

TAMIL NADU AGRICULTURAL UNIVERSITY

PROCEEDINGS

40th Rice Scientists Meet 2021 (April 8-9, 2021)

Lead Centre

Tamil Nadu Rice Research Institute
Aduthurai – 612 101

Directorate of Research

Tamil Nadu Agricultural University
Coimbatore 641 003

2021

PROCEEDINGS

40th Rice Scientists Meet 2021 (April 8-9, 2021)

The 40th Rice Scientists Meet was held during April 8-9, 2021 at the Tamil Nadu Agricultural University, Coimbatore, through on-line connecting all scientists across the University College Campuses, Research Stations and KVKs besides main campus. **Dr. K.S. Subramanian**, Director of Research welcomed the gathering and provided basic statistics on current scenarios and flagged off issues to be addressed to meet the challenges and way forward. **Dr. N. Kumar**, Vice Chancellor highlighted the need for the scientists to develop collaborate research projects with a focus on improving the productivity of rice. Indeed, the productivity of rice has increased by one tonne in the past 10 years because of improved crop varieties, technologies and farm mechanization besides timely interventions to manage pests and diseases. Land races are to be given priority to promote as a variety to gain the advance of therapeutic and nutritional benefits.

The Director of Research flagged off a few researchable issues accelerated breeding, trait specific molecular breeding, strategies to infuse multiple resistance using molecular breeding, digital agriculture, endophyte medicated biotic and abiotic stress management, use of botanicals and biocontrol agents in insect pest management and plant health monitoring using artificial intelligence. The action taken reports on the 39th Rice Scientists Meets were presented by the lead scientists from Tamil Nadu Rice Research Institute, Aduthurai. During the pre-review, the technical directors had reviewed the on-going university research projects (89), action plan projects (19), core projects (11), AICRPs (5) besides externally funded projects (57).

The outcome of the review process was presented by **Dr. S. Geetha**, Director (CPBG), **Dr. S. Mohankumar** (CPMB), **Dr. S. Sundareswaran**, Director (Seeds), **Dr. V. Geethalakshmi**, Director (Crop Management), **Dr. R. Santhi**, Director (DNRM), **Dr. S. Panneerselvam**, Director (WTC) and **Dr. K. Prabakar**, Director (CPPS). In the closing remarks, the Vice Chancellor said that the rice scientists should continue to work multi-disciplinary mode to improve the quality of research with a definite technology delivery and a landmark variety may be proposed for a special variety release during Golden Jubilee Celebrations during 2021-2022. He also emphasized that the both plant breeders and seed technologists work together and ensure the maintenance of purity of seeds. The Director of Research suggested that documentation on landraces, SOPs for organic rice production, technology package for complete farm mechanization, drone enabled spray of agri-inputs and pesticide residues in rice at the farm gate are to be done to get the update for the university and advice the policy makers suitably. **Dr. V. Ambethgar**, Director, TRRI, Aduthurai, proposed a formal vote of thanks.

The proceedings of the 40th Rice Scientists Meet are furnished below in the following headings:

1. CROP IMPROVEMENT

- A. Cultures recommended for Variety release/OFT/ART/MLT
- B. Action Plan (2021- 2022)
- C. Project-wise Remarks

2. CROP MANAGEMENT

- A. For Adoption/OFT/Information
- B. Action plan (2021 – 2022)
- C. Project-wise Remarks

3. CROP PROTECTION

- A. Technologies for adoption/OFT/information
- B. Action plan (2021 – 2022)
- C. Project-wise Remarks

4. GENERAL REMARKS

5. LIST OF PARTICIPANTS

I. CROP IMPROVEMENT

A. Cultures recommended for Variety Release/OFT/ART/MLT

I. Cultures Recommended for the submission of Variety Release Proposal to UVTRC during 2021

1. AD 09219 – Early- Irrigated

Parentage : ADT(R)45 / ACK 03002
Duration : 115days and suitable for *Sornavari/Kar/Kuruvai* seasons
Yield (192) : 6442kg/ha (12.7 per cent higher than ADT 43 and 9.2 % than CO 51
Special Features : Resistant to Blast, Moderate Resistance to Sheath Blight, Stem Borer and BPH, Medium Slender grains, High HRR (63.6%) and good cooking qualities

2. TM12077- Early- Drought

Parentage : TKM(R)12 / IET 21620
Duration : 120-122 days under semi dry and dry conditions
Yield : 3924 kg/ha (9.6 per cent higher than Anna(R)4)
Special Features : Resistant to Stem Borer, Leaf Folder and Gall midge; High HRR (60 %), short slender grain type; Tolerance to drought

3. TR 09030- Early- Salinity

Parentage : Mutant of TRY 2
Duration : 111 days
Yield : 4352 kg/ha (10.18 percent higher than TRY2)
Special Features : Long Slender Grain,
Resistant to BPH, GLH and Moderately resistant to WBPH
Intermediate Amylose

4. AD 12132- Mid Early Irrigated

Parentage : ADT 39 / Konark
Duration : 125-128 days under transplanted condition
Average yield : MLT (15): 5608kg/ha which is 19.4 per cent higher than ADT 39
ART (133) :5814 kg/ha manifesting 2.16 per cent yield advantage over ADT 39
Special Features : Resistant to Brown spot and MR to Blast under field condition.
Semi dwarf plant type with medium slender grains.
Good milling and cooking properties with intermediate amylose (23.9 %)

5. CB 12132- Medium Irrigated

Parentage : CO (R) 50 / CB 05501
Duration : 135-137 days under transplanted condition
Average yield : MLT (17): 5480 kg/ha which is 15.2% higher yield over BPT 5204 and 10.5 % over ADT 49.
ART (168): 5966 kg/ha which is 2.70 per cent higher yield than TKM 13 and 1.40 per cent with CO 52

Special Features : Resistance to Blast, non-lodging, medium slender grain with HRR 64.1%. The LER is 1.7 with good volume expansion

II. Cultures Identified for On Farm Trial – 2021-22

1. TNTRH 55

Parentage : TNAU 60S /CB SN 405 (TGMS hybrid)
 Duration : 123-125 days under transplanted condition
 Average yield : MLT (15): 5414 kg/ha which is 15.3% increase over ADT 39
 ART (90): 5815 kg/ha which is on par with ADT 39.
 Special Features : Long slender grain type with good linear elongation upon cooking (LER: 1.76). Resistant to RTD & GLH and Moderately resistant to blast and brown spot

III. Cultures Recommended for Adaptive Research Trials (2021-22)

Cultures with Parentage and Checks	Yield and Duration	Special Attributes	Locations
Rice 4/2021-22: Transplanted (Oct.25-Nov.10, 110 to 125 days)			
AS 15024 (R) (ASD16/ Manjalsaradai) Checks : TPS 5 and TKM 13	6306 kg/ha in 119 days 14.95 per cent higher yield than CO 51 and 5.50 per cent than TPS 5	HRR: 57%, Intermediate amylose, soft gel, Low GT, LER: 1.42 and BER: 1.28MR to leaf folder and stem borer	All Districts except Virudhunagar, Ramnad, Sivagangai and The Nilgiris
Rice 15/2021-22: Special Transplanted Medium (September- October Sowing)			
AD 13253 (AD 01246 / CO(R) 49) Checks : ADT 54 and CO 52	5830 kg/ha in 132 days which is 9.65 per cent higher than CO 52.	Moderate Resistance to BLB under Artificial condition, Medium Slender grain with good cooking properties	All Districts except Virudhunagar, Ramnad, Sivagangai and The Nilgiris
CK 145-3 (CO(R)50 /Kavuni) Check :Karuppukavuni	5077kg/ha in 140 days which is 58.26 per cent higher than Kavuni	High protein(10.6%), Zinc content(25.6mg/kg), phenolic content(612.1 mg/100g) and resistant starch (3.06%)	

IV. Cultures promoted to ART & OFT under fast track mode (2021-22)

Cultures with Parentage and Checks	Yield and Duration	Special Attributes	Locations
Short Duration- Short Bold (2021-22)			
AD 18006 (ADT 37 / WGL 14377)	(MLT: 7 Locations) 5583 kg/ha in 108 days (13% higher than ADT 37 and 8.7% than ASD 16)	Short bold grains	All Districts except Virudhunagar, Ramnad, Sivagangai and

AD 17152 (IET 22075 / ADT (R) 48)	6163 kg/ha in 111 days (24.7 % higher than ADT 37 and 20 % than ASD 16)	Long flag leaf with dense panicle	The Nilgiris
Checks: ADT 37 and ASD 16			

Short Duration- Super Fine (Navarai/Summer 2021-22)			
CB 15569 ADT 45/ CB 04110	MLT (10 Locations) 5225 kg/ha in 107 days	MR to GLH, Blast, brown spot, RTD SS grain with intermediate amylose	Tiruvannamalai Villupuram Tirunelveli Thanjavur Kancheepuram Tiruvallur Cuddalore & Krishnagiri
AD 16052 (Turant Dhan /IET 22075)	4902 Kg/ha in 109 days		
CB 15714 ADT 43 / GEB 24	(MLT: 7 Locations) 5145 Kg/ha in 112 days	Medium slender grain	
Checks: ADT 53 and RNR 15048			

V. MULTILOCATION TRIALS (2021-22)

Table 1. MLT I (100- 115 days; May-June sowing) 2021-22

Entry	Parentage	Duration (days)	Grain yield (kg/ha)	Rice grade	Nominating Centre
Advanced / Second year					
ACK 12026	Mutant Progeny of I.W.Ponni	110-114	6340	MS	KKM
New					
ACK 12025	ADT 43/ADT 37	109	6780	MB	KKM
AD 18028	WGL14377/MDU5	115	6402	MS	ADT
AD 19175	ADT 37/AD 09219	117	6025	MS	ADT
AS 19005	IR50/ASD16	105	6862	SB	ASD
AS 19047	IR 50 / AS 12050	112	6787	MS**	ASD
CB 16660	CB 08504/ JGL17190	114	7149	MS	CBE
CB 16618	CO 51/ IET 20142//CO- 51/ IET 20716	115	6979	MS	CBE
CB 18528	CO 51 / IET 23750	115	6883	SS**	CBE
CB 17510	CO51 / ARC10319	117	7118	SS**	CBE

MS grain type cultures will be compared with CO 51 and ADT 53; MB and SB cultures with TPS 5 and ADT 37 and ** culture nominated for Super Fine trial with RNR 15048

Checks	:	Rice Co 51, TPS 5 , ADT53, RNR15048 and ADT 37
Replications	:	Three
Plot size	:	9 m ²
Spacing	:	15 x 10 cm
Locations (12)	:	Aduthurai, Coimbatore, Madurai, Ambasamudram, Tirur, Thirupathisaram, Killikulam, Thanjavur, Paiyur, Cuddalore, Palur and Pattukottai
Seed despatch	:	5.0 kg to be sent before 28.05.2021

Table 2. MLT II (115-125 days, September/October sowing) 2021-22

Entry	Parentage	Duration (days)	Grain yield (kg/ha)	Rice grade	Nominating Centre
Advanced / Second year					
AD 19055	TurantDhan/IET 22075	116	5372	SS(SF)	ADT
ACK 12024	Mutant Progeny of White Ponni	122-125	6233	MS	KKM
New					
ACM 20003	Mutant of Anna (R) 4	129	5122	SS(SF)	MDU
AD 17100	MDU 5/Pusa 677	125	6510	SS (SF)	ADT
AD 18035	ADT37/JGL17004	123	6534	MS	ADT
AD 16145	AD 04072/AD 08141	125	6352	MS	ADT
AS 19183	ADT 37/BPT 5204	122	6950	MS	ASD
CB 17505	CO51/CB08538	125	6700	SS (SF)	CBE
CB 17624	CB0550/CB11609	124	6980	SS(SF)	CBE
TNRH 294	COMS 23A/CBSN 68	126	6389	LS(SF)	CBE
TNRH 303	COMS 23A/CBSN120	126	6325	LS	CBE

SF culture will be compared with RNR 15048.

Checks	:	ADT 39, TKM 13 , RNR 15048 and US 312
Replications	:	Three
Plot size	:	9 m ²
Spacing	:	15 x 10 cm
Locations (10)	:	Aduthurai, Coimbatore, Madurai, Ambasamudram, Tirur, Thirupathisaram, Killikulam, Thanjavur, Sirugamani and Paiyur.
Seed dispatch	:	4.5 kg to be sent before 28.05.2021

Table 3. MLT III (131-140 days, September/October sowing) – 2021-22

Entry	Parentage	Duration (days)	Grain yield (kg/ha)	Rice grade	Nominating Centre
Advanced / Second year					
CB12122	BPT 5204 / CO (R) 48	128	5361	SF	CBE
New					
ACK 14039	TPS3/ADT43	130	5022	MB	KKM
ACK 14027	TPS3/ASD16	130	5223	MB	KKM
AD 18568	ADT39/NDR359	135	6152	MS	ADT
AD 18641	CO(R)50/AD 07302	135	6237	MS	ADT

AS 16059	Manjalsaradai/ASD16	134	6513	MS	ASD
CB 05022**	CO51/IET 23750	138	7160	MS	CBE
CB 18107	CB05219/WGL 14	132	6809	MS	CBE
CB 16101	BPT5204/CR1009	137	7073	SB	CBE
AD 18545	ADT(R) 46 / AD 09391	136	6058	SF	ADT
CB 18107	CB 05219/WGL 14	132	6809	SF	CBE
CB 16217	CO52/JGL17190	138	6796	SF	CBE
TP 16005	TPS3/ <i>Kothandan</i>	138	5056	SB	TPS

** Entry included for organic method of cultivation
SF cultures will be compared with CO 52

Checks	:	CO 52, TPS 3, ADT 54, andAMMAN
Replications	:	Three
Plot size	:	9 m ²
Spacing	:	20 x 10 cm
Locations (12 +5)	:	Aduthurai, Ambasamudram, Coimbatore, Madurai, Sirugamani, Thirupathisaram, Tirur, Killikulam, Thanjavur, Cuddalore, Pattukottai and Palur. Organic cultivation : Aduthurai, Coimbatore, Tirur, Madurai and Ambasamudram
Seed despatch	:	6.5kg to be sent before 28.05.2021

Table .4 MLT IV (140 days and above, August Sowing)- 2021-22

Entry	Parentage	Duration (days)	Grain yield (kg/ha)	Rice grade	Nominating Centre
Advanced / Second year					
AD 18073	CR 1009/BPT 2270	150	6760	SB	ADT
AD 18111	CR 1009/OR 23780	148	7000	MB	ADT
New					
AD 16135	CR1009/MTU1150	148	6820	SB	ADT
AD 16154	CR1009/CR2942-68	152	6742	SB	ADT
AD 18145	CR1009/MTU 1075	150	6557	SB	ADT
AD 18134	CR1009/MTU 1075	155	6858	SB	ADT

Checks	:	CR 1009 <i>Sub1</i> and ADT 51
Replications	:	Three
Plot size	:	9 m ²
Spacing	:	20 x 15 cm
Locations (8)	:	Aduthurai, Ambasamudram, Coimbatore, Thirupathisaram, Sirugamani, Tirur, Killikulam, Thanjavur

Table.5 MLT V (Drought) - 2021-22

Entry	Parentage	Duration (days)	Grain yield (kg/ha)	Rice grade	Nominating Centre
ACM 20003	Mutant of ANNA (R) 4	129	5122	SS	MDU

AD 18668	ADT43*4/CT 9993	118	5250	MS	ADT
PM17009	ADT43/PMK3	110	4565	MS	PMK
PM17011	ASD16/CHANDIKAR	104	4638	MS	PMK

Checks	:	Anna (R) 4and CO 53
Replications	:	Five
Plot size	:	9 m ² (At ROS- Three Replications with Plot size of 6m ²)
Spacing	:	20 x 10 cm
Locations (5)	:	Ramnad, Paramakudi (2), Coimbatore and Tirur
Seed dispatch	:	3.5 kg to be sent before 28.05.2021

At Paramakudi, trial is to be conducted both at field and ROS. The breeder at Paramakudi is the incharge for the MLT at Ramnad. At Coimbatore, trial is to be conducted in ROS.

Apart from the regular observations, Drought Sensitivity (DRS), Leaf Drying at vegetative stage, Spikelet Fertility and Drought Recovery (DRR), root traits need to be recorded at Department of Rice, TNAU, Coimbatore with the technical support of Dr. K. Krishnasurendar, AP (CRP).

Table 6a. MLT VI (Saline/Alkaline - Early) 2021-22

Entry	Parentage	Duration (days)	Grain yield (kg/ha)	Rice grade	Nominating Centre
Advanced / Second year					
TR 13069	ADT 43/ FL 478// ADT 43	115	5139	MS	TRY
TR 13083	ADT 43/ FL 478// ADT 43	113	5171	MS	TRY
TR 15035	CSR 36 / IRGC 41-05//RPBio 226	110	4018	MS	TRY
TR 15057	IR 20 / CSR 23 // CSR 23	113	4315	MS	TRY
New					
TR15014	CST7-1/IRGC69891//Pusa 44	115	3916	MS	TRY
TR15051	ADT 49/TRY 3	119	3981	MS	TRY

Checks	:	TRY 2and ADT 53
Replications	:	Three
Plot size	:	9 m ²
Spacing	:	15 x 10 cm
Locations (5)	:	Trichy, Ramanathapuram, KVK Tirur, KVK, Tindivanam, KVK, Needamangalam
Seed dispatch	:	3.5 kg to be sent before 28.5.2021

Table 5b. MLT – VII (Saline/Alkaline - Medium) 2021-22

Entry	Parentage	Duration (days)	Grain yield (kg/ha)	Rice grade	Nominating Centre
Advanced / Second year					
TR15029	CSR 36 / IRGC 41-05//RPBio 226	135	5613	MS	TRY
TR15031	CSR 36 / IRGC 41-05//RPBio 226	132	5893	MS	TRY
New					
TR15045	CSR30/IRGL41-05//RP Bio2266	130	5878	SB	TRY

Checks	:	TRY 3 and TRY 4
Replications	:	Four
Plot size	:	9 m ²
Spacing	:	20 x 10 cm
Locations (5)	:	Trichy, Ramanathapuram, KVK Tirur, KVK, Tindivanam, KVK, Needamangalam
Seed despatch	:	3.5 kg to be sent before 28.5.2021

VI. Rice MultiLocation Trials Monitoring Team 2021-22

Sl.No	MLT Stations	Monitoring Team
1.	Aduthurai and Thanjavur	Dr.R.Manimaran, Assoc.prof(PB&G) Dr.R.Pushpa, Asst.Prof(PB&G)
2	Pattukottai and Needamangalam	Dr.R.Suresh, Asst.Prof(PB&G) Dr. L. Subha, Asst.Prof(PB&G)
3	Tirur, KVK, Tirur, & KVK, Tindivanam	Dr. S.Banumathy, Assoc.Prof(PB&G) Dr.Yoga Meenakshi Asst.Prof (PB&G)
4	Cuddalore and Palur	Dr.D.Sassikumar, Assoc. Prof(PB&G)
5	Coimbatore	Dr. R.Saraswathi, Prof (PB&G)
6	Trichy	Dr. Shakila, Asst.Prof(PB&G)
7	Sirugamani	Dr.P.Jeyaprakash, Prof (PB&G)
8	Madurai and Ramnad	Dr.S.Muthuramu, Asst.Prof (PBG)
9	Paramakudi	Dr. S. Juliet Hepziba, Prof.(PBG)
10	Killikulam	Dr.S. Arumugachamy, Prof (PB&G)
11	Thirupathisaram	Dr.M..Arumugam Pillai, Prof (PB&G)
12	Ambasamudram	Dr.R.Latha, Asst.Prof(PBG) Dr.S. Saravanan, Asst.Prof(PBG)

The services of the Entomologist and Pathologist in the MLT conducting centre or nearby research stations may be availed for pest and disease scoring.

The Monitoring team will visit at appropriate stage of the trial and report on

1. General Conduct of the Trial
 - a. Plot size and Replications adopted
 - b. Labelling of the plots
2. Admixtures, Disease and Pest Susceptibility if any
3. Top Two entries based on visual observations
4. General Remarks of the trial.

B. Action Plan (2021-2022)

THEME I DEVELOPING CLIMATE SMART RICE VARIETIES BY GENE PYRAMIDING

S.No.	Activity	Action plan for the year 2021-22
A.	Pyramiding of biotic stress resistance genes	
	<p>Development of Biotic stress tolerant rice through pyramiding of genes for BB, Blast, BPH and false smut resistance.</p> <p>Centre: Aduthurai : D.Sassikumar, AP (PB&G) Coimbatore: Dr.K.Amudha, AP (PB&G) CPMB&B: Dr.M.Raveendran, P&H, CPMB</p>	<p>a. Molecular screening for the presence of target genes and selection of plants for intermating.</p> <p>b. Effecting inter-crosses between double cross F₁ (TKM 13/BB donors// CO 52/BPH donors) and single cross F₁ (Blast and false smut donors)</p> <p>c. Raising of inter-cross gene pyramided F₁s, screening for target genes and selfing</p>
B.	Double trouble (drought + salinity) tolerantrice	
1.	<p>Development of rice genotypes tolerant to drought and salinity stress through marker aided selection and hotspot screening</p> <p>Centre: Coimbatore: Dr.R.Pushpam, AsP(PB&G) Paramakudi:Dr.S.Muthuramu, AP (PB&G) Trichy: Dr.T. Thirumurugan, AP(PB&G) CPMB&B: Marker Validation Dr.M.Raveendran, P&H, CPMB</p>	<p>a. Raising of BC₁ F₁ of CO 52/ 3-11-11-2 and effecting second backcross based on marker assisted foreground and background selection</p> <p>b. Phenotypic screening of F₂ populations involving the parents ADT 37, Trichy 2, TR 13069, RNR 15048 and TR 13083 at ADAC&RI, Trichy for salinity tolerance in the first season</p> <p>c. Evaluation of salt tolerant plants identified at Trichy in ROS and screening for drought tolerance at Coimbatore</p> <p>d. Phenotypic screening of F₂ populations involving the parents Anna (R) 4, CO 52, ADT 53, TR 13083, TR 09027 and 3-11-11-2 in hotspot at Paramakudi for drought tolerance</p>

THEME II. BREAKING THE YIELD BARRIERS IN RICE

S.No.	Activity	Action plan for the year 2021-22								
1.	Synthesis of TNAU 'MAGIC' population Centre : Aduthurai :Dr.R.Suresh AP (PB&G) Coimbatore: Dr.R. Pushpam, AsP (PB&G) Tirur :Dr. S.Banumathy, AsP(PB&G)	<table border="1"> <thead> <tr> <th>Stations</th> <th>Double crosses to be effected</th> </tr> </thead> <tbody> <tr> <td>Aduthurai</td> <td>ADT 39/GEB 24//TKM 13/AC 384712. Numoli/Imp. Samba Mahsuri// TPS 5/CB 13132</td> </tr> <tr> <td>Coimbatore</td> <td>IR 20/TRY 3//CR 1009/Thooyamalli CB 16533/Kranthi//NLR 34449/Norungan</td> </tr> <tr> <td>Tirur</td> <td>I.W.Ponni/RNR 15048//Erramalli/IR 64 Drt CB 14514/VGD 1//Swarna/Poongar</td> </tr> </tbody> </table>	Stations	Double crosses to be effected	Aduthurai	ADT 39/GEB 24//TKM 13/AC 384712. Numoli/Imp. Samba Mahsuri// TPS 5/CB 13132	Coimbatore	IR 20/TRY 3//CR 1009/Thooyamalli CB 16533/Kranthi//NLR 34449/Norungan	Tirur	I.W.Ponni/RNR 15048//Erramalli/IR 64 Drt CB 14514/VGD 1//Swarna/Poongar
Stations	Double crosses to be effected									
Aduthurai	ADT 39/GEB 24//TKM 13/AC 384712. Numoli/Imp. Samba Mahsuri// TPS 5/CB 13132									
Coimbatore	IR 20/TRY 3//CR 1009/Thooyamalli CB 16533/Kranthi//NLR 34449/Norungan									
Tirur	I.W.Ponni/RNR 15048//Erramalli/IR 64 Drt CB 14514/VGD 1//Swarna/Poongar									
2.	Developing of pre- breeding lines using restorers and Wild Rice Magic lines Coimbatore : Dr.R.Saraswathi, Professor (PB&G)	Evaluation of F ₃ s generated from Restorer x Wild Rice Magic parents and forwarding to F ₄ after molecular screening of selected crosses.								
3.	Development of restorers from inter sub specific crosses for utilization in hybrid program Centre : Coimbatore: Dr.R.Saraswathi, Professor (PB&G)	<p>a. Evaluation of F₄ generation of <i>indica/ japonica</i> crosses and selection of plants with complete fertility and other agro-morphological traits and generation advancement to F₅. Molecular screening for presence of restorer genes in selected crosses.</p> <p>b. Phenotypic assessment of BC₁F₃s of <i>indica/ japonica</i> crosses and advancement to F₄.</p>								
4.	Development of breeding lines from inter sub specific crosses with high yield potential for utilization in varietal program Coimbatore: Dr.R.Saraswathi, Professor(PB&G)	Raising F ₃ and F ₄ families of CB 174R/Iguapecateto and selecting lines with sturdy stem and component traits to achieve high yield.								

THEME III. BREEDING FOR SPECIAL TRAITS

S.No.	Activity	Action plan for the year 2021-22
1.	Developing Pre-breeding stocks for direct seeded rice Aduthurai : Dr.R.Suresh AP (PB&G)	<p>a. Generation advancement of F₁ and F₂ developed from crosses involving identified donors for anaerobic germination</p> <p>b. Effecting new crosses</p>

2.	Improvement of landraces through pure-line selection and their nutrient profiling Centre : Coimbatore : Dr.R.Saraswathi Professor (PB&G) & Dr.K.Amudha, AP (PB&G) Aduthurai : Dr. D.Sassikumar AsP(B) and Dr.R.Pushpa, AP (PB&G)	a. Evaluation of selected morpho-types and fixing of improved type in <i>Mappillai samba</i> and selected landraces
		b. Assessment of grain quality parameters, protein, iron, zinc and resistant starch content in grains

THEME IV ACCELERATED BREEDING TO DEVELOP RICE VARIETIES WITH MARKET PREFERENCE

S.No.	Activity	Action plan for the year 2021-22
1.	Development of Super fine rice varieties for high end market.	a. Compilation of results from MLT, ART, OFT conducted with early duration superfine cultures and proposing a culture for variety release
		b. Testing of the promoted medium duration cultures viz., CB 12122, CB 15714 and AD 19055 simultaneously in ART and OFT
2.	Development of Short bold rice varieties to replace ADT 37 and ASD 16 Centre	a. Testing of identified short bold cultures viz., AD 17152, AD 18006 simultaneously in ART and OFT. b. Compilation of data and proposing the best culture for variety release

CPMB& B

MINING AND TRAIT DISCOVERY THEME V. NEXT GENERATION GENOMICS AND BIO-INFORMATICS FOR ALLELE

Whole genome re-sequencing	<ul style="list-style-type: none"> Re-sequencing more number of native landraces and known TNAU donors (Dr. M. Raveendran, Dr. S. Mohankumar, Dr. Manonamani (PGR), Dr. J. Ramalingam, , Dr. John Joel, Dr. M. Jayakanthan and Dr. N. Saranya) Exploiting IRRI-3K rice genome data for mining novel alleles of yield and stress tolerant genes (Dr. M. Raveendran, Dr. R. Suresh (TRRI), Dr. M. Sudha, Dr. N. Senthil and Dr. N. Bharathi)
Metabolomics	<ul style="list-style-type: none"> Metabolite profiling of local rice diversity for medicinal and therapeutic clues (Dr. John Joel, Dr. M. Raveendran, Dr. D. Uma, Dr. V.P. Santhanakrishnan, Dr. N. Senthil and Dr. S. Vellaikumar)

Metagenomics	<ul style="list-style-type: none"> Microbiome based approaches for enhancing growth and stress tolerance (Dr. S. Nakkeeran, Dr. S. Varanavasiappan, Dr. R. Renuka, Dr. N. Saranya and Dr. R.Raghu)
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THEME VI. NEWER BIOTECH TOOLS

Exploiting newer areas of biotechnology	<ul style="list-style-type: none"> Genome editing for trait improvement (Dr. D. Sudhakar, Dr. L. Arul, Dr. S. Mohankumar, Dr. E. Kokiladevi and Dr. S. Varanavasiappan)
	<ul style="list-style-type: none"> Developing tools and techniques for Genome editing in rice (Dr. M. Raveendran, Dr. D. Sudhakar, Dr. M. Jayakantahn and Dr. N. Saranya)
	<ul style="list-style-type: none"> Haplotype diversity of yield and stress tolerant genes in rice and initiating assembly of elite haplotypes (Dr. M. Raveendran, Dr. D. Sassikumar (TRRI), Dr. M. Sudha, Dr. N. Senthil and Dr. M. Jayakanthan)
	<ul style="list-style-type: none"> Doubled Haploids for Speed Breeding (Dr. R. Gnanam, Dr. P. Meenakshisundaram, Dr. V. Rajanbabu and Dr. M. Dhandapani (AEC&RI, Kumulur))

C. Project-wise Remarks

S. No.	Project No. & title	Remarks
I. PROJECTS ON GERMPLASM MAINTENANCE		
COIMBATORE		
1.	CPBG/CBE/PBG/RIC/2016/001: Germplasm collection, evaluation and conservation in rice Dr. K. Amudha , Assistant Professor (PB&G) (June 2016 to May 2021)	<ul style="list-style-type: none"> ✘ Pure line selections (PLS) made from landraces has to be evaluated along with the base population under ROS for studying the drought tolerance level ✘ The lines identified with very strong spikelet density of pubescence of lemma may be shared with rice entomologist for screening against insect pests ✘ The project may be closed and work continued in a new subproject ✘ A booklet may be prepared detailing about the characteristics of the studied rice land races with clear photographs

II. PROJECTS ON EVOLUTION – ADUTHURAI		
2.	CPBG/ADT/PBG/RIC/2020/001:Development of medium duration rice with high yield potential, preferential grain quality and resistance to BLB suitable for irrigated ecosystem of Tamil Nadu Dr.D.Sassikumar Associate Professor (PB&G) Dr.A.Ramanathan Professor (Plant Pathology) August 2019 - July 2022	Genetically diverse parents should be utilized in the crossing programme. The cross with Xa 33 allele may be concentrated for BLB resistance. A comparative yield trial to assess the performance of AD 12132 has to be laid along with TKM 13 and TRY 4
3.	CPBG/ADT/PBG/RIC/2017/001: Evolving short duration rice varieties/culture with fine grain and resistance to blast, brown plant hopper and bacterial leaf blight Dr.R.Suresh, Asst. Professor (PBG) June 2017 to May 2022	1. Diverse parents should be used in hybridization programme 2. Attention should be given to recombination breeding while breeding for biotic/abiotic stress tolerance rather than adhering to backcross only 3. Pre-release culture AD 09219 should be compared with ADT 54 in OFTs during <i>Kuruvai</i> , 2021 4. Donors should be used as per the requirement of the objectives of the project
4.	CPBG/ADT/PBG/RIC/2017/05: Evolution of extra early rice varieties (<100 days) suitable for direct seeding in water limited areas of CDZ Dr.R.Suresh, Asst. Professor (PBG) June 2017 to May 2022	1. More no. of extra early donors should be included in the crossing programme 2. In IYT, promising cultures with < 100 days duration should be fixed 3. Yield trials(AYT)should be conducted both under direct seeded and irrigated conditions
5.	CPBG/ADT/PBG/RIC/2017/006: (Core project) Development of breeding stocks in rice with preferable nutritional properties Dr.R.Pushpa, Assistant Professor (PBG) November 2017 to September 2020	The closure proposal should be submitted on or before 30.06.2021 a new project may be formulated with clear cut objective and workplan The advancement of plants to the next generation should have been based on grain assessment for Iron, Zinc , Protein and amylose content.
6.	CPBG/ADT/PBG/RIC/2018/CP044: (Core Project) Development of super fine short slender rice variety with enhanced nutritional qualities suitable for Tamil Nadu Dr.R.Pushpa, Assistant Professor (PBG) April 2018 to September 2020	The closure proposal should be submitted on or before 30.06.2021 and the cultures developed if any from this project may be nominated to MLT

7.	<p>CPBG/ADT/PBG/RIC/2020/New Development of high yielding long duration rice varieties with preferable quality, sturdiness and resistance major pest and diseases Dr.R. Suresh, Asst. Professor (PBG) Dr.D. Sassikumar, Assoc. Professor (PBG) Aug. 2020 to July 2025</p>	<p>Sub-project should be proposed immediately to obtain URP number Efforts should be taken to notify ADT 52 for Tamil Nadu Non-lodging culture AD 18073 promoted in MLT IV may be tested simultaneously under ART & OFT during 2021 Efforts should be taken to register under NBPGR Valsuramundanas new donor for submergence after conformity trials.care should be taken to maintain the genetic purity of Valsuramundan Cultures with sturdiness and dormancy should be identified</p>
COIMBATORE – CPBG		
8.	<p>CPBG/CBE/PBG/RIC/2016/002: Evolution of fine grain medium duration rice varieties resistance to blast and BLB Dr. K. Amudha Assistant Professor (PB&G) June 2016 to May 2021</p>	<p>Genetically diverse parents should be used in hybridization programme for widening the genetic base One or two crosses should be attempted using donors for short bold type AtleastTwo crosses should be attempted using wild species A comparative yield trial has to be raised so as to assess the superiority of pre release culture CB 12132 over CO 52 and ADT 54. The project may be closed and work continued in a new subproject</p>
9.	<p>CPBG/CBE/PBG/RIC/2016/003: Development of stable CMS lines and restorer/maintainer breeding in rice with good phenotypic acceptability Dr.R.Saraswathi,Professor (PB&G) June 2016 to May 2021</p>	<p>Desirable lines in terms of floral traits favouring out crossing showing maintainer reaction may be converted into CMS lines. The project may be closed and work continued in a new subproject</p>
10.	<p>CPBG/CBE/PBG/RIC/2016/004: Development of new three line hybrids with high yield and quality Dr.R.Saraswathi, Professor(PB&G) June 2016 to May 2021</p>	<p>The hybrid TNRH 297 has ranked first in yield and it may be nominated to MLT Development of Bold grain typed three line / two line hybrids may be given more focus to realize higher grain yield in the hybrids The project may be closed and work continued in a new subproject</p>

11.	CPBG/CBE/PBG/RIC/2016/005: Developing early maturing (105-115 days) rice varieties resistant /tolerant to BPH and blast (Dr. R.Pushpam, Associate Professor(PB&G) June 2016 to May 2021	Genetically diverse parents should be used in hybridization programme for widening the genetic base Two crosses should be attempted using wild species The project may be closed and work continued in a new subproject
12.	CPBG/CBE/PBG/RIC/2017/001: Development of two line hybrids and TGMS lines in rice Dr.R.Saraswathi, Professor (PB&G) January 2017 to December 2021	Genetic purity of parental lines should be maintained. Project may be continued.
RRS, AMBASAMUDRAM		
13.	CPBG/ASD/PBG/RIC/2019/001: Evolving high yielding short duration rice variety suitable for <i>Kar</i> and late <i>Pishanam</i> seasons of Thambarbarani tract Dr. S. Arumugachamy, Professor (PB&G) April 2019 – March 2024	The ART culture AS 15024 should be nominated for AICRIP trials. The donors for BLB, blast should be included in the crossing programme
14.	CPBG/ASD/PBG/RIC/2019/002: Evolution of medium duration rice (<i>Oryza sativa</i> L.) varieties with higher yield and grain quality suitable for <i>Pishanam</i> season. Dr.R.Thangapandian Assoc. Prof. (PB&G) April 2019 to March 2022	Large sized segregating population should be subjected for selection. Diverse parents may be involved in the crossing programme. Objective oriented selection should be done in this project.
ARS, THIRUPATHISARAM		
15.	CPBG/TPS/PBG/RIC/2016/001 Evolving early duration rice variety suitable for <i>Kannipoo</i> season of Kanyakumaridistrict. Dr.R.Latha, Assistant Professor (PB&G), Dec. 2016 - Nov. 2021	The segregating materials may be obtained from TRRI, Aduthurai for assessing the suitability to kannipoo season.
16.	CPBG/TPS/PBG/RIC/2016/002 Evolving long duration rice variety suitable for <i>Kumbapoo</i> season of Kanyakumari district. Dr.R.Latha, Assistant Professor (PB&G), Dec., 2016 to Nov., 2021	The project may be closed. The promising entries evolved from this project may be evaluated further for yield and quality attributes. New project on evolution of medium duration rice varieties may be proposed.
17.	CPBG/TPS/PBG/RIC/2020/001. Introgression of nonlodging traits in traditional rice varieties Mottakuruva and Kattisamba by mutation breeding. Dr.R.Latha, Assistant Professor (PB&G), Dec 2020 to Nov 2025	Mutants with red kernel and semi dwarf plant stature should be selected. Nutritional qualities of selected mutants may be studied.
ARS, TIRURKUPPAM		

18.	CPBG/TKM/ PBG/RIC/2015/001 Evolving short duration drought tolerant rice varieties suitable for rainfed /semidry conditions Dr. A. Sheeba, Assistant Professor (PB&G) December 2015 – November 2020	Completion report is to be submitted on or before 30.06.2021
19.	CPBG/TKM/PBG/RIC/2020/002 Developing Multi-Parental Advanced Generation Intercross (MAGIC) population in Rice Dr. A. Sheeba, Assistant Professor (PB&G) December, 2019 to July,2020 Dr.S.Banumathy, Associate Professor (PB&G) August, 2020 to till date Dec, 2019 – Nov, 2024	Seeds of two F ₁ s involving diverse parents may be obtained from TRRI, Aduthurai and Dept. of Rice, Coimbatore for developing double cross.
AC&RI, MADURAI		
20.	CPBG/MDU/ PBG/ RIC/ 2019/001 Evolution of high yielding fine grain quality medium duration rice variety suitable for Periyar Vaigai River Project Area. Dr. A. Sheeba, Assistant Professor (PB&G) Dr.G.Sreenivasan, Assoc. Professor (Agrl.Ento.) December 2018 to November 2023	New crosses may be made involving the parental lines having fine grains. Project may be continued
21.	CPBG/MDU/PBG/ RIC/2019/002 Development of high yielding short duration variety suitable for PVP area Dr.S. JulietHepziba)Professor (PB&G) Dr.M. Ilamaran, Assistant Professor (FSN) June,2019 to May, 2022	Specific crosses may be made for developing short duration fine grain rice varieties. Project may be continued
22.	CPBG/MDU/PBG/RIC/2019/003 : Improvement of grain quality in Anna (R) 4 ricevariety through mutation breeding. Dr. P. Arunachalam, Asst. Professor (PBG) KVK, Ramanathapuram Dr. S. Muthuramu, Asst. Professor (PBG), ARS, Paramakudi April 2019 to March 2022	The selected mutants may be evaluated for drought tolerance along with Anna (4) and CO53 Any other desirable mutants suitable for short duration may also be identified
AC&RI, KILLIKULAM		
23.	CPBG/ KKM/ PBG/ RIC/ 2014/ 001 Evolution of high yielding short duration rice variety (110-115 days) for kar and pishanam seasons of thoothukudi district. Dr.M. Arumugam Pillai, Professor and Head (PBG) June 2014 - March 2017- Extended upto March 2020	Completion report should be submitted on or before 30.06.2021 A new subproject with suitable objective for kar season may be proposed.
24.	CPBG/KKM/PBG/RIC/2017/001: Development of high yielding medium duration rice variety with desirable cooking quality traits suited for Pishanam season in Southern districts	Relevant elite parents may be involved in the crossing programme More segregating population may be studied.

	of Tamil Nadu Dr. S. Saravanan Assistant Professor (PBG) April 2017 to March 2022	
ADAC&RI,TRICHY		
25.	CPBG/TRY/PBG/RIC/2020/003 Evolution of high yielding medium duration rice genotypes tolerant to sodicity Dr. T. Thirumurugan Assistant Professor (PB&G) October 2019 to September 2022	Latest salt tolerant varieties from CSSRI, karnal may be obtained and used for crossing. Salt tolerant cultures may be proposed for AL&ISTVT AICRP trials
26.	CPBG/TRY/ PBG/ RIC/ 2020/002 Development of short duration sodicity tolerant rice varieties Dr.P.Jeyaprakash Professor and Head April 2020 – March 2025	National check for salinity may be included in the station yield evaluation trial The culture TR09030 may be evaluated in large scale along with TRY 4 and CO 54.Proposals for registering TR 13069 and TR13083 with NBPGR should be submitted on or before 30.06.2021 without making any more delay
HREC,GUDALUR		
27.	CPBG/GDR/PBG/Rice/2020/001. Development and Evaluation of Temperature Sensitive Genic Male Sterile (TGMS) lines in rice Dr. D. Kumaresan Associate Professor (PBG) September 2015 - August 2020	The required quantity of stable TGMS lines may be produced and supplied to Coimbatore for development of two line hybrid
ARS,PARAMAKUDI		
28.	CPBG/PMK/PBG/RIC/2020/002 Development of early duration drought resilient rice genotypes with medium slender grain quality for rainfed rice ecosystem of Ramanathapuram District 1. Dr.S.Muthuramu, Assistant Professor (PB&G), ARS, Paramakudi. 2. Dr.A.Sheeba, Assistant Professor (PB&G), Dept. of Plant Breeding & Genetics, AC&RI, Madurai. September, 2020 – August, 2025	Fresh crosses may be done with rice land races specific to Ramanathapuram District All the breeding trials should be laid out first as soon as the season starts .First priority should be given for laying out the Station's breeding trials only
ARS,THANJAVUR		
29.	CPBG/TNJ/PBG/RICE/2018/NEW: Development of extra early duration rice cultures suitable for direct sown paddy areas in Cauvery Delta Zone of Tamil Nadu Dr.L.Subha Assistant Professor (PBG), April 2018 to March 2021	The extra early variety ADT(R)48 is to be included as check in the evaluation trials of this project. As no project number obtained a fresh research project should be proposed on or before 30.06.2021

MISCELLANOUS PROJECTS		
ADUTHURAI		
30.	CPBG/ADT/PBG/RIC/2020/001 :Maintenance and production of nucleus seeds of TRRI released short duration varieties in seed chain Dr.D.Sassikumar Associate Professor (PB&G) May 2019 to April 2022	Utmost care should be given to maintain the genetic purity of the varieties. The genetic uniformity should be restored in the varieties ADT 53 and ADT 37
31.	CPBG/ADT/PBG/RIC/2017/002 Nucleus seed production of medium and long duration rice varieties of TRRI, Aduthurai Dr. R. Suresh Asst. Professor (PBG) September 2017 to August 2022	Utmost care should be given to maintain the genetic purity of the varieties
COIMBATORE-CPBG		
32.	CPBG/CBE/PBG/RIC/2016/006 Maintenance breeding of "CO" rice varieties and breeder seed multiplication Dr. K. Ganesamurthy Professor (PB&G) June 2016 – May 2021	Utmost care should be given for maintaining genetic purity The project may be closed and work continued in a new subproject
33.	CPBG/CBE/PBG//RIC/2017/ 002 Maintenance breeding of parents, seed multiplication of advanced hybrids and released hybrids in rice Dr. R. Saraswathi, Professor (PB&G) June 2017 to May 2022	Genetic purity of parental lines should be maintained. Project may be continued
RRS,AMBASAMUTHIRAM		
34.	CPBG/ASD/PBG/RIC/2020/001: Breeder Seed Production of rice varieties ASD 16 and ASD 19. Dr.R.Thangapandian Assoc. Prof. (PB&G) June 2019 – May 2022	The project may be continued Genetic purity should be maintained in breeder seeds
AC&RI, MADURAI		
35.	CPBG/MDU/PBG/ BSP /2020/001 Nucleus and breeder seed production of MDU varieties of rice, barnyard millet and black gram Dr. A. Sheeba, Assistant Professor (PB&G) Dr. A. Yuvaraja, Associate Professor (PBG), Dr. G. Anand, Assistant Professor (PBG) September,2019 to August, 2022	Quantity may be produced as per the target. Project may be continued.
ADAC&RI, TRICHY		
36.	CPBG/TRY/PBG/RIC/2020/001 Nucleus seed production in rice varieties developed at ADAC& RI, Trichy Dr.T. Thirumurugan, Assistant Professor (PB&G) Sep 2019 to Aug 2022	Project may be continued, New variety TRY 4 has to be included in the seed chain

37.	CPBG / TRY / PBG / RIC / 2018 / 001 Rice breeder seed production and distribution Dr. S. Chitra Assistant Professor (PB&G) June 2018 to May 2021	Project may be continued
ARS,VAIG Aidam		
38.	CPBG/VGD/PBG/RIC/2020/001. Nucleus and Breeder Seed Production of VGD 1 paddy variety Dr.S.Juliet Hepziba, Professor (PB&G) and Head, Sep 2019 to Aug 2021	Progeny row method may be adopted for nucleus seed production. Genetic purity should be ensured.
39.	CPBG/VGD/PBG/RIC/2018/001: Breeder Seed Production in Paddy Dr.M.Jayaramachandran Assistant Professor (PBG), Oct 2018 to Sep 2021	Project may be continued
RRS,TIRURKUPPAM		
40.	CPBG/TKM/PBG/RIC/2020/001 Nucleus / Breeder seed production of TKM rice varieties Dr.S.Banumathy, Associate Professor (PB&G) December 2019 – November 2022	The project may be continued
ARS,PARAMAKUDI		
41.	CPBG/PMK/PBG/RIC/2020/001 Nucleus and Breeder seed production of rice varieties released from ARS, Paramakudi. Dr.S.Muthuramu, Assistant Professor (PB&G) September, 2020 – August, 2025	Crop under Breeder Seed Production may be raised in advance instead of taking sowing in November.
ARS,THANJAVUR		
42.	CPBG/TNJ/PBG/SPN/2019/001 Breeder seed production in paddy and pulses Dr.L.Subha Assistatn Professor (PB &G) April 2018 to March 2021	Completion report is to be submitted on or before 30.06.2021 New sub project is to be proposed with the same objective. Care must be taken to ensure genetic purity, timely supply of breeder seed and no short fall in supply

CPMB&B, Coimbatore		
43	No.R/P2/ASO/GOIDBT/Biotechnology/2017: Deploying biotechnology based decision making tools in postharvest grain pest management to enhance food security and market access. (Dr. S. Mohankumar, Director (CPMB & B) February 2017 to March 2021	Project completed; Leads may be utilized for obtaining new projects
44	DBT/CPMB/CBE/DPB/2016/R020: DBT-CEIB:	Project period ended during January'2021; Extension proposal may

	Program Support for Developing Resilient Rice through Genomics: Accelerating the development and delivery of multiple stress tolerant and resilient rice genotypes through genomics assisted breeding (Dr. M. Raveendran Professor and Head (DPB))April 2016 to April 2021	be submitted to develop multiple stress tolerant rice varieties. Phenotyping of developed products may be intensified and elite lines may be selected.
45	DBT/CPMB/CBE/DPB/2016/R020: Program Support for Developing Resilient Rice through Genomics: Understanding physiological and molecular basis of QTLs controlling grain yield under drought stress in rice (Dr. M. Raveendran, Professor and Head (DPB))April 2016 to April 2021	Project period ended during April'2021; Project activities may be continued to identify putative candidate genes underlying drought tolerance in rice
46	DBT/CPMB/CBE/DPB/2016/R020: Program Support for Developing Resilient Rice through Genomics: Ensuring rice productivity under warming climate and molecular dissection of heat tolerance related traits (Dr. D. Sudhakar, Professor and Dr. M. Raveendran, Professor and Head (DPB))January 2016 to April 2021	Project period ended during April'2021; Superior NILs of CO 51 may be identified and nominated for evaluation under MLT
47	DBT/CPMB/CBE/DPB/2019/R034: Establishing efficient Platform for Precise genome editing in rice (Dr. M. Raveendran, Professor and Head (DPB))April 2019 to April 2022	Project may be continued; Establishing Platform for base editing and multiplex editing may be given importance
48	NASF/CPMB/CBE/DPB/2020/R037: Identification of QTLs for subcomponent traits of WUE through strategic utilization of whole genome sequences and accurate phenotyping in rice (Dr. M. Raveendran Professor and Head (DPB)) December 2020 to November 2023	Project may be continued; Bioinformatics pipeline for GWAS analysis may be established
49	ICAR/CPMB/CBE/DPB/2015/R018: ICAR-Network project on Transgenics in Crops-BPH resistance in Rice (Dr. D. Sudhakar Professor (Biotechnology)) January 2015 to March 2021	Project completed. Developed RNAi lines may be subjected to Bio-assay against BPH. Besides, expression of chitin synthase gene in malformed BPH may be carried out.
50	ICAR/CPMB/CBE/DPB/2017/R029: Genetic improvement of biotic stress tolerance through RNA guided genome editing (CRISPR - Cas9/cpf1) (Dr. D. Sudhakar, Professor (Biotechnology)) February 2018 to January 2022	Project may be continued; Homozygous mutant lines may be identified and subjected to bioassay against RTD
51	DBT/CPMB/MDU/DPB/2018/R005 Introgression of phosphorus stress tolerant and multiple disease resistance genes into rice through marker assisted selection (Dr. J. Ramalingam, Professor (Biotechnology)) September 2018 to August 2021	Developed lines may be evaluated for Blast resistance HREC, Gudalur; Use of SNP chips for Background selection may be attempted

52	DBT/CPMB/CBE/PMB/2016/R008: Genome and transcriptome sequencing of aromatic rices from North East Region Dr. J. Ramalingam, Professor (Biotechnology) October 2016 to April 2020	Completion report submitted; Developed NILs &RILs may be registered with PGT and NBPGR. NILs may be shared with AAU, Jorhat for evaluation under drought
53	DBT/ACRI/MDU/DPB/2020/R009: Developing multiple stress resistance rice genotypes through Marker Assisted selection Dr. J. Ramalingam, Professor (Biotechnology) December 2019 to December 2021	Efforts may be taken for the registration of developed genetic stocks; Pheno typing of BC ₃ F ₃ lines for the target traits may be varied out.
54	CPMB/CBE/PBT/RIC/2018/CP139: Cloning genes associated with K ⁺ uptake and in turn salt tolerance in rice (Dr. L. Arul, Professor (Biotechnology) February 2018 to September 2020	Completion report submitted; Publication has to be done. All land races may be screened at ADAC&RI, Trichy with the help of Dr. Thirumurugan, Asst. Professor (PBG) along with TRY 1, TRY2, TRY3 and TRY4. Haplotype Diversity analysis of 4 genes involved in K ⁺ uptake pathway may be attempted (Action Dr. M. Jayakanthan & Dr. N. Saranya, DPMB&B)
55	DBT/CPMB/CBE/DPB/2019/R035: CRISPR mediated development of Thermo-sensitive Genic Male Sterile Lines (TGMS) in rice (<i>Oryza sativa</i>) (Dr. E. Kokila Devi, Associate Professor (Biotechnology) April, 2019 to April 2022	More number of events may be generated so as to get novel alleles of tms5
56	DST / DCM / CBE / AGR / 2018 / R003: Major Project: Building Resilience to Climate Change and Improving Food Security through Climate Smart Solutions (BRIFS) Sub project: "Heat Responsive Gene Networks: Comparative Transcriptome Profiling" Dr.P.Meenakshisundaram, Assistant Professor (Biotechnology) November 2018 to March 2022	Pheno typing may be given importance; Leaf and floral tissues may be collected for heat responsive gene expression profiling in CO 51 and N22 at different growth stages (50, 60, 70 and 80 DAS); Adequate number of replications may be maintained in the biological experiments.
57	CPMB/CBE/BIF/RIC/2018/CP005: Genome wide identification of rice long noncoding RNAs responsive to <i>Xanthomonas oryzae</i> infection (Dr. N. Saranya, Assistant Professor (Bioinformatics) August 2018 to September 2020	Completion report submitted; Publication may be given importance; Validation of bioinformatics predictions through laboratory experiments may be carried out
58	CPMB/CBE/BIF/2018/00: Functional annotation of hypothetical proteins present in <i>Xanthomonas oryzae pv. oryzae</i> for prioritizing the targets against Bacterial blight (Tmt. N. Bharathi, Assistant Professor (Bioinformatics) Jan. 2018 to Dec. 2020	Completion report submitted; Validation of Quercetin may be carried out

II. A. CROP MANAGEMENT

A. For Adoption / OFT / Information

1. Rice varieties suitable for organic farming

CO 48, Improved White Ponni and Mappillai Samba are highly suitable for organic rice cultivation. Package of practices to be followed for organic rice cultivation:

Nursery

- Raising of Green manure (*Sesbania aculeata*) and *insitu* incorporation
- Soaking of seeds with *Bacillus subtilis* @ 10g/kg + *Azospirillum* & *Phosphobacteria* each @ 30 g/kg.
- Basal application of well decomposed FYM @ 1.25 kg/m² + Neem cake @ 50 g/m²
- Gypsum application @ 100 g/m² at 10 days after sowing to prevent root snapping.

Main field

- Neem cake @ 250 kg/ha as basal
- Gypsum @ 500 kg /ha (source of Ca and S nutrients) at last ploughing.
- Seedling root dip with *Azospirillum* (1kg/ha) + *Phosphobacteria* (1kg/ha) in 40 l of water for 15 - 30 minutes before transplanting.
- Soil application of *Azospirillum* @ 2 kg + *Phosphobacteria* @ 2 kg mixed with 25 kg of FYM/ha and applied before transplanting.
- Vermicompost @ 1tonne / ha each at active tillering, panicle initiation and heading stages.
- Panchagavya @ 30ml/l of water twice at 30 and 45 DAT as growth promoter
- Application of Neem Seed Kernel Extract (5%) at tillering stage, insect herbal repellent and *Beauveria bassiana* (2%) at maximum tillering stage for controlling insect pests.
- Foliar application of *Bacillus subtilis* @ 0.04% at maximum tillering stage for controlling foliar diseases.

2. Rice mechanization for different soil types of Tamil Nadu

- For sandy clay loam and sandy loam soils, use of 6 row Yanmar transplanter for transplanting and Manual cono-weeding are recommended for Tamil Nadu.
- For clay soils, use of 8 row Yanmar transplanter for transplanting and single row power weeder for weeding are recommended.

ON FARM TRIALS (OFT)

OFT 1. Enhancing productivity of rice through foliar application of fermented egg extract

Objective: To enhance the productivity of rice through foliar application of fermented egg extract

Treatment details:

- T₁: 1.5% fermented egg extract
- T₂ : 2.0% fermented egg extract
- T₃ - Control

Season: Samba, 2021-22; Foliar spray three times at tillering, PI & flowering stages

Observations to be recorded:

- Growth and yield parameters, chlorophyll content, observation on pest & diseases, grain yield and economics.

Co-ordinating centre & Scientist in-charge:	ADAC & RI, Trichy	Dr. T. Ramesh, Asst. Professor (Agronomy)
	Dept. of SOA, TNAU, Coimbatore	Dr. S. Manickam Professor and Head
Centres & Scientist in-charge:	AC&RI, Madurai	Dr. E. Subramanian Assistant Professor (Agronomy)
	TRRI, Aduthurai	Dr. M. Raju Associate Professor (Agronomy)

OFT 2: Evaluation of the performance of pre-release culture CB 05022 under organic farming

Objective: To evaluate the performance of pre-release culture CB-05022 under organic farming in different locations.

Treatment details:

- T₁ - CO (R) 48
- T₂ - CB 05022 (Seeds will be supplied by Dept. of SOA, TNAU, Coimbatore)
- T₃ - Standard check (Best performing variety of the region)

Package of practices for organic rice cultivation as given in adoption need to be followed.

Observations to be recorded:

In Green manures: Plant height, Fresh weight, dry weight, nutrient uptake and N added to the soil.

In Rice crop:

Growth characters: Plant height at harvest, DMP at harvest

Yield characters: Days to 50% flowering, No. of productive tillers / hill, No. of grains & filled grains / panicle, test weight, grain yield, straw yield and HI.

Quality characters: Head rice recovery, hulling per cent, milling per cent, kernel length and breadth before cooking (mm), kernel length and breadth after cooking (mm), LER, Volume expansion ratio, breadth wise expansion ratio, gel consistency, alkali spreading value, aroma, Glycemic Index and organoleptic characters.

Economics: Cost of cultivation, Net returns with and without premium (20%) and BCR

Co-ordinating centre & Scientist in-charge:	Dept. of Sustainable Organic Agriculture, TNAU, Coimbatore	Dr. S. Manickam, Prof & Head Dr. M. Suganthy, Assoc. Prof (Agrl. Entomology) Dr.G.Senthil Kumar Asst. Professor(Agronomy), Dept. of Rice
Centres & Scientist in-charge:	TRRI, Aduthurai	Dr. S. Elamathi Assistant Professor (Agronomy)
	RRS, Ambasamudram	Dr. S.R. Shri Rangasami Assistant Professor (Agronomy)
	RRS, Tirur	Dr. K. Sivagami Assistant Professor (Agronomy)
	AC&RI, Madurai	Dr. E. Subramanian Assistant Professor (Agronomy)
	AC&RI, Killikulam	Dr. J. Bhuvaneshwari Assistant Professor (Agronomy)
	ARS, Bhavanisagar	Dr. N. Satheesh Kumar Assistant Professor (Agronomy)

OFT 3: Development of foliar formulations for yield enhancement in rice under water deficit and high temperature conditions

Objective: To test verify the rice foliar formulation for enhancing yield under water deficit and high temperature conditions

Treatment details:

Water deficit	High temperature
T ₁ : Absolute control (Irrigated)	T ₁ : Absolute control (Irrigated)
T ₂ : Water deficit (Withdrawing water from booting stage to 50% flowering)	T ₂ : High temperature (Booting stage coincide with high temperature)
T ₃ : Water deficit + Rice formulation foliar spray	T ₃ : High temperature + Rice formulation foliar spray
Stage of foliar application: At booting stage and ten days after first application	

Observations to be recorded:

Physiological parameters: Relative water content, SPAD value, Gas Exchange Parameters Yield and Yield components: Total dry matter accumulation, No. of productive tillers, Panicle length & weight, Spikelet fertility (%), Grain yield (kg/ha), BC ratio.

Co-ordinating centre & Scientist In-charge:	Department of Crop Physiology, TNAU, Coimbatore	Dr. V. Ravichandran, Associate Professor (Crop Physiology) Dr. D. Vijayalakshmi, Associate Professor (Crop Physiology) Dr.P.Jeyakumar, Professor (CRP)
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	Department of Rice, TNAU, Coimbatore	Dr. K. Krishana Surendar, Assistant Professor (Crop Physiology)
Centres & Scientist In-charge:	AC&RI, Madurai	Dr. T. Sivakumar, Associate Professor (Crop Physiology)
	ARS, Paramakudi	Dr. S. Muthuramu, Assistant Professor (Plant Breeding and Genetics)

For Information

1. Development of crop geometry for cost effective drip irrigation system in rice

- Combination of direct seeded rice using ADT 54 with the spacing of 20x40x10 cm in paired row system is the best for getting higher yield (6864 kg/ha) and net return (Rs. 80318/ha), BCR (2.72) and higher water use efficiency (7.46 kg/ha-mm) in drip irrigated paddy cultivation during samba season.

2. Feasibility of inter cropping in aerobic rice

- Rice (3.3 lakh ha⁻¹) intercropped with black gram (2:1) (1.67 lakh ha⁻¹) and green gram (2:1) (1.67 ha⁻¹) produce higher system productivity.
- Rice intercropped with black gram and green gram recorded lesser weed density and dry weight because of its smothering effect
- Rice + green gram and rice + black gram intercropping at 2:1 increased the system productivity with minimum competition and observed Rice equivalent yield (6155 and 5829 kg ha⁻¹), LER (1.40 and 1.31) and B:C ratio (2.21 and 2.09) compared to sole rice.
- Water consumption of crops during cropping period was 695 mm with the water productivity of 8.85 kg ha mm⁻¹.

3. Response of different land races of rice for organic farming

- The rice variety Kuzhiadichan recorded the highest grain yield (5300 kg/ha) followed by Anaikomban (5167 kg/ha), Milagu samba (5100 kg/ha), Sorna masuri (5050 kg/ha) and Kullakar (4910 kg/ha).
- Straw yield was highest (11000 kg/ha) in Anaikomban which is followed by Garudan samba (10100 kg/ha), Kuzhiadichan (10083 kg/ha) and Athur Kichili samba (9850 kg/ha).
- The rice variety Kuzhiadichan fetched the highest net return of Rs.1,04,659/ha followed by Anaikomban (Rs.1,03,617/ha), Milagu samba (Rs.94,742/ha).
- Highest benefit cost ratio was also realized from traditional varieties Kuzhiadichan (2.97) and Anaikomban (2.95), followed by Milagu samba (2.79).

4. Evaluating agronomic efficiency of marine gypsum in sodic soil amelioration in irrigated low land rice

- Application of Green manure + Marine Gypsum has recorded significantly higher grain yield than that of application of Marine gypsum alone.

5. Standardization of drip fertigation techniques in rice based cropping systems of Tamil Nadu

- Drip irrigation is suitable only in sandy clay or sandy loam soil.
- For Maize: DI at 125% PE recorded higher grain yield at (BSR, KKM & MDU & 100% PE in Thanjavur; water saving of 18 to 22% observed over conventional irrigation method.

- For Rice: DI at 200% PE recorded higher grain yield with 23 to 30% water saving. However, 12 to 15% yield reduction observed over conventional method.
- For Blackgram and Onion: DI at 125% PE recorded higher yield over conventional method with the water saving of 25 to 30%.

6. Development of foliar formulations for yield enhancement in rice under irrigated, water deficit and high temperature conditions

- Rice formulation II enhanced the physiological traits, yield and yield components of all the varieties compared to unsprayed plants under drought and high temperature stress condition.

7. Multi- site monitoring network of canopy micrometeorology and heat stresses in rice for evaluating the adaptation strategies under the climate change

- Rice genotype IR 64 EMF demonstrated heat escape mechanism by showing its first spikelet opening time before 7.00 AM.

8. Estimation of regional – Global methane emissions: GOSAT-2 & observations

- SRI, MSRI and AWD methods reduced CH₄ emission by 40, 49 and 52%, respectively over conventional method and saved irrigation water by 26, 27 and 28%.

9. Increasing water and nutrient use efficiency in wet seeded rice under Thamirabharani command area

- Irrigation at 10 cm depletion + 125% NPK recorded comparable growth parameters, yield and higher B:C ratio than STCR based NPK application with continuous submergence apart from saving of 20.5 percent water and 6.97 kg ha⁻¹mm⁻¹ of WUE.

10. Rice husk ash as carrier of silica on growth and yield of direct sown rice

- Rice husk ash SSB enriched compost 4.0 t ha⁻¹ registered highest grain yield (4267 kg ha⁻¹) which was on par with application of Rice husk ash SSB enriched compost 3.0 t ha⁻¹ (4213 kg ha⁻¹).

11. Slot modifications in paddy drum seeder in conjugation with seed priming in wet seeded rice

- In paddy drum seeder, the round slot with guiding pipe recorded lesser seed rate requirement when compared to other methods

12. Documentation of weed biology and assessing the impact of crop weed competition in direct seeded rice eco system

- In DSR method, field should be free from weeds up to 45 DAS either in puddled or un-puddled condition in order to obtain higher productivity of the rice crop.
- Critical period for crop weed competition in DSR is between 30 to 45 DAS which also results higher grain yield and lesser weed density under puddled condition than un-puddled condition.

B. Action Plan (2021-2022)

Action Plan 1: Evaluation of biofertilizers in mitigating Greenhouse Gas emissions in puddled rice

Rationale

- Rice cultivation is the second largest contributor of global agricultural methane emission after enteric fermentation.
- In order to mitigate climate change, there is a need to identify cost effective ways to avoid emissions of GHGs.
- In the global methane cycle, biological processes consume substantial amount of methane.
- The photosynthetic systems such as BGA and Azolla are known to minimise the GWP in flooded rice by enhancing dissolved oxygen content in the soil water interface which ultimately suppress the activity of methanogens.

Objectives

- To quantify the GHG emission in puddled rice
- To study the mitigation potential of BGA (Cyanobacteria) and Azolla in minimizing the GHG emission in rice

Treatment details

- T₁ - SRI method of rice cultivation with organic farming SOP
- T₂ - SRI method of rice cultivation with inorganic farming SOP
- T₃ - T₁+BGA application @ 10 kg/ha
- T₄ - T₂+ BGA application @ 10 kg/ha
- T₅ -T₁+Azolla application @ 250 kg/ ha
- T₆ -T₂+ Azolla application @ 250 kg/ ha

Variety: CO 52; **Season:** Samba 2021-22 and 2022-23; **Design:** RBD;

Replications: Four

Period: Sept. 2021- March 2023

Observations to be recorded:

- Soil Physical characteristics
- Soil Microbial load
- Soil Temp at frequent intervals
- Water Temp at frequent intervals
- GHG emission at Seedling, Tillering, PI, Booting, Flowering and Maturity
- Growth and Yield Parameters
- Physiological attributes viz., LAI, SPAD etc.

Co-ordinating centre & Scientist in-charge:	ACRC, TNAU, Coimbatore	Dr. N. K. Sathyamoorthy, Assoc. Professor (Agron) Dr. S. Kokilavani, Asst. Professor (Ag.meteorology)
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	TRRI, Aduthurai	Dr. M. Raju, Assoc.Prof (Agron) Dr. C. Uma Maheswari, Assoc. Prof(Agron)
Centres & Scientist In-charge:	AC & RI, Madurai	Dr. E. Subramaniam, Asst. Prof(Agron) Dr. P. Kannan, Asst. Prof(SS&AC)

Action Plan - 2: Standardization of crop geometry and fertilizer dose for newly released rice variety ADT 54.

Rationale

- Fertilizer is one of the costliest inputs in agriculture and the use of right amount of fertilizer is fundamental for farm profitability and environmental protection.
- Managing the location specific variability in nutrient supply is a key strategy to overcome the current mismatch of fertilizer rates and crop nutrient demand in irrigated rice environment.
- Location specific fertilizer recommendations are possible for soils of varying fertility, resource conditions of farmers and levels of targeted yield for similar soil classes and environment.
- ADT 54 is a medium duration rice variety recommended during Thaladi (Rabi) season of Cauvery Delta Zone and blanket recommendation of 150:50:50 kg NPK/ha is invariably recommended whereas 75:50:50 Kg NPK/ha is recommended for Improved White Ponni variety. Improved White Ponni is the one of the parents of ADT 54 variety. Therefore, it is important to find out optimum fertilizer dose for ADT 54.

Objectives

- To find out optimum crop geometry and fertilizer dose for newly released rice variety ADT 54.

Period: 2021-23

Treatments details:					
Main plot (Spacing)					
M ₁ -	20 cm x 15 cm	M ₂ -	25 cm x 25 cm		
Sub plot (Fertilizer dose) N kg/ha					
S ₁ -	Control	S ₂ -	50	S ₃ -	75
S ₄ -	100	S ₅ -	125	S ₆ -	150
S ₇ -	STCR				

Co-ordinating centre & Scientist In-charge:	TRRI, Aduthurai	Dr. S. Elamathi Assistant Professor (Agronomy) Dr. K. Sathiyabama Associate Professor (SS&AC)
Centres & Scientist In-charge:	ARS, Thanjavur	Dr. S. Porpavai Professor and Head

Observations to be recorded:

- Growth characters: Population/m² , Plant height at harvest, DMP at harvest
- Yield characters: No. of productive tillers/hill, No. of filled grains/panicle, test weight, grain yield, straw yield and HI.

Soil characters: Initial and final NPK Status, Uptake of nutrient studies

Economics: Cost of cultivation, Net returns and BCR

Action Plan - 3: Photoperiodic flower induction in rice for speed breeding**Rationale:**

The light duration, intensity and quality influenced in flowering duration of rice and accelerates rice breeding research through Rapid Generation Advancement by reducing the vegetative stage duration.

Objectives:

- To standardize the protocol for early flower induction in rice through photoperiodic alteration.

Technical Programme:

Period: Two years (2021-2023)

Methodology and treatments:

- Rice genotypes with long vegetative phase will be used as experimental material. Treatment of LED source of Red and Blue lights (4000 lux intensity) will be given by different duration at BVP phase of crop to standardise for early flowering induction in rice.

I year (2021-2022):

- Standardization and development of protocol for altering photoperiodic response for early flowering in rice

II year (2022-2023):

- To validate the standardized protocol in other rice genotypes

Observations to be made:**Flowering phenology :**

- Days to panicle initiation
- Days to booting
- Days to heading
- Days to 10% flowering
- Days to 50% flowering
- Days to end of flowering
- Photosynthetic efficiency

Expected Outcome:

- Early flowering rice genotypes will be identified based on photoperiod alteration to achieve the number of generation per year for variety development

Co-ordinating centres:**Department of Crop Physiology, TNAU, Coimbatore-3**

Dr. M.K.Kalarani, Professor and Head

Dr. V. Ravichandran, Associate Professor (Crop Physiology)

Department of Rice, TNAU, Coimbatore-3

Dr. K. Krishana Surendar, Assistant Professor (Crop Physiology)

Dr. R. Saraswathi, Professor (Plant Breeding and Genetics)

Dr. K. Amudha, Assistant Professor (Plant Breeding and Genetics)

Action plan- 4: Standardization of seed rate of VGD-1 Rice**Objectives**

- As the VGD 1 is a newly released variety, the seed rate needs to be optimized for increased productivity.

Treatment details**Factor 1: Seed rate**T₁ - Seed rate @ 25 kg/haT₂ - Seed rate @ 20 kg/haT₃ - Seed rate @ 15 kg/haT₄ - Seed rate @ 10 kg/ha**Factor 2: Spacing**S₁ - 20 x 10 cmS₂ - 20 x 15 cm

Co-ordinating centre & Scientist In-charge	ARS, Vaigai Dam	Dr. R. Jeyasrinivas Assistant professor (Agronomy)
Centres & Scientist In-charge	TRRI, Aduthurai	Dr. M. Raju Associate professor (Agronomy)
	ARS, Bhavanisagar	Dr. N. Satheesh Kumar Assistant professor (Agronomy)

Observations to be recorded**Growth characters:** Population/m², Plant height at harvest, DMP at harvest**Yield characters:** No. of productive tillers / hill, No. of grains / panicle, Test weight, Grain yield, Straw yield and HI.**Economics:** Cost of cultivation, Net returns and BCR**Action plan - 5: Preventing seed germination during unseasonal rainfall****Rationale:**

Unseasonal rainfall is a common characteristic of the monsoon season in Tamil Nadu, leading to pre-harvest seed germination in rice. Thus, there is a need to control the pre-harvest seed germination through foliar sprays of growth regulators and nutrients.

Objectives:

- To standardize the protocol for inducing flooding stress in rice at dough stage.

- To prevent pre-harvest seed germination during unseasonal rains through foliar sprays of growth regulators and nutrients.

Technical Programme:

Period: Two years (2021-2023)

I year (2021-2022):

- To standardize the level and duration of flooding stress in rice at dough stage under pot culture study.
- To standardize the concentration of different growth regulators and nutrients through foliar spray to prevent pre-harvest seed germination in rice.
- To study the effect of different growth regulators and nutrients on seed germination traits and grain yield in rice.

II year (2022-2023):

- To confirm the efficacy of different growth regulators and nutrients through foliar spray to prevent the pre-harvest seed germination in rice genotypes

Methodology and treatments:

- Rice varieties with short and medium duration will be grown in pots and subjected to flash floods at different time intervals at dough stage of the crop and different foliar treatments will be given after twenty days of dough stage of the crop. Treatment details as given below:

Treatment details:	
T1	Control
T2	Urea (5 %)
T3	NaCl (10 %)
T4	Sodium Molybdate (0.01%)
T5	Cycocel (0.1%)

Stage of Foliar spray- 20 days after dough stage of the crop

Observations to be made:

- Germination percentage at 15 DAH, 30 DAH and 60 DAH
- Vigor index at 15 DAH, 30 DAH and 60 DAH
- Yield and yield components

Expected Outcome:

- Suitable growth regulators and nutrients will be identified to prevent pre-harvest seed germination in rice during unseasonal rainfall

Co-ordinating centres and Scientists:

Department of Crop Physiology, TNAU, Coimbatore-3

Dr. K. Vanitha, Assistant Professor (Crop Physiology)

Dr. D. Vijayalakshmi, Associate Professor (Crop Physiology)

Department of Seed Science and Technology, TNAU, Coimbatore-3

Dr. P. R. Renganayaki, Professor and Head

Dr. R. Vigneshwari, Assistant Professor (Seed Science and Technology)

Action plan - 6: Generation of Genetic Coefficients for rice var CO-54 for simulation modeling

Objective:

- Developing Genetic coefficients for newly released rice variety CO-54.
- To undertake simulation studies with CO 54 for varied nutrient, water and temperature environments.

Rationale:

- Since climate change is ever dynamic, the global average temperature has increased by more than 0.65^oC during the period 1986 - 2016 compared to 1901 - 2016, which is about 1.8^oC.
- In addition to the temperature rise, global warming may lead to increased variability of monsoon patterns, poor rainfall distribution and subsequent decline in soil moisture. It may lead to a combination of one or more abiotic stresses, and in such conditions, the decline in agricultural production will be inevitable.

Treatment details:

Factor 1: Time of sowing

- T₁ - Ist fortnight of June
- T₂ - IInd fortnight of June
- T₃ - Ist fortnight of July

Factor 2: Nutrient levels

- N₁ – 75% Recommended dose of NPK (112.5:37.5:37.5 kg/ha)
- N₂ – 100% Recommended dose of NPK (150:50:50 kg/ha)
- N₃ – 125% Recommended dose of NPK (187.5:62.5:62.5 kg/ha)

Period: 2021-22 Kharif

Observations to be recorded:

Growth attributes: Plant height, LAI, DMP at regular interval

Yield attributes: No. of productive tillers / hill, No. of grains/panicle, Grain yield and Straw yield.

Co-ordinating centre & Scientist In-charge:	ACRC, TNAU, Coimbatore	Dr. N. K. Sathyamoorthy, Associate Professor (Agronomy)
	Department of Rice, TNAU, Coimbatore	Dr. G. Senthil Kumar Assistant Professor (Agronomy)

Action plan -7: Evaluation of organic farming practices followed at Singampatti, Ambasamudram for standardizing location specific organic rice cultivation.

Objective:

- To document and validate the location specific organic package of practices followed at Singampatti, Ambasamudram for organic rice cultivation in comparison with the existing package of practices for organic rice cultivation developed by the Department of Sustainable Organic Agriculture.

Treatment details:

T₁ - Package of practices developed by DSOA, TNAU, Coimbatore for organic rice cultivation

T₂ - Organic package of practices followed by the rice farmer's of Singampatti, Ambasamudram

Period: 2021-22

Variety: Variety suitable for the location / Farmer's preferred variety

Package of practices developed by DSOA, TNAU, Coimbatore for organic rice cultivation**Nursery practices**

- Green manure crop (*Sesbania aculeata*) *in-situ* cultivation and incorporation
- Seeds soaking with *Bacillus subtilis* @ 10g/kg + Azospirillum & Phosphobacteria each @ 30 g/kg.
- Basal application of well decomposed FYM @ 1.25 kg/m² + Neem cake @ 50 g/m²
- Gypsum application @ 100 g/m² at 10 days after sowing to prevent root snapping.

Main field practices

- Neem cake @ 250 kg/ha as basal
- Gypsum @ 500 kg /ha (source of Ca and S nutrients) at last ploughing.
- Seedling root dip with Azospirillum (1kg/ha) + Phosphobacteria (1kg/ha) in 40 l of water for 15 - 30 minutes before transplanting.
- Soil application of Azospirillum @ 2 kg + Phosphobacteria 2 kg mixed with 25 kg of FYM and applied before transplanting.
- Vermicompost @ 1t / ha each at active tillering, panicle initiation and heading stages.
- Panchagavya @ 30ml/l of water twice at 30 and 45 DAT as growth promoter
- Application of Neem Seed Kernel Extract (5%) at tillering stage, insect herbal repellent and *Beauveria bassiana* (2%) at maximum tillering stage for insect pests.
- Application of *Bacillus subtilis* @ 0.04% at maximum tillering stage for foliar diseases.

Observations to be recorded:

Growth characters: Plant height at harvest, DMP at harvest

Yield characters: Days to 50% flowering, No. of productive tillers / hill, No. of grains and filled grains / panicle, test weight, grain yield, straw yield and HI.

Economics: Cost of cultivation, Net returns and BCR

Co-ordinating centre & Scientists In-charge:	Dept. of Sustainable Organic Agriculture, TNAU, Coimbatore	Dr. S. Manickam, Prof & Head Dr. M. Suganthy, Assoc. Prof (Ento.)
Other Centre & Scientist In-charge:	RRS, Ambasamudram	Dr. S.R. Shri Rangasami Assistant Professor (Agronomy)

C. Project-wise Remarks**I. Action Plan**

Sl. No.	Title	Scientist involved / Lead scientist	Duration	Remarks
1.	Development of crop geometry for cost effective drip irrigation system in rice	Dr. S. Vallal Kannan, Asst. Prof., (AGR), AEC&RI, Kumulur	2020-22	To be Continued. Given for Information
2.	Feasibility of intercropping in aerobic rice	Dr. E. Subramanian, Asst. Prof.,(AGR), AC&RI, Madurai Dr. S. Porpavai, Professor and Head, ARS, Thanjavur Dr.S. Vallalkannan, Asst. Prof., (AGR), AEC&RI, Kumulur	2020-22	To be Continued. Given for Information
3.	Response of different landraces of rice for organic farming	Dr. S. Manickam, Professor and Head, SOA, TNAU, CBE Dr. M. Suganthy, Assoc. Prof., (Agrl. Ento.), SOA, TNAU, CBE Dr. G. Senthil Kumar, Asst. Prof., (AGR), TNAU, CBE	2020-22	To be Continued. Given for Information
4.	Evaluating the Agronomic efficiency of Marine Gypsum in sodic soil amelioration in Irrigated lowland rice	Dr. A. Alagesan, Asst. Professor (AGR), ADAC & RI, Trichy Dr. P. Janaki, Assoc.Prof.(SS&AC), ADAC&RI, Trichy Dr. S. Nithila, Asst. Prof.,(CRP), ADAC & RI, Trichy Dr. J. Ejilane, Asst. Prof., (AGM), ADAC&RI, Trichy	2020-22	To be Continued. Given for Information

5.	Standardization of Drip fertigation techniques in rice based cropping systems of Tamil Nadu	Dr. S. Porpavai, Professor and Head, ARS, Thanjavur Dr. V.K. Duraisamy, P&H, ARS, Bhavanisagar Dr. A. Valliammai, Asst. Prof., (SWCE), ARS, Bhavanisagar M. Joseph, Asso. Prof. (Agro), AC&RI, Killikulam.	2019-21	To be closed. Completion report to be submitted.
6.	Development of foliar formulations for yield enhancement in rice under irrigated, water deficit and high temperature conditions	Dr. V. Ravichandran, Assoc. Prof., (CRP), TNAU, CBE Dr. D. Vijayalakshmi, Assoc. Prof., (CRP), TNAU, CBE Dr. K. Vanitha, Asst. Prof., (CRP) , TNAU, CBE Dr. K. Krishna Surendar, Asst. Prof., (CRP), TNAU, CBE Dr. T. Sivakumar, Assoc. Prof. (CRP) , AC& RI, Madurai Dr. P. Boominathan, Assoc. Prof. (CRP) , TNAU, CBE Dr. C. Tamilselvi, Asst. Prof., (CRP), TNAU, CBE	2020-22	To be continued. Recommended for OFT.

II. ON FARM TRIAL

Sl. No.	TITLE	Scientist involved / Lead scientist	Duration	Remarks
1	Reducing methane emission from rice ecosystem	Dr. C. Umamageswari, Assoc. Prof., (AGR) TRRI, Aduthurai Dr. E. Subramanian, Asst. Prof., (AGR), AC& RI, Madurai Dr. C. Muralidaran, Professor (AGR), RRS, Tirur Dr. S. R. Shri Rangasamy, Asst. Prof., (AGR), RRS, Ambasamudram	2020-21	To be continued for one more year. Lacuna should be addressed
2	Evaluation of response of different rice varieties suitable for organic farming	Dr. S. Manickam, Professor and Head, SOA, TNAU, CBE Dr. M. Suganthy, Assoc. Professor (AEN), SOA, TNAU, CBE Dr. M. Raju, Assoc. Professor (AGR), TRRI, Aduthurai Dr. S. R. Shri Rangasami, AP, (AGR), RRS, Ambasamudram Dr. Bhuvaneswari, Asst. Prof., (AGR), AC&RI, Killikulam Dr. N. Satheesh Kumar, AP (AGR), ARS, Bhavanisagar	2020-21	Recommended for Adoption

III. University Research Projects

Sl. No.	Title	Scientist involved / Lead scientist	Duration	Remarks
1	Documentation of weed biology and assessing the impact of crop weed competition in direct seeded rice ecosystem	Dr. P. Murali Arthanari, Assoc. Prof., (AGR), TNAU, CBE Dr. M. Raju, Assoc. Prof., & Head (AGR), TRRI, Aduthurai Dr. E. Subramanian, Asst. Prof., (AGR), AC&RI, Madurai Dr. N. Senthil Kumar, Asst. Prof., (AGR), AC&RI, Killikulam Dr. N. Satheesh Kumar, Asst. Prof., (AGR), ARS, Bhavanisagar	2019 – 21	To be closed. Completion report to be submitted. Given for Information
2	DCM/CBE/AMT/RIC/2019/001 Climate smart organic farming in rice	Dr. SP. Ramanathan, Prof. (Agron) & Head, AMRC, CBE Dr. S. Kokilavani, Asst. Prof(Agmet), AMRC, CBE Dr. S. Manickam Prof (Agron) & Head, SOA, TNAU, CBE Dr. M. Suganthy Assoc. Prof (Ento), SOA, TNAU, CBE Dr. S. R. Shri Rangasami, Asst.Prof (Agron), RRS, Ambasamudram Dr. K. G. Sabarinathan, Asst. Prof (Micro), ADAC&RI, Trichy. Dr. P. Muralidharan, Professor (Agron),RRS, Tirur Dr S. Malathi, Asst. Professor (Plant Patho),RRS, Tirur Dr. E. Subramaniam, Asst. Prof (Agron), AC&RI, Madurai Dr. P. Kannan, Asst.Prof (Soil Science),	2019 - 22	To be continued for one more year. The practices may be adopted uniformly at all the centres.

		AC&RI, Madurai Dr. M. Raju, Assoc. Prof(Agron), TRRI, Aduthurai Dr. C. Uma Maheswari, Assoc. Prof (Agron) , TRRI, Aduthurai		
3.	DCM/KUM/AGR/RIC/2019/001 Rice mechanization for different soil types of Tamil Nadu for higher rice productivity and profitability	Dr. S. Vallal Kannan, Asst. Prof., (AGR), AEC&RI, Kumulur Dr. A. Veeramani, Prof., (AGR), AC & RI, Madurai Dr. M. Hemalatha Assoc. Prof., (AGR), AC&RI, Killikulam Dr. S. Elamathi, Asst. Prof., (AGR), TRRI, Aduthurai Dr. C. Umamageswari, Assoc. Prof., (Agron), TRRI, Aduthurai Dr. N. Satheesh Kumar, Asst. Prof., (AGR), ARS, Bhavanisagar Dr. S.R. Shri Rangasami, Asst. Prof., (AGR), RRS, Ambasamudram	2019 – 21	To be closed. Completion report to be submitted. Recommended for Adoption
4.	DCM/KKM/ AGR/RIC/2020/001 Increasing water and nutrient use efficiency in wet seeded rice under Tamiraparani command area	M. Joseph, Assoc. Prof., (AGR), AC&RI, Killikulam Dr. S. Jothimani, Professor (SS&AC), AC&RI, Killikulam	2020 - 22	To be Continued. Given for Information
5.	DCM/KKM/AGR/RIC/2020/002 Effect of rice husk ash as carrier of silica and its levels on growth and yield of direct sown rice	Dr. D. Rajakumar, Asst. Prof., (AGR), AC&RI, Killikulam Dr. M. Gomathy, Asst. Prof., (Microbiology), AC&RI, Killikulam	2020 - 22	To be Continued. Given for Information
6.	DCM/KKM/AGR/RIC/2020/003 Production of sturdy rice seedlings for machine transplanting	M. Hemalatha, Assoc. Prof., (AGR), AC&RI, Killikulam	2020 - 22	To be Continued.
7.	DCM/TRY/AGR/RIC/2018/CP151 Evaluation of fermented egg and fish waste extracts as foliar spray on yield and	Dr. T. Ramesh, Asst. Prof., (AGR), ADAC & RI, Trichy	2019 – 21	To be closed. Completion report to be submitted.

	economics of rice and green gram			Recommended for OFT
8.	DCM/ CBE/ CRP/RIC/2021/001 No. DR/P1/URP/1384/New Project approval/2021 dt.13.01.2021 Identifying Climate Resilient Rice Genotypes for Anaerobic Stress Tolerance	Dr. D. Vijayalakshmi, Assoc. Prof., (CRP) TNAU, CBE.	2021 - 22	To be Continued.
9.	DCM/ CBE/ CRP/RIC/2021/002 No.DR/P1/URP/1384/New Project approval/2021 dt.13.01.2021 Study on Silicon mediated changes in anatomy and physiology of rice genotypes under salt stress condition	Dr. V. Ravichandran, Assoc. Prof., (CRP), TNAU, CBE.	2021 - 22	To be Continued.
10	Assessment of the yield advantage, water requirement and water use efficiency under different methods of irrigation in rice	Dr. K. Kalaichelvi, Asst. Prof., (AGR), AC&RI, Madurai Dr. J. Prabhakaran, Asst. Prof., (SS&AC), AC&RI, Madurai	2019 - 21	To be closed. Completion report to be submitted.
11.	Slot modifications in paddy drum seeder in conjugation with seed priming in wet seeded rice	Dr. Durai Singh, Prof & Head, Dept. of Agronomy, AC&RI, Madurai	2021 - 22	To be Continued.

IV. AICRIP Projects

Sl. No.	TITLE	Scientist involved / Lead scientist	Duration	Remarks
1	AICRP /PBG /ADT / RIC/ 002 Nutrient Management Trials –Nutrient response trials on selected AVT 2 rice cultures under high and low input management.	Dr. S.Elamathi, Asst. Prof., (AGR), TRRI, Aduthurai	2020-21	To be Continued.
2.	AICRP /PBG /ADT / RIC/ 002. Cultural Management Trial (CMT 1) Development of package of practices for mechanized transplanting	Dr. S.Elamathi, Asst. Prof., (AGR), TRRI, Aduthurai	2019-21	To be Continued.

3.	AICRP /PBG /ADT / RIC/ 002 Cultural Management Trial (CMT 3) Developing suitable package of practices for wet DSR	Dr. S.Elamathi, Asst. Prof., (AGR), TRRI, Aduthurai	2019-21	To be Continued.
4.	AICRP /PBG /ADT / RIC/ 002 Cultural Management Trial (WMT 2) Long term trial on weed dynamics in mono or double cropped rice system under different establishment methods	Dr. S.Elamathi, Asst. Prof., (AGR), TRRI, Aduthurai	2019-21	To be Continued.
5.	AICRP /PBG /ADT / RIC/ 002 Cultural Management Trial (WMT 2) Evaluation of promising cultivars for late planting and management for higher productivity and mitigate the effect climate change	Dr. S.Elamathi, Asst. Prof., (AGR), TRRI, Aduthurai	2019-21	To be Continued.
6.	AICRP /PBG /CBE / RIC/ 003 Nutrient Management Trials – AVT 2 – E (TP) Nutrient response trials on selected AVT 2 rice cultures under optimum and low input management	Dr. G. Senthil Kumar, Asst. Prof., (AGR), TNAU, Coimbatore	2020-21	To be Continued.
7.	AICRP /PBG /CBE / RIC/ 003 Nutrient Management Trials – AVT 2 – IM (TP) Nutrient response trials on selected AVT 2 rice cultures under high and low input management.	Dr. G. Senthil Kumar, Asst. Prof., (AGR), TNAU, Coimbatore	2020-21	To be Continued.
8.	AICRP / DCM / CBE / AGR / RIC / 2020 / 002: Cultural Management Trial (CMT 3) Developing a suitable package of practices for wet direct seeded rice (Wet DSR)	Dr. G. Senthil Kumar, Asst. Prof., (AGR), TNAU, Coimbatore	2020-21	To be closed.

9.	AICRP /PBG /CBE / RIC/ 003 Weed Management Trial (WMT 4) Evaluation of advanced cultivars for weed competitiveness under aerobic rice system.	Dr. G. Senthil Kumar, Asst. Prof., (AGR), TNAU, Coimbatore	2020-21	To be closed.
10.	AICRP /PBG /CBE / RIC/ 003 Weed Management Trial (WMT 4) Sustainable weed management in aerobic rice system	Dr. G. Senthil Kumar, Asst. Prof., (AGR), TNAU, Coimbatore	2020-21	To be Continued.
11.	AICRP/DCM/CBE/AGR/001 Identification of cropping systems module for different farming systems	Dr. S. Porpavai, Professor & Head (AGR), ARS, Thanjavur	2019-22	To be Continued.
12.	AICRP/NRM/TRY/SAC/005: Evaluating the reclamation efficiency of different sources of Gypsum for Sodic Soil Management.	Dr. A. Alagesan, Asst. Prof., (AGR), ADAC&RI, Trichy	2019-22	To be Continued.
13.	AICRP/PBG/CBE/RIC/003 Influence of silicon on improving abiotic stress tolerance in rice genotypes	Dr. K. Krishna Surendar, Asst. Prof., (CRP), TNAU, Coimbatore	2019-22	To be Continued.
14.	AICRP/PBG/CBE/RIC/003 Screening for submergence tolerance in rice genotypes	Dr. K. Krishna Surendar, Asst. Prof., (CRP), TNAU, Coimbatore	2020-21	To be Continued.
15.	AICRP/PBG/CBE/RIC/003 Physiological characterization of selected rice genotypes for multiple abiotic stress tolerance	Dr. K. Krishna Surendar, Asst. Prof., (CRP), TNAU, CBE	2020-21	To be Continued.
16.	AICRP/PBG/CBE/RIC/003 (All India Co-ordinated Rice Improvement Project) Phenotyping of elite rice genotypes for Drought Tolerance	Dr. K. Krishna Surendar, Asst. Prof., (CRP), TNAU, Coimbatore	2020-21	To be Continued.

17.	ICAR/DCM/CBE/SOA/2015/R001: Network Project on Organic Farming - Evaluation of response of different rice varieties suitable for organic farming	Dr. S. Manickam, Professor and Head Dept. of SOA, TNAU, Coimbatore Dr. M. Suganthy, Assoc. Prof., (Agrl. Entomology) Dept. of SOA, TNAU, Coimbatore	2020-22	To be Continued.
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IV. Externally Funded Projects

Sl. No.	Title	Scientist involved / Lead scientist	Duration	Remarks
1	NIAES/ DCM/ CBE/ CRP/ 2019/ R010 No. DR/ P7/ NIAES, Japan/ CRP, CBE/ ASO/ 2019 dt.22.01.2019 of DR,TNAU, CBE Multi- site monitoring network of canopy micrometeorology and heat stresses in rice for evaluating the adaptation strategies under climate change (HOA: F38IB)	Dr. D.Vijayalakshmi, Assoc. Prof., (CRP), TNAU, Coimbatore	01.04.2019 to 31.03.2022	To be Continued. Given for Information
2.	JAPAN/ DCM/ ADT/ AGR/ 2016/ R006 Estimation of Regional- Global Methane Emissions and Refinement of its Estimate by GOSAT-2 and Surface Observations (Phase I & II)	Dr. V. Ambethgar, Director, TRRI, Aduthurai Dr. M. Raju, Assoc. Prof., (AGR), TRRI, Aduthurai Dr. C. Umamageswari, Assoc. Prof., (AGR), TRRI, Aduthurai Dr. K. Sathiya Bama, Assoc. Prof., (SS & AC), TRRI, Aduthurai	Phae I: 01.04.2016 – 30.06.2018 PhaeII: 01.07.2018 – 28.02.2021	To be Continued. Given for Information

II. B. NATURAL RESOURCE MANAGEMENT

Rice Meet, 2021 was organized on 8th - 9th, April, 2021 and Director (NRM) reviewed the projects on Rice representing action plan, OFT, University Research Projects, AICRPS and externally funded projects. About 22 projects comprising 4 action plan projects, 10 URPs, 2 AICRPs, 1 externally funded project, 2 OFT/demonstration and 3 student theses on rice werereviewed. Twenty two scientists attended the review and presented the salient findings of the project on online/offline mode. The following findings were forwarded for adoption/ OFTinformation.

a). For adoption

1. STCR - IPNS based Fertilizer Prescriptions for Rice on Sodic Soils

The Fertilizer Prescriptions for rice on sodic soils *viz.*, FN = 6.08 T - 0.72 SN - 0.80 ON; FP₂O₅ = 1.64 T - 1.55 SP - 0.69 OP;FK₂O= 2.96 T - 0.39 SK- 0.73OKwere developed and validatedat farmers' holding of Trichy Dt. on sodic soils. The results showed that, targeting of 5.0 - 6.0 t ha⁻¹ grain yield of rice in sodic soil,after reclamation with gypsum, under STCR-IPNS is ideal forincreasing the grain yield (4.68 and 5.53 t ha⁻¹), response ratio (7.31 & 8.59 kg kg⁻¹) and BCR (1.87 & 1.89) besides soil fertility maintenance. Therefore, STCR-IPNS based fertiliser prescriptions can be recommended for sodic soils.

2. Nitrogen Management for direct seeded rice in Cauvery Delta Zone

Application of 125 kg N ha⁻¹ along with 50 kg P₂O₅, 50 kg K₂O and 25 kg ZnSO₄ is optimum for increasing the grain yield of rice during kuruvai and samba seasons with higher N use efficiency (11.36 – 13.06 kg kg⁻¹) and BCR (1.01-1.47) in direct seeded rice for Old and New Cauvery delta zone of Tamil Nadu.

3. Technology for improving the productivity of rice in sodic soil under water scarce condition

Incorporation of dainchafollowed by rice wet seeding + antioxidant microbial consortia (AOMC) @ 1.50% as foliar spray at panicle initiation and boot leaf stages + 100% STCR based NPK recorded the highest grain yield (4823 kg ha⁻¹), BCR (1.72), microbial population and DPPH assay in all the locations.

b). OFTs for the year 2021-2022

1. Evaluation of functional microbial consortium for the enhancement of rice productivity under varying methods of establishment

Objective

- ✓ To improve the productivity of rice grown under low land and semi dry conditions
- ✓

Treatments

T₁: 100% RDF (STCR)

T₂* :75 % N&P + *Azotobacter vinelandii* MAZO 36 + AMF + PSB

T₃* :75 % N&P + *Azospirillum*+ PSB

* 75% N&P as per STCR

Establishment methods

Low land: Direct sown & Machine transplanted

Semi Dry: Direct sown & SRI

Inoculation Methods

- Powder Formulation
- Seed coating & seedling dipping @ 25 g ha⁻¹ each

Observations

- Plant Nutrient uptake
- Dehydrogenase & Reactive Oxygen Species (ROS) enzyme activities
- Grain and Straw Yield

Lead centre & Scientists In-charge

Department of Agril. Microbiology, AC&RI, Madurai
Dr. K. Kumutha, Professor & Head (AGM)

Co-ordinating centres & Scientists In-charge

Semi dry rice: Dr. J. Prabhakaran, CSRC, Ramnad

Dr. B. Jeberlin Prabina, AC&RI, Killikulam

Low land Rice: Dr. Jeyabharathi, AC&RI, Madurai

Dr. T. Sivasankari Devi, TRRI, Aduthurai

c). For Information

1. Long term STCR-IPNS Experiment on rice-rice sequence

After 22 years of rice-rice cropping with STCR-IPNS technology, maintenance of available N (280 to 263 kg ha⁻¹), built up in OC (4.6 to 8.5 g kg⁻¹) and available P (20.2 to 28.4 kg ha⁻¹), lesser magnitude of decline in available K (670 to 590 kg ha⁻¹) and increased yield by 26.1 % (6.84 t ha⁻¹) and 23.9 % (6.06 t ha⁻¹) was observed in *kharif and rabi* seasons respectively.

2. Demonstration of STCR-IPNS based Fertilizer Prescription for Rice in Cauvery Delta Zone

STCR-IPNS based fertilizer prescription during kuruvai, 2020 recorded the highest grain yield (6720 kg ha⁻¹), response ratio (9.80 kg kg⁻¹) & maintenance of soil fertility. Mean yield increase in STCR-IPNS (6730 kg ha⁻¹) over blanket fertilizer recommendation and farmer's fertilization practice was 20.3 and 37.0% respectively. Exposure visit of farmers to KVK, Needamangalam and Farmers - Scientist interaction, created awareness about the benefits of adopting STCR-IPNS technology in rice.

3. STCR based IPNS fertiliser prescription for desired yield target of Rice in North Eastern Zone of Tamil Nadu

Fertiliser prescription equations (FPEs) and Ready Reckoner for fertilizer doses were developed for Kadambady series. The FPEs are: FN = 3.61 T - 0.43 SN - 0.88 ON; FP₂O₅ = 1.80 T - 2.58 SP - 0.89 OP; FK₂O = 2.71 T - 0.42 SK - 0.81 OK .

4. Permanent Manurial Experiment in Rice

In Madurai, after 62 crops of rice, positive balance of available P&K and higher OC and negative balance of N, reduction in Al-P and Fe-P in Urban Compost and GLM added plots as compared to unmanured control was recorded. Higher urease, dehydrogenase activity and microbial population in GLM treatment were observed. Application of 120:40:40 kg NPK + GLM @ 6.25 t ha⁻¹ in *rabi* recorded the highest yield (5485 kg ha⁻¹) with the yield increase of 29.1% over RDF. To test the impact of skipping of P₂O₅ on high P soils (42 kg ha⁻¹) an OFT was conducted which showed comparable yield with RDF.

5. Permanent Manurial Experiment in Rice - Rice sequence

In Aduthuraicentre, after 29 years of rice cropping (58 crops) positive balance of available NPK and higher organic carbon (13.84 g kg^{-1}) was observed in INM treatments. Higher soil carbon pools (labile and water soluble C) and dehydrogenase enzyme activity along with higher yield was registered with the application of $125:50:50 \text{ kg NPK} + \text{GM @ } 6.25 \text{ t} + 500 \text{ kg gypsum ha}^{-1}$ (6182 kg ha^{-1}) in Kuruvai while in Thaladi, addition of $150:60:60 \text{ kg NPK} + 12.5 \text{ t FYM} + 500 \text{ kg gypsum ha}^{-1}$ recorded the higher grain yield (6536 kg ha^{-1}). An overall increase (mean of 29 years) in yield by 23.6% (6042 kg ha^{-1}) and 18.3% (6431 kg ha^{-1}) in *kuruvai* and *Thaladi* seasons respectively over RDF was recorded.

6. Management of water logging associated soil problem in the rice ecosystem of Cauvery delta zone of Tamil Nadu

Experiments conducted at TRRI, Aduthurai and KVK, Needamangalam in two consecutive seasons during kuruvai and samba 2020 -21 showed that in clayey soils of Cauvery Delta Zone, water logging associated soil problems *viz.*, iron toxicity, deficiency of zinc and potassium and resultant reduction in yield can be managed with the application of Gypsum @ 500 kg ha^{-1} + cono weeding twice + AWDI + microbial consortia (200 ml ha^{-1}).

7. Insitu Decomposition of Rice Stubbles and industrial amendments for reclamation of sodic soil and their effect on rice

In sodic soil, *insitu* decomposed rice stubbles using the isolated microbial consortia @ 2 L ha^{-1} with either Fly Ash Vermicompost (partially decomposed cow dung and fly ash @ 3:1 ratio) @ 50% Gypsum Requirement (or) Gypsum @ 50% GR recorded higher Yield (5869 and 5754 kg ha^{-1}), nutrient uptake, BCR (1.54 & 1.55) & reduction in soil ESP (25.89 to 17.74%).

8. Reclamation efficiency of different sources of Gypsum for Sodic Soil Management

Among the different sources of gypsum evaluated on sodic soil, significantly higher grain yield (4511 & 6367 kg ha^{-1}) was obtained during both kharif 2020 and rabi 2020-21 seasons respectively for the treatment Marine Gypsum @ 50 % GR (92.21 % Purity) followed by Mineral Gypsum @ 50 % GR (81.10 % Purity) and Phospho Gypsum @ 50 % GR (38.58 % Purity).

9. Demonstration of TNAU Micronutrient Mixture for Rice

Field demonstrations conducted at western zone of Tamil Nadu revealed that application of TNAU Micronutrient mixture @ 25 kg ha^{-1} as enriched FYM with RDF (STCR/blanket) registered 12.4% higher grain yield of rice over NPK alone.

10. Amino acid encapsulated Zn fertilizer for semidry rice of the Coastal soils of Ramanathapuram district

For alleviating Zn deficiency under abiotic stress (saline/saline-alkali/alkali) conditions, an organic chelate *viz.*, Zn lysinate has been formulated and characterized.

11. Boron fertilisation for improving the yield and quality of rice varieties on Inceptisol of Thamirabarani tract

Soil application of STCR-IPNS + borax @ 10.7 kg ha^{-1} for ASD16 and STCR-IPNS + borax @ 18.8 kg ha^{-1} for TPS 5 rice varieties respectively was found economically optimum. The yield increase of 16% (6.98 t ha^{-1}) in ASD 16 and 22.2% in TPS 5 (6.93 t ha^{-1}) was observed over STCR-IPNS practice with less chaffiness (13.2 and 14.5%). Boron addition

also increased the amylose content (24-26%) in both the varieties. Marginal increase in HWSB (0.54 mg kg⁻¹) was noted over initial status (0.46 mg kg⁻¹) with the application of 20 kg borax ha⁻¹.

12. Nutritive Value of Traditional Rice Cultivars

Characterisation of 50 traditional rice cultivars collected from Thiru. NelJayaraman, Centre for Indian Knowledge System (CKIS), Paddy Breeding Station (PBS) and Tamil Nadu Rice Research Station (TRRI) indicated that traditional cultivars had better grain quality than ruling cultivars. Higher Nutritive value was observed in the order: Brown rice > Parboiled rice > Polished rice. Out of the 50 rice genotypes Karupukavuni is having high nutritive and biochemical value followed by Karunkuruvai and Kaatuyanam cultivars.

13. *Sphingobium myanoikuyae* MH394206 - an endophytic bacterium for drought stress management in rice

Sphingobium myanoikuyae, a new endophytic bacterium inoculation, protects the plants from wilting at 75% moisture stress under pot culture conditions in rice. It also expressed the drought related genes (DHA, LEA, GST and NAM) in normal condition and GST (147 fold) & NAM (59 fold) apart from antioxidants and compatible solutes.

14. Development of multifunctional strains of *Azotobacter* sp. for enhancing rice productivity

Combined inoculation of *Azotobacter vinelandii* MAZO 36 + PSB with 75% N and P and 100% K recorded higher grain yield (4970 – 6725 kg ha⁻¹) and BCR (1.97-2.17) in both transplanted and direct sown rice than the un-inoculated control and *Azospirillum*+ PSB inoculation.

d). Action Plans proposed for 2021-22

Action Plan 1: Demonstration of STCR-IPNS based fertilizer Prescription for Rice in Cauvery Delta Zone (Phase II)

Rationale

- ✓ Avoids over or under usage of fertilizer inputs
- ✓ Ensures site specific & balanced nutrient supply
- ✓ Nutrient requirement of the crop, nutrient contribution from soil, fertilizer and organic manure are taken care of.
- ✓ Efficient fertilizer use and sustained soil health and productivity

Objectives

- ✓ To demonstrate the benefits of STCR-IPNS technology

Duration: 1 Year (2021-2022)

Treatments

- T₁: Blanket recommendation
- T₂: STCR-IPNS based fertilizer prescription
- T₃: Farmer's Fertilization Practice

Soil Type : Kalathur and Alathur soil series

Observations to be recorded

- ✓ Grain and Straw Yield

Lab analysis

- ✓ Initial and post-harvest soil fertility status

Locations and Scientists involved

Team Leader: Dr. R. Santhi, Director (DNRM) & Professor (SS&AC)

Lead centre: Department of SS&AC, TNAU, Coimbatore (coordinating the demonstrations)
Dr. S. Maragatham, Assoc. Professor (SS&AC) & STCR scheme in-charge

Co-ordinating centres (conduct of demonstrations)

TRRI, Aduthurai: Dr.K.SathiyaBama, Assoc. Professor (SS&AC)

ADAC&RI, Trichy: Dr.D.Janaki, Assistant Professor (SS&AC)

Action Plan 2: Optimization of Boron fertilization for rice**Rationale**

- ✓ Boron is the second most deficient micronutrient next to Zn
- ✓ Boron deficiency in rice causes chaffy grains and failure in panicle production
- ✓ Boron application augment higher productivity and rice quality

Objectives

- ✓ To optimize the boron fertilizer application for rice cultivars

Duration: 1 Year (2021-2022)

Treatments

T1: STCR-IPNS (No borax)

T2: STCR-IPNS + 5 kg borax ha⁻¹

T3: STCR-IPNS + 10 kg borax ha⁻¹

T4: STCR-IPNS + 15 kg borax ha⁻¹

T5: STCR-IPNS + 20 kg borax ha⁻¹

Varieties: TPS 5 & ASD 16

Observations to be recorded

- ✓ Yield attributes, Grain and Straw Yield
- ✓ Quality of grain & Economics
- ✓ Economic optimum of boron

Analysis

- ✓ Initial and post-harvest soil fertility status
- ✓ B content, uptake and availability

Locations and Scientists involved

Dept. of SS&AC, AC&RI, Killikulam & ARS, Thirupathisaram

Dr. S. Suresh, Professor & Head (SS&AC), AC&RI, Killikulam

Dr. D. Leninraja, Asst. Professor (SS&AC), AC&RI, Killikulam

Action Plan 3: Harpin, a protein based smart formulation for defense priming and health in rice crop

Scope

- ✓ Harpins are a class of proteins - Gram-Negative plant pathogenic bacteria-secreted through type III secretion system
- ✓ Induce virulence in host plants; Induce hypersensitive cell death and also elicit multiple responses in non-host plants
- ✓ Exogenous applications of Harpins induce systemic acquired resistance (SAR) in plants by the activation of defense pathways mediated by salicylic acid, jasmonic acid, or ethylene (Shao *et al.*, 2008).
- ✓ HPaG from *Xanthomonas* spp. was overexpressed in *Escherichia coli* and the rHPaG exerts plant growth promotion, reduction of BLB incidence in rice (Beslin, 2021-unpublished).

Objectives

- ✓ To unravel the mechanistic insight into metabolomic and transcriptomic profiling of rHPaG primed rice seedlings
- ✓ To evaluate the crop response of rHPaG protein formulation on rice

Parameters to be recorded

- ✓ Plant morphological and root system architecture parameters, Biochemical parameters (ROS enzymes and osmolytes), metabolites and genes for plant growth, defense and disease resistance, yield and yield parameters

Location : Coimbatore

Period : 2021-23

Lead Centre: Department of Agricultural Microbiology, TNAU, Coimbatore

Scientists Incharge: Dr. U. Sivakumar, Professor (AGM),
Dr. R. Arul, Assoc. Professor (Biotech) &
Dr. C. Gopalakrishnan, Professor (Pl.Patho),
Dept. of Rice, TNAU, Coimbatore

Project wise remarks

S.No	Title of the project	Scientist involved	Duration	Remarks
a. Action Plan Projects				
1	NRM/ADT/SAC/RIC/2020/001 : Management of water logging associated soil problem in the rice ecosystem of Cauvery delta zone of Tamil Nadu	Dr. K. Sathiyabama, Assoc. Professor (SS&AC) Dr. S. Elamathi, Asst. Professor (Agronomy) Dr. T. Sivasankari Devi, Asst. Professor (AGM) Dr. A. Anuratha, Asst. Professor (SS&AC), KVK,Needamangalam	July 2020 to June 2022	<ul style="list-style-type: none"> To be continued and given for information Water saving may be quantified Fe toxicity and Zn deficiency may be assessed and the symptoms may be documented. Details on time of application and concentration of zinc Solubilizing and potash releasing bacteria should be furnished in detail. Data on control of algal growth may be included on regular basis as important observation.
2	NRM/ CBE/ SAC/ RIC/ 2020/ 001: Refinement of Existing STCR based IPNS fertilizer prescription for desired yield target of Rice in North Eastern Zone of Tamil Nadu	Dr. S. Maragatham Assoc. Prof. (SS&AC), Dr. S. Suganya AP (SS&AC), TNAU-I&TC, Chennai Dr. V. Arunkumar AP (SS&AC), AC&RI, VVNR Overall Coordination Dr. R. Santhi Director (NRM) & Prof. (SS&AC)	Aug, 2020 to July, 2022	<ul style="list-style-type: none"> To be continued Given for information
3	Demonstration of STCR-IPNS based fertiliser Prescription for rice in Cauvery Delta Zone (Action Plan: 2019-21 – Phase I)	Dr. S. Maragatham, ASP (SS&AC) Dr. A. Anuratha AP (SS&AC), KVK, Needamangalam	2019-20 & 2020-21	<ul style="list-style-type: none"> Kharif results given for information After the completion of ongoing demonstration, two year results may be compiled and submitted to DNRM.
4	Action Plan :Field evaluation of <i>Bacillus</i>	Dr.U.Sivakumar, Prof (AGM)	2020-22	<ul style="list-style-type: none"> May be continued

	<i>altitudinis</i> FD48 for moisture stress tolerance, crop growth and yield in rice	Dr. M. Gnanachitra, Assoc. Prof (AGM) Dr. P.Muthuramu Asst. Prof (PBG) Dr. M. Jayabharathi, Asst. Prof (AGM) Dr. T. Sivasankaridevi, Asst. Prof (AGM)		<ul style="list-style-type: none"> Yield data from the pooled experiments may be reported to DNRM by July 2021.
b. On farm trials /Demonstrations				
1	Demonstration of Micronutrient mixture in rice (Vice Chancellor review remarks)	Dr. D. Muthumanickam Professor (SS&AC), ARS, Bhavanisagar		<ul style="list-style-type: none"> Results given for information
2	OFT: Technology for improving the productivity of rice in sodic soil under water scarce condition	ADAC&RI, Trichy Dr. P. Janaki, Assoc. Prof. (SS&AC) Dr. D Janaki, Asst. Professor (SS&AC) Dr. A. Alagesan, Asst. Professor (Agron.) Dr. J. Ejilane, Asst. Professor (AGM) AC&RI, Killikulam Dr. D. Lenin Raja, Asst. Professor (SS&AC) Dr. K. G. Sabarinathan Asst. Professor (AGM) RRS, Paiyur Dr. Vijayakumar, Asst. Prof. (SS&AC) AC&RI, Kudimiyamalai Dr. P.P. Mahendran, Prof. & HD (SS&AC) Dr. R. Jagadeeswaran, ASP (SS&AC) Dr. K.G. Anitha, Asst. Prof. (AGM)		<ul style="list-style-type: none"> Recommended for adoption Microbial consortia may be made available for use.
c. University Research Projects				
1	NRM/ADT/SAC/RIC/2017/001: Permanent Manurial experiment in rice	Dr. K. Sathiyabama Associate Professor (SS&AC)	Apr. 2017 to Mar. 2022	<ul style="list-style-type: none"> To be continued Given for information

	based cropping system.	TRRI, Aduthurai		<ul style="list-style-type: none"> • The data generated from the project for the past 29 years may be brought as a compendium and steps may be taken to release the book in the ensuing International conference to be organized in lieu of Golden Jubilee Celebrations. • A draft copy of the compendium may be submitted to Director (DNRM) for perusal and providing suggestions. • Nutrient equivalence of organic manure needs to be calculated and included. • As mandatory, once in 5 years an interim completion report to be submitted and concurrently new project number to be obtained.
2	NRM/ ADT/ SAC/ RIC/ 2017/ 002: Nitrogen Management for direct seeded rice in Kuruvai and Samba season	Dr.K.SathiyaBama Assoc.Professor (SS & AC) Dr. M.Babu, Professor (SS & AC) AC&RI, Vazavachanur	August 2018 to July 2021	<ul style="list-style-type: none"> • Given for adoption • Project may be closed and completion report to be submitted on time.
3	NRM/MDU/SAC/RIC/2020/001 : Permanent Manurial Experiment on Rice	Dr. P. SaravanaPandian Professor (SS&AC), AC&RI, Madurai	Oct 2020 to Sep 2025	<ul style="list-style-type: none"> • To be continued • Given for information • The OFT conducted for skipping Phosphorus in alternate season in high P soils may be repeated with a rice – rice cropping sequence • Data generated may be brought as compendium and released during TNAU Golden Jubilee celebrations. • A draft copy of the compendium may be submitted to Director

				<p>(DNRM) for perusal and providing suggestions.</p> <ul style="list-style-type: none"> • As mandatory, once in 5 years an interim completion report to be submitted and concurrently new project number to be obtained.
4	NRM/MDU/SAC/RIC/2018/001: Enhancing phytolith and phytolith occluded carbon on carbon sequestration in rice ecosystems.	Dr. P. Christy Nirmala Mary Associate Professor (SS&AC), AC&RI, Madurai	August 2018 – December 2021	<ul style="list-style-type: none"> • To be continued. • In addition to variety suitability, changes in phytolith and phytolith occluded carbon at different stages of rice, significance of phytolith on yield and carbon sequestration are to be reported. • In the report, interpretation of data should be focused as per objectives. • An interim report compiling past two years data should be submitted to DNRM by July 2021.
5	NRM/MDU/AGM/RIC/2016/001 : Development of multifunctional strains of Azotobacter sp. for enhancing Rice productivity	Dr. K. Kumutha Professor and Head Dept. of Agrl. Microbiology AC&RI, Madurai	October 2016 to September 2020	<ul style="list-style-type: none"> • Given for information • Recommended for OFT and STCR recommendation for the soil test values of different locations may be obtained from Dept. of SS&AC and included. • The value on uptake of macro and micro nutrients may be included. • Project may be closed.
6	NRM/ TRY/ SAC/ RIC/ 2019/ 001 Refinement of Fertilizer Prescription Equations for Paddy under Sodic Soil through Soil Test Crop Response	Dr.T.ShereneJenitaRajammal, Asst. Professor (SS&AC), KVK, Vamban Dr.S.Maragatham	September 2019- September 2021	<ul style="list-style-type: none"> • Recommended for adoption • To be closed and completion report to be submitted on time.

	correlation studies [URP serial number: 956]	Assoc. Professor (SS &AC), TNAU, Coimbatore		
7	NRM/KKM/AGM/RIC/2021/001 Microbial synthesis of Zinc nanospheres to enhance Zinc use efficiency in rice	Dr. M. Gomathy Asst. Prof. (Microbiology) Dr.K.S. Subramainan Director of Research	August 2020 to July 2023	<ul style="list-style-type: none"> To be continued The reference strains of Zinc solubilising bacteria may be included as one of the treatment check.
8	New URP: Alleviation of zinc deficiency under abiotic stress conditions with amino acid encapsulated Zn fertiliser in Semidry rice for the Coastal soils of Ramanathapuram district	Dr. J. Prabhakaran, Asst. Professor (SS&AC) Dr. K. Senthil Asst. Prof.(Agrl. chemicals) Dr. T. Ragavan Professor and Head CSRC, Ramanathapuram	January 2021 to March 2023	<ul style="list-style-type: none"> To be continued Given for information Raman spectra for Zn may be compared New proposal may be submitted for externally funding
9	NRM/CBE/AGM/RIC/2018/CP134: Screening plant growth promoting rice apoplastic fluid bacterial strains for drought stress management in rice	Dr. T. Kalaiselvi Professor (AGM) Dr. P. Jeyakumar Professor (CRP)	February 2019 to September 2020	<ul style="list-style-type: none"> Given for information <ul style="list-style-type: none"> To be closed and completion report may be submitted along with publications. A new URP may be proposed for the evaluation of the present study under pot and field conditions.
10	NRM/CBE/AGM/RIC/2020/001: Exploring bioinoculants for developing coated seeds for enhanced nutrient uptake in Rice	Dr.M.Gnanachitra Associate Professor (AGM)	November 19 to October 21	<ul style="list-style-type: none"> To be continued Detailed scientific evidences may be explored on pH reduction in broth. The stabilization of microbial population may be tried with nutrients to extend the shelf life Seed technology scientist may be included in the project Zn and NPK solubiliser may be given as single package of microbial consortia.

	d. AICRP Projects			
1	AICRP/NRM/TRY/SAC/005: Evaluating the reclamation efficiency of different sources of Gypsum for Sodic Soil Management	Dr. A. Alagesan Assistant Professor (Agronomy), ADAC&RI, Trichy Dr. P. Balasubramanian, Prof & Head (SS&AC) ADAC&RI, Trichy	2019-20 to 2021-22	<ul style="list-style-type: none"> To be continued Given for information
2	AICRP/NRM/CBE/SAC/002 AICRP on Soil Test Crop Response: Long term STCR-IPNS Experiment on rice-rice sequence.	Dr. S.Maragatham Associate Professor (SS&AC) Dr. J.Balamurugan Asst. Professor (SS&AC) Dr. M.Gopalakrishnan Asst. Professor (SS&AC)	Continuous project	<ul style="list-style-type: none"> To be continued Compendium on the data generated may be prepared and released in lieu of Golden Jubilee Celebrations.
	e. Externally funded projects			
1	Exploring rhizo spheric microbiome (PGPR and AM fungi) for regulating the expression of zinc transporter genes (ZRT) in rice to augment the zinc nutrition	Dr. M. Gomathy Asst. Prof. (Microbiology) AC&RI, Killikulam	April 2019 to March 2022	<ul style="list-style-type: none"> To be continued The common microbial consortia for Zinc nutrition may be developed after discussion with Dept. of Agrl. Microbiology, TNAU, Coimbatore with Dr. D. Balachander, Professor (Agrl. Microbiology), TNAU, Coimbatore. The bio formulations with PGPR + ZSB may be developed. Another URP on PGPR may be proposed to further revive and test the PGPR strains developed.
	f. Student thesis			
1	Effect of boron application on the growth, yield of rice cultivars and soil	Chairman: Dr.S.Suresh Professor and Head (SS&AC)	2020-21	<ul style="list-style-type: none"> Given for information An action plan may be proposed to

	properties in the Inceptisol soils of Thamirabharani tract (Student thesis work)	AC&RI, Killikulam		finalize the rate of B application to rice varieties.
2	Nutritive value of rice cultivars and measures to increase iron nutritive quality	Chairman: Dr. N. Chandra Sekaran Professor (SS&AC)	2020-21	<ul style="list-style-type: none"> • Given for information
3	Reclamation of sodic soil with organic and industrial amendments and their effect on rice.	Chairperson: Dr. S. Meena Professor (SS&AC)	2016-20	<ul style="list-style-type: none"> • Given for information • Recommended for OFT

II. C. SEED CENTRE

The 40th Crop Scientists Meet on Rice 2021 was held on 9th April 2021 at Tamil Nadu Agricultural University, Coimbatore by online mode through Zoom webinar. Action taken on the recommendations of 39th CSM on Rice - 2020 research highlights of action plan for 2020-2021 pertaining to Seed Science and Technology were presented by the Director, Seed Centre. The session was chaired by the Hon'ble Vice-Chancellor and co-chaired by the Director of Research, TNAU, Coimbatore.

A. List of projects reviewed

Project	Ongoing projects
University Research Projects	2
Action Plan	1
AICRP	1
Externally Funded Project (GOI- DUS scheme)	1
Total	5

Remarks in the ongoing projects reviewed

Action Plan

Title	Scientist involved / Lead scientist	Duration	Remarks
Assessment on morphological characters and seed storage potential of traditional rice varieties	Dr.K.Raja Assoc. Prof. (SST) Dr.D.ThirusenduraSelvi Asst. Prof. (SST) DSST, Seed Centre, TNAU, Coimbatore Dr.K.Amudha Asst. Prof. (PBG) Dept. of Rice CPBG, TNAU, Coimbatore (2020-21)	2019-20 & 2020-21	To be continued.

University Research Projects

Sl. No.	Title	Scientist involved / Lead scientist	Duration	Remarks
1	SEC/TKM/SST/RIC/2019/001 Estimating effects of high temperature on yield and seed quality traits in rice	Dr.M.Bhaskaran Professor & Head Dr.S.Banumathi Assoc. Prof. (CPBG)	November 2019 to October 2021	To be continued.

2	SEC/BSR/SST/RIC/2019/002 Assessment of storage potential of TNAU rice varieties under seed chain	Dr.V.Vakeswaran Asst. Prof. (SST)	February 2020 to April 2023	To be continued.
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AICRP

Sl. No.	Title	Scientist involved / Lead scientist	Duration	Remarks
1	Influence of terminal heat stress on seed set, seed yield and quality in Rice	Dr. C. Vanitha Asst. Prof. (SST)	2019-2021& 2021-2022	To be continued.

Externally Funded Project

Sl. No.	Title	Scientist involved / Lead scientist	Duration	Remarks
1	Implementation of PVP Legislation through DUS testing under ICAR and SAU Systems	Dr.P.R.Renganayaki Professor and Head Dr.R.Vigneshwari Asst. Prof.(SST)	April 2003 totill date	To be continued.

B. Technology for adoption : Nil

C. Technology for information

1. Dormancy status of traditional rice varieties

The traditional rice varieties *viz.*, Kuruvaikalangium, Kothamalli samba, Nootripathu, KallundrikarKarunkuruvai, Anaikomban, Arupatham samba, Channangi, Senthooram, Senthooram selection, Thengaipoo samba, Arasamba and Sembaraishowed strong seed dormancy of about 30-60 days.

2. Storage potential of traditional rice varieties

The traditional rice varieties *viz.*,Mattaikar, Kuruvaikalangium, Vassanaiseeraga samba, Kothamalli samba, Kattanur and Karunkuruvai maintained more than 90% germination even after 10 months of storage.The traditional varieties *viz.*, Mappillai samba, Mattaikar, Kuruvaikalangium, Vaasanaiseeraga samba, Poongaar, Kothamalli samba, Nootripathu, Kallundrikar, Kallukkar, Kattanur, Karunkuruvai and Karukka maintained more than 80% germination up to 10 months under ambient storage condition.

3. Foliar treatment to improve seed set, seed yield and quality in rice under heat stress

Foliar application of salicylic acid @ 400 ppm at vegetative and anthesis stage increased 11.5% seed set, 12.9% seed yield and 5% seed germination over control under open field condition. Under 4°C elevated temperature condition, the same treatment increased the seed set by 12.6%, seed yield by 14.3% and seed germination by 7% over control.

D. Action Plan 2021-2022

Action Plan I: Assessment of morphological characters and seed storage potential of traditional rice varieties

Objectives:

- Documenting morphological characters of traditional rice varieties as per the DUS guidelines.
- Assessing the status of seed dormancy.
- Evaluating the physiological and biochemical seed quality attributes.
- Assessing the seed storage potential.

Varieties: 137 traditional varieties

Duration: Two Years (2019-20 & 2020-21) and will be continued for 2021-22.

Observations to be recorded:

Germination (%)	EC (dsm ⁻¹)
Fresh ungerminated seeds (%)	Viability (%)
Root length (cm)	Starch (g/100 g of sample)
Shoot length (cm)	Amylose (%)
Dry matter production	Amylopectin
Vigour index	Alpha amylase (mg of Maltose / Min)

Co-ordinating centre & Scientist In-charge:	Dept. of Seed Science & Technology, Seed Centre, TNAU, Coimbatore	Dr.K.Raja Assoc. Professor (SST) Dr.D.ThirusenduraSelvi Asst. Professor (SST)
Centres & Scientist in-charge	AC & RI, Madurai	Dr.R.Geetha Professor and Head
	ADAC & RI, Trichy	Dr.T.Eevera Asst. Professor (SST)
	TRRI, Aduthurai	Dr.N.Punithavathi Assoc. Professor (SST) HC&RI(W), Trichy
	Dept. of Rice, CPBG, TNAU, Coimbatore	Dr.K.Amudha Asst. Professor (PBG)

III. CROP PROTECTION

A. Technologies for Adoption / OFT / Information

1. IPM capsule for major pests of rice

IPM Package *viz.*, high yielding rice variety, black gram (ADT 6) as bund crop, pheromone traps @ 20/ac for yellow stem borer, release of egg parasitoid, *Trichogramma japonicum* @ 1,00,000/ha (coinciding with moth activity), Azadirachtin 10,000ppm @ 2ml/lit. spray at 25 and 45 DAT and chlorantraniliprole 18.5 SC @ 150 ml/ha (need based) recorded minimum damage of rice pests *viz.*, yellow stem borer (5.93 % dead heart) and leaf folder (5.59 % damage) with high number of natural enemies (1.49 nos./hill) and the highest yield (6586.4 kg/ha).

1. Management of rice grain discolouration through botanicals

Foliar spray of neem oil @ 3 per cent at 50 % flowering stage followed by second spray 10 days later is recommended for the management of rice grain discolouration.

2. Management of sheath rot and grain discoloration in rice

Seed treatment with *Bacillus subtilis* (Bbv57) @ 10g/kg + one foliar spray with azoxystrobin @ 0.2 % at 50 per cent flowering is recommended for the management of sheath rot and grain discolouration.

II. Technology for OFT

OFT 1: Evaluation of sequential application of botanical and chemical insecticides against major pests of rice

Treatments:

1. Botanicals + Insecticide: Azadirachtin 1% EC 1000ml/ha 25 DAT + Chlorantraniliprole 0.4G 10 kg/ha 45 DAT + Neem oil 2% 10 lit/ha 60 DAT
2. All botanicals: Azadirachtin 1% EC 1000ml/ha 25 DAT + Eucalyptus oil 1000ml/ha 45 DAT + Neem oil 2% 10 lit/ha 60 DAT
3. All insecticides: Chlorantraniliprole 0.4G 10 kg/ha 25 DAT + cartap hydrochloride 50% SC 1.0 kg/ha 45 DAT + Fipronil 5% SC 1000 ml/ha 60 DAT
4. Control (Untreated check)

Design : RBD
Replication : 5
Season : Samba

Centres to be involved:

AC&RI, KKM [MS]*	: Dr. N. Balakrishnan, Assoc. Professor (Entomology)
AC&RI, MDU	: Dr. G. Srinivasan, Assoc. Professor (Entomology)
TRRI, ADT	: Dr. P. Anandhi, Asst. Professor (Entomology)
TNAU, CBE	: Dr. Sheela Venugopal, Asst. Professor (Entomology)
ADAC&RI, TRY	: Dr. P. Yasodha, Asst. Professor (Entomology)
AC&RI, VVNR	: Dr. N. Muthukrishnan, Dean, AC&RI, VVNR

* MS-Monitoring Scientist

Observations:

- To be taken from 15 days after transplantation till pre-harvest stage at weekly interval on the existing pests and natural enemies as indicated below.
1. Thrips population per sweep and damage (leaf damage)
 2. Stem borer adults per sweep and damage (DH/WE)
 3. Leaf folder adults per sweep and damage (leaf damage)
 4. Gall midge damage (silver shoot)
 5. Number of leaf and plant hoppers /10 hills
 6. Any other pests (if noticed)
 7. Natural enemies such as coccinellids, rove beetles and spiders
 8. Grain yield
 9. CB Ratio

Note: Pre-treatments counts (PTC) should be recorded and per cent reduction over control should be calculated using PTC.

OFT 2: IPM capsule for Rice Gall Midge

Treatment:

1. T1- IPM capsule
 - Early sowing (based on water availability)
 - Seed treatment with imidacloprid 48FS @ 2.5 g/kg seed
 - Distribution of *Platygaster oryzae* parasitized @ 1 gall per 10 m², when natural parasitization is noticed in abundance and
 - Azadirachtin 10000 ppm at 1lit /ha on 25 DAT and Fipronil 0.3 % G @ 20 kg/ha on need basis

2. T2- Farmers' practice

3. T3-Control (Untreated check)

Plot size : 1 acre

Design : RBD

Replication : 7

Season : *sambaseason* & two trials per centre

Centres to be involved:

AC&RI, MDU [MS]* : Dr. G. Srinivasan, Assoc. Professor (Entomology)

TRRI, ADT : Dr. P. Anandhi, Asst. Professor (Entomology)

TNAU, CBE : Dr. Sheela Venugopal, Asst. Professor (Entomology)

KVK, NDM : Dr. V. Radhakrishnan, Asst. Professor (Entomology)

* MS-Monitoring Scientist

Observations

- No. of tillers
- No. of silver shoots
- No. of parasitized silver shoots in 10 randomly selected hills / treatment / replication starting from 15 DAT at weekly intervals upto grain formation stage
- Yield/plot

OFT 3: Evaluation of newer molecules for the management of false smut disease in rice

Treatments

T1. Two sprays with tebuconazole 50% + trifloxystrobin 25% @ 200 gm/ha at tillering stage and early booting stages.

T2. Two sprays with azoxystrobin 7.1% + propiconazole 11.9 % W/W SE @ 500 ml/ha at tillering stage and early booting stages.

T3. Farmers' Practice

T4. Absolute control

Observations to be recorded: False smut incidence and severity; CB ratio

Season: Rabi

Design: RBD

Replication: 5

Coordinating scientist: Dr. A. Ramanathan, TRRI, Aduthurai

Centres to be involved: Aduthurai (Dr. A. Ramanathan); ADAC&RI, Trichy (Dr. V. K. Sathya); Tirur (Dr. S. Malathi); Vazhavachanur (Dr. D. Deivamani); ASD (Dr. Ramjegethesh); Thirupathisaram (Dr. A. Kavitha); Coimbatore (Dr. C. Gopalakrishnan)

OFT 4: Eco - friendly management of blast and sheath blight diseases of rice

Treatments

T1. RDF 75 % + soil application of Daincha @ 6.25 t/ha and *B. Subtilis* (Bbv 57) @ 2.5kg/ha + foliar spraying of Panchakavya @ 3.0 % + foliar spraying of zineb + hexaconazole @ 0.25 % at tillering stage.

T2. Soil application of Daincha @ 6.25 t/ha. + seed treatment @ 10 gm/kg. of seed and soil application of *B. subtilis* (Bbv 57) @ 2.5kg/ha + foliar spraying of neem oil @ 3.0 % at tillering stage.

T3. Farmers' Practice

T4. Untreated control

Observations to be recorded: Blast and sheath blight severity in PDI, Yield and C:B ratio.

Season: Rabi

Design: RBD

Replication: 5

Coordinating scientist: Dr. R. Ramjegethesh, RRS, ASD.

Centres to be involved: Aduthurai (Dr. A. Ramanathan); Tirur (Dr. S. Malathi); Vazhavachanur (Dr. D. Deivamani); ASD (Dr. R. Ramjegethesh); Thirupathisaram (Dr. A. Kavitha); KKM (Dr. N. Rajinimala).

III. For Information

1. Moderate to heavy incidence of rice blackbug, BPH, thrips and gall midge were recorded in the districts of Thanjavur, Nagapattinam, Tiruvarur and Thiruvallur during 2020-21.
2. The maximum light trap catches of yellow stemborer noticed during December 2020-January 2021 and sucking pests (GLH & BPH) during January- February 2021.

- Correlation of weather parameters with pest incidence showed that the incidence of GLH, BPH, Leaf folder, rove beetles and mirids were negatively correlated with maximum temperature, while, YSB, GLH and BPH are negatively correlated with minimum temperature.
- As evident from the *in-situ* count and light trap catches, maximum incidence of the stem borer species, *Scirpophaga incertulas* (YSB) was observed followed by pink stem borer, *Sesamia inferens* and dark headed borer, *Chilo polychrysus*.
- Among the leaf folder complex, *Cnaphalocrocis medinalis* was observed to be dominant followed by *Marasmia patnalis*. Stray occurrence of *Marasmia ruralis* was observed.
- Resistant entries against major insect pests:

Pests	Entries identified	Category
Stem borer	ART 420 (2), MLT 106, 110, 202, 203, 401, 403, 405, 406, 607 and 608, AD 18034, 09219	Moderately Resistant
BPH	ART 420 (1) & 420 (2), MLT 101, 109, 110, 208, 210, 405, 502, 503, AD 17035	Moderately Resistant
Leaf folder	ACK 12026, AD 17037, AD 17759, TKM 13, ACK 12024 and TPS 3	Moderately Resistant
BPH, WBPH, GLH	MLT 503	Multiple- moderate resistance

- IPM capsule for stem borer and leaf folder comprising of suitable less susceptible variety (ADT 51), seed treatment with imidacloprid 48FS @ 2.5 g/kg seed, border crop with aromatic rice, light trap @ 1/ac, spraying of chlorantraniliprole 18.5 SC 150 ml/ha during vegetative stage, spraying of botanical Azadirachtin 10000 ppm at 1000 ml/ha during grain formation stage resulted in moderate incidence of stem borer (5.51% dead heart) and leaf folder (5.14 % damage) , higher population of coccinellids (1.49 nos./hill) and spiders (1.16nos./hill)with higher yield (5898 kg/ha) and BC Ratio (2.01) compared to control.
- IPM package for rice gall midge including resistant/ tolerant variety, early sowing, seed treatment with imidacloprid 48FS @ 2.5 ml/kg seed, distribution of *Platygaster oryzae* parasitized galls at 1 per 10m² on 10 DAT, Neemazal 1% EC at 1000ml/ha on 25 DAT, fipronil 0.3 % G @ 20 kg/ha during boot leaf stage recorded moderate incidence of gall midge (7.34% silver shoot)with 67.77 percent parasitization and higher yield (4840 kg/ha)coupled with high BC Ratio (2.33).
- Application of fenazaquin 10 EC @ 1.5 ml/lit twice at 15 days interval resulted in less mite population 3.03/ 10 cm leaf length in rice variety CO 51 with 87.45 per cent reduction in mite population over control. Pooled grain yield was observed to be high 4618.9 kg / ha with 15.23 per cent yield increase over unprotected field and higher BC Ratio of 2.36. Residues of foliar applied thiamethoxam 25 WG @ 25 g ai/ha in rice leaves dissipated to below quantification level within seven days, while residues of chlorantraniliprole 18.50% SC @ 30 g ai/ha persisted in the leaves upto 30 days. In the harvested paddy samples (72 days after second spraying), chlorantraniliprole residue was detected at the level of 0.015 µg g⁻¹ in whole grains.
- Pre - storage treatment of paddy grains (variety CO 51) treated with thiamethoxam 30 FS @ 3 ml/kg seeds left initial deposit of 326.40 µg g⁻¹ in paddy whole grain. An

increased level of residue deposit was seen in bran (1447.09 $\mu\text{g g}^{-1}$) and husk (1285.31 $\mu\text{g g}^{-1}$). Thirteen per cent of the paddy grain samples collected from 20 districts recorded residues of insecticides *viz.*, deltamethrin (0.94 $\mu\text{g/gm}$), imidacloprid (0.0165 $\mu\text{g/gm}$), lambda cyhalothrin (0.133 $\mu\text{g/gm}$), cypermethrin (0.0152 $\mu\text{g/gm}$), thiamethoxam (0.0156 $\mu\text{g/gm}$) and profenophos (0.0021 $\mu\text{g/gm}$) and these chemicals especially, the synthetic pyrethroids are not prescribed for rice ecosystem. However the level estimated for a particular pesticide was below the prescribed Codex Maximum Residue Level (MRL).

11. Blast, sheath rot, false smut and bacterial leaf blight were the re-emerging diseases during 2020-21 in Tamil Nadu.
12. Solar operated impaction and suction spore traps were designed for sampling of air borne inocula of important rice pathogens.
13. A rapid highly sensitive and specific LAMP assay was developed for early detection of rice blast and brown spot pathogens.
14. The MLT entries *viz.*, 202, 207, 308, 309, 501, 502, 603 and 604; ART culture 420-1, Advance yield trial entries (Early) CB18-156, CB18-215, and CB12 – 132 and hybrid entries *viz.*, TNTRH 306, TNTRH 55, TNTRH 150 and HRI 174 were moderately resistant to leaf blast.
15. MLT entries 503 and 603 were moderately resistant to tungro disease.
16. The BLB differentials *viz.*, IRBB 54 showed immune reaction and IRBB 3 showed resistant reaction to Coimbatore *Xoo* isolate.
17. Foliar spraying of copper hydroxide @ 0.25 % along with streptomycin sulphate @ 150 ppm and foliar spraying of copper hydroxide @ 0.25 % along with potassium nitrate @ 0.5 % at initial appearance of the disease symptom and second spray at 15 days later recorded the lowest intensity of bacterial leaf blight and increased grain yield.
18. Among the different plant extracts and essential oils tested against *Xanthomonas oryzae* pv. *oryzae in vitro*, ginger rhizome extract, perunthumbai leaf extract, amla leaf extracts @ five per cent and lemongrass oil @ 500 ppm recorded highest inhibition zone.
19. *Ocimum sanctum* at 10% concentration has reduced the mycelial growth of *A. flavus* by 86% followed by *Eucalyptus teretecornis* (73%).
20. Eleven bacterial isolates were isolated from spermosphere of paddy land races *viz.*, Swarna, Mappillai samba, Navara, Abiya, Thuyamalli, Mallikar, Kerala Kandagasala and Swarnamalli.
21. Seed treatment with *Bacillus subtilis* (Bbv 57)+ foliar spray of tebuconazole 50% + trifloxystrobin 25% WG @ 1g/l recorded the lowest incidence of rice blast (15.26%) and highest yield of 5867 kg/ha.

B. Action Plan (2021-2022)

Action Plan 1: Monitoring of pest status in rice

Theme leader		Dr. K. Bhuvanewari, Professor (Entomology), TNAU, Coimbatore		
Activity	Name of the Scientist and Centre	Observations to be recorded	Deliverables/ expected out come	
<ul style="list-style-type: none"> • Monitoring pest status and keeping vigilance on emerging pests • Assessment of insect pest, mites and natural enemies population <i>in situ</i>. • Fixed plot study (One on campus fixed plot study during each season: ADT, CBE, MDU, BSR, TKM, NDM & VVNR)with light and pheromone trap • Impact of light trap on non-target arthropods in fixed plot studies • Roving survey at fortnightly interval in all the identified districts during the district specific crop seasons • Uploading of data in Google forms 	<p><u>Coordination at State level-TNAU, CBE*</u> Dr. K. Bhuvanewari, Professor (Entomology) <u>TNAU, CBE</u> Dr. Sheela Venugopal, Asst. Professor (Entomology) <u>TRRI, Aduthurai</u> Dr. P. Anandhi, Asst. Professor (Entomology) <u>AC&RI, MDU</u> Dr. K. Suresh, Asst. Professor (Entomology) <u>ARS, BSR</u> Dr. K. Ganesan, Asst. Professor (Entomology) <u>AC & RI, VVNR</u> Dr. Y. S. Jhonson Edward Thangaraj, Professor (Entomology) <u>AC&RI, KKM</u> Dr. M. Ravi, Asst. Professor (Entomology) <u>KVK, Tirur</u> Dr. V. A. Vijayashanthi, Asst. Professor (Entomology)</p>	<ul style="list-style-type: none"> • Fixed and roving survey on pest incidence. • Recording of weather parameters. • Multiple correlation and regression analysis with previous years weather data and pests damage and population data 	<p>Forewarning on emerging pests and pest management decisions Intervention with suitable IPM package Monthly documentation of pest status in the major tracts</p>	

	<p><u>KVK, TRY</u> Dr. Sheeba Jasmine, Asst. Professor (Entomology)</p> <p><u>KVK, RMD</u> Dr. K. Elanchezhyan, Asst. Professor (Entomology)</p> <p><u>KVK, Needamangalam</u> Dr. V. Radhakrishnan, Asst. Professor (Entomology)</p> <p>* will consolidate the monthly data, make assessment of the pest scenario and submit state report o/b 25th of the month to the Department.</p>		
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Action Plan 2. Identification of resistant sources and exploring insect resistance mechanisms

Theme Leader	Dr. R. P. Soundararajan, Assoc. Professor (Entomology), HC&RI(W), Trichy		
Activity	Name of the Scientist(s) and Centre(s)	Observations to be recorded	Deliverables
<p>1. Identification of resistance sources to major insect pests.</p> <p>a. Screening of TNAU (MLT/ART) entries</p> <p>b. Screening of local germplasms</p> <ul style="list-style-type: none"> Artificial screening for sucking pests: Standard Seedling Box Method of screening to be followed (CBE & ADT) Field screening for stem borer & leaf folder (to be planned coinciding with peak pest incidence period of the respective centre). <p>2. Investigation of resistance</p>	<p><u>TNAU, CBE</u> Dr. Sheela Venugopal, Asst. Professor (Entomology) SB, BPH, WBPH (Field & Artificial Screening & Mechanism resistance)</p> <p><u>TRRI, ADT</u> Dr. P. Anandhi, Asst. Professor (Entomology) SB, LF, BPH (Field & Artificial Screening & Mechanism resistance)</p> <p><u>AC&RI, MDU</u> Dr. G. Srinivasan, Assoc. Professor, (Entomology) SB, LF (Field Screening)</p>	<p>Levels of resistance in field screening/artificial as per standard procedure. Biophysical and biochemical characters of best pipeline entries only.</p>	<p>Resistant sources for BPH/WBPH/GLH/Stemborer/Leaf folder. Underlying mechanism</p>

mechanisms- Attributes contributing antixenosis & antibiosis have to be evaluated for the best entries selected for Stemborer, Leaf folder and Sucking pests (CBE & ADT). (Protocol will be sent by the Theme Leader to the participating Scientists)	<u>ARS, BSR</u> Dr. K. Ganesan, Asst. Professor(Ento) SB, LF (Field Screening) <u>ARS, TPS & RRS, ASD (Hot spot)</u> Dr. Abdul Razak, Professor (Entomology), AC & RI, KKM SB, LF (Field Screening)		
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Action Plan 3. Pesticide residue monitoring in rice grains

Theme Leader	Dr. G. Ravi, Professor (Entomology), AC&RI, KKM		
Activity	Name of the Scientist(s) and Centre(s) – Proposed	Observations to be recorded	Deliverables
<u>Activity 1:</u> <ul style="list-style-type: none"> Pesticide use pattern study through questionnaire <u>Activity 2:</u> <ul style="list-style-type: none"> Residue analysis for insecticides in all the Centres Samples to be collected: Two popular rice cultivar grown in the identified district. Sample to be collected as per the standard procedure. Season: Samba crop No. of samples per Dt.: 3 samples x 2 cultivars=6	<u>TNAU, CBE-Zone I</u> Dr. A. Suganthi, Asst. Professor (Entomology) Coimbatore, Erode, Karur , Namakkal, Salem, Vellore, Villupuram, Kancheepuram, Thiruvallur) <u>AC & RI, MDU- Zone II</u> Dr. D. S. Rajavel, Professor (Entomology) (Madurai, Dindigul, Theni, Pudukottai, Sivagangai) <u>AC & RI, TRY-Zone III</u> Dr. P. Yasodha, Asst. Professor (Ento) (Trichy, Thanjavur, Mayiladuthurai, Thiruvarur, Nagapattinam,) <u>AC&RI, KKM-Zone IV</u> Dr. G. Ravi, Professor (Entomology) (Tirunelveli, Kanyakumari, Thenkasi, Virudhunagar, Ramanathapuram)	Data collection through questionnaire Collection and analysis of residues in rice grains from six nearby Districts in each zone	For monitoring residues of important insecticides in two popular rice varieties of their region

Action Plan 4. Species complex, population dynamics and yield loss due to stem borer in rice

Theme Leader	Dr. S. Sheeba Joyce Roseleen, Asst. Professor (Ento.), ADAC & RI, Tiruchirappalli		
Activity	Name of the Scientist(s) and Centre(s) - Proposed	Observations to be recorded	Deliverables
<p>Activity 1: Seasonal incidence of stem borer complex (YSB, PSB, DHB) in rice Determination of species complex rice stem borer</p> <ul style="list-style-type: none"> • Light trap and pheromone trap to be installed • Lure in traps to be replaced once in 15 days 	<p><u>ADAC & RI, TRY</u> Dr. S. Sheeba Joyce Roseleen, Asst. Professor (Entomology) <u>TRRI, ADT</u> Dr. P. Anandhi, Asst. Professor (Entomology) <u>TNAU, CBE</u> Dr. Sheela Venugopal, Asst. Professor (Entomology)</p>	<ul style="list-style-type: none"> • Weekly observation on the species trapped • Destructive sampling @ 10 tiller/40m² • Relative abundance = Total number of each species/total number of individuals of all species x100 	<p>Stemborer complex in Tamil Nadu Yield loss due to the stemborer complex Natural enemy complex</p>
<p>Activity 2: Population dynamics and distribution pattern of stem borer complex in rice in different seasons</p>	<p><u>KVK, NDM</u> Dr. V. Radhakrishnan, Asst. Professor (Entomology)</p>	<ul style="list-style-type: none"> • Weather data • Stem borer catches/counts to be correlated with weather data and season • Natural enemies population • Larval parasitoids of the SBs 	<p>Seasonal incidence of stem borer species could be determined</p>
<p>Activity 3: Yield loss assessment due to stem borer complex in different seasons T1 – Protected (Need based application of chlorantraniliprole 18.5 SC @ 150 ml ha or flubendiamide @ 39. 35 M/M @ 50 g /ha) T2- Unprotected Design: Exploded Block & paired T test</p>		<ul style="list-style-type: none"> • Dead heart at vegetative stage and white ear at reproductive stage at fortnightly interval • Per cent dead heart and per cent white ear • Natural enemies (if any) should be recorded • Yield to be recorded at harvest 	<p>Yield loss due to stemborer complex will be assessed</p>

III. B. Plant Pathology

Theme Area

1. Disease monitoring, surveillance, epidemiological studies on rice diseases and forewarning.
2. Exploring mechanisms involved in silicon induced disease resistance in rice.
3. Developing diagnostic kits for detection of seed borne pathogens of rice.
4. Characterization of *Ustilaginoidea virens* and management of false smut disease in rice.
5. Management of bacterial leaf blight of rice.
6. Developing IDM capsule for rice blast disease.

Action Plan 1: Disease monitoring, surveillance, epidemiological studies on rice diseases and forewarning

Theme Leader	Dr. A. Ramanathan, TRRI, Aduthurai		
Activity	Name of the Scientist and Centre	Observations to be recorded	Deliverables/ out come
<p>I. Monitoring of pest and diseases under irrigated and direct sown rice (blast, sheath blight, sheath rot, bacterial blight, brown spot, grain discoloration and false smut) diseases</p> <p>1. Fixed plot survey 2. Roving survey 3. Correlation with weather factors. (All centers)</p> <p>II. Development of forecasting model for major diseases of rice using the available data (Coimbatore and Aduthurai centers)</p>	<p>1. Dr. C. Gopalakrishnan Dept. of Rice, CBE</p> <p>2. Dr. R. Akila AC&RI, Madurai</p> <p>3. Dr. V.K. Satya ADAC&RI, TRY</p> <p>4. Dr. N. Rajinimala AC&RI, KKM.</p> <p>5. Dr. R. Ramjagathesh RRS, ASD</p> <p>6. Dr. S. Malathi RRS, Tirur and ACRC, Coimbatore.</p>	<p>Per cent disease incidence / PDI as per standard grades.</p> <p>Correlation and regression analysis of pest and disease progression during cropping periods in relation to weather parameters.</p> <p>Regular bulletins on pest and disease scenario in the particular zone should be given for the benefit of farmers through press and media marking a copy to Director (CPPS).</p>	<p>Timely monitoring of disease epidemics and fore-warning of farmers and line departments.</p>

Action Plan 2: Exploring mechanisms involved in silicon induced disease resistance in rice

Theme Leader	Dr. C. Gopalakrishnan, Dept. of Rice, Coimbatore		
Activity	Name of the Scientist and Centre	Observations to be recorded	Deliverables

I.. Identification of resistant sources for major diseases (blast, sheath blight, sheath rot, bacterial blight, brown spot, false smut and grain discolouration)	1. Dr. A. Ramanathan, TRRI, Aduthurai 2. Dr. R. Akila AC&RI, Madurai 3. Dr. R. Ramjegathesh RRS, Ambasamudram.	Multiple resistant entries for diseases under both natural and artificial conditions (wherever possible).	Mechanism involved in silica induced disease resistance in promising/advance rice cultures will be characterized.
II. Unravelling the silicon induced mechanism of resistance in rice by applying silixol as foliar spray @ 0.6% twice at 7 days interval at tillering stage under glass house conditions.	4. Dr.J.Sheela, AC & RI, Killikulam. 5. Dr. N. Rajinimala AC&RI, KKM. 6. Dr. K. Kalpana, AC&RI, Madurai	The mechanism of silica induced resistance viz., physical (silica content in leaves, leaf and epidermal thickness, stomata length and width, Trichome characters, pattern of silica deposition (SEM studies) and biochemical changes in silica treated and untreated plants 7-10 days after application have to be studied in advanced/pipeline cultures for major diseases.	

Action Plan 3: Developing diagnostic kits for detection of seed borne pathogens of rice

Theme Leader	Dr. C. Goplakrishnan, Professor, Dept. of Rice, TNAU, Coimbatore		
Activity	Name of the Scientist and Centre	Observations to be recorded	Deliverables
Developing LAMP based protocol for the detection of important seed borne pathogens of rice.	1. Dr. C. Goplakrishnan Dept. of Rice, Coimbatore 2. Dr. A. Kamalakannan, Dept. of Plant Pathology, TNAU, Coimbatore 3. Dr. T. Anand Seed Centre, TNAU, Coimbatore	i. Isolation of DNA of <i>Magnaporthe grisea</i> , <i>Cochliobolus miyabeanus</i> , and <i>Sarocladium oryzae</i> from seeds. ii. Designing lamp primers for each pathogen iii. Validating sensitivity and specificity of LAMP primers iv. Developing LAMP based protocol for the detection of seed borne pathogens	Development of diagnostic kit for the detection of important seed borne diseases in rice seeds which can be used in quarantine and seed certification.

Action Plan 4: Characterization of *Ustilagoideae virens* and management of false smut disease

Theme Leader:	Dr. K. Kalpana, Asst. Prof. (Pl. Path.) AC&RI, Madurai		
Activity	Name of the Scientist and Centre	Observations to be recorded	Deliverables
<p>i. Isolation of <i>Ustilagoideae virens</i> from different locations and its characterization</p> <p>ii. Diversity analysis and comparisons with disease severity and regions</p> <p>iii. Development of forewarning system</p> <p>iv. Standardization of artificial inoculation methodologies.</p> <p>v. Isolation and identification of potential endophytes against <i>Ustilagoideae virens</i>.</p>	<p>1. Dr. A. Ramanathan, Professor (Pl. Path.), TRRI, Aduthurai</p> <p>2. Dr. V.K. Satya ADAC&RI, TRY</p> <p>3. Dr. N. Rajinimala, Asst. Prof. (Pl. Path.), AC&RI, KKM</p> <p>4. Dr. R. Ramjegathesh, Asst. Prof. (Pl. Path.), RRS, Ambasamudram</p> <p>5. Dr. S. Malathi, Asst. Prof. (Pl. Path.), RRS, Tirur</p> <p>6. Dr. M. Devanathan, AC & RI, VVNR</p> <p>7. Dr. C. Gopalakrishnan Professor (Pl. Path.), Dept. of Rice, CBE.</p>	<p>i. Morphological variability</p> <p>ii. Molecular variability (Molecular characterization should be carried out at Madurai and all the centres should send cultures to Dr. K. Kalpana, AC & RI, Madurai from all seasons)</p> <p>iii. Per cent disease index</p> <p>iv. Grain yield</p>	<ul style="list-style-type: none"> To have pathogenic diversity data An artificial inoculation method will be available A forewarning model will be available To develop suitable management methods for rice false smut disease.

Action Plan 5: Management of bacterial leaf blight (BLB) of rice

Theme Leader:	Dr. R. Akila, Asst. Prof. (Pl. Path.) AC&RI, Madurai		
Activity	Name of the Scientist and Centre	Observations to be recorded	Deliverables
<p>1. Exploitation of endophytes</p> <p>a. Isolation of endophytes against Xoo. b. <i>In vitro</i> and <i>in vivo</i> evaluation</p> <p>2. Management of BLB by non-chemical methods</p> <p>T1. Seed treatment with <i>Bacillus subtilis</i> (Bbv57) (10g/kg) + foliar spray 0.5 % at 30 and 45thDAP</p> <p>T2. Foliar spraying of <i>Mentha piperita</i> (10%) at 30 and 45thDAP</p> <p>T3. Foliar spraying of fresh cow dung extract (20%) at 30 and 45thDAP</p>	<p>1. Dr. V.K. Satya, Asst. Prof. (Pl. Path.) ADAC&RI, TRY</p> <p>2. Dr. R. Ramjegathesh, Asst. Prof. (Pl. Path.), RRS, Ambasamudram</p> <p>3. Dr. S. Malathi RRS, Tirur</p> <p>4. Dr. A. Ramanathan TRRI, Aduthurai</p>	<p>1. PDI at 15 and 30 Days after application</p> <p>2. Yield (kg/ha)</p> <p>3. C:B ratio</p>	<p>To develop suitable non chemical method for rice BLB management</p>

T4.Foliar spraying of neem oil (3%) at 30 and 45 th DAP T5.Foliar spraying of copper hydroxide 77WP (1.25 kg/ha) at 30 and 45 th DAP T6. Control	5. Dr. D. Deivamani AC & RI, VVNR		
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Action Plan 6: Developing IDM capsule for rice blast disease

Theme Leader:	Dr. R. Ramjagathesh, RRS, Ambasamudram		
Activity	Name of the Scientist and Centre	Observations to be recorded	Deliverables
Developing IDM capsule for Rice blast disease T1. IDM capsule for rice blast disease 1 - Selection of variety (tolerant / resistant variety - ADT45 / TKM13) 2- Seed treatment (10g/kg) + seedling dip (500 g/ha) + soil application (2.5kg/ha) of <i>Bacillus subtilis</i> 3- Cultural practices (Cleaning of weeds in bunds) 4- Nutrient management- Soil application of Daincha@ 6.25 t/ha (or) FYM 12.5 t/ha + recommended dose of fertilizers with split application. 5- Need based spraying of chemicals - Picoxystrobin 6.78% + Tricyclazole 20.33% SC @ 0.1 % T2. Farmer's practice T3. Control	Dr. A. Ramanathan, TRRI, Aduthurai Dr. C. Goplakrishnan, TNAU, Coimbatore Dr. S. Malathi, RRS, Thirur Dr. N. Rajinimala, AC & RI, Killikulam Dr. R. Ramjagathesh, RRS, Ambasamudram	1.Per cent disease index 2.Grain yield 3.CB ratio	To develop suitable IDM capsule for rice blast disease management

C. Project-wise Remarks

Crop	Agri. Ent. (No.)	Pl. Path. (No.)
University Research Projects	6	9
AICRP Projects	2	2
Externally Funded Projects	-	1
Core Projects	-	-
Total	8	12

1. AGRICULTURAL ENTOMOLOGY

Sl. No.	Project No. and Title	Remarks
Core Project		
1	CPPS/CBE/ENT/RIC/2018/ CP017: Ecological engineering for rice Dr. N. Muthukrishnan, Professor (Agrl. Entomology) June 2018 to May 2020	Completion report approved
University Research Project		
2	CPPS/TRY/ENT/RIC/2018/CP093: Exploring the effectiveness of newer insecticides and its detoxifying mechanisms for the management of Stem borer complex in rice. Dr. Sheeba Joyce Rosleen, AP (Ento.) and Dr. G. Preetha, AP (Ento.) Sept, 2018 – Sep' 2020	<ul style="list-style-type: none"> • Publication has to be made in peer reviewed journals and a copy may be sent to director, CPPS • Completion report must be submitted on or before 31st May, 2021
3	CPPS/ADT/ENT/RIC/2020/001 Determination of population dynamics and formulation strategies for the management of Rice hispa, Black bug and whorl maggot Dr. P. Anandhi, Asst. Professor (Agrl. Entomology) (April 2019- March 2022)	Project may be continued
4	New project: Impact of post-harvest processing techniques on thiamethoxam and chlorantraniliprole residues in paddy. Dr. A. Suganthi, Asst. Professor (Agrl. Entomology) (September, 2020 – August 2022)	Project may be continued
5.	AICRP/CPPS/CBE/ENT/RIC/2020/001 Developing ergonomic methods for mass culturing of rice moth <i>Corcyra cephalonica</i> Stainton Dr. S. Jeyarajan Nelson, Professor (Agrl. Entomology)	<ol style="list-style-type: none"> 1. Corcyra egg output in regular trays may be compared with the new bucket method. 2. Addition of amaranthus seeds @100 g/ 2.5kg of cumbu seeds may also be tried separately for both regular tray and bucket method and yield in terms of eggs may be compared.

AICRP Project

1.	AICRP/PBG/CBE/RIC/003: All India Co-ordinated Rice Improvement Project – Entomology Part (Coimbatore) Dr. Sheela Venugopal, Asst. Professor, (Agrl. Ento.)	Project may be continued
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2.	AICRP/PBG/ADT/RIC/002 All India Co-ordinated Rice Improvement Project – Entomology Part (Aduthurai), Dr. P. Anandhi, Asst. Professor (Agrl. Ento.)	Project may be continued
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2. PLANT PATHOLOGY

S. No	Project No. and Title	Remarks
University Research Projects		
1	CPPS/ADT/PAT/RIC/2020/001. Studies on host plant resistance and management of Blast, Brown Spot and BLB in rice under artificial and field conditions. (September 2020 – August 2022) Dr.A. Ramanathan	The project may be continued.
2	CPPS/CBE/PAT/RIC/2019/001. Management of aflatoxin contamination in rice through botanicals. (July 2019 –June 2022) Dr. C. Gopalakrishnan,	The project may be continued.
3	CPPS/TRY/PAT/RIC/2020/001 Bio-intensive management of blast and bacterial leaf blight in paddy using <i>Streptomyces</i> spp. under salt affected soils (September 2020- August 2023) Dr. V.K. Satya	The project may be continued.
4	CPPS/ASD/PAT/RIC/2018/001. Eco - friendly management of blast and sheath blight diseases of rice. (May 2018 – April 2021) Dr. R. Ramjegathesh	The project may be continued.
5	CPPS/ASD/PAT/RIC/2018/002. Management of bacterial leaf blight disease in rice. (June 2018 – May 2021) Dr. R. Ramjegathesh	The project may be continued.
6	CPPS/TKM/PAT/RIC/2020/001: Management of rice blast disease under irrigation and direct sown conditions (March 2020 –February 2023) Dr. S. Malathi	The project may be continued.
7	New. Management of false smut disease of rice in North Eastern Zone of Tamil Nadu (May 2021- April 2024) Dr. S. Malathi	The project has been resubmitted for RPAC approval and work may be initiated.

8.	CPPS/KKM/PAT/RIC/2020/001 Biocontrol potential of spermospheremicrobiomes on rice brown spot pathogen <i>Bipolarisoryzae</i> (April 2020-March2023) Dr.J. Sheela	The project may be continued.
9.	CPPS/KKM/PAT/RIC/2020/002 Management of Bacterial Leaf Blight of Rice caused by <i>Xanthomonas oryzae</i> pv. <i>oryzae</i> using plant products and essential oils. (July 2020- June 2023) Dr.N.Rajinimala	The project may be continued.

AICRIP Projects		
1.	AICRP/PBG/CBE/RIC/003 All India Co-ordinated Rice Improvement Project – Pathology Part (Coimbatore) Dr. C. Gopalakrishnan	The research work may be continued as per the technical programme of AICRIP.
2.	AICRP/PBG/ADT/RIC/002 All India Co-ordinated Rice Improvement Project – Pathology Part (Aduthurai) Dr. A. Ramanathan	The research work may be continued as per the technical programme of AICRIP.
External funded Projects		
1.	DST/CPPS/CBE/PAT/2019/R020. External funded Project (DST) Climate change mediated aerobiological studies on air borne pathogens of rice (March2019-February 2022) Dr. A. Kamalakannan	The work may be continued as per the objectives of the project.

Technical Recommendations of the Director CPPS

- a. All the scientists are instructed to monitor the insect pests and diseases of rice in their districts regularly. If any outbreak of existing pests, disease and nematodes or occurrence of new insect pests, diseases and nematodes of rice noticed report to the Director (CPPS) immediately.
- b. The Scientists identified for pest and disease surveillance in the state are requested to upload the data in the Google Forms for consolidation by the Head of the Departments.

The Heads of the Department are instructed to submit the monthly pest and disease surveillance report to the Director CPPS on or before 2nd of every month without fail.

- c. The monthly progress made under the OFT and Action Plans should be submitted to the respective Head of the Departments by the Monitoring Scientist/Theme Leader o/b 25th of every month and a consolidated report of the progress made should be made by the respective Head of the Departments to Director CPPS along with the Monthly Reports.
- d. Basic work on mechanism of resistance, effect of cropping systems on pests and diseases and their natural enemies, insect plant interaction, host pathogen interaction and induced systemic resistance should be taken up using PG and Ph.D. students.
- e. The microbial culture collections have to be deposited with the University Repository available at the Plant Pathology Department by all the Scientists working on microbials.
- f. Forecasting model may be developed for major diseases of rice using the available data.

4. GENERAL RECOMMENDATIONS

I. CROP IMPROVEMENT

- All the wild rice species are to be studied for their unique traits and documented. Species having specific trait need to be utilized for crossing (Action: Department of Rice, Coimbatore).
- The available traditional rice varieties are to be evaluated systematically and breeding for improvement of specific land races can be allotted to different rice breeding stations based on the regional preference / popularity. (Action : Coimbatore, Aduthurai, Tirur, Ambasmudram, Madurai and Vaigaidam).
- All the advanced pre-release rice cultures need to be evaluated under larger plots to assess the yield potential and pests and disease reaction. (Action : Coimbatore, Aduthurai, Tirur, Ambasmudram, Trichy, Killikulam, Madurai)
- A rice variety with superior yield potential and with a special attributes may be identified and released to commemorate the TNAU's Golden Jubilee Year. (Action : Director, CPBG)
- Research work may be initiated on the production of doubled haploids in rice through Ph.D., research programme. (Action : Director, CPBG)
- All the available traditional rice varieties need to be screened for seed dormancy. (Action: SS&T, Coimbatore)
- All the new rice varieties are to be popularized aggressively through large scale seed production and distribution. A new project on strengthening seed production at different BSP centers need to be submitted under NADP. (Action : Seed Centre)
- All the MLT/ART entries are to be decoded in advance and only the culture name should be presented during the CSM. (Action : Aduthurai)
- New breeding approaches is to focused to maximize the yield

II. CROP MANAGEMENT

- Exclusive brain storming session on farm mechanization in rice to be organized (Online / Offline) by coordinating with all rice scientists and Engineers in TNAU to develop standard operating procedure for rice mechanization (Action : DCM, TNAU).
- Documentation and validation of location specific organic package of practices followed at Singampatti, Ambasamudram for organic rice cultivation (Action: DSOA, TNAU, Coimbatore and RRS, Ambasamudram).
- Complete mechanization in rice especially for Labour saving, Timely operation *etc.* (Action: TRRI, Aduthurai and AEC & RI, Kumulur).
- The detailed report on Zinc Solubilising Bacteria trials may be presented in the Non crop Specific Projects Meet 2021 for further forwarding and finalization (Action: Dept. of Agri. Microbiology, TNAU, Coimbatore).

III. CROP PROTECTION

- All the plant protection screening trials should include both susceptible and resistant varieties. (Director, CPPS)
- While screening for Gall midge, MDU 3 should be included as resistant check. (Action : Director, CPPS)
- Incidence of mite during summer and samba season need to be studied and reported.(director, CPPS)
- Incidence of false smut need to be studied and the resistant checks identified may be utilized in the crossing programme. (Action : Director, CPPS, Dept. of Rice)

5. LIST OF PARTICIPANTS

The review of the University Research Projects pertaining to crop protection in rice was conducted at the Seminar Hall of the Department of Agricultural Entomology on 8.04.2021.

Present:

1. Dr. K. Prabakar, Director, CPPS & RPAC Chairman
2. Dr. N. Sathiah, Professor and Head, Department of Agri. Entomology & RPAC Member
3. Dr. G. Karthikeyan, Professor and Head, Department of Plant Pathology & RPAC Member
4. Dr. A. Shanthi, Professor and Head, Department of Nematology & RPAC Member

The following University Officers attended the review online.

1. Dr. V. Ambethgar, Director, TRRI, Aduthurai
2. Dr. S. Palpandi, Dean, AC&RI, Madurai
3. Dr. I. Eraivan Arutkani Ayyanathan, Dean, AC&RI, Killikulam
4. Dr. N. Muthukrishnan, Dean incharge, AC&RI, Vazhavachanur
5. Dr. A. Velayutham, Dean incharge, AC&RI, Eachankottai

The list of Scientists who have attended the review is given below.

AGRICULTURAL ENTOMOLOGY

In person
1. Dr. S. V. Krishnamoorthy, Professor (Entomology), Dept. of Entomology, TNAU, Coimbatore
2. Dr. G. Umapathy, Professor (Entomology), Dept. of Entomology, TNAU, Coimbatore
3. Dr. S. Jeyarani, Professor (Entomology) & RC, Dept. of Entomology, TNAU, Coimbatore
4. Dr. K. Bhuvaneswari, Professor (Entomology), Dept. of Entomology, TNAU, Coimbatore
5. Dr. S. Jeyarajan Nelson, Professor (Entomology), Dept. of Entomology, TNAU, Coimbatore
6. Dr. M. Murugan, Professor (Entomology), Dept. of Entomology, TNAU, Coimbatore
7. Dr. R. Vishnupriya, Professor (Entomology), Dept. of Entomology, TNAU, Coimbatore
8. Dr. E. Sumathi, Associate Professor (Entomology), Dept. of Entomology, TNAU, Coimbatore
9. Dr. V. Baskaran, Asst. Professor (Entomology), Dept. of Entomology, TNAU, Coimbatore
10. Dr. B. Vinothkumar, Asst Professor (Entomology), Dept. of Entomology, TNAU, Coimbatore
11. Dr. A. Suganthi, Asst. Professor (Entomology), Dept. of Entomology, TNAU, Coimbatore
12. Dr. SheelaVenugopal, Asst. Professor (Entomology), Dept. of Rice, TNAU, Coimbatore
Online (Campus/Station/KVK)
1. Dr. M. Shanthi, Professor and Head, Dept. of Entomology, AC &RI, Madurai
2. Dr. M. R. Srinivasan, Professor and Head, Dept. of Agrl. Entomology, AC&RI, Killikulam
3. Dr. C. Gailce Leo Justin, Professor and Head, Dept. of Crop Protection, ADAC&RI, Trichy
4. Dr. D.S. Rajavel, Professor (Entomology), AC &RI, Madurai
5. Dr. C. Chinniah, Professor (Entomology), AC &RI, Madurai
6. Dr. S. Manisegarane, Professor (Entomology), AC &RI, Madurai
7. Dr. J. Jayaraj, Professor (Entomology), AC &RI, Madurai
8. Dr. G. Srinivasan, Assoc. Professor (Entomology), AC&RI, Madurai
9. Dr. R. P. Soundararajan, Assoc. Professor (Entomology), HC&RI(W), Trichy
10. Dr. P. Yasodha, Asst. Professor (Entomology), ADAC&RI, Trichy
11. Dr. Sheeba Joyce Rosleen, Asst. Professor (Entomology), ADAC&RI, Trichy
12. Dr. Abdul Razak, Professor(Entomology), AC&RI, Killikulam
13. Dr. G. Ravi, Professor(Entomology), AC&RI, Killikulam
14. Dr. N. Balakrishnan, Assoc. Professor(Entomology), AC&RI, Killikulam
15. Dr. G. Preetha, Asst. Professor(Entomology), AC&RI, Killikulam
16. Dr. M. Ravi, Asst. Professor(Entomology), AC&RI, Killikulam
17. Dr. S. Douressamy, Professor (Entomology), AC&RI, Vazhavachanur
18. Dr. A. Thirumurugan, Professor (Entomology), AC&RI, Eachankottai
19. Dr. P. Anandhi, Asst. Professor (Entomology), TRRI, Aduthurai
20. Dr. K. Ganesan, Asst. Professor, ARS, Bhavanisagar
21. Dr. B. Usharani, Asst. Professor (Entomology), KVK, Madurai
22. Dr. Sheeba Jasmine, Asst. Professor (Entomology), KVK, Sirugamani
23. Dr. V. Radhakrishnan, Asst. Professor (Entomology), KVK, Needamangalam
24. Dr. V. A. Vijayashanthi, Asst. Professor (Entomology), KVK, Tirur

PLANT PATHOLOGY

In person
1. Dr. Dr. C. Gopalakrishnan, Professor, Dept. of Plant Pathology, TNAU, Coimbatore
2. Dr. A. Kamalakannan, Professor, Dept. of Plant Pathology, TNAU, Coimbatore
Online (Campus/Station/KVK)
1. Dr. A. Ramanathan, Professor, TRRI, Aduthurai
2. Dr. S. Malathi, Asst. prof., Rice Research Station, Tirur
3. Dr. Rajinimala, Asst. Prof., Dept. Plant Pathology, AC&RI, Killikulam
4. Dr. R. Akila, Asst. Prof., Dept. of Plant Pathology, AC&RI, Madurai
5. Dr. K. Kalpana, Asst. Prof., Dept. of Plant Pathology, AC&RI, Madurai
6. Dr. V. K. Satya, Asst. Prof. Dept. Plant Pathology, ADAC&RI, Tirchy
7. Dr. R. Ramjegathesh, Asst. Prof., Rice Research Station, Ambasamudhram