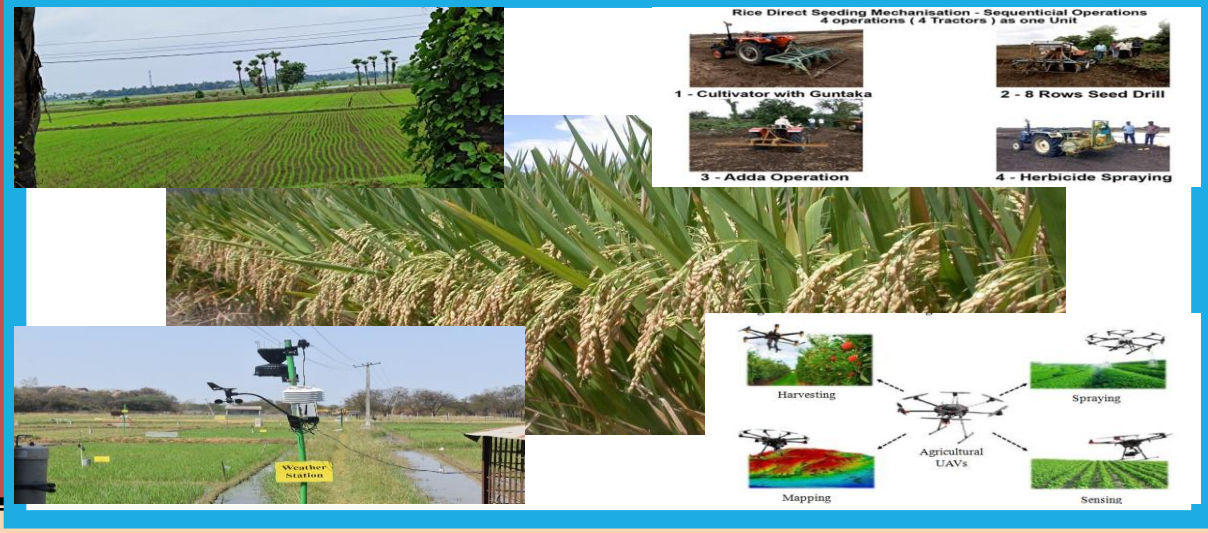
59th

ALL INDIA CO-ORDINATED RESEARCH PROJECT ON RICE (AICRP on RICE)

AGRONOMY

TECHNICAL PROGRAMME (2023-24)



भाकृअनुप
ICAR

ICAR – INDIAN INSTITUTE OF RICE RESEARCH

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		enhancement of the productivity in Wet direct seeded rice (puddle soil)	
III	**RICE BASED CROP DIVERSIFICATION SYSTEM TRIALS (RBCDTs)**		
8	RBCDS-1	Conservation Agriculture / System based Management Practices in rice and rice-based cropping systems (crop diversification) for higher profitability (**Interdisciplinary with Entomology and Pathology**)	
9	RBCDS-2	Assessing the performance and yielding ability of Sorghum hybrids in Rice fallows (**Interdisciplinary with IIMR)**	
10	RBCDS-3	Long term trial on weed dynamics in rice based cropping systems under different establishment methods	
11	RBCDS-4	Weed survey in different zones	
12	RBCDS-5	Analysis of long term meteorological data of AICRIP centres (temp and rainfall) for identifying the reasons for yield reduction (Collection of 25 years data)- **Computer Sciences and Statistics**	
IV	**INTERDISCIPLINARY TRIALS**		
13	IDT-1	a) Yield maximization of rice in different zones (Interdisciplinary with Soil Science)	
14	IDT-2	Agronomic evaluation of the package of practices of the best farmers of the state/ region and yield gap analysis of the region. (Agronomy, Soil science and Agricultural Economics)	
15	IDT-3	Evaluation of Organic fertilizers and Natural farming practices for enhancing the productivity and soil heath (Interdisciplinary trial – Agronomy, Soil Science and Crop protection)	
16	IDT-4	Nano-fertilizers for increasing nutrient use efficiency, yield and economic returns in transplanted rice (New trial)- (Interdisciplinary with Agronomy and IFFCO)	
17	IDT-5	Integrated Pest Management – (E**ntomology and Pathology)**	
18	IDT-6	Evaluation of drone for its suitability to various Agronomy interventions	

I. AGRONOMIC EVALUATION TRIALS – AVT-2 (Interdisciplinary trials with Plant Breeding)

Introduction:

Nutrients are playing as a key role in productivity and required in large quantities. These nutrients viz., NPK has a positive influence on the production of yield attributes such as effective tillers per plant, grain number and ultimately grain yield. Many researchers have reported a significant response to nutrients in different soils.

The AVT-2 cultures which performed consistently for the last 3 years will be tested for their nutrient response at different locations before the release of the variety which is mandatory for release of the variety . Further, the herbicide tolerant cultures , identification of nutrient efficient (N and P) cultivars and Near Isogenic Lines (NILS for pests and diseases , drought) were also initiated for the past 2 years and continued.

Hence, Advanced Variety Trial materials (AVT-2) of different groups are tested for their performance under an optimum dose of fertilizer and 50 % and 100 % of optimum dose (RFD) at different locations.

Objectives:

- To study the grain yield potential, nutrient response and nutrient use efficiency of promising AVT-2 cultures under optimum and low input management in rice.
- To identify promising, efficient and stable genotypes based on the Grain Yield Efficiency Index (GYEI) and yield reduction in reduced Nutrient application
- To identify nutrient efficiency , herbicide tolerant and NILs (biotic and abiotic tolerance)
- To support breeders with agronomy data for release of varieties in CVRC

Trial No.	**:**	**1 (AET 1(a) to 1(l))**
Name of the trial	**:**	**Nutrient response trials on selected AVT-2 rice cultures under optimum and low input management & Evaluation of Herbicide tolerant cultivars**

AVT-2 Culture	***Days to 50% flowering***	**Checks**	**Locations**
(a) AVT 2-M (H)	AET-1a		
IET 29654 IET 28906 IET 30503	100	RC Maniphace 1(NE), Vivekdhan 62, V L Dhan 65(N), K 343 (RP) and LC	Almora, Khudwani, Lamphelpat, Malan, Umiam, Upper Shillong, Wangbal
(b) AVT 2-E(TP)	AET -1b		
IET 29947 IET 29940 IET 29939 IET 29694 IET 29689 IET 29692 IET 28123 IET 29691 IET 29690 IET 29696 IET 29700 IET 29975 IET 28965 IET 28956 IET 29142(R)	80	CO-51 (NC), PR-124 (N),Narendra 97(E), Luit (NE), Sahbhagidhan (C&W), MTU 1153 (S), US 314 (Hybrid); and LC	Coimbatore, Dhangain, Faizabad, Ghaghraghat, Karjat,Hazaribagh, Jagdalpur, Mandya, Maruteru, Nagina, Nawagam, Puducherry, Ranchi, Rewa, Sabour, Vadgaon, Varanasi
(c)AVT 2 – IME	AET -1c		
IET 29738		Gontra Bidhan-3	Aduthurai,Chinsura

IET 29734 IET 29726 IET 29708 IET 29717 IET 29820 IET 29808 IET 29822 IET 29188 IET 29304 IET 30282 IET 29203 IET 30697		(NC); PR 113 (N), Lalat (E & NE), Karjat-7 (W), MTU 1010 (C& S), IR64 sub1(RP), US 312 and Local Check	h,Dhangain,Faizabad,Gangavathi, Ghaghraghat, Kanpur,Karjat, Kota, Mandya, Maruteru, Nagina, Navsari, Nawagam, Puducherry, Varanasi, Warangal
(d) AVT 2 – IM AET -1d			
IET 29743 IET 29741 IET 29833 IET 28523 IET 29742 IET 29290(R) IET 29301(R) IET 29257(R) IET 29284(R) IET 29014(R) IET 29002(R) IET 30757 IET 29859	100	NC- NDR 359; Zonal- PR121 (N), CR Dhan 300 (E& NE), Karma Mahsuri (C), Akshaydhan (W), Jaya (S), HRI 174, and local and Hybrid check	Chinsurah,Coimbatore, Dhangain,Faizabad, Jagdalpur,Karjat, Kaul, Maruteru, Nagina, Navsari, Nawagam, Pantnagar, Puducherry, Pusa, ARI-Rajendranagar, Titabar, Varanasi, Warangal
(e) AVT 2-L AET -1e			
IET 28524 IET 29891 IET 29935 IET 30826 IET 30828		Swarna (NC), NDR 8002 (E &C), Ranjeet (NE), Salivahana (W), Pushyami (S), PA 6444 (Hybrid) and Local check;	Aduthurai, Chinsurah, Chiplima Dhangain, Karjat, Mandya Maruteru, Nawagam, Pusa,

		Samba Mahsuri (RP)	ARI - Rajendranagar
(f) AVT 2-CSTVT AET -1f			
IET 30201		CSR 10, CSR 36, Pusa 44 and local check	Chinsurah, Canning Town,Maruteru, Nagina, Navsari,Panvel, Vytilla, Gangavathi, Kaul
(g) AVT 2-AL&ISTVT AET -1g			
IET 30162 IET 30164 IET 30165 IET 30176 IET 30178 IET 30827 IET 30830		CSR 36 (Alkaline), CSR 10 (Early), FL 478 (Saline Tolerant), CSR 23 (Inland Saline), Pusa 44 (Sensitive) and local check	Ghaghraghat, Kanpur, Navsari, Lucknow, Pusa, Kampasagar (KPS)
(h) AVT 2-AEROBIC AET -1h			
IET 30051 IET 30024 IET 30004 IET 30029 IET 30021 IET 30041 IET 29405(R) IET 28636		CR Dhan 201(NC), CR Dhan 202 (N, E, NE & C), AAUDR-1 (W), MAS 946-1 (S); PA 6129 (Hybrid), DRRDhan 54, Pusa 44(RP) and Local Check	Cuttack,Jagdalpur, Kaul, Kota,Ludhiana, Nawagam, Pantnagar, Raipur, Vadgaon, Varanasi, Hazaribagh
(i) AVT 2-MS AET -1i			
IET 30083 IET 30078 IET 30107 IET 29536 (R)		WGL 14 (NC 1), BPT 5204 (NC 2); Zonal-Improved Samba Mahsuri (N, E & C),	Chakdah, Dhangain, Faizabad, Karjat, Kaul, Mandya,

		Ketekejoha (NE), Karjat-6 (W), ADT-49 (S) and Local Check	Maruteru, Nagina, Nawagam, Raipur, ARI-Rajendranagar
(j) AVT 2-LPT*(Details inside)* AET -1j			
IET 29549 IET 30240 IET 30252 IET 30235 IET 30233 IET 30230 IET 30242		Swarna, Rasi, Improved Samba Mahsuri, BPT 5204 and local check	Gangavathi, Karjat, Kaul, Mandya, Maruteru, Pusa, Raipur, Ranchi, Varanasi, Vadgaon, IIRR
(k) AVT 2-LNT *(Details inside)* AET -1k			
IET 29578 IET 29577 IET 30270 IET 30261 IET 29581 IET 30273		Swarna, Rasi, Improved Samba Mahsuri, BPT 5204 and Local check	Gangavathi, Karjat, Kaul, Mandya, Maruteru, Pusa, Raipur, Ranchi, Varanasi, Vadgaon, IIRR
(l) AVT 2 – BORO AET -1l			
IET 29624		Gowtam, IR 64	Arundhatinagar, Bankura, Chiplima, Chinsurah, Cuttack, Gerua, Pusa and Titabar
(m) AVT1- NIL (HT cultivars- trait verifications) AET-1m			
G1 G2 G3 G4 G5 G6 G7 G8			Cuttack Hazaribagh Chinsurah Bikramganj Titabar Gerua Coimbatore Naira New Delhi

G9 G10 G11 G12 G13			
(n) BAS-HT AET-1n			
(o) AVT 2 – EDS AET-1o			
IET29036 IET30330 IET30328 IET29052 IET30351 IET30334 IET30336		NC: Sahabhagidhan LC:_____	Hazaribagh Raipur Coimbatore Jagdalpur Ranchi Rewa
(p) AVT 2 – RSL AET-1p			
IET30409 IET30410 IET30367		NC: Swarna Sub 1 LC:_____	Chinsurah Bikramganj Cuttack Ghagraghat Titabar Maruteru
(q) AVT-2 SDW AET-1q			
IET29026 IET29031		NC: CR Dhan 506 LC:_____	Chinsurah Cuttack Pusa Karimganj Ghagraghat

*** NC- National Check, ZC- Zonal Check, E-Eastern, W- Western, N-Northern, S-Southern, NE- North Eastern, HC- Hybrid Check, LC-Local Check**

Note:

- ***National check, Zonal check and local check must be included in the trial***
- ***Please include most recently released variety as local check***
- ***Keep the seeds of standard checks for next season.***

Observations:

1. Number of panicles/m^2 at harvest
2. Panicle weight (g)
3. Days to 50% flowering (compulsory)
4. Duration (Seed to Seed) (in days)
5. Grain yield (kg/ha)
6. Water quantification* (for AEROBIC TRIALS/ Drought NILS)
7. Incidence of disease and pests, if any (NIL trials)
8. Soil nutrient status (available NPK) for all trials and plant N or P uptake in plants for Nutrient trials in collaboration of Soil Science

(a) General instructions for transplanted

Layout **:** Split Plot Design
Replications **:** 3
Plot Size **:** 15 m^2
Spacing **:** 20 cm x 10 cm (Location specific spacing)
Treatments:
Season **:** *Kharif*
Main plots: **Nutrient for cultivars**

Nutrient level1 -50% NPK/ha of recommended dose
Nutrient level 2 -100% NPK /ha of the recommended dose.

Recommended dose will be as per the soil test based and mention while sending the data

Sub-plots **:** Cultures &Varieties (5-10)

Use urea as a source of nitrogen, apply N in 3 splits (50% at basal + 25% at tillering + 25% at Panicle initiation) and **indicate Nutrient rate applied (kg/ha)** under Nutrient-1and Nutrient 2 treatments for computing Nutrient response.
N Should be applied in three splits, K in two splits and P as basal
Use one Neem coated Urea
Mention the dose of Nutrients applied for each treatment

(b) General instructions for aerobic rice (AVT-2 E/ME direct-seeded):

Layout **:** Split Plot Design
Replications **:** 3
Plot Size **:** 15 m^2
Spacing **:** Dibble 1 or 2 seeds / hill at spacing of 20 x 10 cm

- Apply Pendimethalin herbicide @ 1 kg a.i. /ha at near-saturated condition within 3– 4 days of sowing.
- Inter-cultivation at regular intervals is recommended to control weeds
- Maintain aerobic condition and provide need-based frequent irrigation so that plants will not experience moisture stress at critical stages of crop growth
- Rainfall data and quantity of irrigation water and Number of irrigations given during crop growth need to be recorded

P, K & Zn levels :

Apply P, K and Zn on soil test basis through Single Super Phosphate, Muriate of Potash and Zinc Sulphate. Indicate the levels of P, K and Zn applied.

Water Management: Recommended practices of irrigation **(Transplanted/direct-seeded rice/ Aerobic rice)** and follow other operations as per package of practices uniformly.

- **Conduct the trials with same of cultivars mentioned in the Technical program**
- **Please retain the seed of check varieties for next season sowing**
- **Furnish the duration of cultures (seed to seed) under different fertilizer levels.**
- Indicate the recommended dose of fertilizer (RDF)
- Supply the data of cultivars as per the sequence given in the technical program.
- Mention the reasons for very high or low yields of the trials
- Mention the incidence of pests and diseases in different levels of Nutrients

Trial No : 1(j)
Trial Code : AVT 2-LPT(Phosphorus efficient cultivars)

Trial Name : Evaluation of identified cultures and cultivars for low phosphorus tolerance in irrigated rice (Interdisciplinary with Plant breeding)

Introduction:

Rice is a major cereal crop in India. Phosphorus is an important nutrient for rice production but the use efficiency of this nutrient is very low (20-30%) and phosphorus deficiency has been identified as one of the major constraint limiting crop production. Enhancing phosphorus use efficiency in rice would offer an affordable option for improving yields and economic returns with reduced inputs. Further, research studies have revealed that genotypic differences for PUE exist. There is a need to identify the cultivars, which are adapted to low P situations and have higher P use efficiency.

Objectives :

- To study the comparative performance of elite lines and cultivars in different levels of Phosphorus
- To identify the elite lines for tolerance to low P soil conditions

Locations :

Gangavathi	Karjat	Kaul	Ludhiana
Mandya	Maruteru	Pusa	Raipur
Ranchi	Varanasi	Vadgaon	IIRR

Design: Split Plot Design Replications: 3

Treatments: Main = 3 P doses

P_1- No Phosphorus (Control) (**N and K Constant**)

P_2- 50 %of recommended P dose – 30 kg /ha (N and K is constant)

P_3- 100 % of the recommended dose of P- 60 kg/ ha (N and K constant)

Dose of the P as per the recommendation of the location

Sub-plots: Entries

Plot size: 10 m^2

Note:

- Maintain a fixed plot for conducting the trial.
- Initial analysis of soil in each level is a must.

Observations:

- Soil phosphorus content should be estimated before transplanting, 45 DAT and at harvesting stage (3 times minimum)
- Days to 50% flowering
- Plant height (cm), Productive tiller Number per plant (No.) or m^2
- Panicle length (cm), No. of filled grains per panicle
- Spikelet Sterility percentage
- Grain yield per plot (kg) or kg/ha
- Phosphorus content in grain in each plot after harvest
- Notes on pests, diseases and lodging
-

General instructions:

- Genotypes should be evaluated at 0, 50% Phosphorus (30kg/ha), and 100% Phosphorus (60kg/ha)
- Sow the seed in bed as thin as possible like regular trial
- Transplant 25-day old seedlings, one seedling/hill.
- Gap-fill within a week of planting
- Incorporate fertilizer evenly of the recommended dose
- 50% of nitrogen at transplanting as basal dose and the remaining 50% in two top dressings, while K I two splits (75 % Basal + 25 % at 50 DAT)
- Spacing : 20 x 15 cm

Trial No : 1(k)
Trial Code : AVT 2- LNT (Nitrogen efficient cultivars)

Trial Name : Evaluation of identified cultures and cultivars for low Nitrogen tolerance in irrigated rice (Interdisciplinary with Plant breeding)

Introduction:

The productivity of rice is very low due to imbalanced and excessive use of nitrogen fertilizers by the farmers. It has been reported that the apparent recovery efficiency of applied nitrogen is approximately about 30-33%. The remaining amount of N is either lost through surface runoff, leaching, volatilization or denitrification and further adds to the increased cost of production and environmental degradation. The use of efficient and economical rates of nitrogen fertilizer is important for enhancing crop productivity and maintaining environmental sustainability. To achieve this, it is imperative to identify high nitrogen utilizing cultivars which can minimize the losses. Large numbers of rice cultivars have been released in India so far, but the question is whether these cultivars are capable of utilizing the nitrogen efficiently. Inter varietal differences for nitrogen use efficiency has been reported by many researchers. Therefore, there is a need to identify the cultivars which can efficiently utilize the nitrogen and to develop a sustainable nitrogen rate recommendation for these cultivars which can further give enhanced yield and resource use efficiency.

Objectives: To study the comparative performance of elite lines and cultivars under different levels of nitrogen

Locations:

Gangavathi	Karjat	Kaul	Ludhiana
Mandya	Maruteru	Pusa	Raipur
Ranchi	Varanasi	Vadgaon	IIRR

Design: Split Plot Design Replications: 3 Plot size: 10 m^2

Treatments: Main = 3 N doses

N_1- No nitrogen (Control) (**P and K is constant**)

N_2-50 %of recommended N dose (**P and K is constant**)

N_3- 100 % of the recommended dose of N (**P and K constant**)

Sub-plots: Entries**:**

***Fixed plot needs to be maintained for this trial which is deficient in Nitrogen. Soil nitrogen estimation is essential before the start of the experiment**

Observations :

- Soil nitrogen content before transplanting, and at harvesting
- Days to 50% flowering
- Plant height (cm)
- Total Tiller Number per plant or /m^2
- Productive tiller per plant (No.) or /m^2
- Panicle length (cm)
- No. of filled grains per panicle
- Spikelet Sterility percentage
- Grain yield per plot or t/ha
- Straw yield per 5 plants, grain yield per square meter and grain yield per plot
- % nitrogen in grain and straw
- Nitrogen uptake kg/ha
- Notes on pests, diseases and lodging
- Rainfall during the crop growth (Number of rainy days), Maximum and minimum temperature.

General Instructions:

- Genotypes should be evaluated at Two levels of nitrogen 50kg/ha and 100 kg/ha
- Sow the seed in bed as thin as possible in nursery

- Transplant 25-day old seedlings, one seedling/hill.
- Gap-fill within a week of planting
  Incorporate fertilizer evenly as per the trial 50% of nitrogen at transplanting as basal dose and the remaining 50% in two top dressing
- Spacing : 20 x 15 cm

Trial No : 1(m)
Trial Code : AVT1- NIL (HT cultivars- trait verifications)

Name of the trial : Evaluation of Imazethapyr herbicide-tolerant genotypes under direct-seeded condition

Introduction : Rice crop suffers more from weed competition, unlike other cereal crops. Efficient cultivars will reduce weed competition and enhance productivity with reduced input. So, present investigation is planned to study the herbicide tolerance in elite genotypes (NILs) for their efficiency in the zones where the recurrent parents have been notified.

Objective :
1. To identify the promising herbicide-tolerant cultivars for enhancing the productivity
2. To assess the weed control efficiency and herbicide tolerance of the cultivars

Locations:

Cuttack	Hazaribagh	Chinsurah
Bikramganj	Titabar	Gerua
Coimbatore	Naira	New Delhi

Materials will be supplied by ICAR-NRRI to the above centers. Please intimate after receiving the material.

Experimental Design: Split plot design, **Replications**: 3

Plot size: 10 m^2

Main plot treatments:

T1 -Imazethapyr application.

T2 – Bispyribac sodium application.

T3 - Weed-free check. (No spray to be done in this plot and manual weeding as per the standard methods (15,30,45 & 60 days after emergence, DAE) to keep the plot completely weed free).

T4- Weedy check (No spray to be done in this plot and no manual weeding at any stage).

Sub-plot treatments:

Genotypes: 13 (G1 to G13). Package of practices to be followed as per the respective state recommendation.

Layout of the Experiment:

	T1	**T2**	**T3**	**T4**
Replication 1	G12	G11	G8	G10
	G9	G8	G10	G13
	G1	G5	G7	G4
	G13	G12	G13	G9
	G5	G2	G3	G7
	G10	G13	G11	G12
	G2	G6	G4	G6
	G11	G9	G9	G11
	G7	G4	G1	G2
	G8	G10	G12	G8
	G4	G3	G6	G1
	G3	G1	G2	G5
	G6	G7	G5	G3
ep lic ati	G4	G1	G5	G5

	G13	G8	G9	G11
	G7	G5	G2	G4
	G12	G10	G13	G8
	G5	G4	G6	G2
	G6	G7	G1	G7
	G8	G13	G12	G9
	G2	G2	G7	G1
	G11	G9	G8	G10
	G3	G6	G4	G3
	G10	G11	G11	G12
	G1	G3	G3	G6
	G9	G12	G10	G13
Replication 3	G7	G5	G3	G2
	G10	G9	G8	G9
	G3	G7	G6	G7
	G2	G4	G2	G6
	G11	G13	G12	G8
	G9	G8	G11	G12
	G4	G1	G7	G1
	G5	G3	G4	G4
	G8	G12	G13	G10
	G1	G6	G5	G5
	G12	G11	G10	G13
	G13	G10	G9	G11
	G6	G2	G1	G3

A) Imazethapyr 10% SL (Foliar Spray) (Trade name Pursuit (BASF) will be used)

Concentration: 0.25%

- Avoid spray if rain is expected within 6 hrs.
- Imazethapyr (Pursuit)– Add 2.5 ml per lit water. Additionally, add 2.5 ml adjuvant (Outright 35) in the solution.
- Spray by flat fan or flood jet nozzle. Spray the canopies properly covering complete surfaces.

- Time of application: Post Emergence alone, at 21 DAE, weeds should be at least 3-4 leaf stage at the time of spray.
- Moisture should be sufficient in soil **without any standing water** considering that **no irrigation should be given up to 48 hrs** after herbicide application. **If there is any rainfall within 48 hours, it must be reported.**
- No. of Sprays: 1.
- One month after Imazethapyr spray, each centre needs to report number and names (G1-G13) of genotypes showing incidences of complete mortality of rice plants (replication-wise).

B) Bispyribac Sodium- 10% SC –Foliar Spray

- Concentration: 120 ml in 200 lit water (for one acre).
- Time of application: Post Emergence, 10-12 DAE, 2-3 leaf stages of weeds. Moisture should be sufficient earlier and no irrigation up to 48 hrs. A maximum of 2 times spray can be done.
- No of sprays:1

Note:

- Avoid spray if rain is expected within 6 hrs.
- Spray in saturated soil moisture, three will be no standing water during spraying
- If there is any rainfall within 48 hours of Imazethapyr spray, it must be reported. If rain within 6 hours trial needs to be repeated.
- Seeds of all the entries need to be sent back to ICAR-NRRI, Cuttack for further detailed analysis.

OBSERVATIONS TO BE RECORDED:

- Crop phytotoxicity in 1-10 scale
- Phyto toxicity shall be recorded at 7, 14, 21, 28 and 35 days after herbicide application. Observations for specific parameters like chlorosis, necrosis, wilting, scorching, hyponasty and epinasty should be noted by using the following scale.
-
    - Phyto toxicity Rating Scale (PRS)

CROP RESPONSE/CROP INJURY	Rating
0	0
1-10 %	1
11-20 %	2
21-30 %	3
31-40 %	4
41-50 %	5
51-60 %	6
61-70 %	7
71-80 %	8
81-90 %	9
91-100 %	10

1. Weed population/m^2 group-wise and species-wise for 1 Day Before Herbicide Application, 15 Days After Herbicide Application (DAHA), 30DAHA, 45 DAHA & 60 DAHA
2. Weed biomass/m^2 group-wise and species-wise for 1 Day Before Herbicide Application, 15 DAHA, 30DAHA, 45 DAHA & 60 DAHA
3. Plant height (cm) at max. vegetative stage and panicle initiation stage
4. No. of tillers/m^2 at max. vegetative stage and panicle initiation stage
5. At harvest stage – No. of panicles/m^2, panicle weight, test weight, filled grain %, Grain yield, Straw yield.

Trial No : 1(n)

Trial Code : BAS-HT

Name of the trial : Evaluation of Imazethapyr (10% SL) herbicide tolerant Basmati rice NILs under dry direct seeded rice (DDSR) condition

OBJECTIVE :
1. To evaluate the bio-efficacy of Imazethapyr 10% SL against weeds in herbicide tolerant Nils of Basmati rice.
2. To evaluate the phyto-toxicity of Imazethapyr 10% SL in herbicide tolerant Nils of Basmati rice.
3. Effect on following crop, if any.

NO. OF TRIALS : Second season

VARIETY : Herbicide tolerant rice Near-Isogenic Lines (NILs) of Basmati rice along with the Recurrent Parents as Checks

I. Evaluation of the bio-efficacy of Imazethapyr 10% SL against weed complex in herbicide tolerantNILs of Basmati rice.

DESIGN : Split Plot Design
CROP CONDITION : DryDirect Seeded Rice
MAIN PLOTTREATMENTS: Nine (9)
SUB-PLOT TREATMENTS : Six (6)
REPLICATIONS : Three (3)
WATER VOLUME : 375 L/ha

Main Plot Treatments

T. No.	Treatments	Dose g or ml / Ha		Application timing	Tank mix volumes(for 250 m^2 area for three replications)
		g a.i.	Formulation		
T_1	Imazethapyr 10% SL (X dose)	100	1000	Early post (16-18 DAS)	26.0 ml in 10.0 L water
T_2	Imazethapyr 10% SL (1.25X dose)	125	1250	Early post (16-18 DAS)	33.00 ml in 10.00 L water
T_3	Imazethapyr 10% SL (2X dose)	200	2000	Early post (16-18 DAS)	53.0 ml in 10.00 L water
T_4	Imazethapyr 10% SL ***fb*** Imazethapyr 10% SL (X dose)	100+100	1000 + 1000	Early post (16-18 DAS) ***fb*** Late Post (35-37 DAS)	26.0 ml in 10.0 L water***fb***26.0 ml in 10.0 L water
T_5	Imazethapyr 10% SL ***fb*** Imazethapyr 10% SL (1.25 X dose)	125+125	1250+1250	Early post (16-18 DAS) ***fb*** Late Post (35-37 DAS)	33.00 ml in 10.00 L water***fb***33.00 ml in 10.00 L water

T_6	Imazethapyr 10% SL ***fb*** Imazethapyr 10% SL (2 X dose)	200+200	2000+2000	Early post (16-18 DAS) ***fb*** Late Post (35-37 DAS)	53.0 ml in 10.00 L water***fb*** 33.00 ml in 10.00 L water
T_7	Pendimethalin(PM) 30% EC + Bispyribac-sodium (BS)10% SC			PM-2 DAS BS -Early post emergence (16-18 DAS) Late post emergence (23-25DAS)	PM:125ml in 17.5L water BS:6.25ml in7.5L water
T_8	Weed free control (2 times Hand weeding)	-	-	-	
T_9	Untreated Control (Weedy check)	-	-	-	

Note: Imazethapyr (active ingredient) is to mixed with ammonium sulphate (Mainboost @ 2.0g/L of water and surfactant (Mainspread -1.5 ml/L of water). All the three are to be mixed together and then applied.

Sub-Plot Treatments:

Sub plot treatment No.	Entry No.
S_1	1815
S_2	1816
S_3	1819
S_4	1823
S_5	1824
S_6	1825

LAYOUT OF EXPERIMENT:

T1	S2	S1	S6	S5	S3	S4	R1
	S4	S6	S2	S3	S1	S5	R2
	S4	S6	S5	S3	S1	S2	R3
T2	S3	S1	S4	S6	S5	S2	R1
	S3	S4	S6	S5	S2	S1	R2
	S1	S2	S5	S3	S4	S6	R3
T3	S3	S4	S2	S6	S1	S5	R1
	S4	S6	S3	S2	S5	S1	R2
	S3	S4	S6	S2	S5	S1	R3
T9	S2	S6	S4	S3	S1	S5	R1
	S4	S3	S6	S2	S5	S1	R2
	S6	S1	S5	S2	S3	S4	R3
T8	S1	S5	S6	S4	S2	S3	R1
	S6	S4	S1	S3	S2	S5	R2
	S1	S2	S4	S6	S5	S3	R3
T7	S3	S4	S6	S1	S2	S5	R1
	S5	S1	S3	S2	S4	S6	R2
	S2	S5	S6	S4	S3	S1	R3
T5	S6	S5	S3	S2	S1	S4	R1
	S5	S6	S3	S4	S1	S2	R2
	S2	S6	S5	S1	S3	S4	R3
T4	S5	S4	S3	S1	S2	S6	R1
	S2	S3	S1	S5	S4	S6	R2
	S4	S5	S1	S3	S6	S2	R3
T6	S3	S6	S4	S2	S1	S5	R1
	S2	S1	S4	S5	S3	S6	R2
	S4	S6	S1	S3	S2	S5	R3

R_1- Replication 1; R_2 – Replication 2; R_3 – Replication 3

*Package of practices to be followed as per their state recommendation.

APPLICATION METHODOLOGY FOR BIO-EFFICACY TRIAL:

Time of Application:

Main plot Treatments T1 to T6: Test compound**Imazethapyr (10% SL)**is a post emergence herbicide and should be applied at 2 to 3 leaf stage of weeds (i.e. 16-18 days after sowing – Early post emergence) with a tank mix of Ammonium Sulphate(Mainboost) @ 2.0 g/L of water. A surfactant (Mainspread) should be added in treatments numbers T1, T2 T3, T4, T5 and T6 @ 1.5 ml/L of water. At the time of application, there should be sufficient moisture in the soil. In case of follow up treatment of Imazethapyr 10% SL, it should be applied at 4-5 leaf stage (i.e. 35-37 days after sowing – Late post emergence).

Main plot Treatment T7: **Pendimethalin 30% EC** is a pre-emergence herbicide recommended for use in rice within 2 days of sowing.Good soilmoisture is essential for the activation of pre-emergence herbicides.Pendimethalin should be applied after rice seed has imbibed germination water, that is, 2–3 days after sowing to avoid crop injury. No irrigation upto 48 hrs.**Bispyribac Sodium10% SC** to be used at 2-5 leaf stage of weeds which can be applied approx. 16-18 days (15-25days)after sowingas standalone. Moisture should be sufficient earlier and no irrigation upto 48 hrs after application.

Main plot Treatment T8: Weed free treatment should ensure that weeds are taken out at 1-2 leaf stage itself to avoid any competition with crop.**Maximum 2 times hand weeding** is to be done.

Main plot Treatment T9: Weedy check should not be disturbed and all weeds to be allowed to grow with normal competition to crop.

Note: Avoid spray if rain is expected within 6 hrs.

Weed bio-metric observations in the crop

i. **Weed population:** Five places(or all the plots- data need to be recorded and sent for all the treatments) should be selected at random and marked

with pegs in each plot. Weed count should be recorded (species wise separately)and should be grouped for **Grasses, Sedges and Broad leaf weeds**, using 0.25 m^2 quadrant in the peg marked areas and computed to number of weeds per square meter. Weed population should be recorded at species wise at pre-treatment 1 Day before herbicide application (1 DBHA), 15, 30 and 45,60 days after herbicide application(DAHA).

ii. Weed biomass should be recorded (species wise separately) and grouped for **Grasses, Sedges and Broad leaf weeds**, using 0.25 m^2 quadrant in the peg marked areas and computed to number of weeds per square meter. Weed population should be recorded at species wise at pre-treatment, 15, 30 and 45,60 days after herbicide application(DAHA).

iii. Both fresh weight and dry weight of the weeds is to be recorded.

iv. Weed control efficiency (WCE): It should be calculated by using the following formula and recorded in percentage.

$$\%WCE = \frac{\text{Weed Dry weight in untreated plot} - \text{Weed dry weight in treated plot}}{\text{Weed dry weight in untreated plot}} \times 100$$

v. Weed dry matter production (WDMP): The counted weeds should be removed from the plots(cut down the roots) and air dried for a few days and kept in hot air oven at $60^{O}C$ for further drying. Then each dried sample should be weighed and recorded in g per sq. meter. Weed dry matter production should be recorded at 30 and 45 days after treatment application(Dry weight for all– fresh weight data needs to be recorded).

vi. Statistical analysis: The experimental data should be statistically analyzed as per the procedure. Wherever the treatments are significant, the critical difference is worked out at 5 percent probability level.

II. Evaluation of Phytotoxicity of Imazethapyr 10% SLin herbicide tolerant NILs of Basmati rice.

T. No.	Treatments	Dose g or ml / Ha		Application timing	Tank mix volumes
		g a.i.	Formulation		
T_1	Imazethapyr 10% SL (X dose)	100	1000	26.0 ml in 10.0 L water	
T_2	Imazethapyr 10% SL (1.25X dose)	125	1250	33.00 ml in 10.00 L water	
T_3	Imazethapyr 10% SL (2X dose)	200	2000	53.0 ml in 10.00 L water	
T_4	Imazethapyr 10% SL***fb***Imazethapyr 10% SL (X dose)	100+100	1000 + 1000	26.0 ml in 10.0 L water***fb***26.0 ml in 10.0 L water	
T_5	Imazethapyr 10% SL***fb***Imazethapyr 10% SL (1.25 X dose)	125+125	1250+1250	33.00 ml in 10.00 L water***fb***33.00 ml in 10.00 L water	
T_6	Imazethapyr 10% SL***fb***Imazethapyr 10% SL (2 X dose)	200+200	2000+2000	53.0 ml in 10.00 L water***fb*** 33.00 ml in 10.00 L water	

T_7	Pendimethalin (PM) 30% EC + Bispyribac-sodium (BS) 10% SC	25	250	PM:125ml in 17.5L water BS:6.25ml in7.5L water	
T_8	Weed free control (2 times - Handweeding)	-	-	-	
T_9	Untreated Control (Weedy check)	-	-	-	

Observations to be made:

i. Observations for phyto-toxicity should be taken at 0, 1, 3, 5, 7 and 10 days after application only(7,14,21,28 and 35 days).

ii. Observations for the specific parameters like yellowing, chlorosis, vein clearing, necrosis, wilting, scorching, epinasty and hyponasty should be noted by using following scale;

Score	Phyto-toxicity (%)
0	0-00 (No Phyto-toxicity)
1	0 -10
2	11 – 20
3	21 – 30
4	31 – 40
5	41 – 50
6	51 – 60
7	61 – 70
8	71 – 80
9	81 – 90
10	91 - 100

iii. Observations for the specific parameters like yellowing, chlorosis, vein clearing, necrosis, wilting, scorching, epinasty and hyponasty should be recorded in following format;

T. No.	**Treatments**	**Dose g or ml / Ha**		**Days of observation**					
		g a.i.	**Formulation**	**0**	**1**	**3**	**5**	**7**	**10**
T_1	Imazethapyr 10% SL (X dose)	100	1000						
T_2	Imazethapyr 10% SL (1.25X dose)	125	1250						
T_3	Imazethapyr 10% SL (2X dose)	200	2000						
T_4	Imazethapyr 10% SL***fb***Imazethapyr 10% SL (X dose)	100+100	1000 + 1000						
T_5	Imazethapyr 10% SL***fb***Imazethapyr 10% SL (1.25 X dose)	125+125	1250+1250						
T_6	Imazethapyr 10% SL***fb***Imazethapyr 10% SL (2 X dose)	200+200	2000+2000						
T_7	Pendimethalin(PM) 30% EC + Bispyribac-sodium(BS) 10% SC	25	250						
T_8	Weed free control (2 times Hand weeding)	-	-						

T_9	Untreated Control (Weedy check)	-	-						

III. EFFECT ON DIFFERENT AGRONOMIC PARAMETERS:

- Plant height (cm) at max. vegetative stage, panicle initiation and harvesting stage to be recorded.
- No. of tillers/m^2 at max. vegetative stage, panicle initiation, days to 50% flowering and harvesting stage to be recorded.
- At harvest stage – No. of panicles/m^2,panicle weight, test weight (g) andfilled grain %.

IV. EFFECT ON YIELD PARAMETERS:

Yield of rice grains and straw in each treatment should be recorded and reported as q/ha.

V.RESIDUE SAMPLES:

(Depth of soil samples to be mentioned) Soil samples to be collected before application of test herbicide and Rice grain, straw and soil samples at harvest from **T1, T2, T3, T4, T5, T6, T7, T8& T9 (X, 1.25 X, 2.5X and untreated control treatments** for residue analysis along with meteorological data of the trial location.

1. 500 grams of the samples of straw from 1 m^2 area from all the three replications in the nine treatments needs to be harvested and kept separately, for analysis of residue, if any.
2. 300 grams of soil samples from three depths 6, 12 and 18 inches in each of the three replications in the nine treatments needs to be collected by core sampling and kept separately, for analysis of residue if any.

VI. EFFECT ON SUCCEEDING CROP:

Kindly take up the commonly followed rotation crop in undisturbed layout of bio-efficacy trial including the phyto-toxicity trial plots to study the effect of the test chemical on the succeeding crop. Please inform us proposed crop before taking succeeding crop. Observations on the crop

germination, plant stand and any symptoms of phyto-toxicity need to be recorded at 30 days after sowing. Record the crop yield at harvest.

1. 500 grams of the samples of straw from 1 m^2 area from all the three replications in the nine treatments needs to be harvested and kept separately, for analysis of residue, if any.
2. 300 grams of soil samples from three depths 6, 12 and 18 inches in each of the three replications in the nine treatments needs to be collected by core sampling and kept separately, for analysis of residue if any.

RESULTS:

The report needs to contain the parameters like introduction, experimental details, methodology, observation and conclusion. Details of date of sowing, herbicide application,date of harvest,weed density, weeds fresh weight,weeds dry weight and WCE after application of herbicide should be provided in the report. Data be statistically analyzed with suitable transformation and results interpreted for as per standard protocol. The results should be reported in a systemic form and report should include an interpretation of the results obtained.

Trial No : 1(o)
Trial Code : AVT 2- E (DS)

Trial Name : Nutrient response trials on selected AVT-2 rice cultures under optimum and low input management

Objectives:

- To study the grain yield potential, nutrient response and nutrient use efficiency of promising AVT-2 cultures under optimum and low input management in rice.
- To identify promising, efficient and stable genotypes based on the Grain Yield Efficiency Index (GYEI) and yield reduction in reduced Nutrient application
- To identify nutrient efficiency, herbicide tolerant and NILs (biotic and abiotic tolerance)
- To support breeders with agronomy data for release of varieties in CVRC

Sl. No.	AVT2 Culture	Checks	Locations
1	29036	NC: Sahabhagidhan	Hazaribagh
2	30330	LC:----------	Raipur
3	30328		Coimbatore
4	29052		Jagdalpur
5	30351		Pusa
6	30334		Ranchi
7	30336		Rewa

(b) General instructions for aerobic rice (AVT-2 E/ME direct-seeded):

Layout : Split Plot Design
Replications : 3
Plot Size : 15 m^2
Spacing : Dibble 1 or 2 seeds / hill at spacing of 20 x 10 cm

- Apply Pendimethalin herbicide @ 1 kg a.i. /ha at near-saturated condition within 3– 4 days of sowing.
- Inter-cultivation at regular intervals is recommended to control weeds
- Maintain aerobic condition and provide need-based frequent irrigation so that plants will not experience moisture stress at critical stages of crop growth
- Rainfall data and quantity of irrigation water and Number of irrigations given during crop growth need to be recorded

P, K & Zn levels :

Apply P, K and Zn on soil test basis through Single Super Phosphate, Muriate of Potash and Zinc Sulphate. Indicate the levels of P, K and Zn applied.

Water Management:

- Recommended practices of irrigation (Transplanted/direct-seeded rice/ Aerobic rice)and follow other operations as per package of practices uniformly.
- Conduct the trials with same cultivars mentioned in the Technical program
- Please retain the seed of check varieties for next season sowing
- Furnish the duration of cultures (seed to seed) under different fertilizer levels.
- Indicate the recommended dose of fertilizer (RDF)
- Supply the data of cultivars as per the sequence given in the technical program.
- Mention the reasons for very high or low yields of the trials
- Mention the incidence of pests and diseases in different levels of Nutrients

Trial No : 1(p)
Trial Code : AVT 2- RSL

Trial Name : Nutrient response trials on selected AVT-2 rice cultures under optimum and low input management

Objectives:

- ❖ To study the grain yield potential, nutrient response and nutrient use efficiency of promising AVT-2 cultures under optimum and low input management in rice.
- ❖ To identify promising, efficient and stable genotypes based on the Grain Yield Efficiency Index (GYEI) and yield reduction in reduced Nutrient application
- ❖ To identify nutrient efficiency, herbicide tolerant and NILs (biotic and abiotic tolerance)
- ❖ To support breeders with agronomy data for release of varieties in CVRC

Sl. No.	AVT2 Culture	Checks	Locations
1	30409	NC: Swarna Sub 1 LC:----------	Chinsurah
2	30410		Bikramganj
3	30367		Cuttack
			Pusa
			Ghaghraghat
			Titabar
			Maruteru

Note:

- National check, Zonal check and local check must be included in the trial
- Please include most recently released variety as local check
- Keep the seeds of standard checks for next season**.**

Observations:

1. Number of panicles/m^2 at harvest
2. Panicle weight (g)

3. Days to 50% flowering (compulsory)
4. Duration (Seed to Seed) (in days)
5. Grain yield (kg/ha)
6. Water quantification* (for AEROBIC TRIALS)
7. Incidence of disease and pests, if any
8. Soil nutrient status (available NPK)

(a) General instructions for transplanted rice

Layout **:** Split Plot Design
Replications **:** 3
Plot Size **:** 15 m^2
Spacing **:** 20 cm x 10 cm (Location specific spacing)

Treatments :
Season **:** *Kharif*

Main plots : Nutrient for cultivars

Nutrient level 1 - 50% NPK/ha of recommended dose
Nutrient level 2 - 100% NPK /ha of the recommended dose.

Recommended dose will be as per the soil test based and mention while sending the data

Sub-plots: Cultures & Varieties (5-10)

Use urea as a source of nitrogen, apply N in 3 splits (50% at basal + 25% at tillering + 25% at Panicle initiation) and indicate Nutrient rate applied (kg/ha)under Nutrient-1 and Nutrient 2 treatments for computing Nutrient response.
N Should be applied in three splits, K in two splits and P as basal
Use one Neem coated Urea

Mention the dose of Nutrients applied for each treatment

Trial No : 1(q)
Trial Code : AVT 2- SDW

Trial Name : Nutrient response trials on selected AVT-2 rice cultures under optimum and low input management

Objectives:

- ❖ To study the grain yield potential, nutrient response and nutrient use efficiency of promising AVT-2 cultures under optimum and low input management in rice.
- ❖ To identify promising, efficient and stable genotypes based on the Grain Yield Efficiency Index (GYEI) and yield reduction in reduced Nutrient application
- ❖ To identify nutrient efficiency, herbicide tolerant and NILs (biotic and abiotic tolerance)
- ❖ To support breeders with agronomy data for release of varieties in CVRC

Sl. No	AVT2 Culture	Checks	Locations
1	29026	NC: CR Dhan 506	Chinsurah
2	29031	LC:_____	Cuttack
			Pusa
			Karimganj
			Ghaghraghat

Note:

- National check, Zonal check and local check must be included in the trial
- Please include most recently released variety as local check
- Keep the seeds of standard checks for next season**.**

Observations:

1. Number of panicles/m^2 at harvest
2. Panicle weight (g)
3. Days to 50% flowering (compulsory)

4. Duration (Seed to Seed) (in days)
5. Grain yield (kg/ha)
6. Water quantification* (for AEROBIC TRIALS)
7. Incidence of disease and pests, if any
8. Soil nutrient status (available NPK)

(a) General instructions for transplanted

Layout **:** Split Plot Design
Replications **:** 3
Plot Size **:** 15 m^2
Spacing **:** 20 cm x 10 cm (Location specific spacing)

Treatments :

Season **:** *Kharif*
Main plots **:** **Nutrient for cultivars**

Nutrient level 1 - 50% NPK/ha of recommended dose
Nutrient level 2 - 100% NPK /ha of the recommended dose.

Recommended dose will be as per the soil test based and mention while sending the data

Sub-plots: Cultures & Varieties (5-10)

Use urea as a source of nitrogen, apply N in 3 splits (50% at basal + 25% at tillering + 25% at Panicle initiation) and indicate Nutrient rate applied (kg/ha)under Nutrient-1 and Nutrient 2 treatments for computing Nutrient response.

N Should be applied in three splits, K in two splits and P as basal

Use one Neem coated Urea

Mention the dose of Nutrients applied for each treatment

II. RESOURCE CONSERVATION TECHNOLOGIESTRIALS

TrialNo. : 2

Trial Code : RCT-2.1 RCT-1

RCT-1 : Water management for enhancing water use efficiency and productivity of mechanical transplanted rice (Interdisciplinary with Agricultural Engineering)

Introduction : Mechanical transplanting of rice is the process of transplanting young rice seedlings, which have been grown in a mat nursery, using a paddy transplanter. In conventional manual transplanting practice, 8-12 laborers are required to transplant one acre. The process is also very time consuming and difficult. However, if self-propelled paddy transplanters are used, three people can transplant up to three to four acres in one day. This has great advantages in areas where farm labor is scarce and expensive.

Hence the present trial is constituted to enhance the productivity of the mechanized transplanted rice.

Objectives: i) To enhance the productivity of mechanized transplanted rice

ii) To identify the suitable agronomic management practices to enhance the water use efficiency of mechanized transplanting

Locations:

Aduthurai	**Ludhiana**	**Rajendranagar**
Chplima	**NRRI- Cuttack**	**Gangavathi**
Sabour	**Ranchi**	**Warangal**
Khudwani	**Rewa**	**Karaikal (K)**
Raipur	**Mandya**	**Puducherry (R)**

Any other center, if interested can also take up the trial with intimation to PI

Design: Split plot design, Replications: 3

Treatments

Main -plot (Methods of crop establishment)

M1. Mechanical TP / manual Transplanting method on puddled soil (crop management methods same as for puddled transplanted rice)

M2. Direct wet seeding on puddled soil (Use of Drum seeder/ dibbling of sprouted seed at 25 x 25 cm) fb crop management practices as per direct wet seeded rice

Sub plots : (3 irrigation management practices)

I_1 – Flooding throughout crop growth (3 + / - 2 cm) after 15 days

I_2 - Irrigation at Saturation (No flooding)

I_3 -Alternate wetting and drying (**AWD—flooding to a water depth of 5 cm when the water level drops to 5 -10 cm Below ground level from 15 DAT to PI-** with the help of Boumans Water-tube)/ (**IOT based System – colloboration with CultYvate**- Bangalore)

Fertilisers: As per the location specific based on the Soil test based

Clearly mention in details the weed management method/timings

Data to be collected:

- No of hills per m^2 (15 days afterplanting)
- Plant height (cm), Dry matter /m^2 at30 days interval
- Tiller Number/m^2, Productive tiller number/m^2
- Panicles per sq. m (No.)
- Days to 50% flowering
- Grain Number/Panicle
- Panicle weight (g)/m^2
- Sterility percentage, Test Weight (g)
- Notes on pests, diseases and lodging
- Grain and straw yield (kg/plot or t/ha) based on net plot size
- Rainfall during the crop growth (Number of rainy days)

- Maximum and minimum temperature.
- Quantification of water used
- Energy use efficiency
- Production efficiency

General Instructions

Initial soil analysis report for Ec, pH, N, P, K and Zn traits from locations has to be submitted to IIRR; accordingly, fertilizer recommendation will be intimated.

a. Follow the nursery management as illustrated in '**Details of the Mechanised Transplanting' (**see next page**).**To begin with, seeds are sown in nursery and seedlings are prepared. After 4-5 weeks (better make it 3-4 weeks, younger seedlings are necessary for high yields) the seedlings are uprooted and planted in the field which has already been prepared for the purpose. The entire process is done by hand. It is, therefore, a **very** difficult method and requires heavy inputs. But at the same time it gives some of the highest yields.
b. **Land preparation**: Plow, harrow, puddle, and level the land; construct channels at regular intervals to facilitate easy drainage
c. **Optimum sowing time**: For TPR, complete the nursery sowing before the onset of heavy rains; early to mid-June for IGP
d. **Seed preparation & sowing**: pre-germinate the seeds by soaking for 24 h in water or 1% KCl solution and incubating for 24-36 h and then broadcast or drum-seed
e. **Water management**: Keep a water level of 2-3 cm for the first 10 days after transplanting (DAT) to make the transplanted seedlings recover fast from the transplanting shock and establish well. Then, follow **AWD irrigation during the vegetative ph**ase (10-45 DAT); maintain **3-5 cm water level during the reproductive phase** (45-75 DAT); drain the field after physiological maturity (75-90 DAT); 30-40% water saving from reduced deep drainage, seepage & runoff in transplanted rice.
f. **Integrated Weed management**: cultural, mechanical & herbicides; the water level in the field determines the level of weed infestation.

g. **Fertilizer management**: Incorporate all organic matter or manure into the soil during plowing; Apply the fertiliser as per the treatment and N in 3 splits P as Basal and K as 2 splits.
h. **Pest and disease control**: Follow IPM

Details of the methods of crop establishment

I. Puddled rice situation:

M-1: Manual Transplanting Method:

1. This method is practiced in areas of fertile soil, abundant rainfall and plentiful supply of labour. To begin with, seeds are sown in nursery and seedlings are prepared. After 4-5 weeks (better make it 3-4 weeks, younger seedlings are necessary for high yields) the seedlings are uprooted and planted in the field which has already been prepared for the purpose. The entire process is done by hand. It is, therefore, a **very** difficult method and requires heavy inputs. But at the same time, it gives some of the highest yields.
2. **Land preparation**: Plow, harrow, puddle, and level the land; construct channels at regular intervals to facilitate easy drainage
3. **Optimum sowing time**: For TPR, complete the nursery sowing before the onset of heavy rains; early to mid-June for IGP
4. **Seed preparation & sowing**: pre-germinate the seeds by soaking for 24 h in water or 1% KCl solution and incubating for 24-36 h and then broadcast or drum-seed
5. **Water management**: Keep a water level of 2-3 cm for the first 10 days after transplanting (DAT) to make the transplanted seedlings recover fast from the transplanting shock and establish well. Then, follow **AWD irrigation during the vegetative ph**ase (10-45 DAT); maintain **3-5 cm water level during the reproductive phase** (45-75 DAT); drain the field after physiological maturity (75-90 DAT); 30-40% water saving from reduced deep drainage, seepage & runoff in transplanted rice.

6. **Integrated Weed management**: cultural, mechanical & herbicides; the water level in the field determines the level of weed infestation.
7. **Fertilizer management**: Incorporate all organic matter or manure into the soil during plowing; apply 14-18 kg/ha P and first dose of 20 kg/ha K before last harrowing & leveling; apply 90-120 kg/ha N in 3 splits – 33% basal just before transplanting, 33% at tillering, and 33% at Panicle Initiation (PI).
8. Pest and disease control: Follow IPM

M-1: Mechanised transplanting

Methodology : Raising seedling for Transplanter

Trays (60cm x 28 cm) are filled with sieved soil (2.5 cm soil depth). Seeds are uniformly placed (100 g/tray) on soil, covered with thin soil layer and water through rose cans. Use 15-day old seedlings. Foliar spray of 2% nitrofoska (19:19:19) may be given.

{OR}

Prepare a 10 cm raised bed. Level it. Place a thick polythene sheet on the bed. Make small holes on the sheet. Spread 2.5 cm soil on the polythene sheet. Place or sow seeds uniformly on the soil without overlapping. Cover the seeds with a thin soil layer. Cover the soil with straw mulch. Water the beds with rose can for 3 days. Remove the straw mulch after 3days. Open a channel around the beds and let in water into a channel to keep seedbed moistened. Use 15-day old seedlings.

SM SRI – Transplanting with a transplanter and follow the other practices of SRI (water management, weed management by conoweeder).

Follow the principles the same as above: b-h

a) **Weed control:** Use a cono weeder in both directions to uproot and incorporate the weeds into the soil and most importantly, aerate the soil.
b) **Water management:** No standing water during the growth period. Intermittent wetting and drying until panicle initiation (saturation field condition). After panicle initiation. 1-2 cm of water is kept for about three weeks.

c) **Nutrient management:** Use straw, green manure and animal manure to enrich populations of earthworms, microorganisms and to facilitate nutrient availability. Use reduced amounts (less than 50%) of chemical fertilizer to assess the requirement. Mention the dosage of nutrients applied for the trial (75% RDF through organic form and 25% through inorganic form or chemical fertilizers)

M2- Wet direct-seeded rice using Drum seeders

- **Rice varieties**: with early seedling vigor, rapid growth, weed suppressive ability –
- **Seed quality & seed rate**: **High yielding fine grain variety 30-40 kg/ha & coarse grain 45-60 kg/ha** of clean, quality seed to ensure uniform germination & good crop stand (150-200 plants m^{-2}); high seed rates reduced weeds by 41-48%
- **Land preparation**: Plow, harrow, puddle, and level the land; construct canals at regular intervals to facilitate easy drainage
- **Optimum sowing time**: sowing on the same day as nursery sowing for TPR; complete the sowing before the onset of heavy rains; early to mid-June for IGP
- **Seed preparation & sowing**: pre-germinate the seeds by soaking for 24 h in water or 1% KCl solution and incubating for 24-36 h and then broadcast or drum-seed
- **Use drum seeder for line seeding or planting**
- **Water management**: For the first 10-15 DAS, **flush irrigate the field** to keep the soil saturated but not flooded to enhance seedling emergence, root development & anchorage; follow **AWD irrigation during vegetative phase** (15-60 DAS); maintain **3-5 cm water level during reproductive phase** (60-90 DAS); drain the field after physiological maturity (90-105 DAS); 30-40% water saving from reduced deep drainage, seepage & runoff in DSR
- **Integrated Weed management**: cultural, mechanical & herbicides; high seed rates reduced weeds by 41-48%
- **Fertilizer management**: Incorporate all organic matter or manure into the soil during plowing; apply 14-18 kg/ha P and first dose of

20 kg/ha K before last harrowing & leveling; apply 90-120 kg/ha N in 3 equal splits 1/3rd at 10-15, 1/3rd at 25-30, & 1/3rd at 45-50 DAS

- **Pest and disease control**: Follow IPM

Details of the Mechanised Transplanting:

Manual transplating is a labour-intensive operation comprising nursery raising, uprooting of the seedlings, transporting and transplanting the uprooted seedlings in the main field, with a total labour requirement of about 280-350 man-hrs/ha. High labor demand during the peak periods adversely affects the timeliness of operation, thereby reducing the crop yield. The steady drift of agricultural labour to industrial sector is adding more to the woes of the rice farmer. Because of drudgery and notion that the farm operations are below the dignity, labour availability, in general, has decreased considerably in farm operations.

Chinese design of Paddy Transplanter

To offset these problems, mechanical transplanting is the solution. Many transplanters were developed in the past involving the use of traditionally grown paddy nursery for mechanical transplanting. However, several on-farm attempts made with different models of transplanters using the traditional root washed nursery were not successful because of the machine-related problems to use the nursery. This called for the necessity of raising the nursery in a special way, called mat nursery technique. Among the existing commercially available designs suiting mat nursery, Chinese model of paddy transplanter is found to have great promise.

Features of the Machine

- Available with its own source of power of 3-4 hp diesel engine.
- Covers eight rows at a time with a row to row spacing of 23 cm.
- Provision to vary the plant to plant spacing by 10 and 12cm.
- Provision for cage wheel for field use and rubber wheel for transport.

Features of the Mat Nursery

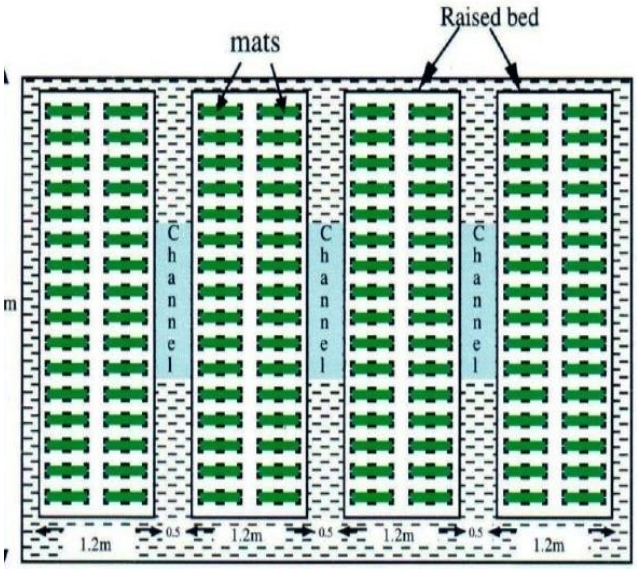
Seed preparation

- Soak the seeds for one day
- Incubate the seeds for one day
- Apply a seed rate of 50 kg/ha

Mat preparation

- Choose the suitable site for mat nursery raising (preferably within or nearer to the main field) and puddle the selected site.
- Raise the puddled soil bed to a level of about 5 cm and level it properly. To lay more than two rows of mats, select each bed width as 1.2 m. To cover one hectare of land, selected plot should be of size of about 20 x 7.5 m with provision of channels of width of 0.5 m (See the figure of mat layout).

- Spread the plastic sheet evenly on the levelled and raised beds.
- Mix the soil with FYM and water to prepare slurry.
- Keep the DRR designed mat frame (having dimansions of 19 x 50 x 2 cm of each block) on the plastic sheet and spread the slurry mixture in each block of the frame.
- After proper settling, lift the frame to leave the mats behind.
- Take 100-110 g of sprouted seed and spread it evenly on the prepared mats and press them gently. One hectare of main field needs 500-600 mats.



Layout of Mat Nursery (for 1 ha)

- The procedure is repeated to prepare all the mats. Spread either grass or plastic sheet on the mats overnight and take it out in the morning. Do not uncover if there is rain during the first week of mat raising.
- Sprinkle with rose can on all the mats everyday to keep the mats moist.
- After a week when the nursery looks green, provide water through channels to the level just below the mats.
- Apply fertilizer@30 g of DAP / litre of water and sprinkle on the mats with hand sprayer after 7-10 days of the nursery.
- The nursery will be suitable for transplanting after 15-20 days when the plant reaches a height of 12-15 cm.

Mat Nursery

Paddy Transplanter Operation

For efficient operation of transplanter the land preparation and knowledge of the mechanical provisions incorporated with the transplanter are essential to be known.

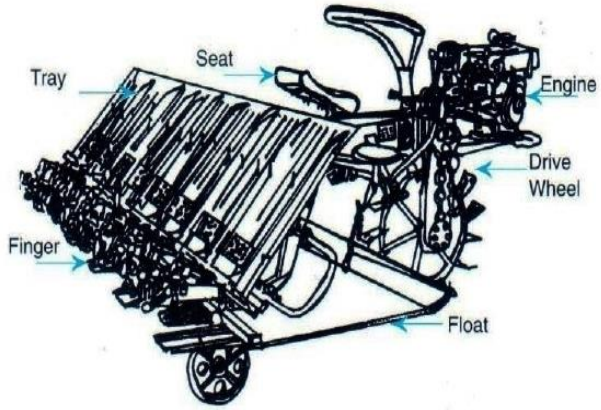
Land preparation

- Puddle the land, level it and remove the water after 24 hours (for clay soil) or 12 hours (for sandy/loamy soil) before the transplanting. In black or clayey soils the settlement is critical as the loosened soil can bury the seedlings planted.

- Just before the operation of transplanter, a thin film of water is necessary to ensure the free movement of transplanter and avoid adhering of soil to the moving parts of the transplanter.

Operation of the transplanter

- Check oil level in gear box, fuel tank and grease the specified parts.



Line diagram of transplanter

- While operating observe for any missing hills in any particular row and diagnose the problem immediately. The missing hills can be due to presence of stones/ foreign matter that would have obstructed the fingers that pick the seedlings from the tray.
- Choose the right speed of operation for a plant hill to hill distance of 10 or 12 cm.
- Observe the number of plants per hill and adjust to the requirement using the lever operating the finger movement.
- Observe the depth of planting with the lever and adjust accordingly.

Plant stand with transplanter

Performance

There will be a net saving of about 45 per cent over the manual transplanting. It can transplant about one hectare in a day of 8 hours. The transplanter performs with missing hills of 2-3 per cent. The machine costs about Rs.1,25,000 and is marketed by VST Agro Inputs, Mahadevpura, Whitefield Road, Bangalore-560 048

Courtesy: Dr. T.Vidhan Singh,Principal Scientist, Agricultural Engineering, IIRR

Trial No : 3
Trial Code : RCT-2.2 (Dry DSR) RCT-2
Name of the trial : Developing a suitable package of practices for higher yield in dry DSR system

Introduction: Imminent water crisis, labour scarcity and climate change threaten the sustainability and profitability of traditional transplanted rice. Direct-seeded rice (DSR) technology has been proposed to reduce water requirement, save labour demand, mitigate greenhouse gas emission and improve environmental sustainability. It involves three principal methods viz., dry seeding, wet seeding, and water seeding, among which dry DSR is gaining momentum due to relatively high grain yield, less water consumption, reduced labour intensity, facilitating to mechanization during crop establishment, and less greenhouse gases emission. The major challenges confronting the development of dry DSR in India are poor crop establishment, weed infestation, lodging susceptibility, yield decline under continuous cropping, and variety breeding; and the strategies which may help in mitigating the constraints to dry DSR.

Trial No : 3
Trial Code : RCT 2.2.a RCT-2.2 -a
Name of the trial : Identification of suitable sowing method of Dry DSR for higher productivity in different zones

Objective :
1. To identify suitable and cost-effective Dry DSR method to enhance the productivity of dry DSR in different Zones
2. To maximize the resource use efficiency and benefit cost ratio

Locations:

Gangavathi	Jagdalpur	Khudwani	Nawagam
Ludhiana	Mandya	Nagina	Varanasi
Pantnagar	Pusa	Raipur	Rewa
Rajendranagar	Khudwani	Sabour	Vadgaon
Arundhatinagar	Chatha	Varanasi	
Bankura (K+R)			

Kharif - 2023
Treatments:
S_1-Broadcasting of seeds
S_2-Mechanized line sowing of seeds (Dibbler, Happy seeder or any Drum seeder: Spacing as per the equipment specifications)
S_3- Raised bed sowing (1 m raised bed and 4 rows of 20 cm spacing) (Details to be included)
S_4- Semi-Dry system (Sowing in dry soil and Wet/flooding after one month of sowing)
S_5- Any improved system like Tar Vattar method of DSR may be followed wherever feasible
S6- Location specific high yielding Dry DSR method
S7- Farmers practice of the Dry DSR method of the region

*Seed rate for S_1 = 50 kg /ha; S_2& S_3 = 25 kg /ha. S_4: as per the system followed)

(Mention the seed rate if followed otherwise)

Design : RBD Replication : 3
Plot size : 30 m^2
Variety : Any HYV (Medium duration) of the location.

Observations:

- Plant population at 10 days and 20 days from a fixed area.
- Soil moisture content at 10, 15 and 20 days after sowing from 0-5 and 5-10 cm depth.
- Plant height and Tiller production (effective and ineffective)
- Dry matter accumulation and partitioning of the dry matter (stem, leaves and grains at different stages)
- Days to 50% flowering
- **Weed parameters in all the treatments (Weed photos,Weed species, weed density no/m2, weed dry weight g/m^2 at active tillering and panicle initiation stages of rice crop)**
- Pest and disease incidence/dynamics
- Root activity and root parameters
- If possible microbial activities
- Uptake of major and minor nutrients
- Availability of nutrients in the soil (initial and after harvest)
- Yield attributes (Grain number, panicle number, panicle length, panicle weight and test weight)
- Grain and straw yield
- Initial and final available soil nutrient status of each treatment.

Experimental details:

1. Identify a suitable plot with the least interference of water seepage from adjoining rice fields as irrigation water input needs to be quantified.
2. Soil from the experimental area must be analyzed initially for texture, bulk density, soil fractions, pH, OC, EC, CEC, available nutrients N, P,

K, Zn, S and soil moisture characteristics at saturation, field capacity and wilting point.

3. After dry ploughing the field making the soil into a fine tilth, proper levelling, main blocks are laid with provision for double irrigation channels, and leaving buffer zone of 2 m all around the blocks to minimize water interference from the adjoining plots. Subplots are laid as per the layout. **The total quantity of irrigation water applied during crop season and effective rainfall must be provided.**
4. For dry direct-seeded rice, dibble 2 – 3 seeds per hill in a well-prepared and levelled field maintaining the spacing of 20 x 10 cm and irrigated and ensure proper crop stand.
5. Apply fertilizer as per the treatments.In event of Fe deficiency, the problem may be corrected by a suitable spray schedule (0.50% $(NH_4)_2$ Fe $(SO_4)_2$ in water at pH 5.0) after recording observations on the intensity of deficiency.

2.2.b. Identification of suitable varieties for Dry DSR system

Trial No : 4

Trial Code : RCT 2.2.b RCT -2.2-b
Name of the trial : Evaluation of varieties for their suitability and enhancement of the productivity in dry direct seeded rice (un-puddle soil)

Objectives:

- To identify the suitable and promising rice cultivars in dry direct seeded rice
- To assess the various agronomic parameters for suitability of rice cultivars in in dry direct seeded rice establishment method

Locations:

ARI-Rajendranagar	Dhangain	Gangavathi	Kota
Mandya	Nawagam	Pusa	Raipur

Design : RBD
Replications : 3
Row spacing : 20 x 15 cm- for line sowing
Plot size : 25 m2
Cultivars : 5-6 Cultivars from IIRR
One or Two varieties of each – Promising HYVs, Hybrids (115-120 days), Hybrids of the Zone found promising for Dry DSR method
Location specific standard checks

Tentative list of Promising Cultivars :
The followings are the varieties for Dry DSR trials,

1. DRR Dhan 44 (early)

2. Sabhagidhan (very early)
3. DRR Dhan 60
4. DRR Dhan 42 (Mid early)
5. Vandana (rainfed upland)
6. Anjali
7. Varalu (Upland-western zone)
8. IRRI 1
9. IRRI 2
10. IRRI 3
11. Local check 1
12. Local check 2
13. Local check 3

*If varieties & Hybrids are not received from IIRR, the location specific varieties & hybrids can be used (send the details of the varieties such as duration, yield potential along with data)

Observations:

- Germination (%)
- Plant density/m2 (at 21 DAS and at maturity)
- Tillers/m2 (at maximum tillering)
- Dry matter Production /m2
- Days for 50 % Flowering
- No. of panicles/m2
- Test grain weight (g)
- Cost of cultivation for each treatment
- Grain yield (kg/plot)
- Straw yield (kg/plot)
- Quantity of water applied
- Qualification of irrigation water used is essential.

Note: Season : Kharif and rabi

Note :The state wise fertility maps are available and all the fertiliser recommendations in the AICRP trials should be based on the fertility level suggested by these maps in different states. This is for strict compliance and provide RFD as per the recommendation

Trial No : 5
Trial Code : RCT 2.2.c RCT 2,2.-c
Name of the trial : Seed priming in Dry DSR for proper establishment and productivity

Rationale : In dry direct seeding, good crop establishment is constrained by subsurface soil drying associated with high temperature. Besides, poor germination under aerobic soil condition results in sparse and patchy stands, which encourages weed growth and reduces the competitive ability of rice against weeds. Since seedling vigour is an agronomical trait that predicts the possibility of seed germination, seedling growth, and climate tolerance, there are a few agronomic interventions that can promote seedling vigour as well, which include seed invigoration/priming, a simple, yet effective technique. Seed priming is one of the most important developments to help rapid, uniform germination and emergence of seeds and to increase seed tolerance to adverse environmental conditions. Invigoration /Priming of seeds has been shown to have positive effects on the emergence, yield, and quality of dry direct-seeded rice. With this back ground the trial is initiated.

Objectives:

1.To Evaluate different seed invigoraters in crop establishment, growth and yield of dry DSR

2.To identify the suitable, cost effective and promising seed invigoraters in dry direct seeded rice

Locations:

Chatha	Coimbatore	ICAR- IIRR	Jagdalpur
Ludhiana	Mandya	Vadagaon	

Design : RBD
Replications : 3
Row spacing : 20 x 5 cmfor line sowing
Plot size : 20 m^2

Treatments :

1.Hydropriming
2. Hardening
3. Priming with NaCl 1%
4.Seed treatment with CPB-1 (Chitinolytic bacterium)
5. Seed treatment withTrichoderma asperellum
6. Seed treatment with Bacillus subtilis
7. Control

❖Fertilizer Schedule: Site Specific Nutrient Management

Observations:

1. Seedling Vigor Index at 7,14,21,28,35 DAS
2. Root-Shoot ratio at 7,14,21,28,35 DAS
3. Shoot dry weight (g/m^2)) at seedling stage, maximum tillering, 50% flowering stage
4. Root dry weight (g/m^2) at seedling stage, maximum tillering, 50% flowering stage
5. Leaf area Index at seedling stage, maximum tillering, 50% flowering stage
6. Plant height(cm) at Harvest
7. No. of panicles/m^2 at Harvest
8. 1000 grain weight (g)
9. Panicle weight (g)
10. Filled grain (%)
11. Grain yield (t/ha)
12. Straw yield (t/ha)

Trial No : 6
Trial Code : RCT-2.3.a(Wet DSR) RCT-2.3a
Name of the trial : Identification of suitable sowing method of Wet DSR for higher productivity I different zones (Puddle soil)

Introduction: Wet Direct seeded rice offers the advantage of faster and easier planting, reduced labour and less drudgery, 7-10 days earlier crop maturity, more efficient water use and higher tolerance to water deficit, less methane emission, and often higher profit in areas with assured water supply. This method of seeding in the past has received relatively less attention than transplanting. Sowing of sprouted rice seed or wet-seeded rice in puddled soil though becoming increasingly important as a method of crop establishment under lowland rice is beset with weed problems, particularly grassy weeds besides other management practices. Weeds emerge at about the same time that the rice seeds germinate, and therefore the yield losses caused by weeds will become greater with the trend towards wet seeding. Effective weed control is one of the key issues and major requirements to ensure a successful wet-seeded rice crop. Furthermore, varieties must be improved for early seedling vigor, weed competitiveness, submergence tolerance to survive untimely rainfall during stand establishment and drought tolerance to survive dry conditions during germination and later growth stages, and for lodging resistance at maturity.

Objective :
1. To identify suitable and cost-effective establishment method practices to enhance the productivity of wet DSR
2. To maximize the resource use efficiency in wet DSR method

Locations:

Aduthurai	Pattambi(K+R)	Mandya	Navsari
Nawagam	Coimbatore	Pusa	ARI-Rajendranagar
Varanasi	Vadgaon	Maruteru(R)	Karjat
Moncompu(K+R)	Puducherry(K+R)	Titabar	Tuljapur
Warangal	Chatha	Rewa	Chiplima
	Vadgaon		

Treatments:

S_1-Broadcasting of seeds

S2- Manual Line sowing

S_3-Mechanized line sowing of seeds (Dibbler, Happy seeder or any Drum seeder: Spacing as per the equipment specifications)

S_4- Raised bed system (Sowing in 1 mt beds raised to hight of 15 cm)

S_5- Any improved system in that particular location

S6- Location specific

S7- Farmers wet DSR method

*Recommended dose of fertilizer should be applied in all treatments. Nitrogen should be applied as 50% basal and 25% each as top dressing at active tillering and panicle initiation stages

(Mention the seed rate)

Design : RCBD
Replication : 3
Plot size : 30 m^2
Variety : Any HYV (Medium duration) of the location.

Observations:

- Plant height and Crop stand (plants for m^2 at 15 days after sowing)
- Dry matter accumulation and partitioning of the dry matter (stem, leaves and grains at different stages)
- Tiller production (effective and ineffective)
- Days to 50% flowering

- **Weed parameters in all the treatments (Weed photos,Weed species, weed density no/m^2, weed dry weight g/m^2 at active tillering and panicle initiation stages of rice crop)**
- Pest and disease incidence/dynamics
- Root activity and root parameters
- Uptake of major and minor nutrients
- Availability of nutrients in the soil (initial and after harvest)
- Yield attributes (Grain number, panicle number, panicle length, panicle weight and test weight)
- Grain and straw yield
- Economic evaluation of different methods of crop establishments
- Initial and final available soil nutrient status of each treatment.

Experimental details:

- Identify a suitable plot with the least interference of water seepage from adjoining rice fields as irrigation water input needs to be quantified.
- Soil from the experimental area must be analyzed initially for texture, bulk density, soil fractions, pH, OC, EC, CEC, available nutrients N, P, K, Zn, S and soil moisture characteristics at saturation, field capacity and wilting point.
- After dry ploughing the field making the soil into a fine tilth, proper levelling, main blocks are laid with provision for double irrigation channels, and leaving buffer zone of 2 m all round the blocks to minimize water interference from the adjoining plots. Sub plots are laid as per the layout. At the entry point of the plot for irrigation, provision should be made to install digital water meter for quantifying water input or water meter.
- **The total quantity of irrigation water applied during crop season and effective rainfall must be provided.**
- For dry direct-seeded rice, dibble 2 – 3 seeds per hill in a well-prepared and levelled field maintaining the spacing of 20 x 10 cm and irrigated and ensure proper crop stand.
- Apply fertilizer as per the treatments.

- In case of the occurrence of Fe deficiency, the problem may be corrected by a suitable spray schedule (0.50% $(NH_4)_2$ Fe $(SO_4)_2$ in water at pH 5.0) after recording observations on the intensity of deficiency.

Trial No : 7
Trial Code : RCT 2.3.b RCT-2.3 b
Name of the trial : Evaluation of varieties for their suitability and enhancement of the productivity in wet direct seeded rice (puddle soil)

Objectives:

1. To identify the suitable and promising rice cultivars in wet direct seeded rice
2. To assess the various agronomic parameters for suitability of rice cultivars in in wet direct seeded rice establishment methods

Locations:

ARI-Rajendranagar	Dhangain	Gangavathi	Kota
Mandya	Nawagam	Maruteru	Puducherry

Design : RBD
Replications : 3
Row spacing : 20 x 15 cm- for line sowing
Plot size : 25 m^2
Cultivars :5-6 Cultivars from IIRR

One or Two varieties of each – Promising HYVs, Hybrids (115-120 days), Hybrids of the Zone found promising for Dry DSR method
Location specific standard checks

Tentative list of Promising Cultivars :

The followings are the varieties for wet DSR trials,

1. DRR Dhan 44 (early)
2. Sabhagidhan (very early)
3. DRR Dhan 60
4. DRR Dhan 42 (Mid early)

5. Vandana (rainfed upland)
6. Anjali
7. Varalu (Upland-western zone)
8. IRRI 1
9. IRRI 2
10. IRRI 3
11. Local check 1
12. Local check 2
13. Local check 3

*If varieties & Hybrids are not received from IIRR, the location specific varieties & hybrids can be used (send the details of the varieties such as duration, yield potential along with data)

Observations:

1. Germination (%)
2. Plant density/m^2 (at 21 DAS and at maturity)
3. Tillers/m^2(at maximum tillering)
4. Dry matter Production /m^2
5. Days for 50 % Flowering
6. No. of panicles/m^2
7. Test grain weight (g)
8. Cost of cultivation for each treatment
9. Grain yield (kg/plot)
10. Straw yield (kg/plot)
11. Quantity of water applied
12. Qualification of irrigation water used is essential.

Note: Season :*Kharif and rabi*

Note :The state wise fertility maps are available and all the fertiliser recommendations in the AICRP trials should be based on the fertility level suggested by these maps in different states. This is for strict compliance and provide RFD as per the recommendation

I.RICE BASED CROP VIVERSIFICATION SYSTEMS (RBCDS)

Trial No. : 8

Trial code : RBCDS -3.1 RBCDS-1

Name of the trial : Conservation Agriculture/System based management practices in rice and rice-based cropping systems (crop diversification) for higher profitability (Interdisciplinary with Entomology and Pathology)

Introduction

Conservation agriculture (CA) systems are yet to be developed for the intensive rice-based cropping systems (comprising rice plus additional cereal, legume and/or oilseed crops) that are common across India. Implementing CA in the rice-based crop system is feasible using a novel approach to establish rice (transplanting, direct wet seeding and aerobic). Further, in rabi season rice straw left out after harvesting can be used as mulch instead of adding outside mulch.

CA refers to a set of agricultural practices involving three basic principles of proven scientific soundness. These include (i) continuous minimum mechanical soil disturbance; (ii) permanent organic (crop residues or cover crops) soil cover; and (iii) diversified, efficient and economically viable crop sequences. These principles are very specific to prevailing agro-climatic conditions, bio-physical and socio-economic conditions of the farmers. Selection of cropping system, crop establishment, residue retention and their management practices may vary as per the situations prevailing under different agro-ecosystems. Sustainability of conventional agriculture, declining profit, labor shortages, degradation of natural resources with

expected climate change are the force behind the adoption of CA based on above said three principle

The objective of the present study was to study the possibility of CA practices on rice base cropping systems to enhance the productivity of the system. Key questions were: how critical is it for increased residue retention to enable the CA system to be productive and; how long is the transition phase before the main benefits of CA for crop yield become apparent?

Objectives

- To study the effect of establishment methods on productivity of rice and on succeeding crop
- To analyse nutrient uptake pattern in different rice based systems
- To calculate the profitability of the systems

Locations:

Ghaghraghat(K+R)	Karjat	Pattambi	Vadgaon
Rajendranagar	Titabar	Rewa	Tuljapur

All centres should conduct both *kharif* and *Rabi*

Design : Split-split plot design
Replications : 3
Plot size : *Kharif* - 150 m^2 for each main plot

Treatment
Main plots (Crop establishment methods)-Kharif
M_1: Transplanting
M_2: Wet seeding (line sowing under puddle condition)
M_3: Aerobic rice – Dry rice cultivation

***Kharif*- RCBD**

Divide each main plot into 2 sub-plots and each sub-plot into 4 sub-sub plots to superimpose the ***rabi***crops and Tillage management

Sub-plot*:* Tillage management

S_1: Conventional tillage

S_2: Minimum tillage

****Rabi crops will be grown under both conventional tilled and minimum tilled plots***

Further sub divided into 4 plots

Sub – Sub plot (Cropping sequences - 3 or 4) – preferably cereals, pulses and oilseeds

a. CS-1
b. CS-2
c. CS-3
d. CS-4

Design in *Rabi*: Split-Split

- Crops of *rabi* will be as suitability of the location – predominant cropping sequence
- For *Kharif* rice, *rabi* crops (wheat,/ rice/ maize / oilseeds/ pulse) nutrient will be applied as per the recommended package of the location

This layout will continue for 3-4 years

Kharif* 2022 lay out similar to Previous *rabi

Note: Please mention recommended dose of fertilizer for all crops at the respective test location

During summer season all pulse crops will be sown under zero tillage condition

Layout of the Experiment -*Kharif* 2022 (for example)

150 m^2 M1	**M1**	**M1**
Channel-		
M2	**M2**	**M2**
M3	**M3**	**M3**

Rabi 2022-23

M1- Coventional CSI	**M1- Coventional CSI**	**M1- Coventional CSI**
M1- Coventional CS2	**M1- Coventional CS2**	**M1- Coventional CS2**
M1- Coventional CS3	**M1- Coventional CS3**	**M1- Coventional CS3**
M1- Coventional CS4	**M1- Coventional CS4**	**M1- Coventional CS4**
M1- Minimum CSI	**M1- Minimum CSI**	**M1- Minimum CSI**
M1- Minimum CS2	**M1- Minimum CS2**	**M1- Minimum CS2**
M1- Minimum CS3	**M1- Minimum CS3**	**M1- Minimum CS3**
M1- Minimum CS4	**M1- Minimum CS4**	**M1- Minimum CS4**
M2- Coventional CSI	**M2- Coventional CSI**	**M2- Coventional CSI**
M2- Coventional CS2	**M2- Coventional CS2**	**M2- Coventional CS2**
M2- Coventional CS3	**M2- Coventional CS3**	**M2- Coventional CS3**
M2- Coventional CS4	**M2- Coventional CS4**	**M2- Coventional CS4**
M2- Minimum CSI	**M2- Minimum CSI**	**M2- Minimum CSI**
M2- Minimum CS2	**M2- Minimum CS2**	**M2- Minimum CS2**
M2- Minimum CS3	**M2- Minimum CS3**	**M2- Minimum CS3**
M2- Minimum CS4	**M2- Minimum CS4**	**M2- Minimum CS4**
M3- Coventional CSI	**M3- Coventional CSI**	**M3- Coventional CSI**
M3- Coventional CS2	**M3- Coventional CS2**	**M3- Coventional CS2**
M3- Coventional CS3	**M3- Coventional CS3**	**M3- Coventional CS3**
M3- Coventional CS4	**M3- Coventional CS4**	**M3- Coventional CS4**
M3- Minimum CSI	**M3- Minimum CSI**	**M3- Minimum CSI**
M3- Minimum CS2	**M3- Minimum CS2**	**M3- Minimum CS2**
M3- Minimum CS3	**M3- Minimum CS3**	**M3- Minimum CS3**
M3- Minimum CS4	**M3- Minimum CS4**	**M3- Minimum CS4**

Observations:

1. Germination (%)
2. Plant density/m^2 (at 21 DAS and at maturity)
3. Tillers/m^2 (at maximum tillering)
4. Dry matter production /m^2
5. No. of panicles/m^2
6. Test weight of grains (g)
7. Weed population (number / m^2 at critical stages -30 and 60 DAS)
8. Weed dry matter (g/ m^2 at critical stages -30 and 60 DAS)
9. Cost of cultivation for each treatment
10. Grain yield (kg/plot)
11. Straw yield (kg/plot)
12. Soil fertility status (initial and after harvest of each crop)
13. Nutrient uptake by crops and soil available nutrient status
14. System productivity
15. Cost of cultivation (Rs./ha)

Note: The state wise fertility maps are available and all the fertiliser recommendations in the AICRP trials should be based on the fertility level suggested by these maps in different states. This is for strict compliance and provides RFD as per the recommendation.

Associated the Soil scientist of the location to collect data on nutrient uptake

*** The trial need to be conducted in both the seasons.**

Interdisciplinary : Entomology and Pathology

Interdisciplinary trial with Agronomy (CA/SM 1 – Conservation Agriculture/ System based management practices in rice and rice based cropping systems (Crop diversification) to utilise resources and enhance the productivity and profitability)- Entomolgy Pathology).

Objectives: i) To study the effect of cropping systems on carryover of insect pests in rice

ii) To assess the effect of *rabi crops* on next kharif rice

Locations (7): Aduthurai, Maruteru, Karjat, Pantnagar, Rajendranagar, Jagdalpur, Pattambi

Treatments, design, plot size, variety and layout are as per the Agronomy technical program. Entomologists will be taking only observations.

Observations will be taken in all the establishment methods & cropping sequences & residue management plots

In three replications of all the establishment methods with residue management and cropping sequences, record observations at 10 day interval starting from 15 days of planting/sowing.

At each observation, in each replication, select 5 plants at random and record the following:

- Total number of tillers / plant
- Total number of leaves/ plant
- Number of dead hearts/ plant
- Number of galls/ plant
- Number of damaged leaves (indicate the pest- hispa, leaf folder, whorl maggot, thrips, case worm etc./ plant)
- Panicle bearing tillers / plant
- White ears/ plant
- Number of BPH/WBPH/GLH per plant
- Any other pest observed
- Natural enemy count and Record yield
- Occurrence of the diseases in each treatment

Entomology and Pathologists can collect data from agronomy Trials

Trial No.	**:**	**9**
Trial code	:	**RBCDS -3.2** RBCDS-2
Name of the trial	:	**Assessing the performance and yielding ability of Sorghum hybrids in Rice fallows (Interdisciplinary with ICAR-IIMR)**

Introduction:

In rice-fallows, sorghum cultivation was found to be high yield potential with labour and inputs intensive crop system. It is found that use of high inputs viz., pesticides, herbicides, fertilizers, labourers, and skillful management of all the innovative practices including irrigations, were resulted into the high yield. It is implied that the farmers were highly profit oriented and obtained high returns from the sorghum cultivation. Their profit margin could be further increased by mechanization and introducing standard package of practices. Keeping the yield benefits in view, the farmers innovative knowledge should be validated on their fields to develop standardize location-specific production technologies so that the productivity and soil health will sustain in long run. These innovative farmers would be able to educate and transfer the viable technologies more effectively among the other sorghum growers in rice-fallows as change agent. Further very efficient genotypes had been developed which are very much suitable for rice fallows. There is need to test in them in rice fallows of different locations to gain the benefit of the Rice sorghum cropping system.

Objectives:

- Quantifying production potential of grain sorghum in zero –tilled rice fallows.
- To develop suitable agronomic management practice for rice fallow grain sorghum

Locations:

Jagdalpur Mandya Arundhathi Nagar Nellore

Ranchi	Mandya(R)	Gerua	IIRR
NRRI Cuttack	Bapatla	Karaikal	Puducherry(R)

Kharif -2022

Rice planting – 3 methods
T_1- Transplanting
T_2 - Wet DSR
T_3- Dry DSR

Design: RBD Replication- 5 Plot size: 200 m^2

Observations:

- Days to 50% flowering
- Plant height (cm)
- Total tiller number per /m^2
- Productive tiller per /m^2
- Panicle length (cm)
- No. of filled grains per panicle
- Spikelet Sterility percentage
- Grain yield per plot converted to t/ha
- Straw yield per 5 plant, grain yield per square meter and grain yield per plot
- Notes on pests, diseases and lodging
- Rainfall during the crop growth (Number of rainy days)
- Maximum and minimum temperature.

During *rabi* in Rice fallows:
Super impose the Varieties and millets: 3-4 supplied by ICAR-IIMR for their yield potential

Season & year : Summer season, 2022-23
Time of sowing : December, 2022 (2^{nd} fortnight)

Sorghum cultivars: 3-4; New Hybrids
Checks: V14 = CSH 25; V15: CSH 30;
(Supplied by the ICAR-IIMR collaborators)

Design: Split-Plot
Replication: 3
Plot size:

Gross: 4.50 x 5.00 m =22.5m2 (No. of rows: 10; Row length: 5m)
Net: 3.60 x 4.40 m=15.84 m2 (No .of rows: 8; Row length: 4.4 m)

Spacing: 45 x 10 cm; [row to row: 45cm and plant to plant 10cm].

Soil & Crop Management:

Paddy field: Sorghum crop should be sown as relay cropping before or immediately after harvest of paddy. The sorghum crop needs to be raised under Zero Tillage with two to three irrigations.
Nutrient/Fertilizer management: RDF (80:40:40 NPK kg/ha).
(Half of N, P, K should be applied as basal, and remaining half of N is to be side dressed at about 35 - 40 days after sowing coinciding panicle initiation stage).

Data to be collected:

Physico-chemical characteristics of soil :

(Soil texture, pH, EC, OC, and available N, P & K) before application of treatments (at least 2-3 samples from each replication).

Soil moisture content at sowing and at harvest

- Plant stand after final thinning and at harvest (plants per net plot and /m^2).
- Days to 50% flowering and physiological maturity

- Plant height at harvest (cm)
- Number of panicles/m^2
- Grains (Number/panicle)
- 100-seed weight (g)
- Grain yield (kg/net plot),
- Dry fodder (Stover) yield (kg/net plot) at physiological maturity
- Harvest index (%)
- Nutrient (NPK) uptake by grain and stover (kg/ha)
- Economics
- Cost of cultivation (Rs./ha)
- Gross monetary returns (Rs./ha)
- Net monetary returns (Rs./ha)
- Benefit: cost ratio

Note: (Dr. Aruna PI, Breeding and Dr. Gangaiah, P.S., Agronomy IIMR to provide genotypes of Sorghum and millets other details)

Trial No. : **10**

Trial Code : **RBCDS–3.3** RBCDS-3

Name of the Trial : **Long term trial on weed dynamics in rice based cropping systems under different establishment methods**

Activity 1:-

Objectives :
1. To assess the changes in weed flora due to continuous rice growing
2. Weed dynamics in different crop establishment methods
3. Survey on weed shift and herbicide resistance over period of time in farmers field

Duration: 5 years.

*** The layout has to be kept <u>permanent for five years</u> and continue with same set of treatments in each season**

Layout: Split plot, **Replications:** 3, **Plot size:** >20 m^2

Locations:

Aduthurai(K+R)	Chinsurah	Gangavathi	Ghaghraghat
Jagdalpur	Nagina	Nawagam	Pantnagar
Pattambi(K+R)	Pusa	ARI-Rajendranagar	Varanasi
Moncompu(K+R)	Puducherry	Chiplima	Cuttack
Karaikal (R)	Rewa	Titabar	Tuljapur
Ranchi	Parbhani	Malan	Chatha
Coimbatore			

Cultivars: Location specific high yielding cultivar

Treatments:

Main plot:

M_1 – Mechanized transplanting/Transplanting (if transplanters not availble)

M_2 – Puddled direct seeding (preferably line sowing by drumseeder)

M_3 – Un-puddled dry direct seeding (Line sowing)

Note: All the three systems must be implemented in the programme and results will be considered. If the location is not suitable for 3 systems, the trial may not be taken up.

Sub plot treatments:

S_1 **–** Weedy check

S_2 **–** Mechanical weeding using weeder

S_3**–**Chemical weed control* (Herbicide recommendation of respective University may be followed)

***The same chemicals have to be repeated every year to find out the changes in resistance or diversity in weed flora.**

**** Details of herbicides used in S3 must be provided**

Fertilizer Schedule: Site Specific Nutrient Management

Observations:

1. Tillers/m^2 at MT and PI stage
2. Panicles/m^2 at harvesting
3. Total dry matter /m^2
4. 1000 grain weight (g)
5. Panicle weight (g)
6. Grain yield (kg/plot or t/ha)
7. Straw yield (kg/plot or t/ha)
8. Cost of cultivation Rs/ha
9. Benefit –Cost Ratio

<u>Weeds</u>

1. Specific and major weed information of the location
2. Weed flora composition
3. Weed Population - Number of individual weeds/ m^2 (species wise) in each treatment should be recorded twice at active tillering stage and panicle initiation stages
4. Relative Weed Density

$$\frac{\text{Density of individual weed species in the treatment plot}}{\text{Density of all weed species in the treatment}} \times 100$$

5. Dry weed biomass/m^2 (species wise) recorded twice at active tillering stageand panicle initiation stages
6. Weed control efficiency

$$\frac{\text{Dry weight of weeds in weedy check- Dry weight of weeds in Treatment plot}}{\text{Dry weight of weeds in weedy check}} \times 100$$

7. Weed index

$$\frac{\text{Yield from weed free plot-yield from treatment plot}}{\text{Yield from weed free plot}} \times 100$$

Trial No. : 11

Trial Code : RBCDS -3.4 RBCDS-4

Name of the trial : Weed survey in different zones

Weed Survey

From 25 rice farmers from each centre

Name of Respondent and full address:_____
Mobile No

- Latitude / longitude : GIS location
- Soil type:

Weed Management

Farmer's Current Weed Problems (Identification)

- List the weed species currently present in your rice field. Then, rank the 5 most important weeds. (photos will be shown)

Rank	Weed species	Rank	Weed species	Rank	Weed species

_____

_____

Current practice of farmers on weed management

1. Pre-emergent herbicide name, dose, application time and cost	
2. Post-emergent herbicide name, dose, application time and cost	
3. Manual weeding, time, cost	
4. Total Weed Control Cost	

Trial No. : 12 RBCDS-5

Trial Code : RBCDS -3.5 (Climate Resilient Agriculture)

Name of the trial : Analysis of long term meteorological data of AICRIP centers (temperature and rainfall) for identifying the reasons for yield reduction

Objective : To determine the relative sensitivity of rice yield to changes in rainfall, T_{min} and T_{max}

Rationale:

The impacts of temperature and solar radiation on rice yield remain imperfectly understood, despite decades of agronomic research. Current knowledge is based primarily on field trials and greenhouse experiments. These experimental studies indicate that increased temperature and decreased radiation can reduce yield, with the impacts varying across the plant's three growth phases (vegetative, establishment to panicle initiation; reproductive, panicle initiation to flowering; ripening, flowering to mature grain). Rice, alike other crops, also exhibits nonlinear relationships with various weather parameters, particularly temperature. Existing studies confirm that significant changes have occurred in the climate of this region during the 20th Century and that in some regions in the tropics, weather is already approaching critical levels during the susceptible stages of rice growth. Thus, the observed climatic changes (and attributed weather fluctuations) in the past may have had significant influences on rice productivity in the region.

Methodology:

Our general approach was to regress yield on weather variables (rainfall, Maximum and minimum temperature) and in some specifications, exogenously determined economic variables, whose inclusion improved the precision of the estimated weather impacts. ICAR-IIRR and its cooperating centres will collect the data on crop establishment and harvest dates,

production inputs, and yields for each location in each season of each year. The mean weekly weather data will be from a single monitoring station at each site, which was within 15–20 km from a site. This detail will enable us to construct location-specific measures of weather variables defined according to the rice plant's three growth phases (for each phase, weekly means of rainfall, T_{min} and T_{max}). The fact that the dataset include observations over multiple growing seasons enable us to use fixed effects to control for unobserved factors that varied across space (i.e., were unique to each location, such as soil) or time (were common to all observational locations at a given site in a given season and year, such as ambient CO_2 concentration).

Locations: All the locations (Data of all locations to be submitted in the prescribed format)

Funded and Voluntary Centres

Data to be collected: Grain yield (t/ha)

Weather parameters (**rainfall, T_{max} and T_{min}**)

Mean weekly rainfall (1990-2022)

Year	**Standard meteorological week**											
1990	1	2	3	.	.	.	.	.	50	51	52	53
1991												
1993												
.												
.												
2019												
2020												
2021												
2022												

Mean weekly maximum temperature (1990-2022)

Year	**Standard meteorological week**											
1990	1	2	3	.	.	.	.	.	50	51	52	53
1991												
1993												
.												
.												
2020												
2021												
2022												

Mean weekly minimum temperature (1990-2022)

Year	**Standard meteorological week**											
1990	1	2	3	.	.	.	.	.	50	51	52	53
1991												
1993												
.												
.												
2022												

Rice grain yield (1990-2022)

Year	*Kharif*	*Rabi*
1990		
1991		
1993		
.		
.		
2022		

Standard meteorological week

Week No.	Dates	Week No.	Dates
1	01 Jan – 07 Jan	27	02 Jul –08 Jul
2	08 Jan – 14 Jan	28	09 Jul – 15 Jul
3	15 Jan – 21 Jan	29	16 Jul – 22 Jul
4	22 Jan – 28 Jan	30	23 Jul – 29 Jul
5	29 Jan – 04 Feb	31	30 Jul – 05 Aug
6	05 Feb – 11 Feb	32	06 Aug – 12 Aug
7	12 Feb – 18 Feb	33	13 Aug – 19 Aug
8	19 Feb – 25 Feb	34	20 Aug – 26 Aug
9	26 Feb – 04 Mar	35	27 Aug – 02 Sep
10	05 Mar – 11 Mar	36	03 Sep – 09 Sep
11	12 Mar – 18 Mar	37	10 Sep – 16 Sep
12	19 Mar – 25 Mar	38	17 Sep – 23 Sep
13	26 Mar – 01 Apr	39	24 Sep – 30 Sep
14	02 Apr – 08 Apr	40	01 Oct – 07 Oct
15	09 Apr – 15 Apr	41	08 Oct – 14 Oct
16	16 Apr – 22 Apr	42	15 Oct – 21 Oct
17	23 Apr – 29 Apr	43	22 Oct – 28 Oct
18	30 Apr – 06 May	44	29 Oct – 04 Nov
19	07 May – 13 May	45	05 Nov – 11 Nov
20	14 May – 20 May	46	12 Nov – 18 Nov
21	21 May – 27 May	47	19 Nov – 25 Nov
22	28 May – 03 Jun	48	26 Nov – 02 Dec
23	04 Jun – 10 Jun	49	03 Dec – 09 Dec
24	11 Jun – 17 Jun	50	10 Dec – 16 Dec
25	18 Jun – 24 Jun	51	17 Dec – 23 Dec
26	25 Jun – 01 Jul	52	24 Dec – 31 Dec

Supplementary information:

Particulars	
Date of sowing (*Kharif)*	
Date of harvesting (*rabi*)	
Variety	
Any major disease, pest attack or reason for yield loss	
Nutrient dose applied	
Irrigated/rainfed	
Succeeding/previous crop	

Data sheet for the Parameters to be collected

Location	2011		2012		2013		2014		2015		2016		2017		2018		2019		2020		2021	
Rainfall	**Week no.**	**RF (mm)**	**Week no.**	**RF (mm)**	**Week no.**	**RF (mm)**	**Week no.**	**RF (mm)**	**Week no.**	**RF (mm)**	**Week no.**	**RF (mm)**	**Week no.**	**RF (mm)**	**Week no.**	**RF (mm)**	**Week no.**	**RF (mm)**	**Week no.**	**RF (mm)**	**Week no.**	**RF (mm)**
	1		1		1		1		1		1		1		1		1		1		1	
	2		2		2		2		2		2		2		2		2		2		2	
	3		3		3		3		3		3		3		3		3		3		3	
	4		4		4		4		4		4		4		4		4		4		4	
	5		5		5		5		5		5		5		5		5		5		5	
	6		6		6		6		6		6		6		6		6		6		6	
	7		7		7		7		7		7		7		7		7		7		7	
	8		8		8		8		8		8		8		8		8		8		8	
	9		9		9		9		9		9		9		9		9		9		9	
	10		10		10		10		10		10		10		10		10		10		10	
	11		11		11		11		11		11		11		11		11		11		11	
	12		12		12		12		12		12		12		12		12		12		12	
	13		13		13		13		13		13		13		13		13		13		13	
	14		14		14		14		14		14		14		14		14		14		14	
	15		15		15		15		15		15		15		15		15		15		15	
	16		16		16		16		16		16		16		16		16		16		16	
	17		17		17		17		17		17		17		17		17		17		17	
	18		18		18		18		18		18		18		18		18		18		18	
	19		19		19		19		19		19		19		19		19		19		19	
	20		20		20		20		20		20		20		20		20		20		20	
	21		21		21		21		21		21		21		21		21		21		21	
	22		22		22		22		22		22		22		22		22		22		22	
	23		23		23		23		23		23		23		23		23		23		23	
	24		24		24		24		24		24		24		24		24		24		24	
	25		25		25		25		25		25		25		25		25		25		25	
	26		26		26		26		26		26		26		26		26		26		26	
	27		27		27		27		27		27		27		27		27		27		27	
	28		28		28		28		28		28		28		28		28		28		28	
	29		29		29		29		29		29		29		29		29		29		29	
	30		30		30		30		30		30		30		30		30		30		30	
	31		31		31		31		31		31		31		31		31		31		31	
	32		32		32		32		32		32		32		32		32		32		32	
	33		33		33		33		33		33		33		33		33		33		33	
	34		34		34		34		34		34		34		34		34		34		34	

	35		35		35		35		35		35		35		35		35		35	
	36		36		36		36		36		36		36		36		36		36	
	37		37		37		37		37		37		37		37		37		37	
	38		38		38		38		38		38		38		38		38		38	
	39		39		39		39		39		39		39		39		39		39	
	40		40		40		40		40		40		40		40		40		40	
	41		41		41		41		41		41		41		41		41		41	
	42		42		42		42		42		42		42		42		42		42	
	43		43		43		43		43		43		43		43		43		43	
	44		44		44		44		44		44		44		44		44		44	
	45		45		45		45		45		45		45		45		45		45	
	46		46		46		46		46		46		46		46		46		46	
	47		47		47		47		47		47		47		47		47		47	
	48		48		48		48		48		48		48		48		48		48	
	49		49		49		49		49		49		49		49		49		49	
	50		50		50		50		50		50		50		50		50		50	
	51		51		51		51		51		51		51		51		51		51	
	52		52		52		52		52		52		52		52		52		52	
	53		53		53		53		53		53		53		53		53		53	
	54		54		54		54		54		54		54		54		54		54	

Dr. B. Sailaja (Computer Application, IIRR) will be associated in testing the models and prediction of yields

V.INTERDISCIPLINARY TRIALS

Trial No **13** IDT-1
Trial Code : IDT-4.1
Name of the trial : Yield maximization of rice in different Zones (Interdisciplinary trial – Agronomy, Soil Science)

Rice (*Oryza sativa* L.) is grown in India over a gross area of 44 million hectares (ha). Total production of Rice during2021-22is estimated at record 127.93 million tonnes. It is higher by 11.49 million tonnes than the last five years' average production of 116.44 million tonnes. However, India would need to produce at least 200 million tonnes of paddy to meet its ever-growing population requirements. Rice occupies a pivotal position concerning food security in India. The future of food security in this region will depend on its ability to improve rice productivity continuously on an ecologically sustainable basis.

One of the main reasons for low rice productivity in India is the variation in fertilizer usage between the country's different agro-climatic zones and between states in each region. Low input use in general is a further factor accounting for the plateau or declining trend of grain yields.

Objectives:

1. To maximize the yield in different zones
2. To compare yield and economics of the best management practices

Locations : (Agronomy and Soil Science)

Agronomy		**Soil Science**	
Chinsurah (K+R)	Faizabad	Kanpur	Karaikal
Gangavathi	Ghaghraghat	Kaul	Mandya
Kota (K+R)	Mandya	Maruteru	Moncompu

Pantnagar	Pattambi (K+R)	Pantnagar	Pusa
Raipur	Maruteru (K+R)	Titabar	Chinsurah
Moncompu (K+R)	Ranchi	Faizabad	Khudwani
Titabar	Malan	Puducherry	Purulia
Karaikal (R)	Khudwani	Bankura	
Kanpur	Bankura (K+R)		

Agronomy and Soil science collaborators are requested to conduct in Interdisciplinary mode and supply data together as decided in the workshop meeting

Design : Randomized Block Design
Replications : 3
Season : Kharif and rabi
Variety (Rice) : High yielding variety
Seed rate : 20-25 kg/ha (20 x 15 cm)
In rabi: Rice or any other rotation crops with same nutrient combinations
Maintain the plot and take big plot size (50 m^2 per treatment)
Yield target: 6 t/ha and above.

Treatments:
T_1: Location specific recommended dose of fertilizer (RDF)
T_2: T_1 + FYM@ 5t/ha
T_3: T_1 + Sampoorna (KAU) @10 g per litre of water twice in the cropping season (250 litre/hectare/application), ie., one week prior to maximum tillering stage and one week prior to panicle initiation (1% foliar application of 'Sampoorna KAU Multimix' @ 2.5 kg/ha each at the above two stages).
T_4: 125% RDF of T_1
T_5: 125% RDF of T_1 + FYM@5 t/ha

T_6: T_1+ Application of micro nutrient (deficient to that location)
T_7: T_1+ Geoxol.COM @ 40 kg/ha during basal fertilizer application (Geoxol will be sent by IIRR)
T8: Optional (According to location- any best treatment of location)

Details on Multi nutrient foliar mix 'Sampoorna KAU Multimix' for application in rice fields

Wide spread occurrence of micronutrient deficiencies observed in the paddy fields can be corrected by the application of 'Sampoorna KAU Multimix' @10 g per litre of water twice in the cropping season (250 litre/hectare/application), ie., one week prior to maximum tillering stage and one week prior to panicle initiation (1% foliar application of 'Sampoorna KAU Multimix' @ 2.5 kg/ha each at the above two stages).

Nutrient Content in 'Sampoorna KAU Multimix' as revealed by KAU

Zinc- 4- 6.5%, Boron – 3.5 - 4.5%, Copper – 0.3 - 0.5%, Iron - less than 0.2%, Manganese - less than 0.2%, Molybdenum - less than 0.02%

Cost of 'Sampoorna KAU Multimix' is Rs 230/kg

Note: The state-wise fertility maps are available and all the fertiliser recommendations in the AICRP trials should be based on the fertility level suggested by these maps in different states. This is for strict compliance and provides RFD as per the recommendation

*Avoid manual labour involvement as much as possible to minimize cost of cultivation
*The goal of this trial should be reducing the cost of cultivation as much possible along with maximization of yield on rice

Observations:

1. Total tillers/m^2
2. Total panicles/m^2

3. Filled grains/panicle
4. Unfilled grains/panicle
5. 1000 grain weight
6. Pests and disease infestation
7. Grain yield/20 m^2 (mention t/ha also)
8. Straw yield/20 m^2 (mention t/ha also)
9. Initial and Final Soil nutrient status
10. Plant uptake NPK at Harvest (Straw + Grain) if soil scientist are associated
11. Cost of cultivation

Note:

- Wherever facilities are available and involve soil scientists for analysis of soil and plant samples and send the analyzed the data for report preparation
- Contact PI of Agronomy for LCC charts (R.Mahender Kumar, PI Agronomy kumarrm21364@gmail.com – 94404 76493)if needed
- Contact Dr. K.Surekha regarding chemical analysis (surekhakuchi@gmail.com–Mobile-9440963382)

Centres (15): Kanpur, Karaikal, Kaul, Mandya, Maruteru, Moncompu, Pantnagar, Pusa, Titabar, Chinsurah, Faizabad, Khudwani, Puducherry, Purulia, Bankura

Note:

- *Wherever facilities are available and involve soil scientists for analysis of soil and plant samples and send the analysed the data for report preparation*
- *Contact PI of Agronomy for LCC charts (Dr. R. Mahender Kumar, PI Agronomy kumarrm21364@gmail.com – 94404 76493)if needed*
- *Contact Dr. K.Surekha regarding chemical analysis (surekhakuchi@gmail.com–Mobile-9440963382)*

Trial : 14

Trial code ID- 4.2 IDT-2

Name of the trial **Agronomicevaluation of the package of practices of the best farmers of the state/ region and yield gap analysis of the region. (Agronomy, Soil science and Agricultural Economics)**

***All funded and voluntary centers (data to be collected from at least 50 to 75 farmers of the zone) to be involved in this trial.**

Objectives

1. To assess variability in rice productivity in relation to soil supply of nutrients and input management in farmers' fields and in research farms / demonstrations with GPS data for yield gap assessment
2. To demonstrate the nutrient management recommendations for realizing yield targets to bridge the gap in a specific environment in some selected farm sites in comparison with existing practices through front line demonstrations.

Locations: All Cooperating Centers

Aduthurai	IIRR	Mandya	Puducherry
Rajendranagar	Gangavathi	Moncompu	Medziphema, SASRD
Arundhatinagar	Giridih	Maruteru	Rahuri
Coimbatore	Jagdalpur	Pattambi	Tuljapur
Chinsurah	Faizabad	Khudwani	Nagina
Navsari	Pantnagar	Dhangain	Varanasi

Annexure -1

Yield Gaps: Rice cultivation details of progressive farmers schedule
ICAR-Indian Institute of Rice Research, Hyderabad

1. District: 2. Mandal:
1. Village: 4. Name of the farmer: 5. Age:
2. Education (Please tick):

Illiterate	Primary	Secondary	College

3. Land holding particulars:
   a. Total land owned in acres: Rainfed:
      Irrigated:
   b. Total land leased in (specify the land rent):
   c. Total cultivated area:
   d. Area under rice cultivation: *Kharif*: *Rabi*:
4. Experience in cultivating rice:
5. Caste of the farmer:
6. Extension contacts:
7. Number of family labour involved in rice cultivation:

	Male	Female
Number		

8. Promising Cultivars grown in the Zone and % area : 5-6 cultivars

Sl.NO	Variety	Average yield (t/ha)	(%) area

9. Method of crop establishment Such transplanting, DSR Rain fed etc

Sl.NO	Method of Cultivation	Average yield (t/ha)	(%) area

14. **Cost of cultivation per ha Method of Cultivation (T.P)**

S. No.	**Particulars**	**Time of operation /application**	**Qty (kg / t)**	**Price/ unit**	**Total value (Rs.)**	**Labour**						
						Human Labour				**Bullock Labour (Rs.)**	**Machine Labour (Rs.)**	**Total Labour Cost (Rs.)**
						Male No.	**Wage**	**Female No.**	**Wage**			
a	Land preparation											
b	Seed cost											
c	Nursery raising											
d	Transplanting											
e	Weeding											
f	Manures											
g	Fertilizers											
h	Pesticides											
i	Irrigation No.											
j	Harvesting											
k	Threshing											
l	Bagging											
m	Transportation											

14. **Cost of cultivation per ha Method of Cultivation (DSR)**

S. No.	**Particulars**	**Time of operation /application**	**Qty (kg / t**	**Price / unit**	**Total value (Rs.)**	**Labour**						
						Human Labour				**Bullock Labour (Rs.)**	**Machine Labour (Rs.)**	Total Labour Cost (Rs.)
						Male No.	**Wage**	**Female No.**	**Wage**			
a	Land preparation											
b	Seed cost											
c	Nursery raising											
d	Transplanting											
e	Weeding											
f	Manures											
g	Fertilizers											
h	Pesticides											
i	Irrigation No.											
j	Harvesting											
k	Threshing											
l	Bagging											
m	Transportation											

15. Returns from rice cultivation:

S. No.	Main product		By product	
	Quantity (kg/acre)	Value(Rs./t)	Quantity (kg/t)	Value (Rs./t)
1.				
2.				
3.				

16. Other Costs (Rs. per acre)

S.No.	Particulars	Rs./t
1.	Marketing costs	
2.	Rental value of own land	
3.	Rent paid for leased in land	
4.	Depreciation on farm buildings, implements, etc	
5.	Fixed costs	
6.	Interest on fixed capital	

17. Major constraints experienced in rice cultivation:

a.
b.
c.
d.
e.

18. Technologies developed at the centre

a. New Varieties

Sl.NO	Variety	Average yield (t/ha)	(%) area

b.New Agro techniques

Sl.NO	Agro techniques	Average yield (t/ha)	(%) area

19. Any specific observations on rice cultivation:

Trial No **15** IDT-3

Trial Code : IDT-4.3

Name of the trial : Evaluation of Organic fertilizers and Natural farming practices for enhancing the productivity and soil heath (Interdisciplinary trial – Agronomy, Soil Science and Crop protection)*permanent trial for 5 years and in permanent plot and system-based approach Zones*

(Interdisciplinary trial – Agronomy and Soil Science)

Organic farming and natural farming is rapidly gaining recognition worldwide as a promising means to offer healthier food and to ensure environmental sustainability. Currently, organic produce including organic rice is in huge demand owing to its potential to fetch premium prices in the global market. Use of diverse organic nutrient sources including the split application of fast mineralizable nutrient-rich manures (vermicompost, poultry manure), green manures and bio-fertilizers can supply optimum nutrients in organic rice system. In parallel, development and deployment of rice varieties having a response to organic nutrient inputs, resistance to diseases/insects and the ability to compete with weeds can help minimize the risk of crop failure. Natural farming (NF) is purported to be a disruptive farm practices addressing major concerns of farmers of rising cost of production. It basically envisages ecological or regenerative agriculture approaches and any kind of chemicals to soil systems are strictly prohibited. This practice does not involve any external Chemical or Organic Fertilizers. It is also known by various names like; Zero Budget Natural Farming, Prakrithik Krishi, Cow Based Natural Farming, Shashwat Kheti, Chemical Free Agriculture, etc. The addition of formulation made up of cow dung and urines to trigger the microorganisms in the soil system and enhance the nutrient availability

Even though rice performs well under organic production system/natural farming system, a set of constraints including nitrogen stress at critical growth stages, unavailability of rapidly mineralizable organic amendments, lack of appropriate varieties and intense crop–weed competition pose major challenges to realize the potential yield.

However, a substantial research gap still exists demanding a deeper understanding of the organic rice system to register higher yield gains. There is an urgency for the alignment of modern agricultural techniques with organic rice production to improve both the system productivity and the product quality along with effectively avoiding the risks associated with indiscriminate use of chemicals in agriculture.

Objectives:

1. To maximize the yield in rice through organic and natural farming practices
2. To compare yield and economics of the different organic and natural farming practices
3. To assess the soil health, Pest dynamics and seed quality parameters in organic and natural farming practices

Locations:

Agronomy		**Soil Science**	
Chinsurah (K+R)	Faizabad	Karaikal	Kaul
Gangavathi	Ghaghraghat	Mandya	Maruteru
Pattambi (K+R)	Raipur	Moncompu	Titabar
Karjat	Puducherry	Pantnagar	Chinsurah
Moncompu (K+R)	Chiplima	Pusa	Puducherry
Karaikal (R)	Titabar	Khudwani	Purulia
Parbhani	Chatha	Kanpur	
Khudwani			
Pusa			

Note: Agronomy and Soil science collaborators are requested to conduct in Interdisciplinary mode and supply data together as decided in the workshop meeting

Design : Randomized Block Design

Replications : 4

Season : *Kharif and rabi*

Variety (Rice) : High yielding variety

Seed rate : 20-25 kg/ha (20 x15 cm)

Treatments details

Treatments	**Details**
T1	Control(No additionof anyinputsexceptlabourforoperationsincluding weeding)
T2	CompleteNF(1.Beejamrit+Ghanjeevamrit+Jeevamrit;2.Cropresidue mulching; 3Intercropping) ***[Pre-monsoondry sowing(PMDS) / Muti-variate cropping(MVC)with multiple cropsduring fallow+ Prophylactic/preventivemethodofapplication ofNeemaster,Dashparniark, Brahmaster,Neemseedkernelextract,bordercrop,trapcrop,seedtreatment with Trichoderma, Pseudomonas and Curativeapplication of leaf extracts of Datura,vitex, Agniaster, sourbuttermilk, 2 G/3Gextractanduseof bio-control agents and mechanical traps]***
T3	AI-NPOF package- State wise package can be adopted (Link is provided) **(https://iifsr.icar.gov.in/icar-iifsr/npof/index.php?id=package_of_practices)**
T4	IntegratedCropManagement(50%nutrientapplicationthroughorganic manuresand 50% nutrient application through inorganicsourceswith**pre-monsoondrysowing / *Muti-variate cropping (MVC)*with multiplecropsduringfallow+Prophylactic/preventive methodofapplicationof Neemaster,Dashparniark,Brahmaster,Neemseedkernelextract,bordercrop, trapcrop, seed treatment with Trichoderma,Pesudomonas and Curative applicationofleafextracts ofDatura,vitex,Agniaster, sourbuttermilk,2 G/3G extract and useof bio-control agents andmechanical traps]**
T5	IntegratedCropManagement(50%nutrientapplicationthroughorganic

	manuresand 50% nutrient application through inorganic sources with application of need based pesticidesfor pest management)

T3: AI-NPOF package- State wise package can be adopted (Link is provided):

Punjab: Basal application of organic Source Quantity/ha Source Quantity/ha manures including soil FYM (1% N) 10 t/ha FYM (1% N) 6.75 t/ha application of bio-fertilizers, VC (1.5% N) 2.25 t/ha bio-control agents etc Irrigation practices

(State wise variation will be there which need to be mentioned while sending the data)

Note:

- Maintain permanent plot for 5 years
- Minimum plot size per treatment is 100 m^2 with thorough bunding
- Rice – rice or any rice based system can be tested with similar treatments for rabi crop

Observations:

1. Total tillers/m^2
2. Total panicles/m^2
3. Filled grains/panicle
4. Unfilled grains/panicle
5. 1000 grain weight
6. Pests and disease infestation
7. Lodging resistance
8. Grain yield/20 m^2
9. Straw yield/20 m^2
10. Quality parameters of the seed
11. Initial and Final Soil nutrient status
12. Soil organic carbon and microbial properties after harvest

13. Pests and Disease infestation (Collaboration with Entomology and Pathology)

14. Plant uptake NPK at Harvest (Straw + Grain) by associating soil scientist of the center

Note:

- *Wherever facilities are available and involve soil scientists for analysis of soil and plant samples and send the analysed the data for report preparation*
- *Contact PI of Agronomy for LCC charts (R. Mahender Kumar, PI Agronomy kumarrm21364@gmail.com – 94404 76493)if needed*
- *Contact Dr. K.Surekha regarding chemical analysis (surekhakuchi@gmail.com–Mobile-9440963382)*
- *Dr. Ch. Padmavathi: chintalapatipadmavathi68@gmail.com*
- *Dr. M.S.Prasad : data.msprasad@gmail.com*
- *For Quality analysis Please send 500 g of harvested seed (14% moisture) to Dr. Aravind Kumar I/C Quality lab by 15th January 2022.*
  Dr. Aravind Kumar. Principal Scientist and I/C Quality lab, aravindjukanti@gmail.com

Trial No **16** IDT-4

Trial Code : IDT-4.4

Name of the trial : Nano-fertilizers for increasing nutrient use efficiency, yield and economic returns in transplanted rice (New trial)- (Interdisciplinary soil science and IFFCO)

permanent trial for 5 years and in permanent plot and system-based approach Zones

(Interdisciplinary trial – Agronomy and Soil Science)

Since the industrial revolution, the use of synthetic Nfertilizershas led to the increase of atmospheric N_2O, one of the most important anthropogenic greenhouse gases causing global warming. Despite previous efforts, the Nitrogen Use Efficiency (NUE) in agricultural systems has remained low; meaning that on a global scale, more than 50% of the N applied to agricultural soils is potentially lost into the environment. One of the major challenges of modern agriculture is to satisfy actual and future global food demands efficiently. The current NUE needs to be improved substantially by increasing the efficiency of agricultural systems, adopting environmentally sound agronomic practices, and exploring disrupting technologies. Nano-fertilizers possess unique features which enhance plants' performance in terms of ultra-high absorption, increase in production, rise in photosynthesis, and significant expansion in the leaves' surface area. Besides, the controlled release of nutrients contributes in preventing eutrophication and pollution of water resources. Replacement of traditional fertilizer by nano-fertilizer is beneficial as upon application, it releases nutrients into the soil steadily and in a controlled way, thus preventing the water pollution. It would be very helpful if we use nano-fertilizer for specific crops such as rice to minimize the potential negative effects brought about by the extensive use of chemical inputs without compromising production and nutritional benefits.

Objectives: Based on the previous study and present status the trial is constituted with the following objectives:

1. To study the efficiency of nano-fertilizer in increasing the growth and yield of rice crop and

2. To find out nutrient use efficiency of nano-fertilizers in rice crop.

Treatments:

T_1: Recommended dose of nitrogen (RDN) through urea (recommended P and K)-Urea in three splits (50% Basal + 25% active tillering (AT) + 25 % Panicle initiation (PI)

T_2: T_1 + 2 sprays of Nano urea (4 ml/L of water) (AT and PI)
T_3: 50% of RDN (Urea) as total N as basal + Two foliar spray Nano-Urea at active tillering and panicle initiation stages (4ml /L of water)
T_4: 75 % of RDN (66% Basal + 17 % active tillering (AT) + 17 % at Panicle initiation (PI))
T_5: 75% of RDN (66% Basal + 17 % active tillering (AT) + 17 % at Panicle initiation (PI))) + Two foliar spray Nano-urea (4ml/lt of water) (AT and PI)
T_6: Control (no application of N)

Fertiliser application method

If the Recommended Nitrogen dose is 100 kg Nitrogen /ha

Treatment	**Basal (kg/ha)**	**First split at tillering (kg/ha)**	**Second Split at PI (kg/ha)**
T_1	50	25	25
T_2	50	25+ Nano (4ml/L)	25 + Nano (4ml/L)
T_3	50	0 + Nano application	0+ Nano application
T_4	50	12.5	12.5
T_5	50	12.5 + 1st spray Nano urea	12.5 + 2nd spray Nano urea
T_6	0	0	0

Design: Randomized Block Design **Replication**: 3

Note:

**Rice crop will be grown in transplanted condition. Recommended package and practices of transplanting rice should be followed. All varieties duration should be same. In all treatments recommended dose of P_2O_5 and K_2O will be applied.*

**Trial will be conducted in fixed plot for studying nutrient depletion in soil.*

Nano Urea (Liquid) Fertilizer

IFFCO NANO UREA (Liquid)

IFFCO Nano Urea is the only Nano fertilizer approved by the Government of India and included in the Fertilizer Control Order (FCO). It is developed and Patented by IFFCO. Application of 1 bottle of Nano Urea can effectively replace at least 1 bag of Urea. It has been tested on more than 90 crops across 11,000 locations in Interdisciplinary with ICAR- KVKs, Research Institutes, State Agriculture Universities and progressive farmers of India. When sprayed on leaves, Nano Urea easily enters through stomata and other openings and is assimilated by the plant cells. It is easily distributed through the phloem from source to sink inside the plant as per its need. Unutilized nitrogen is stored in the plant vacuole and is slowly released for proper growth and development of the plant. Small size (20-50 nm) of Nano Urea increases its availability to crop by more than 80%.

Locations: Agronomy

Faizabad	Gangavathi	Jagdalpur	Khudwani
Mandya	Nagina	Pattambi (K+R)	Pusa
ARI-Rajendranagar (K+R)	Jagtial	Maruteru (K+R)	Puducherry (K+R)
Moncompu (K+R)	Warangal	Sabour	Bankura (K+R)
Coimbatore	Kanpur	Kaul	Navsari
Chatha	Ludhiana		

Soil Science centres:

Kaul	Mandya	Karaikal	Maruteru
Khudwani			

Observations

1. Initial soil N, P and K status
2. Growth and yield parameters of rice crop at active tillering, panicle initiation and harvest stages
3. Total tillers/m^2
4. Total panicles/m^2
5. Filled grains/panicle
6. Unfilled grains/panicle
7. 1000 grain weight
8. Grain yield (kg/ha) $_{and}$Straw yield (kg/ha)
9. Quality parameters of the seed
10. Post-harvest Soil nutrient status
11. Pests and Disease infestation (Interdisciplinary with Entomology and Pathology)
12. Plant Nitrogen uptake at Harvest (Straw + Grain) by associating soil scientist of the center
13. Grain quality parameters to be assessed
14. Nutrient use efficiency indicators

15. Cost of cultivation and net returns

Trial No.	**:**	**17** IDT-5
Trial code	**:**	**IDT – 4.5**
Name of the Trial	**:**	**Integrated Pest Management – On farm management of insects, diseases and weeds IPMs (Entomology, Pathology and Agronomy) - Special Interdisciplinary trial**

Introduction: Biotic stresses are the major constraints in rice production resulting in significant yield losses. In the present context, IPM is considered as one of the major approaches to achieve the goal of sustainable rice production on a profitable basis. Farmers consider IPM as an advantageous option in protecting crop from ravages of pests. However, its implementation at farmers' level is inadequate, mainly due to the unawareness of the options available, limited resources and economic feasibility. Some of these IPM options need to be refined at farm level, working with farmers in their fields and selecting technologies suitable for their situation. Thus, IPMs trial was formulated with an objective to manage pests' viz., insects, diseases and weeds in a holistic and participatory way in farmers' fields.

Objectives:

1. To validate IPM practices from a basket of options available and demonstrate to farmers the management of pests in a holistic way (including insects, diseases and weeds).

Locations:

Chinsurah	Coimbatore	Gangavathi	Pusa
Kaul	Mandya	Navsari	Pattambi
Raipur	Vadgaon	Malan	Puducherry
Titabar	Ludhiana		

Variety	Local popular variety of the region
Plot size Replications	Two blocks of not less than 1 acre for each block. 5 replications. Divide each block into 5 equal sized units (each unit = one replication)
Treatments	Take 3-5 farmers in each centre/location, each farmer representing a replication with at least 1acre area/farmer as IPM plots. Farmers can be selected from same village or different villages
Details of the treatments	The package of practices to be followed in IPM module in each zone is given below

Zone 1 – Hilly areas

Locations (3): 1) Khudwani (J&K)
2) Malan (HP)
3) Umiam(Barapani) (ML)

Major Insect Pests: Grasshopper, rice hispa, caseworm, stem borers
Major Diseases: Leaf blast, Sheath blight, brown spot, false smut
Major weeds:Grasses : *Echinochloa colona,Echinochloa crusgalli, Panicum sp;*
Sedges: *Cyperus iria, Eleocharis sp;* ***BLW :*** *Alternanthera sp, Monochoria sp*

IPM module for Zone I		
	IPM	**FP**
Nursery	• Seed treatment with Trichoderma @ 10g/kg. Pre-soak the seeds in water for 12 hrs, take the seeds in a container and add the Trichoderma, coat the seeds with Trichoderma, later allow it for germination in gunny/cloth bag. • Need based application of bispyribacsodium 10% SC @ 0.5 ml/L water at 15 days of nursery.	As per the local farmers practice. **Please record the practices followed by farmers' whenever you go for observation/visit.**
Main field Up to 40	• Transplant seedlings at a spacing of 20 x 15 cm.	As per the local farmers practice.

DAT Within 3-5 days after transplanting the crop At 25-40 DAT	• Fertilizers should be applied as per the local recommended fertilizer dose. • Apply Pretilachlor 500 g ai/ha (or) Anilophos 300 g ai/ha (or) Pyrazosulfuron ethyl 20 g ai/ha (or) Oxadiargyl 80-100 g ai/ha. mix with fine sand (50kg/ha) and broadcast it. • Survey for pest incidence and level of damage at weekly interval starting from 15 DAT. • If blast/brown spot symptoms seen between 20 to 30 DAT, need based application of carbendazim+ mancozeb combination fungicide. • Spray NeemAzal @ 3 ml/ liter water and repeat after 10 days' interval • Mechanical weeding using conoweeder or • Depending on weed intensity spray post emergence herbicide triafamone+ethoxysulfuron @67.5 g a.i./ha for 2 nd flush of weeds. If only Broad leaf weeds predominate, apply ethoxysulfuron @ 20 g a.i./ha. For herbicide spraying mix in 500 liters' water/ha and spray by flat Z type nozzle uniformly within 3 to 7 days after transplanting. It is necessary to maintain standing water (2-3 cm water) in the field. Water should not be let in or let out for 2 days.	**Please record the practices followed by farmers' whenever you go for observation/visit.**
40 – 60 DAT	• N top dressing to be taken up as given in protocol using Leaf Color Chart • Need based application of Fipronil 0.3G @ 10 kg/ acre depending on the severity of caseworm, hispa and stem borers	As per the local farmers practice. **Please record the practices followed by farmers when-**

		ever you go for observation/visit
61 – 90 DAT	• One spray of cartap hydrochloride 50 WP/SP @ 400 g/ acre (or) chlorantraniliprole (Rynaxypyr) 18.5 SC @ 60 ml/ acre (against lepidopterous pests, if incidence crosses ET value). • Need based application of Propiconazole (1 ml/lit).	As per the local farmers practice. **Please record the practices followed by farmers when-ever you go for observation/visit**
> 90 DAT up to harvest	• Mark 5 X 5 m2 area and take yield, at 5 places (1 from each repl.) in this IPM block • Also record the cost involved for each practice/ operation taken in IPM starting from nursery to harvest to estimate cost of cultivation as given in data sheet	• Mark 5 X 5 m2 area and take yield, at 5 places (5 repl.) in FP field • Also record the cost involved for each practice/ operation taken in FP starting from nursery to harvest to estimate cost of cultivation as given in data sheet

Zone II – Northern

Locations (3): 1) Pantnagar (Uttarakhand)
2) Ludhiana (Punjab)
3) Kaul (Haryana)

Major Insect Pests: Planthoppers, stem borers, leaf folder

Major Diseases: Leaf blast, sheath blight, BLB, False smut, brown spot

Major weeds: Grasses: *Echinochloa colona, Eleusine indica,, Leptochloa chinensis;**Sedges:** Cyperus rotundus,Fimbristylis milliacea;**BLW :** Caesulia axillaris, , Eclipta alba, Ludwigia sp.*

IPM module for Zone II		
	IPM	**FP**
Nursery	• Seed treatment with Trichoderma @ 10g/kg. Pre-soak the seeds in water for 12 hrs, take the seeds in a container and add the Trichoderma, coat the seeds with	As per the local farmers practice. **Please record the**

	Trichoderma later allow it for germination in gunny/cloth bag • Need based application of bispyribacsodium 10% SC @ 0.5ml/L water at 15 days of nursery.	**practices followed by farmers' whenever you go for observation/visit.**
Main field Up to 40 DAT Within 3-5 days after transplanting the crop At 25-40 DAT	• Transplant seedlings at a spacing of 20 x 15 cm. • Cut the tips of leaf blades after removing seedlings from nursery for transplanting in the main field. • Leave alleyways 30 cm after every 2 m or 10 rows • Fertilizers should be applied as per the local recommended fertilizer dose. • Apply Pretilachlor 500 g ai/ha (or) Anilophos 300 g ai/ha (or) Pyrazosulfuron ethyl 20 g ai/ha (or) Oxadiargyl 80-100 g ai/ha. mix with fine sand (50kg/ha) and broadcast it. • Grow cowpea, marigold, soybean, green gram or any flowering plant on bunds to attract natural enemies • Survey for pest incidence and level of damage at weekly interval starting from 15 DAT. • At 15 DAT, install pheromone traps with 5 mg lure @ 3 traps/acre for stem borer monitoring. While installing, make sure that the trap remains 5 inches above the crop canopy. Change the lure after 3 weeks. If the trap catches exceed 30 – 35 adults/trap/week, go for the pesticide application. • Release of *Trichogramma japonicum* adults against yellow stem borer and *Trichogramma chilonis* against leaffolder. Release 5 - 6 times @ 40, 000/ acre, starting from 15 days after transplanting.	As per the local farmers practice. **Please record the practices followed by farmers' whenever you go for observation/visit.**

	Tricho cards containing 1000 parasitised eggs to be stapled to the underside of leaves at 40 points uniformly distributed across 1 acre area. • Mechanical weeding using conoweeder or • Depending on weed intensity spray post emergence herbicide triafamone+ethoxysulfuron @67.5 g a.i./ha for 2 nd flush of weeds. If only Broad leaf weeds predominate, apply ethoxysulfuron @ 20 g a.i./ha. For herbicide spraying mix in 500 liters' water/ha and spray by flat Z type nozzle uniformly within 3 to 7 days after transplanting. It is necessary to maintain standing water (2-3 cm water) in the field. Water should not be let in or let out for 2 days.	
40 – 60 DAT	• N top dressing to be taken up as given in protocol using Leaf Color Chart • Spray NeemAzal @ 3 ml/ liter water and repeat after 10 days' interval • Installation of bamboo perches of 2-3 ft height in the field @ 15 to 20 per acre at vegetative stage serve as resting/ landing sites for birds • Mid season drainage of the field to mitigate planthopper multiplication. • If the stem borer incidence is high, install pheromone traps with 5 mg lure @ 8 traps/acre for mass trapping. Change the lure after 3 weeks. • If sheath blight occurs in more than threshold level, then apply hexaconazole 5 EC (2 ml/lit) • When the hopper population exceeds 10 – 15 hoppers/hill, apply Triflumezopyrim 10% SC @ 94 ml/ acre between 45 – 60	As per the local farmers practice. **Please record the practices followed by farmers when-ever you go for observation/visit**

	DAT only once	
61 – 90 DAT	• One spray of cartap hydrochloride 50 WP/SP @ 400 g/ acre (or) Chlorantraniliprole (Rynaxypyr) 18.5 SC @ 60 ml/ acre (against stem borer/leaf folder, if incidence crosses ETL). • In case of severe incidence of planthoppers, apply Pymetrozine 50 WP @ 120 g/ acre (or) Dinotefuran 20 SG @ 80 g/ acre. Do not repeat or use the same insecticide. While spraying, nozzle should be directed to the basal portion of the plants. Application with power sprayer is preferable. • For managing post flowering disease, apply propiconazole @ 1 ml/lit	As per the local farmers practice. **Please record the practices followed by farmers when-ever you go for observation/visit**
> 90 DAT up to harvest	• Mark 5 X 5 m2 area and take yield, at 5 places (5 repl.) in this IPM block • Also record the cost involved for each practice/ operation taken in IPM starting from nursery to harvest to estimate cost of cultivation as given in data sheet	• Mark 5 X 5 m2 area and take yield, at 5 places (5 repl.) in this block • Also record the cost involved for each practice/ operation taken in FP starting from nursery to harvest to estimate cost of cultivation as given in data sheet

Zone III – Eastern

Locations (3): 1) Chiplima (Odisha)
2) Chinsurah (WB)
3) NRRI (Cuttack) (OD)
4) Hazaribagh (JH)
5) Ghaghraghat (UP)

Major Insect Pests: Planthoppers, stem borer, gall midge, leaf folder, caseworm, cutworm, panicle mite

Major Diseases: Leaf blast, neck blast, sheath blight, sheath rot, BLB, brown spot

Major weeds: ***Grasses :*** *Echinochloa crusgalli, Paspalam disticum,;****Sedges:*** *Cyperus difformis,Fimbristylis milliacea;****BLW :*** *Portulaca oleracea, Marsilea minuta.*

IPM module for Zone III		
	IPM	**FP**
Nursery	• Seed treatment with Trichoderma @ 10g/kg. Pre-soak the seeds in water for 12 hrs, take the seeds in a container and add the Trichoderma, coat the seeds with Trichoderma later allow it for germination in gunny/cloth bag • Apply fipronil 0.3 G @ 10 kg/ acre, 5 days before pulling seedlings from nursery for transplantation (in gall midge endemic areas) • Need based application of bispyribacsodium 10% SC @ 0.5ml/L water at 15 days of nursery.	As per the local farmers practice. **Please record the practices followed by farmers' whenever you go for observation/visit.**
Main field Up to 40 DAT Within 3-5 days after transplanting the crop	• Transplant seedlings at a spacing of 20 x 15 cm. • Cut the tips of leaf blades after removing seedlings from nursery for transplanting in the main field. • Leave alleyways of 30 cm after every 2 m or 10 rows • Fertilizers should be applied as per the local recommended fertilizer dose. • Apply Pretilachlor 500 g ai/ha (or) Anilophos 300 g ai/ha (or) Pyrazosulfuron ethyl 20 g ai/ha (or) Oxadiargyl 80-100 g ai/ha. mix with fine sand (50kg/ha) and broadcast it. • Grow cowpea, marigold, soybean, green gram or any flowering plant on bunds to attract natural enemies	As per the local farmers practice. **Please record the practices followed by farmers' whenever you go for observation/visit.**

At 25-40 DAT	• Survey for pest incidence and level of damage at weekly interval starting from 15 DAT. • At 15 DAT, install pheromone traps with 5 mg lure @ 3 traps/acre for stem borer monitoring. While installing, make sure that the trap remains 5 inches above the crop canopy. Change the lure after 3 weeks. If the trap catches exceed 30 – 35 adults/trap/week, go for the pesticide application. • Release of *Trichogramma japonicum* adults against yellow stem borer and Trichogramm *chilonis* against leaffolder. Release 5 - 6 times @ 40, 000/ acre, starting from 15 days after transplanting. Tricho cards containing 1000 parasitised eggs to be stapled to the underside of leaves at 40 points uniformly distributed across 1-acre area. • In case leaf blast or brown spot appears in early stage, then apply combination fungicide i.e. carbendazim + mancozeb (@ 2-2.5 gm/lit). • Mechanical weeding using conoweeder or • Depending on weed intensity spray post emergence herbicide triafamone+ethoxysulfuron @67.5 g a.i./ha for 2 nd flush of weeds. If only Broad leaf weeds predominate, apply ethoxysulfuron @ 20 g a.i./ha. For herbicide spraying mix in 500 liters' water/ha and spray by flat Z type nozzle uniformly within 3 to 7 days after transplanting. It is necessary to maintain standing water (2-3 cm water) in the field. Water should not be let in or let out for 2 days.	

40 – 60 DAT	• N top dressing to be taken up as given in protocol using Leaf Color Chart • Spray NeemAzal @ 3 ml/ liter water at 40 – 45 DAT and repeat after 10 days' interval • Installation of bamboo perches of 2-3 ft height in the field @ 15 to 20 per acre at vegetative stage serve as resting/ landing sites for birds • Mid season drainage of the field to mitigate planthopper multiplication. • If the stem borer incidence is high, install pheromone traps with 5 mg lure @ 8 traps/acre for mass trapping. Change the lure after 3 weeks. • If sheath blight occurs in more than threshold level, then apply hexaconazole 5 EC (2 ml/lit) • If the planthopper population exceeds 10 – 15 hoppers/hill, apply Triflumezopyrim 10% SC @ 94 ml/ acre between 45 – 60 DAT only once	As per the local farmers practice. **Please record the practices followed by farmers when-ever you go for observation/visit**
61 – 90 DAT	• One spray of cartap hydrochloride 50 WP/SP @ 400 g/ acre (or) Chlorantraniliprole (Rynaxypyr) 18.5 SC @ 60 ml/ acre (against lepidopterous pests, if incidence crosses ETL). • In case of severe incidence of planthoppers, apply Pymetrozine 50 WP @ 120 g/ acre (or) Dinotefuran 20 SG @ 80 g/ acre. Do not repeat or use the same insecticide. While spraying, nozzle should be directed to the basal portion of the plants. Application with power sprayer is preferable. • Spray Spiromesifen 240 SC @ 2 ml/ liter in case of severe incidence of panicle mite • For managing post flowering disease, apply propiconazole @ 1 ml/lit	As per the local farmers practice. **Please record the practices followed by farmers when-ever you go for observation/visit**

> 90 DAT up to harvest	• Mark 5 X 5 m2 area and take yield, at 5 places (1 place in each repl.) in this IPM field • Also record the cost involved for each practice/ operation taken in IPM starting from nursery to harvest to estimate cost of cultivation as given in data sheet	• Mark 5 X 5 m2 area and take yield, at 5 places (5 repl.) in this FP field • Also record the cost involved for each practice/ operation taken in FP starting from nursery to harvest to estimate cost of cultivation

Zone IV – North -Eastern

Locations (3): 1) Titabar (Assam)
2) Imphal (Lamphalpat), (MN)
3) Arundhutinagar (Tripura)

Major Insect Pests: Stem borer, leaf folder, rice hispa, case worm, cut worm in flooded areas, gundhi bug
Major Diseases: Leaf blast, neck blast, false smut, sheath blight, BLB (Arundhatinagar and Titabar)
Major weeds: Grasses : *Echinochloa crusgalli, Hymenachne sp;* ***Sedges:*** *Cyperus iria, Eleocharis sp;* ***BLW :*** *Alternanthera sp, Monochoria sp*

IPM Module for Zone IV		
	IPM	**FP**
Nursery	• Seed treatment with Trichoderma @ 10g/kg. Pre-soak the seeds in water for 12 hrs, take the seeds in a container and add the Trichoderma, coat the seeds with Trichoderma later allow it for germination in gunny/cloth bag • Need based application of bispyribacsodium 10% SC @ 0.5 ml/L water at 15 days of nursery.	As per the local farmers practice. **Please record the practices followed by farmers' whenever you go for observation/visit.**
Main field Up to 40 DAT	• Transplant seedlings at a spacing of 20 x 15 cm. • Cut the tips of leaf blades after removing seedlings from nursery for transplanting in	As per the local farmers practice.

Within 3-5 days after transplanting the crop	the main field. • Leave alleyways of 30 cm after every 2 m or 10 rows • Fertilizers should be applied as per the local recommended fertilizer dose. • Apply Pretilachlor 500 g ai/ha (or) Anilophos 300 g ai/ha (or) Pyrazosulfuron ethyl 20 g ai/ha (or) Oxadiargyl 80-100 g ai/ha. mix with fine sand (50kg/ha) and broadcast it. • Grow cowpea, marigold, soybean, green gram or any flowering plant on bunds to attract natural enemies • Survey for pest incidence and level of damage at weekly interval starting from 15 DAT. • At 15 DAT, install pheromone traps with 5 mg lure @ 3 traps/acre for stem borer monitoring. While installing, make sure that the trap remains above the crop canopy. Change the lure after 3 weeks. If the trap catches exceed 30 – 35 adults/trap/week, go for pesticide application. • Release of *Trichogramma japonicum* adults against yellow stem borer and Trichogramm *chilonis* against leaffolder. Release 5 - 6 times @ 40, 000/ acre, starting from 15 days after transplanting. Tricho cards containing 1000 parasitised eggs to be stapled to the underside of leaves at 40 points uniformly distributed across 1-acre area. • In case leaf blast or brown spot appears in early stage, then apply combination fungicide i.e. carbendazim + mancozeb (@ 2-2.5 gm/lit) • Mechanical weeding using conoweeder	**Please record the practices followed by farmers' whenever you go for observation/visit.**
At 25-40 DAT		

	or • Depending on weed intensity spray post emergence herbicide triafamone+ethoxysulfuron @67.5 g a.i./ha for 2 nd flush of weeds. If only Broad leaf weeds predominate, apply ethoxysulfuron @ 20 g a.i./ha. For herbicide spraying mix in 500 liters' water/ha and spray by flat Z type nozzle uniformly within 3 to 7 days after transplanting. It is necessary to maintain standing water (2-3 cm water) in the field. Water should not be let in or let out for 2 days.	
40 – 60 DAT	• N top dressing to be taken up as given in protocol using Leaf Color Chart • Spray NeemAzal @ 3 ml/ liter water at 40 – 45 DAT and repeat after 10 days' interval • Installation of bamboo perches of 2-3 ft height in the field @ 15 to 20 per acre at vegetative stage serve as resting/ landing sites for birds • If the stem borer incidence is high, install pheromone traps with 5 mg lure @ 8 traps/acre for mass trapping. Change the lure after 3 weeks. • If sheath blight occurs in more than threshold level, then apply hexaconazole 5 EC (2 ml/lit)	As per the local farmers practice. **Please record the practices followed by farmers when-ever you go for observation/visit**
61 – 90 DAT	• One spray of cartap hydrochloride 50 WP/SP @ 400 g/ acre (or) Chlorantraniliprole (Rynaxypyr) 18.5 SC @ 60 ml/ acre (against stem borer/leaf folder, if incidence crosses ETL). • For managing post flowering disease, apply propiconazole @ 1 ml/lit • Use of decomposing crabs as bait - As the filling of paddy grain starts, locally	As per the local farmers practice. **Please record the practices followed by farmers when-ever you go for observation/visit**

	available crabs can be smashed and put on pointed bamboo sticks in paddy fields as bait to attract gundhi bugs.	
> 90 DAT up to harvest	• Mark 5 X 5 m2 area and take yield, at 5 places (1 place in each repl.) in this IPM field • Also record the cost involved for each practice/ operation taken in IPM starting from nursery to harvest to estimate cost of cultivation as given in data sheet	• Mark 5 X 5 m2 area and take yield, at 5 places (5 repl.) in this FP field • Also record the cost involved for each practice/ operation taken in FP starting from nursery to harvest to estimate cost of cultivation

Zone V – Central

Locations (3): 1) Rewa (MP)
2) Raipur(CG)
3) Jagadalpur (CG)

Major Insect Pests: Stem borer, leaf folder, gall midge, Planthoppers, gundhi bug
Major Diseases: Leaf blast, neck blast, brown spot, sheath blight, sheath rot, false smut, BLB
Major weeds: ***Grasses :*** *Echinochloa colonum, Echinochloa crusgalli, Ishaemum rugosum, Leptochloa chinensis;* ***Sedges:*** *Cyperus difformis, Cyperus iria, Fimbristylis milliacea;****BLW :*** *Ammania baccifera, Cyanotis axillaris, Ludwigia parviflora, Wedelia chinensis.*

IPM Module for Zone V		
	IPM	**FP**
Nursery	• Seed treatment with Trichoderma @ 10g/kg. Pre-soak the seeds in water for 12 hrs, take the seeds in a container and add the Trichoderma, coat the seeds with Trichoderma later allow it for germination in gunny/cloth bag • Apply fipronil 0.3 G @ 10 kg/ acre, 5 days before pulling seedlings from nursery for transplantation. (In gall midge endemic	As per the local farmers practice. **Please record the practices followed by farmers' whenever you go for observation/visit.**

	areas) • Need based application of bispyribacsodium 10% SC @ 0.5 ml/L water at 15 days of nursery.	
Main field Up to 40 DAT Within 3-5 days after transplanting the crop	• Transplant seedlings at a spacing of 20 x 15 cm. • Cut the tips of leaf blades after removing seedlings from nursery for transplanting in the main field. • Leave alleyways of 30 cm after every 2 m or 10 rows • Fertilizers should be applied as per the local recommended fertilizer dose. • Apply Pretilachlor 500 g ai/ha (or) Anilophos 300 g ai/ha (or) Pyrazosulfuron ethyl 20 g ai/ha (or) Oxadiargyl 80-100 g ai/ha. mix with fine sand (50kg/ha) and broadcast it. • Grow cowpea, marigold, soybean, green gram or any flowering plant on bunds to attract natural enemies • Survey for pest incidence and level of damage at weekly interval starting from 15 DAT. • At 15 DAT, install pheromone traps with 5 mg lure @ 3 traps/acre for stem borer monitoring. While installing, make sure that the trap remains 5 inches above the crop canopy. Change the lure after 3 weeks. If the trap catches exceed 30 – 35 adults/trap/week, go for the pesticide application. • Release of *Trichogramma japonicum* adults against yellow stem borer and Trichogramm *chilonis* against leaffolder. Release 5 - 6 times @ 40, 000/ acre, starting from 15 days after transplanting. Tricho cards containing 1000 parasitised	As per the local farmers practice. **Please record the practices followed by farmers' whenever you go for observation/visit.**

At 25-40 DAT	eggs to be stapled to the underside of leaves at 40 points uniformly distributed across 1-acre area. • In case leaf blast or brown spot appears in early stage, then apply combination fungicide i.e. carbendazim + mancozeb (@ 2-2.5 gm/lit) • Mechanical weeding using conoweeder or • Depending on weed intensity spray post emergence herbicide triafamone+ethoxysulfuron @67.5 g a.i./ha for 2 nd flush of weeds. If only Broad leaf weeds predominate, apply ethoxysulfuron @ 20 g a.i./ha. For herbicide spraying mix in 500 liters' water/ha and spray by flat Z type nozzle uniformly within 3 to 7 days after transplanting. It is necessary to maintain standing water (2-3 cm water) in the field. Water should not be let in or let out for 2 days.	
40 – 60 DAT	• N top dressing to be taken up as given in protocol using Leaf Color Chart • Spray NeemAzal @ 3 ml/ liter water at 40 – 45 DAT and repeat after 10 days' interval • Installation of bamboo perches of 2-3 ft height in the field @ 15 to 20 per acre at vegetative stage serve as resting/ landing sites for birds • Mid season drainage of the field to mitigate planthopper multiplication. • If the stem borer incidence is high, install pheromone traps with 5 mg lure @ 8 traps/acre for mass trapping. • If sheath blight occurs in more than threshold level, then apply hexaconazole 5 EC (2 ml/lit)	As per the local farmers practice. **Please record the practices followed by farmers when-ever you go for observation/visit**

	• If the planthopper population exceeds 10 – 15 hoppers/hill, apply Triflumezopyrim 10% SC @ 94 ml/ acre between 45 – 60 DAT only once	
61 – 90 DAT	• One spray of cartap hydrochloride 50 WP/SP @ 400 g/ acre (or) Chlorantraniliprole (Rynaxypyr) 18.5 SC @ 60 ml/ acre (against stem borer/leaf folder, if incidence crosses ET value). • In case of severe incidence of planthoppers, apply Pymetrozine 50 WP @ 120 g/ acre (or) Dinotefuran 20 SG @ 80 g/ acre. Do not repeat or use the same insecticide. While spraying, nozzle should be directed to the basal portion of the plants. Application with power sprayer is preferable. • Use of decomposing crabs as bait - As the filling of paddy grain starts, locally available crabs can be smashed and put on pointed bamboo sticks in paddy fields as bait to attract gundhi bugs. • For managing post flowering disease, apply propiconazole @ 1 ml/lit	As per the local farmers practice. **Please record the practices followed by farmers when-ever you go for observation/visit**
> 90 DAT up to harvest	• Mark 5 X 5 m2 area and take yield, at 5 places (1 place in each repl.) in this IPM field • Also record the cost involved for each practice/ operation taken in IPM starting from nursery to harvest to estimate cost of cultivation as given in data sheet	• Mark 5 X 5 m2 area and take yield, at 5 places (5 repl.) in this FP field • Also record the cost involved for each practice/ operation taken in FP starting from nursery to harvest to estimate cost of cultivation as given in data sheet

Zone VI – Western

Locations (3): 1) Karjat (MH)
2) Sakoli (MH)
3) Nawagam (GJ)
4) Navsari (GJ)

Major Insect Pests: Stem borer, leaf folder, gall midge, planthoppers, cutworm, panicle mite
Major Diseases: Sheath blight, sheath rot, leaf blast, grain discolouration, brown spot
Major weeds: Grasses : *Dactyloctenium sp, Echinochloa colona,Echinochloa crusgalli;* ***Sedges:*** *Cyperus difformis****,*** *Cyperus iridea;* ***BLW :*** *Alternanthera philoxeroides, Bergia capensis, Eclipta alba, Marsilea quadrifolia, Rotala densiflora, Sphenoclea zeylanica*

IPM Module for Zone VI		
	IPM	**FP**
Nursery	• Seed treatment with Trichoderma @ 10g/kg. Pre-soak the seeds in water for 12 hrs, take the seeds in a container and add the Trichoderma, coat the seeds with Trichoderma later allow it for germination in gunny/cloth bag • Need based application of bispyribacsodium 10% SC @ 0.5 ml/L water at 15 days of nursery. • Apply fipronil 0.3 G @ 10 kg/ acre, 5 days before pulling seedlings from nursery for transplantation (In gall midge endemic areas).	As per the local farmers practice. **Please record the practices followed by farmers' whenever you go for observation/visit.**
Main field Up to 40 DAT	• Transplant seedlings at a spacing of 20 x 15 cm. • Cut the tips of leaf blades after removing seedlings from nursery for transplanting in the main field. • Leave alleyways of 30 cm after every 2 m or 10 rows • Fertilizers should be applied as per the	As per the local farmers practice. **Please record the practices followed by farmers'**

Within 3-5 days after transplanting the crop At 25-40 DAT	local recommended fertilizer dose. • Apply Pretilachlor 500 g ai/ha (or) Anilophos 300 g ai/ha (or) Pyrazosulfuron ethyl 20 g ai/ha (or) Oxadiargyl 80-100 g ai/ha. mix with fine sand (50kg/ha) and broadcast it. • Grow cowpea, marigold, soybean, green gram or any flowering plant on bunds to attract natural enemies • Survey for pest incidence and level of damage at weekly interval starting from 15 DAT. • At 15 DAT, install pheromone traps with 5 mg lure @ 3 traps/acre for stem borer monitoring. While installing, make sure that the trap remains above the crop canopy. Change the lure after 3 weeks. If the trap catches exceed 30 – 35 adults/trap/week, go for pesticide application. • Release of *Trichogramma japonicum* adults against yellow stem borer and Trichogramm *chilonis* against leaffolder. Release 5 - 6 times @ 40, 000/ acre, starting from 15 days after transplanting. Tricho cards containing 1000 parasitised eggs to be stapled to the underside of leaves at 40 points uniformly distributed across 1-acre area. • In case leaf blast or brown spot appears in early stage, then apply combination fungicide i.e. carbendazim + mancozeb (@ 2-2.5 gm/lit). • Mechanical weeding using conoweeder or • Depending on weed intensity spray post emergence herbicide triafamone+ethoxysulfuron @67.5 g	**whenever you go for observation/visit.**

	a.i./ha for 2 nd flush of weeds. If only Broad leaf weeds predominate, apply ethoxysulfuron @ 20 g a.i./ha. For herbicide spraying mix in 500 liters' water/ha and spray by flat Z type nozzle uniformly within 3 to 7 days after transplanting. It is necessary to maintain standing water (2-3 cm water) in the field. Water should not be let in or let out for 2 days.	
40 – 60 DAT	• N top dressing to be taken up as given in protocol using Leaf Color Chart • Spray NeemAzal @ 3 ml/ liter water at 40 – 45 DAT and repeat after 10 days' interval • Installation of bamboo perches of 2-3 ft height in the field @ 15 to 20 per acre at vegetative stage serve as resting/ landing sites for birds • If the stem borer incidence is high, install pheromone traps with 5 mg lure @ 8 traps/acre for mass trapping. Change the lure after 3 weeks. • If sheath blight occurs in more than threshold level, then apply hexaconazole 5 EC (2 ml/lit) • If the planthopper population exceeds 10 – 15 hoppers/hill, apply Triflumezopyrim 10% SC @ 94 ml/ acre between 45 – 60 DAT only once	As per the local farmers practice. **Please record the practices followed by farmers when-ever you go for observation/visit**
61 – 90 DAT	• One spray of cartap hydrochloride 50 WP/SP @ 400 g/ acre (or) Chlorantraniliprole (Rynaxypyr) 18.5 SC @ 60 ml/ acre (against stem borer/leaf folder, if incidence crosses ET value). • In case of severe incidence of planthoppers, apply Pymetrozine 50 WP @ 120 g/ acre (or) Dinotefuran 20 SG @ 80 g/ acre. Do not repeat or use the same	As per the local farmers practice. **Please record the practices followed by farmers when-ever you go for observation/visit**

	insecticide. While spraying, nozzle should be directed to the basal portion of the plants. Application with power sprayer is preferable. • Spray Spiromesifen 240 SC @ 2 ml/ liter in case of severe incidence of panicle mite • For managing post flowering disease, apply propiconazole @ 1 ml/lit	
> 90 DAT up to harvest	• Mark 5 X 5 m^2 area and take yield, at 5 places (1 place in each repl.) in this IPM block • Also record the cost involved for each practice/ operation taken in IPM starting from nursery to harvest to estimate cost of cultivation as given in data sheet	• Mark 5 X 5 m2 area and take yield, at 5 places (5 repl.) in this block • Also record the cost involved for each practice/ operation taken in FP starting from nursery to harvest to estimate cost of cultivation as given in data sheet

Zone VII – Southern

Locations (6): 1) Maruteru (AP)
2) Rajendranagar (TS)
3) Aduthurai (TN)
4) Pattambi (Kerala)
5) Gangavati (KN)
6) Mandya (Karnataka)

Major Insect Pests: Planthoppers, stem borer, leaf folder, gall midge, panicle mite
Major Diseases: Leaf blast, sheath blight, BLB, brown spot, stem rot, neck blast, false smut
Major weeds: Grasses : *Cynodon dactylon,Echinochloa colona,Echinochloa crusgalli, Leptochloa chinensis, Panicume repense, Panicum tripheron;* ***Sedges:*** *Cyperus difformis,* ***Cyperus*** *iria, Cyperus procerus, Fimbristylis miliacea, Scirpus spp;* ***BLW :*** *Ammania baccifera,Eclipta alba, Eclipta prostrate, Glinus oppositifolia, Lindernia veronicifolia, Ludwigia parviflora, Spilanthus acmella*

IPM Module for Zone VII		
	IPM	**FP**
Nursery	• Seed treatment with Trichoderma @ 10g/kg. Pre-soak the seeds in water for 12 hrs, take the seeds in a container and add the Trichoderma, coat the seeds with Trichoderma later allow it for germination in gunny/cloth bag • Need based application of bispyribacsodium 10% SC @ 0.5 ml/L water at 15 days of nursery. • Apply fipronil 0.3 G @ 10 kg/ acre, 5 days before pulling seedlings from nursery for transplantation (in gall midge endemic areas)	As per the local farmers practice. **Please record the practices followed by farmers' whenever you go for observation/visit.**
Main field Up to 40 DAT Within 3-5 days after transplanting the crop	• Transplant seedlings at a spacing of 20 x 15 cm. • Cut the tips of leaf blades after removing seedlings from nursery for transplanting in the main field. • Leave alleyways 30 cm after every 2 m or 10 rows • Fertilizers should be applied as per the local recommended fertilizer dose. • Apply Pretilachlor 500 g ai/ha (or) Anilophos 300 g ai/ha (or) Pyrazosulfuron ethyl 20 g ai/ha (or) Oxadiargyl 80-100 g ai/ha. mix with fine sand (50kg/ha) and broadcast it. • Grow cowpea, marigold, soybean, green gram or any flowering plant on bunds to attract natural enemies • Survey for pest incidence and level of damage at weekly interval starting from 15 DAT. • At 15 DAT, install pheromone traps with 5 mg lure @ 3 traps/acre for stem borer monitoring. While installing, make sure	As per the local farmers practice. **Please record the practices followed by farmers' whenever you go for observation/visit.**

At 25-40 DAT	that the trap remains above the crop canopy. Change the lure after 3 weeks. If the trap catches exceed 30 – 35 adults/trap/week, go for pesticide application. • Release of *Trichogramma japonicum* adults against yellow stem borer and Trichogramm *chilonis* against leaffolder. Release 5 - 6 times @ 40, 000/ acre, starting from 15 days after transplanting. Tricho cards containing 1000 parasitised eggs to be stapled to the underside of leaves at 40 points uniformly distributed across 1-acre area. • In case leaf blast or brown spot appears in early stage, then apply combination fungicide i.e. carbendazim + mancozeb (@ 2-2.5 gm/lit). • Mechanical weeding using conoweeder or • Depending on weed intensity spray post emergence herbicide triafamone+ethoxysulfuron @67.5 g a.i./ha for 2 nd flush of weeds. If only Broad leaf weeds predominate, apply ethoxysulfuron @ 20 g a.i./ha. For herbicide spraying mix in 500 liters' water/ha and spray by flat Z type nozzle uniformly within 3 to 7 days after transplanting. It is necessary to maintain standing water (2-3 cm water) in the field. Water should not be let in or let out for 2 days.	
40 – 60 DAT	• N top dressing to be taken up as given in protocol using Leaf Color Chart • Spray NeemAzal @ 3 ml/ liter water at 40 – 45 DAT and repeat after 10 days' interval • Installation of bamboo perches of 2-3 ft	As per the local farmers practice. **Please record the practices followed by farmers when-**

	height in the field @ 15 to 20 per acre at vegetative stage serve as resting/ landing sites for birds • If the planthopper population exceeds 10 – 15 hoppers/hill, apply Triflumezopyrim 10% SC @ 94 ml/ acre between 45 – 60 DAT only once • If the stem borer incidence is high, install pheromone traps with 5 mg lure @ 8 traps/acre for mass trapping. Change the lure after 3 weeks. • If sheath blight occurs in more than threshold level, then apply hexaconazole 5 EC (2 ml/lit)	**ever you go for observation/visit**
61 – 90 DAT	• One spray of cartap hydrochloride 50 WP/SP @ 400 g/ acre (or) Chlorantraniliprole (Rynaxypyr) 18.5 SC @ 60 ml/ acre (against stem borer/leaf folder, if incidence crosses ETL). • In case of severe incidence of planthoppers, apply Pymetrozine 50 WP @ 120 g/ acre (or) Dinotefuran 20 SG @ 80 g/ acre. Do not repeat or use the same insecticide. While spraying, nozzle should be directed to the basal portion of the plants. Application with power sprayer is preferable. • Spray Spiromesifen 240 SC @ 2 ml/ liter in case of severe incidence of panicle mite • For managing post flowering disease, apply propiconazole @ 1 ml/lit	As per the local farmers practice. **Please record the practices followed by farmers when-ever you go for observation/visit**
> 90 DAT up to harvest	• Mark 5 X 5 m2 area and take yield, at 5 places (1 place in each repl.) in this IPM field • Also record the cost involved for each practice/ operation taken in IPM starting from nursery to harvest to estimate cost of cultivation as given in data sheet	• Mark 5 X 5 m2 area and take yield, at 5 places (5 repl.) in this FP field • Also record the cost involved for each practice/ operation

		taken in FP starting from nursery to harvest to estimate cost of cultivation as given in data sheet

Observations to be recorded:

- Starting from 15 DAT, observations on pest incidence should be recorded on 5 randomly selected hills (each time hills are selected randomly) in each replication (25hills/ acre) at weekly interval. (Total of 25 hills in IPM & 25 hills in FP at each observation).
- At each observation, record total tillers, dead hearts, silver shoots, total leaves, damaged leaves, number of planthoppers/ hill as per the data sheet given.
- Also record disease incidence (% disease severity) against Blast (leaf/neck), bacterial blight and other major diseases.
- Also record the following weed observations:
  - Weed population (number/m^2) 30, 45 DAT
  - Weed Dry matter production (gm/ m^2) of weeds at 30, 45 DAT

Grain yield: Record the yield from 5 places of 5 x 5 m^2 area from each replication.

Note: In case of insect/ disease infestation, please follow ETL's and control measures should be taken as per the IPM guidelines/protocol given below. Inform/consult concerned PI/scientist in case of severe infestation or when in doubt about action to be taken.

IIRR IPM team (Note: You can contact anyone at any time)

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A. Protocol for effective weed management in IPM Special trial (in IPM treatment)

Since the trial is being laid out in irrigated ecology, weed management both in nursery and main field are equally important.

1) Nursery

i. Maintain water level to avoid weeds

ii. In weed intense areas, apply Butachlor @25ml/250 m^2 nursery area or Pretilachlor+ safener @ 60ml/250 m^2 nursery area application at 8-10 days after sowing seed in nursery beds

iii. Raising nursery in strips of 1 m wide and leaving water canal of 0.25 m in between will help in intercultural operations

2) **Main field**: **Immediately after transplanting within a week**

***** Liquid formulation of new herbicides can be applied by mixing with sand or by foliar spray, respectively, within first week after transplanting by following the procedure outlined hereunder.

* Required quantity of herbicide (Butachlor @3 liters/ha or Pretilachlor @1250-1500 ml/ha or Anilophos 1250-1500 ml/ha or Metsulfuron methyl+chlorimuronethyl (Almix)@20g/ha) mixed with fine sand (50kg/ha) and broad casted. Or mixed in 500 liters' water/ha and spray by flat Z type nozzle uniformly within 3 to 7 days after transplanting. It is necessary to maintain standing water (2-3 cm water) in the field.

Do not remove or let in water at least 48 hours after application of herbicide.

*** Note** that under thorough land preparation and proper water management conditions this step may not be required. Take a decision on 2nd day after transplanting based on land levelling and water supply status.

Post-emergence application:

*Broad spectrum weed control – Bispyribasodium @ 250ml/ha after 1 month of planting at 2-3 leaf stage of weeds- spot application or Chlorimuron + Metsulfuron-methyl (Grasses, Sedges and Annual BLW) @ 20 gm/ha

***** If Broad leaf weeds predominate, apply 2, 4-D Na salt @ 1250-1500 g/ha after 1 month of planting

* If grasses predominate, apply Cyhalofoptyl @1000 m/ha at 15-20 DAT or Fenoxaprop p ethyl @ 800-1000ml/ ha after 1 month of planting.

Fertilizer management: Apply top dressing nitrogen based on Leaf Color Chart (modified IIRR -LCC) supplied by IIRR. The instructions to use LCC are given on backside of LCC.

Observation to be recorded under IPM plot as well as in Farmers Practice plots:

Monitor at regular interval weed growth (Group wise no. of weeds i.e., grasses, sedges and broad leaves weeds) in 1 m^2 area in each replication with the help of a quadrate. Collect all the weeds, dry them in oven at 60^0 C for constant dry wet and record dry weight at 20, 40, 60 DAT.

- Weed population (number/m^2) 30, 45 DAT
- Weed Dry matter production (gm/ m^2) of weeds at 30, 45 DAT
- Observe the changes in weed flora

B. <u>Protocol for effective disease management in IPM Special trial (in IPM treatment)</u>

1. Seed Treatment: (can be taken up as prophylactic)

- Seed treatment with Trichoderma @ 10g/kg. Pre-soak the seeds in water for 12 hrs, take the seeds in a container and add the Trichoderma, coat the seeds with Trichoderma later allow it for germination in gunny/cloth bag.

The cloth bag should then be incubated in closed chamber (like cement tank) and should fully covered with paddy straw. After 24 to 48 hours, the seeds will germinate and the germinated seeds can be used for nursery sowing. Use of hand gloves is must at the time of seed treatment and transfer of seeds from bucket to cloth bags.

Most of the diseases appear in the maximum tillering stage onwards

<u>Blast:</u> If still there is incidence of blast in the nursery, then give one spraying with tricyclazole 75 WP @ 0.6 g/l or iprobenphos 48 EC @ 2g/l or isoprothiolane 40 EC @ 1.5 ml/l or carpropamid 30 SC @ 1 ml/l or carbendazim 50 WP @ 1 g/l or kasugamycin 3 SL @ 2.5 g/l or Epoxyconazole 125 g/l + carbendazim 125 g/l @ 0.5 ml/l.

Sheath blight: Sheath blight in general starts at the tillering to maximum tillering stage. Many cases, it has been noticed that the disease appears near the bund (probably from the infected weed hosts or inoculum present in the infected straw kept in the bunds or the sclerotia floating on water and accumulated near the bunds) and then progresses inwards. Regular surveillance is must and if the initiation of the disease is seen in any parts especially near the bunds, then one spraying can be given especially in the affected area. The sprayings can be done with the chemicals like validamycin 3L @2.5 ml/l or propiconazole 25 EC @ 1 ml/l or hexaconazole 5 EC @ 2 ml/l or carbendazim 50 WP @ 1g/l or thifluzamide 24 SC @ 30 g a.i/ ha.

BLB: BLB appears initially in patches and near the shades. If BLB symptoms are noticed, delay the next top dressing.

Brown spot: Under irrigated ecosystem, if the fields are well managed and if fertilizer application is balance, then brown spot will not be a big problem. Moreover, seed treatment with carbendazim will take care of brown spot. However, still if it comes in some of the pockets in plots then, sprayings with chemicals like carbendazim 50 WP @ 1g/l or chlorothalonil75 WP @ 2g/l or combination of carbendazim (12%) and mancozeb (63%) @ 1.5-2 g/l or mancozeb 75 WP @ 2g/l can be done.

Foot Rot (Bakanae): Generally, seed treatment will take care of the seed borne inoculum of the fungus. However, if it is observed then one spraying with carbendazim (0.1%) will take care of the disease.

Stem Rot: Though it is minor disease, it can cause havoc in association with the BPH infestation. If stem rot symptoms are seen, then one spraying with Iprobenphos 48 EC @ 2g/l or thiophanate methyl 70 WP @ 1 g/l or isoprothiolane 40 EC @ 1.5 ml/l can be done.

One need based application (based on the disease history of the location) with 0.1% propiconazole or Nativo (0.4 g/l) around flowering will take care of false smut, grain discolouration and sheath rot diseases.

Economic Thresholds Suggested for application of fungicides

S.No	Disease	ETL
1	Foliar blast	3-5 lesions/leaf
2	Brown spot	2-3 spots/leaf & 2-3 infected plants/ m^2

3	Sheath blight	Lesions of 5-6 mm in length & 2-3-infected plants/m^2
4	Sheath-rot	Lesion length 2-3 mm on sheath &3-5 infected plants/m^2
5	BLB	2-3 infected leaves/m^2
6	Tungro	1 tungro infected plants/m^2 & 2 GLH/hill (in fungus endemic areas)
7	Neck blast	2-5 neck infected plants/m^2

C. Protocol for effective insect pest management in IPM Special trial (in IPM treatment)

Following information on major pests will help to decide on appropriate IPM interventions

Planthoppers

The pest generally appears 45 to 50 days after planting. Adults and nymphs suck the sap at the base of the tillers, resulting in yellowing and drying of the plants. Infestation spreads in concentric circles and in severe cases the affected field gives a burnt appearance. Provision of alley ways leads to change in micro-climate and helps in monitoring pest population and pesticide application. Regular surveillance is a must starting from 40 DAT. Walk along the alleyways and observe on either side at the base of plants for planthoppers. If the population exceeds ETL, go for suggested measures given. In BPH endemic areas, go for mid-season drainage to prevent population build-up.

Stem borers

This pest may appear even in nursery and in main field during any stage of the crop. Adult moths are seen resting on the leaf tip during early hours of the day or egg masses are seen on the stem and leaf. The pest has a patchy distribution resulting in a patch of dead hearts/ white ears depending on the stage of the crop. Installing pheromone traps for monitoring the pest is effective way of tracking the pest. Install 8 traps/ha with 5 mg lure such that trap remains above crop canopy. The trap catches are monitored at weekly interval to know the pest build-up. When trap catches exceed 30-35 moths/trap/week, go for suggested measures. Change the lure after 25 days as it loses its effectiveness. If the stem borer incidence is high, mass trapping can also be done by the installation of 20 traps / ha.

Gall midge

The pest may appear in the nursery or in the main field up to active tillering stage. Galls or silver shoots appear after 4 weeks of adult appearance and egg laying. If pest damage exceeds ETL, resort to control measures as suggested.

Defoliators

Most of the defoliators like leaf folder, case worm, green horned caterpillar, skipper, semi-looper appear immediately after transplanting. Go for regular scouting and only if pest damage exceeds ETL, go for suggested control measures.

Based on the periodic observation compute average pest damage in IPM plot and determine if the damage has crossed Economic threshold level.

Economic Thresholds Suggested for application of insecticides

S.No	Insect pest	ETL	Recommended Insecticides
1	Stem borer	10 % dead hearts or one adult moth or one egg mass per sq. m or >30 moths/pheromone trap/week	Cartap hydrochloride 4G @ 8 kg/ acre (or) Chlorantraniliprole (Rynaxypyr) 0.4 G @ 4 kg/ acre (or) Spray any of the following chemicals: cartap hydrochloride 50 WP/SP @ 400 g/ acre (or) Chlorantraniliprole (Rynaxypyr) 18.5 SC @ 60 ml/ acre
2	Leaf folder	2 damaged leaves per hill with a live larva.	
3	Gall midge	5 % silver shoots	Fipronil 0.3 G @ 10 kg/ acre
4	Planthoppers	10 -15 insects/hill at vegetative stage; 20 insects/hill at later stage.	Apply Triflumezopyrim 10% SC @ 94 ml/ acre between 45 – 60 DAT only once. Apply Dinotefuran 20 SG @ 80 g/ acre (or) Pymetrozine 50 WP @ 120 g/ acre. Do not repeat or use the same insecticide. While spraying, nozzle should be

			directed at the basal portion of the plants. Application with power sprayer is preferable.

Note: Do not apply synthetic pyrethroids like deltamethrn, cypermethrin, lamda cyhalothrin, either alone or in combination of other insecticides in rice crop as they cause resurgence of planthoppers

D. Operational guidelines for implementing IPM (Special) trial

It is envisaged that IPM (special) trial may be implemented in 'On-line real-time' mode. Hence it is essential that all the team leaders of the concerned AICRIP centre's are in touch with IIRR team and coordination unit on almost daily basis.

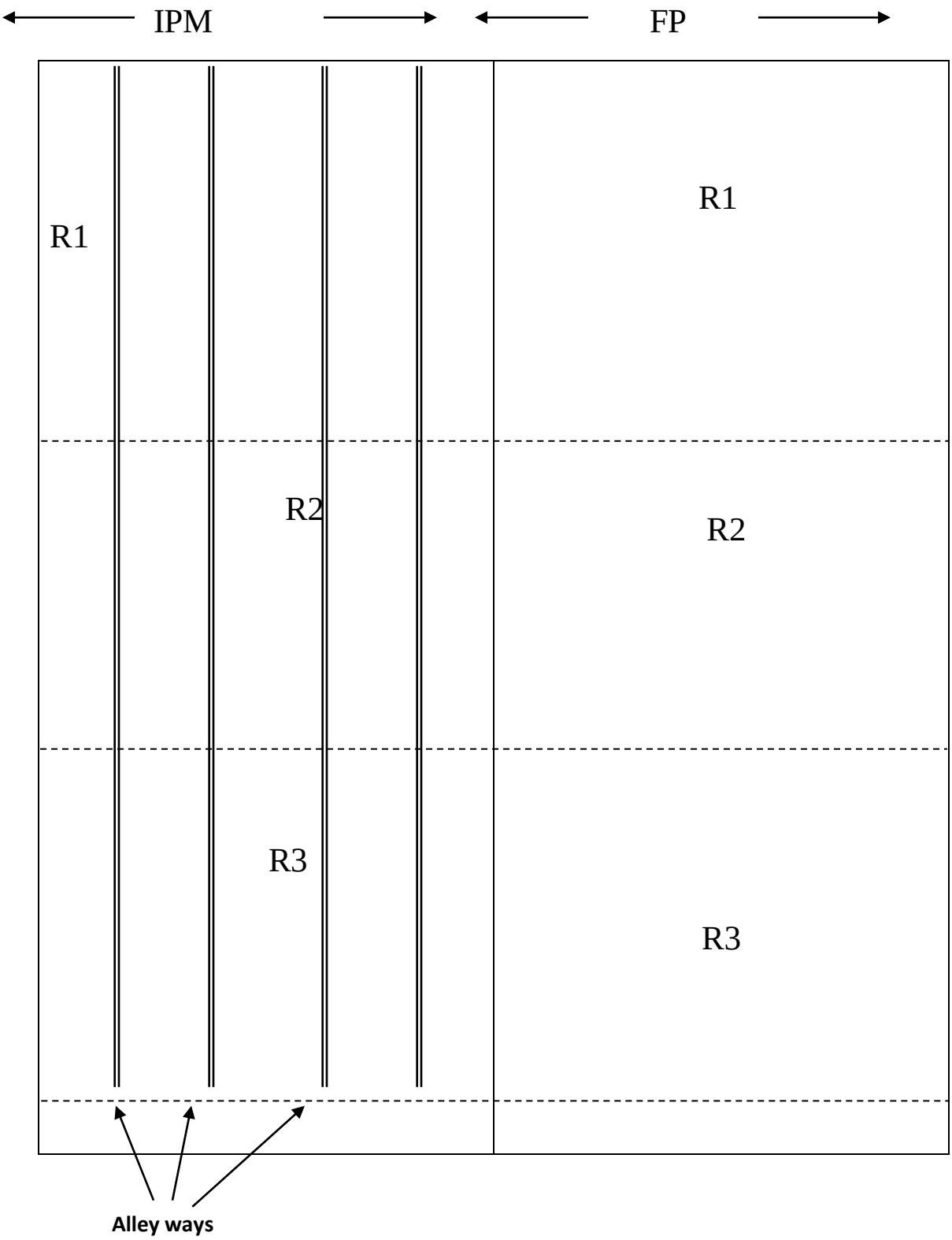
IPM is obviously a knowledge intensive technology and its impact depends on timely and informed decisions. Periodic surveillance at weekly interval is the core activity of the Trail and needs to be religiously followed. It is desirable that entire team of scientists visit the experiment site together, as often as possible, during this surveillance. If not, at least a representative of the scientist may accompany the team.

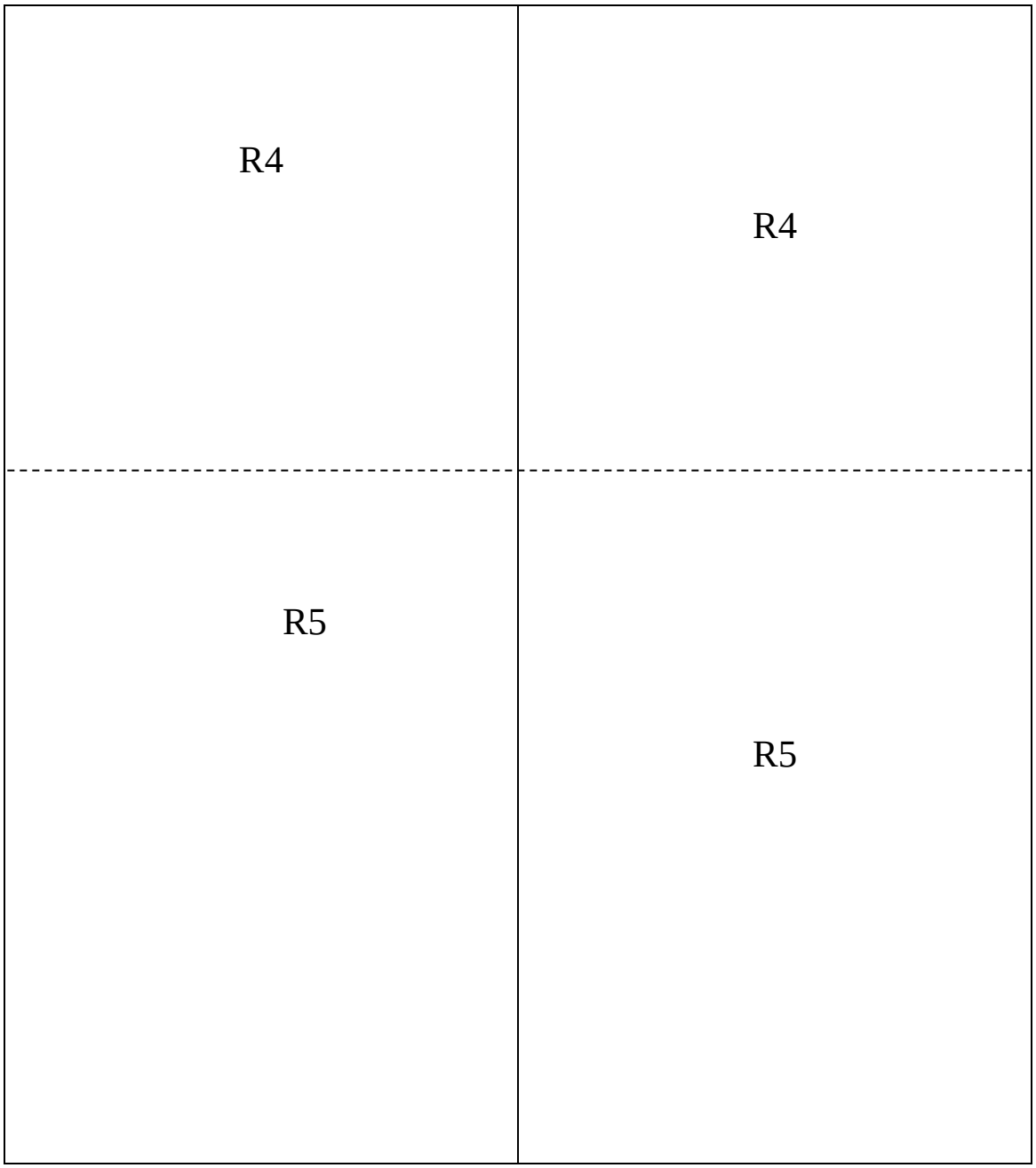
During any of the surveillance, if the pest damage crosses threshold, IPM interventions need to be decided within 24 h in consultation with the IIRR team. If response is not available from IIRR within this time, local decision may be taken and IIRR be informed of this. Impact of such specific intervention needs to be monitored through subsequent surveillance visit.

It is also important to timely record and report farmer's practices being followed in FP plots. This information may also be forwarded to IIRR unit.

LAYOUT PLAN FOR INTEGRATED PEST MANAGEMENT (SPECIAL) *KHARIF* 2022 – Farmer's field only

IPM and FP fields can be separate but has to be in one acre area. Divide each acre into 5 blocks for taking observations




R4
R4
R5
R5

EVALUATION OF CROP PRODUCTION TECHNOLOGY

Trial No. : 18 IDT-6
Trial code : IDT4.6
Name of the trial : Evaluation of drone for its suitability to various Agronomy interventions

Introduction

As much as India depends upon the agriculture, still it is far short from adapting latest technologies in it to get good farm. Developed countries have already started use of UAV's in their precision Agriculture. It is very fast and it could reduce the workload of a farmer. A technical analysis of UAVs in precision agriculture is to analyze their applicability in agriculture operations like pesticide Spraying, soil and field analysis. Drones have long been thought of as expensive equipment's. One area that has seen little attention from drones, perhaps to its detriment, is the agricultural sector. Drones are preferred over full size aircrafts due to major factors like combination of high spatial resolution and fast turnaround capabilities together with low operation cost and easy to trigger. Drone being a modern technology can be solution for farmers to achieve these challenges. Agricultural drones provide relief for the modern-day farmer to reduce drudgery and with less time lots of work can be achieved to bring sustainability in futuristic rice cultivation. Although the use of UAVs in agriculture has been steadily increasing, such growth is hindered by many technical challenges that still need to be overcome. In this context, the objective of this trial is to provide a comprehensive overview of the application of Drone (UAVs) for Agronomy operations in rice for its suitability and cost effectiveness. As indicated, UAV's have been used in many areas in agriculture, although they still have many limitations and challenges to overcome.

Objectives :

1. To Evaluate the suitability of drones to various Agronomic practices (sowing, herbicide spray and top dressing of fertilisers)
2. To evaluate cost reduction and economics of the drone technology

Locations:

IIRR	Adhuthurai	ARI-Rajendranagar	Coimbatore
ARS Maruteru	Moncompu	Panthnagar	

All centershaving Drone should conduct this trial both *kharif* and *Rabi*

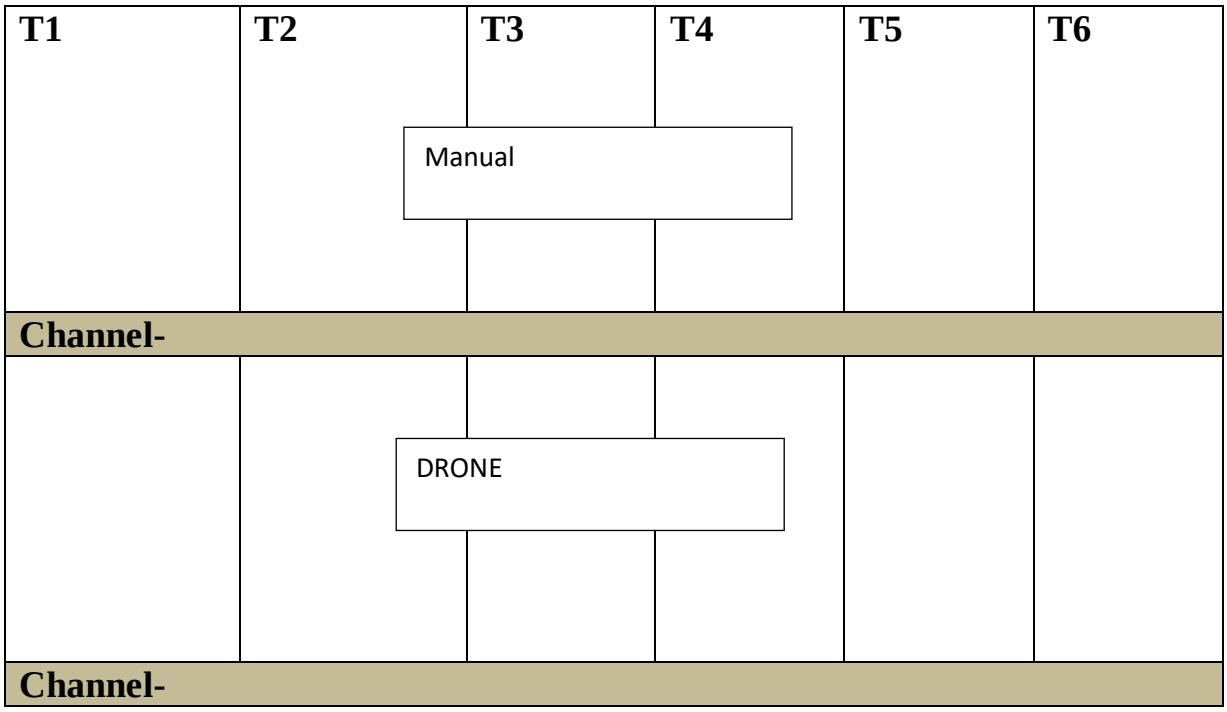
Design : RBD
Replications : 4
Plot size : *Kharif* -500 m^2 for each plot
13-15 points data collection in each treatment

Treatment
T_1: Broadcasting in Wet DSR T2: Drone Broad Casting in Wet DSR
T3:Pre emergence herbicide manuallyT4- Pre-emergence herbicide with Drone
T5- Nano or micro nutrients as Top dressing at 30- 45 DAS manually
T6- Nano or micro nutrients as Top dressing at 30- 45 DAS by Drone

Treatment1: Drone based package	**Treatment 2: Manual package**
Wet direct seeding with drone (Seed rate fine grain: 25 kg/ha)	Wet direct seeding manually broadcasting (Seed rate fine grain: 25 kg/ha)

Pre emergence application of Pyrazosulfuron ethyl (3 DOS, 200 g/ha dose, spray volume 50 l/ha) using drone	Pre emergence application of Pyrazosulfuron ethyl (3 DOS, 200 g/ha dose, spray volume 500 l/ha) manually
Manual application of Basal 50 % urea, RDP and RDK + application using drone 2l/ha nano urea at tillering and 2l/ha nano urea at PI stage	Manual application of Basal 50 % urea, RDP and RDK + Manual application of 2l/ha nano urea at tillering and 2l/ha nano urea at PI stage

Layout of the Experiment -*Kharif* 2023 (for example)



Observations:

1. Germination (%)
2. Plant density/m^2 (at 21 DAS and at maturity)
3. Tillers/m^2 (at maximum tillering)
4. Dry matter production /m^2
5. No. of panicles/m^2
6. Test weight of grains (g)
7. Weed population (number / m^2 at critical stages -30 and 60 DAS)
8. Weed dry matter (g/ m^2 at critical stages -30 and 60 DAS)
9. Cost of cultivation for each treatment
10. Grain yield (kg/plot)
11. Straw yield (kg/plot)
12. Soil fertility status (initial and after harvest of each crop)
13. Nutrient uptake by crops and soil available nutrient status
14. Cost of cultivation (Rs./ha)

Associated the Soil scientist, plant physiology of the location to collect data on nutrient uptake

*** The trial need to be conducted in both the seasons if facilities are available**

Interdisciplinary:Soil Science and Plant Physiology

****

Annexure -1

Associated the Soil scientist, plant physiology of the location to collect data on nutrient uptake

*** The trial need to be conducted in both the seasons if facilities are available**

Interdisciplinary: Soil Science and Plant Physiology

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Note:

- *As per the Work shop proceedings the Agronomy and soil Science trials need to be conducted in Interdisciplinary and there should not be any repetition of the trials at these locations*
- *Agronomist and Soil Scientist should work together in generating the data*
- *Weed management trials were modified in consultation with Directorate of Weed Research Jabalpur- M.P*

Field Noting:

Sl.No	Date	Activity/ observations

Sl.No	Date	Activity/ observations

Note to Co-operators:

- No duplication of trials at each station.
- Interdisciplinary trials need to be conducted by one section and other associated scientists will also collect data, compile and send to one of the PI of the programme.
- Consult PI on phone or e-mail for any clarification.
- Timely conduct and sending data is pre requisite for judging the best AICRIP centre.
- Conduct trials as per technical programme.
- Follow the guide lines strictly.
- Mention the required information while sending data. (for example – Variety taken, Recommended fertilizerdose, Initial soil states detail of the optional treatment etc.)
- Send the data by MIS (contact Dr. B. Sailaja, IIRR) also.
- Send very good pictures of experiment.

Acknowledgement

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