	Virippu	Mundakan	Puncha
Alappuzha	3070	33540	28140
Kottayam	5790	2580	7980
Pathanamthitta	580	1360	1510
Total	**9440**	**37480**	**37530**

12. Normal rainfall

3000-3200 mm per annum

13. Soil type & fertility status

Soil type : Alluvial clay
Fertility status :
Organic matter –5.4 %
Coarse sand – 8.5 %
Fine sand – 34.9 %
Salt - 20.6 %

Clay – 30.6 %

p^H : 4.23
EC : 0.46 dsm $^{-1}$
Organic carbon : 2.55 %
Av. N : 604 kg ha $^{-1}$
Av.P 3.72 kg ha $^{-1}$
Av. K : 185 kg ha^{-1}
Exchangeable Ca : 2.1 meq/100 g
Exchangeable Mg : 0.6 meq/100 g
Exchangeable Na : 438 meg/100 g
SO4-S (Phosphate exctractable) 14.04 ppm
B (Hot water soluble) : 0.35 ppm
Zn (DTPA extractable) : 0.9 ppm
Ca (DTPA extractable) : 1.83 ppm
Mn (DTPA extractable) : 15.3 ppm
Fe (DTPA extractable) : 448 ppm

14. Popular rice varieties:

Jyothi, Uma, Bhadra, Pavizham, Remanika, Krishnanjana, Gouri

15. Major production constraints.

The major production constraints of the zone include small size of holdings, non availability of quality seeds in right time and right quantities, cost of labour as well as scarcity of labour, lack of mechanization etc., in addition to biotic and abiotic stresses experienced by the crop. The biotic stresses include weeds, rodents, insect pests and diseases

Weeds

The major weeds of the tract include *Cyperus* sp., *Echinochloa sp.(Echinochloa colona, Echinochloa crusgalli* and *Echinochloa glabrascence*), *Eichornea*, *Lindernia*, *Ludwigia parviflora, Salvinia*, Wild rice etc.

Rodents

Rodents cause almost 25-30 % crop loss in rice in Kuttanad. The major spp. found in Kuttanad rice fields are *Bandicota bengalensis, Tatera indica*, and *Bandicota indica* .

Pests

Kuttanad is a hot spot for pests and diseases. The high humidity and high temperature experienced during the cropping season increases the incidence of pests and diseases. Major insect pests include BPH, stem borer, gall midge, leaf roller and rice bug and minor pests include thrips, case worm, blue beetle, whorl maggot etc. The minor pests are slowly emerging as major pests threatening rice cultivation in the tract.

Diseases

Fungal diseases like blast, sheath blight, sheath rot, brown spot, false smut, leaf scald and grain discoloration, Bacterial diseases like bacterial leaf blight, and viral diseases like Rice Tungro Virus, Grassy Stunt Virus etc. cause severe damage to rice crop in Kuttanad.

Abiotic Stresses

Flash floods and saline water intrusion in the coastal areas and Kuttanad and soil problems including acidity, iron toxicity, sulphide injury etc. in the Kari soils are the major abiotic stresses limiting rice production in the tract.

16.Major contribution of the centre in terms of varieties/technologies developed

The station has evolved twenty rice varieties with associated crop management and crop protection technologies for raising a profitable rice crop for the farmers of Kuttanad. Details of the rice varieties developed by the station are furnished in the Table given below**.**

Variety No.	Variety name	Year of release	Pedigree	Important Charcteristics
MO.1	Chettivirippu	1945	Pure line selection from Chettivirippu	R to salinity
MO.2	Kallada champavu	1945	Pure line selection from Kallada champavu	R to acidity and salinity
MO.3	Kochathikkira	1968	Pure line selection from Kochathikkira	R to acidity and salinity
MO.4	Bhadra	1978	IR 8/ PTB 20	R to BPH, Susc. to sheath blight
MO.5	Asha	1981	IR 11-1-66/ Kochuvithu	MR to BPH, sheath blight, sheath rot and bacterial blight
MO.6	Pavizham	1985	IR 8 / Karive nnel	MR to BPH, sheath blight, sheath rot and stack burn

MO.7	Karthika	1987	Triveni/IR 1539	MR to BPH, sheath blight, sheath rot and bacterial leaf blight
MO.8	Aruna	1990	Jaya/ PTB 33	MR to BPH, stem borer, Gall midge, sheath blight, bacterial leaf blight and brown spot
MO.9	Makom	1990	ARC 6650 Jaya	MR to BPH, leaf folder, stem borer, gall midge, sheath blight, sheath rot and brown spot
MO.10	Remya	1990	Jaya/ PTB 33	MR to BPH, gall midg,e, sheath blight, sheath rot
MO.11	Kanakom	1990	IR 1561/ PTB 33	HR to BPH, MR to stem borer, gall midge, sheath blight, sheath rot, blast and bacterial leaf blight
MO.12	Renjini	1995	Mo.5/ Improved Sona	R to Blast
MO.13	Pavithra	1998	Surekha/ Mo.5	R to gall midge biotype 1 to 5, Tolerant to Sh. Bl and Sh. rot
MO.14	Panchami	1998	Pothana/ Mo.5	R to gall midge biotype 1 to 5, Tolerant to Sh. Bl and Sh.rot.
MO.15	Remanika	1998	Mutant of Mo. 1	R to BPH and Gallmidge biotype 5. Possess Dormancy
MO.16	Uma	1998	Mo.6/ Pokkali	MR to BPH and other major pests and diseases. Posess dormancy
MO.17	Revathy	1998	Cul.12814/ Mo.6	MR to Blast, Sh. Bl and Sh. rot. Resistant to BPH and Stemborer.
MO.18	Karishma	1998	Mo.1/ Mo.6	R to BPH, moderately resistant to Gall midge biotype 5 and tolerant to iron toxicity and sulphide injury
MO.19	Krishnanjana	1998	Mo.1/ Mo.6	R to BPH, moderately resistant to Gall midge biotype 5 and tolerant toiron toxicity and sulphide injury
MO.20	Gowri	2002	Mo.4/ Cul. 25331	Tolerant to Sheath blight.

R- Resistant MR- Moderately resistant S- Susceptible

Economic Impact of the Moncompu rice varieties on rice farming in Kuttanad

The Green Revolution wave in the 1960's and 70's led to introduction of varieties like T(N) 1, IR 8 etc. to Kerala, which were high yielding but susceptible to the pests and diseases of the tropical region and this in turn resulted in an outbreak of pests, mainly Brown plant hopper (Bph), especially in Kuttanad. Around 30,000- 50,000 ha of rice fields were affected due to Bph attack bringing in a loss of Rs. 80-100 Crores. Development and release of Bph resistant varieties from RRS, Moncompu viz., Bhadra, Pavizham, Aruna, Makom, Remya and Kanakom and the IPM technologies developed

and popularized by the station could bring down the damage to a large extent and rice cultivation could be revived in the area.

Similarly, an outbreak of Gall midge biotype 5 in 1996-97 in Kuttanad affected rice cultivation in about 55,000 ha and the loss due to the attack was estimated to be around Rs. One Hundred and forty Crores

. The timely release of three varieties viz, Pavithra (MO.13), Panchami (MO.14) and Uma (MO.16) from RRS, Moncompu in 1998, which are resistant to this biotype of Gall midge could combat the problem to a large extent in Kuttanad. The rice variety Uma has very high yield potential and out yields Jyothi, another popular variety of Kerala, by 2.0 -2.5 t/ha bringing in an additional income of Rs. 15000- 20000 /- per ha to the farmer. Now this variety occupies more than 60 % of the rice area in Kuttanad enhancing the income from rice cultivation in Kuttanad by Rs. 30- 40 crores per season of cultivation. Another major problem of rice cultivation in Kuttanad viz., Blast disease was brought under control with the development and release of a blast resistant variety Renjini (MO.12) from RRS Moncompu.

Two high yielding varieties viz., Karishma (MO. 18) and Krishnanjana (MO.19) were released from RRS, Moncompu for the Kari soils of Kuttanad . These varieties show resistance to iron toxicity and sulphide injury along with pest and disease tolerance. Average yield of these varieties come to about 3.5 - 4 tons/ha in the Kari lands, where other HYVs give a maximum of 2.5 –3.0 t/ha . By using these varieties alone in this area, the yield could be increased by 1 ton/ha.

Germplasm Assemblage and Management

The Research Station also concentrates on collection and conservation of the local rice germplasm and its effective utilisation in the crop improvement programmes. With the ever increasing number of insect pests and diseases attacking rice, due to rapid shifts in insect populations and equally rapid shifts in the races of pathogens, new genes or more loci of a similar genetic function are needed to meet the ever expanding needs of plant breeding viz., resistance to biotic factors, tolerance to eco-edaphic stresses, to cope with changes in a pathogen or insect, to improve the nutritional quality or processing ease, to compete with new flora etc. The station at present has a substantial collection of the rice genetic resources in our field gene bank, which are used as donors for developing new varieties. Many of our traditional rice varieties and the improved varieties developed from them are internationally acclaimed for their performance and accepted as international donors for biotic and abiotic stress breeding.

Seed rate for direct sowing:

The optimum seed rate for direct sowing is found to be 100 kg/ha.

Weed control

Stale seedbed preparation effectively controls grassy weeds especially *Echinochloa*..

Pre – emergence application of Pretilachlor + safener (SOFIT) @ 0.6 kg ai/ha, Butachlor + safener applied on 0-3 days after sowing and post emergence application of Anilophos 0.4 kg/ha. at 10 DAS effectively control weeds. Broad leaved weeds and sedges can be controlled by 2, 4 – D. Na salt @ 0.80 kg ai/ha applied at 20 DAS.

Sowing calcium peroxide coated seed 20% (w/w) in standing water of 10-15 cm in the puddled field and maintaining the water level for 12 days increase germination of paddy seeds and provide better weed control especially of wild rice and Echinochloa spp. in direct zone rice under puddled condition.

In transplanted rice, Anilophos 30 Ec @ 0.6 kg ai, 24-D EE 4 G @ 0.8 kg ai, Butachlor 50 EC @ 1.0 kg ai, all at 6 DAT effectively control weeds. Butachlor 1.0 kg ai at 3-7 DAT followed by 2, 4-D, 0.4 kg ai at 20 DAT Oxadiazone @ 0.1 kg at 3-7 DAT give good weed control. Pre-emergence application of combination spray of Anilophos + Trichlopyr @ 1.25 kg ai/ha. was also effective in controlling weeds. However pre-emergence application of 2,4-D Na salt @ 1.0 kg ai/ha was the most economical weed control method.

Mixing 2,4 D/Na Salt @ 1 kg ai/ha with 10 kg Urea and broadcasting uniformly on a thin film of water is equally effective as spraying for weed control in rice.

Application of 2,4-D Na salt as pre emergence broad spectrum herbicide @ 0.8 kg ai/ha at 5 days after transplanting helps in controlling most of the weeds in transplanted rice. Spray on to moist soil surface with a fan nozzle to give a blanket coverage. Use 500 litres of spray fluid.

Acidity Management

As the Kuttanad soils are acidic, lime should be applied for direct seeded and transplanted rice @ 600 kg ha^{-1} in two split doses.

Nutrient management

Most economic fertilizer dose for medium duration varieties is 90:45:45 kg NPK ha^{-1} . For best results apply urea in 3 equal splits as basal, at active tillering and at panicle initiation. Application of full dose of 'N' as Nimin coated urea as basal is equally effective as the split application of urea. Mixing neem cake with urea in the ratio 1:5 will enhance 'N' availability to paddy crop and for a longer period. Basal application of NPK can be delayed upto 12-15 days after sowing under puddled condition.

In area where split application of nitrogen is not feasible due to water stagnation after planting or sowing of the crop, full dose of nitrogen as a basal dressing can be given in the form of neem coated urea, coaltar coated urea or Mussoriephos coated urea.

The efficiency of rock phosphate can be enhanced by the application of pyrite in the ratio of 1:1 w/w. Application of water soluble phosphatic fertilizers in two equal splits as basal and at tillering stage is more effective in giving a significantly higher grain yield than a single basal application.

Three split application of potash (1/3 + 1/3 + 1/3) synchronising with the three split application of nitrogen is better for higher nutrient efficiency, resulting in higher grain yield and tolerance to pests and diseases.

Soil samples were taken from all the 15-soil series of Kuttanad and the analysis is being done. Among the series studies, the Karuvatta and Thottappally series are deficient in available. Zn, cu and Mn content the Fe content is high but below the critical level of iron toxicity. In the Pallippad series, the soils have adequate Zn. Cu and Mn, but available iron content is high ie above the critical iron concentration for iron toxicity.

In Zinc deficient areas Pre-soaking paddy seeds in 2% zinc sulphate solution is beneficial for economising rice production. In copper deficient area, pre soaking paddy seeds in 1% copper sulphate solution is effective. In zinc and copper deficient areas pre-soaking paddy seeds in a combination of 1% zinc sulphate and 0.25% copper sulphate solution is found to increase paddy yield. In zinc deficient areas soil application of zinc sulphate @ 25 kg ha^{-1} is recommended. Application of zinc sulphate at this rate, once in four seasons is sufficient for rice.

Application of magnesium as a basal dose in the form of magnesium sulphate (16% MgO) or

magnesite (40% MgO) or dolomite (10% MgO) @ 20 Kg MgO ha^{-1} is effective in giving a significant increase in grain and straw yield of rice in magnesium deficient soils.On per unit MgO basis, magnesite, a naturally occurring mineral which is more concentrated and cheaper than magnesium sulphate is better suited for acid soils.

Pest management

Integrated pest management strategies have been worked out for BPH and Gall midge combining genetic and agronomic methods along with effective chemical.

The population dynamics of BPH in Kuttanad has been worked out and its relation with climatic condition has been established. Application of Imidacloprid (Confidor 200 SL) @ 150 ml/ha is found to be effective for the control of BPH.

Efficacy of carbofuran granules for rice pest control has been established.
Combined application of insecticides and 2,4-D has been found to be feasible in rice fields
An indigenous cheap and efficient rat trap “the Moncompu trap” has been designed for trapping fields rats in rice crop.

Disease management

An economic spray schedule for control of sheath blight disease was brought out using Bavistin followed by Dithane M-45. Dithane. M-45 was found to be effective against grain infection caused by *Helminthosporium oryzae*

Spraying Validacin (Validamycin) 2 ml/l was found to be the most effective, for the control of sheath blight.

Application of Propeconazole 25 EC (TILT) at 0.5 to 0.75 ml/litre is found to be effective in reducing the severity of Sheath blight disease in rice.

17.Any other relevant information

Several high yielding cultures of desirable duration possessing tolerance to major biotic and abiotic stresses experienced in the region have been developed by RRS, Moncompu the details of which are furnished below.

Sl. No	Culture No.	Pedigree	Important Charcteristics
1	KAUM 87-1	DV 85 / MO.7	Medium Dration, MR to Sheath blight, Sheath rot and Gall midge
2	KAUM 88-2	MO.7/ARC10550	
3	KAUM 99-2	MO.7/*O.minuta*	
4	KAUM 87-5	DV.85 / MO.7	
5	KAUM 95-1	Mo.5/Swarnalatha	
6	KAUM 103-104-1(SD 6)	MO.8/HRASWA	Short duration, Moderately Resistant to Sheath blight,
7	KAUM108-262-1(SD 36)	IET 4786/MO.8	

8	KAUM MO.6 10 KR(M9)	Mutant of MO.6	Sheath rot and Gall midge
9	KAUM MO.8 20 KR(M.20)	Mutant of Mo.8	

Rice Research Station, Moncompu has been serving as a co-operative centre of AICRIP since inception of the programme. Several new chemical molecules had been field tested during the period under report for their bio-efficiency for controlling weeds within safe levels of phytotoxicity to Rice in both direct sown rice and transplanted rice.

One of the newer herbicides molecules identified and successfully released for farmer adoption is the pre emergence application of Pretilachlor + Safener @ 0. 45 kg. ai/ha for direct sown rice under puddled conditions.

Several new chemicals have been identified as potential herbicides for transplanted rice, viz. Pyrazo Sulfuron ethyl 5WP @ 0.02 Kg ai/ha 8-10 DAS and Bensulfuron methyl 60DF @ 0.05 Kg ai/ha both as pre emergence at 3-5 DAS and post emergence at 20-25 DAS. The optional treatment of pre-emergence application of 2, 4-D Na salt at 3 – 5 DAT followed by one Hand Weeding was found to be on par with these potential herbicides and Hand Weeding Twice.

Integrating a pre-emergence herbicide application with a subsequent Hand Weeding at 40 DAT rather than 20 DAT was found to be more economically efficient and yielding better benefit : cost ratio.

Use of seed drill for wet sowing in puddled soils has been found to regulate the plant population, reduce the seed rate to 60-80 kg./ha instead of 125-150 kg./ha., increase the yield and result in higher net profit under standard management practices.

In the study on synchronisation of potassium (K) supply for rice hybrids, highest grain yield was obtained when 100% recommended K (45 kg ha^{-1}) was given in 2 splits (75% basal + 25% at PI stage), ie. synchronization of K with crop needs in the silty clay soils of Moncompu with medium K status (201 Kg ha^{-1}). There was no response to additional K application beyond the recommended dose of 45 kg ha^{-1}. All the K treatments recorded significantly higher grain yields over control ie. no K application.

In the trial on screening of rice germ plasm for Zn and Fe contents, zinc concentration in grain and endosperm (mg kg^{-1}) of top ten Moncompu varieties were done. The grain content of zinc was highest in Gouri, 29.84 mg kg^{-1}.The endosperm content of zinc was highest in Jyothi, 41.34 mg kg^{-1}.In the all India level, out of 114 cultures, five Moncompu varieties, GOURI, RANJINI, REMANIKA, KARTHIKA and REMYA figured among the top ten in both grain and endosperm Zinc concentration.

The iron concentration in grain and endosperm (mg kg^{-1}) of top ten Moncompu varieties were done. The grain content of Fe was highest in Revathi, 219.56 mg kg^{-1}. The endosperm content of iron was highest in Jyothi,300.45 mg kg^{-1}.

For Iron, Six Moncompu varieties, **REVATHY, PAVITHRA, KARTHIKA, REMANIKA, PAVIZHAM** and **ARUNA** found place in top ten cultures in the all India level that have high concentration in grain and endosperm.

In the all India level ,out of 114 cultures, three Moncompu varieties, **REVATHY, PAVITHRA and GOURI** have been identified as promising ones as far as Fe & Zn concentration are concerned.

II. c. Crop protection

Two new fungicides RIL-010/F1 25 SC @ 1.5 ml and Amistar 25 SC @ 1 ml/lit were found highly effective against blast disease during the period 2002-2004.

Kitazin 48 EC @ 2 ml , Saaf 75 WP @ 1.5 g , Result 25 EC @ 1 ml, Flusilazole @ 0.6 ml and Achook (botanicals) 5 ml/lit were significantly effective for sheath blight disease for two consecutive years. Farm trials with the best chemicals viz., Kitazin and Achook during Kharif 2004 and Rabi 2006 also confirmed the efficiency of the above two chemicals in controlling sheath blight disease.

The fortnightly planting of varieties conducted during the period of 2002-2006 to decide the most suitable time of planting to avoid disease incidence showed that sheath blight disease intensity increased gradually as the time of sowing was delayed and the disease incidence was very low in early sown crop.