Research achievements

since 1968, more than 1188 varieties including 97 hybrids have been released through multi location testing for various agro-ecological systems prevalent across the country. Of these varieties, 503 are for irrigated areas, 133 for rainfed uplands, 194 for rainfed low lands, 44 for semi deep and 18 for deep water situation, 51 for high altitudes, 42 for saline and alkaline areas, 10 for aerobic, 19 for boro and 74 aromatic long and short grain varieties were released. More than 66 varieties have been developed by the Directorate of which 44 are central releases and the rest are released in different states. Globally 19 varieties released through AICRIP are being cultivated in 25 other rice growing countries.

Significant achievements during 2017-2018
New Varieties and Hybrids released

A total of 94 varieties including 22 Hybrids (Central-34; State-60) for different ecologies have been released by both central and state varietal release committees. Among these 9 varieties for Assam, 7 for Odisha, 6 for Madhya Pradesh, 5 each for West Bengal & Gujarat, 4 each for UP & Bihar, 3 each for AP, Punjab and Tamil Nadu, 2 each for Maharashtra, Chhattisgarh, Uttarakhand, Karnataka & Andaman and Nicobar islands while 1 for Manipur were released. Many of these varieties are resistant/moderately resistant to biotic stresses.
Crop Improvement

- During the year 2017, which is the 53rd year of AICRIP testing, 48 varietal trials, 1 screening nursery and 5 hybrid rice trials were conducted as 813 experiments at 123 locations (45 funded, 78 voluntary centres) across 25 states and 2 union territories in all the 7 zones of the country.

- Two Hundred and fifty three entries were identified as promising for different states and ecologies.

- A totally 95 hybrids were evaluated in four hybrid rice trials viz., IHRT-E, IHRT-ME, IHRT-M, IHRT-MS, in 27-33 different locations representing different agro-climatic regions of the country. 11 hybrids were found to be promising.

- The Varietal Identification Committee identified 5 hybrids and 18 varietal entries for release in different states.
- Of the 390 entries evaluated in INGER observation nurseries at 45 locations, 32 were found to be promising based on phenotypic acceptability and yield.

- Breeder seed production of rice varieties and parental lines of hybrids as per DAC indents was organized at 38 centers across the country, involving 271 varieties and parental lines of eight hybrids. A total production of 78,331 quintals of breeder seed was achieved against the target of 4264 quintals. At IIRR centre, 22 varieties were included in breeder seed production with a total production of 183 quintals.
Agronomy

A total of 70 cultivars belonging to 8 categories were evaluated for hills. In early group, Shalimar Rice -3 and Vivekdhan-86; in the medium group, VL Dhan 65, Vivekdhan 62 and HPR 2143 were identified as promising entries.

Under Integrated Management Trial, the promising cultivars identified were: early irrigated (IET-24797, Gontra Vidhan-3 and IR-64), medium (IR-64, Karjat-7, MTU-1010, Sarjoo-52, NDR-2064, HKR-127, 128, PR 113, Pant Dhan 19, 22, 24, Mahamaya, Numali and Jaya) and late (Swarna, Samba Mahsuri and Pushvami). Under scented category, Pusa 1509, NDR 6093, Pusa 2511, Numali, Pusa 1121, Pant Sugandha 25, 27 and CG Sugandhit Bhog were found to be promising. The promising hybrids identified were HRI-174, Az8433, Arize 6444. Under AL & ISTVT, SR 26B, Jaya and CSR 23.
At most of the locations, integrated agronomic management practice of higher NPK dose (150% RFD) followed by 50% RFD + 5 t/ha FYM was found to be promising and exhibited higher nutrient use efficiency. Saturation maintenance up to PI and (3+/− 2 cm) after panicle initiation treated plots resulted in highest grain yield (5.28 t/ha) followed by alternate wetting and drying (5.11 t/ha). Mechanical transplanting recorded the highest grain yield (6.02 t/ha) over manual transplanting (5.87 t/ha).

Irrespective of the method of crop establishment, by mechanical weeding thrice at 10 days interval using weeder increased grain yields (67%). Under puddled DSR, maintaining weed free period upto 30 DAS, the varieties DRR Dhan 46, DRR Dhan 44, DRR Dhan 42, Swarna and Shreya were found promising. Under aerobic system of cultivation, maintaining weed free period upto 60 DAS, the varieties DRR Dhan 42, DRR Dhan 44, DRR Dhan 46 and Sahbaghidhan, exhibited better weed competitive ability.
In the 29th year of study on long term soil fertility management in rice based cropping systems (RBCS), the treatments RDF+5t FYM/ha and RDF were at par and significantly superior to other treatments in both seasons at Maruteru and in rabi at Titabar. FYM alone treatment was on par to RDF in rabi and significantly superior to RDF in kharif at Titabar.

Yield gap analysis in farmers’ fields indicated very high yield gap 1 and 2 at Titabar to the tune of 50%. At Faizabad, yield Gap 1 was to the tune of 20% which was almost manageable, whereas, at Chinsurah it was minimum since the targeted yields fixed were comparatively low. At Maruteru, with narrow gap, yields obtained at farmers’ fields almost matched the research station yields.

Screening of genotypes for native sodic conditions
the genotypes viz., DRR Dhan 46, DRR Dhan 42, DRR Dhan 45, DRR Dhan 43, DRR Dhan 44 and DRR Dhan 40 at Kanpur and IR 30864, DRR Dhan 41, CSR 23, DRR Dhan 43, and DRR Dhan 40 at Mandya recorded highest yields when supplemented with 100% GR and also under native sodic conditions without gypsum application. While at Faizabad, the genotypes NDRK 500051, IRSSTN 30, IRSSTN 110, Jaya and NDRK 50063 recorded highest yields without gypsum amendment.

· The genotypes HRI 197, Uma, 27 P63 and DRR Dhan 42 were responsive to liming and Uma, KAU 109 and DRR Dhan 42 were efficient under native soil acidity at Moncompu. Whereas, HRI 196, 27 P64,

· 27 P63 at Ranchi; Gitesh, Prafulla, and Aghonibora at Titabar and Indira Maheswari and RP5974-3-2-8-38-12 at Raipur performed well with liming as well as without liming under acid soil conditions.
The supremacy of transplanted rice over DSR and aerobic rice was reported by 14-22% and 13-19% at Kanpur, Puducherry respectively while production systems at Moncompu indicated superior performance of DSR over transplanted and aerobic rice by 14%.

Site Specific Nutrient Management (SSNM) based on Nutrient Expert recorded higher grain yields in most of the locations ranged from 3549 to 7601 kg/ha recording 8-25 % increase over RDF.

Third year of study on “Bio-intensive pest management (BIPM)” indicated the superiority of BIPM over Farmers’ practice (FP) at five (Chinsurah, IIRR, Karjat, Jagdalpur and Titabar) out of ten locations that recorded significantly higher grain yield by 22-44%.
Plant Physiology

- Silixol had positive role with reference to enhanced total dry matter, grain yield/ m2 and Harvest index. Among the tested varieties, PHB-71 and IR64 responded well to silixol application with reference to total dry matter, whereas grain yield response and harvest index were more in KRH-4.

- Under elevated temperature regime, the mean grain yield for all entries and locations was reduced by > 60%. Among the better yielding genotypes under heat stress conditions, IET 26778 and IET 26763 maintained good harvest index (<10% reduction) under heat stress.
Three cultures (MAS 306, MAS 314, MAS 317) were identified based on their performance in terms of germination, shoot, root growth and seedling vigour under for multiple abiotic stress tolerance.

Low light stress resulted in significant loss in yield and its components. Among the tested varieties, IET 25206, IET 25814, IET 23356 and IET 25876 showed lesser reduction in grain yield.
Entomology

- Host plant resistance studies comprised of seven screening trials involving 1728 entries consisting of 1398 pre-breeding lines, 114 hybrids, 16 cultivars, 62 germplasm accessions and 124 check varieties. These entries were evaluated against 13 insect pests in 236 valid tests (50 greenhouse reactions + 186 field reactions). The results of these tests identified 74 entries (4.28%) as promising against various insect pests. Of these, 22 entries (29.73%) were under retesting.

- CR 2711-149, Dhanrasi and KNM 113 as promising in 7-9 tests of the 60 tests against multiple pests. The MRI varied from 7-36 with a PPR of 1.17-6.0. Of the 3 entries, KNM113 was in the third year of testing.
· Host plant resistance studies revealed that four entries - CR 2711-149, KAUM 179-1, KAUM 179-2 and KAUM 182-1 showed consistent resistance reaction against planthoppers during second year of testing. IC 578133 and COGR 2 were found promising for gall midge resistance. Three entries viz., CR3006-8-5, RP 4918-228(S) and JGL 19618 were found promising for multiple pest resistance.

· Evaluation of the gene differentials identified Aganni (Gm8), INRC 3021(Gm8) and W1263 (Gm1) as promising in 5-6 of the 10 tests. In case of planthoppers, among the 16 differentials tested, T 12 (ACC 56989), RP 2068-18-3-5, Rathu Heenati and PTB 33 were promising with a damage score ≤5.
· The botanicals-cedarwood and eucalyptus oils were found effective in reducing damage by stem borer. In case of gall midge, camphor oil showed efficacy in reducing silver shoot damage. Against leaf folder, performance of lemon grass oil was superior, while cedarwood oil was effective in reducing the damage by gundhi bug. Eucalyptus oil was found effective against cut worm and the efficacy was comparable with rynaxypyr.

· Water management along with ecological engineering can significantly reduce hopper population (7.45/hill) when compared to farmers practice (154.37/hill). The interventions increased the natural enemy populations like mirids, spiders and coccinellids and increased egg parasitisation across the locations. The benefit cost was also significantly higher with
ecological engineering (1.38) when compared to Farmers practice (0.60).

- Ecological engineering for planthopper management (EEPM) trial carried out at six locations indicated that a combination of one or more interventions such as growing of flowering plants on bunds, organic manuring, alleyways, spacing and water management increased the populations of mirids, spiders and coccinellids as well as egg parasitisation of hoppers in EE plots as compared to farmers practice.

- Adoption of IPM practices resulted in low incidence of weeds, insect pests and diseases in IPM plots compared to FP plots. Weed population and weed biomass recorded at all the locations were considerably reduced by 2-5 times in IPM implemented plots compared to
farmers practices and resulted in significantly higher grain yields.

Plant Pathology

- Field monitoring of virulence indicated the existence different groups of races of Pyricularia oryzae and Xanthomonas oryzae pv.
oryzae indicated that single bacterial blight resistance genes were susceptible at most of the locations.

- Early sowing of the crop favoured Rhizoctonia solani and BLB and in late sown crop, sheath rot and brown spot diseases were more prevalent. In the Southern region, late sowing by about 15 days helped in the escape of disease.

- Combination fungicide azoxystrobin 18.2 % w/w + difenoconazole 11.4 % w/w SC (1.0 ml/l) found effective against leaf blast, sheath blight and sheath rot and also increasing the yield of the crop.
· IDM studies revealed that seed treatment followed by clean bunds, optimum dose of fertilizer application in split doses with organic manures, followed by application of Trichoderma and need based application of fungicides reduced disease incidence in rice.

· Fungicides azoxystrobin 18.2% + difenoconazole 11.4% w/w SC @ 1.0 ml/l (T3) reduced both percentage of infected panicles/m2 and percentage of infected spikelet/panicle in addition to higher grain yield.

· Production Oriented Survey (POS) revealed that rice hybrids occupy a significant area in North and Central states.
Major problems faced by the farmers were shortage of agricultural labours, non-availability of seeds and inputs in time, implements for farm mechanization market facility and farm loan.

Severe leaf and neck blast was recorded in many places in Chattishgarh and Eastern Uttar Pradesh.

Sheath blight was recorded more in Chattishgarh, Punjab, Eastern Uttar Pradesh and West Bengal.

Unusual high intensity of bacterial blight was recorded in several places in Khammam, Warangal and Nizamabad in Telangana.
Transfer of Technology

- A cafeteria of rice technologies were demonstrated in 723 hectare area covering 20 states and five major rice ecosystems of the country. In total 50 technologies have been identified from 20 states based on their performance in farmers field conditions.
Crop Improvement

Plant Breeding

- IET 23832 (RP 5886-HP 3-IR8 0463-B39-3), the first zinc rich variety
was released by CVRC. It has high zinc content (22 ppm) in polished rice with mean yield of 5.2 t/ha and Recommended for Tamil Nadu, Andhra Pradesh, Telangana and Karnataka under irrigated ecology.
- Five future generation rice lines (FGR) possessing 6.5 to 7 t/ha yield potential were developed by utilizing tropical *japonicas.*

- DRR dhan 46 with 22.7% yield gain over the check Sahbhagidhan was released by CVRC for the states of Bihar, Madhya Pradesh and Maharashtra. Two drought tolerant varieties namely Tripura Kharadhan 1
and Tripura Kharadhan 2 were released in the state of Tripura.
- Chinsurah Nona Dhan 2, a derivative of *O. nivara* was found suitable for coastal saline areas and released in West Bengal.
- Three lines *ie.*, RP 5434-RAU 26-4, RP 5433-RAU-27-17 and RP 5433-RAU-19-2 with > 5 t/ha yield possessing good cold tolerance at seedling stage were identified.
- An elite culture derived from the cross IR
64/ACC 2190 was found promising having resistance to planthoppers in field and green house conditions.
- IET 24395 derived from the cross MTU 1075/ MTU 1010 was found
Research achievements to be superior over the best varietal and hybrid checks with >5% yield advantage and promoted to final year of testing
in AVT-2-
Late trial proposed during kharif, 2016.
- Two rice based products viz., tooth pain relief gel and mosquito repellent lotion were developed utilizing rice bran oil and brown rice extract. Rice based baked products namely
cake,
cookies,
pie

muffins and doughnuts developed using rice bran oil spread (RBOS) were
found to be superior in terms of consumer preference compared to those made from vanaspathi ghee and rice bran oil. Most of them contained low amount of transfats.
Research Achievements

- In vivo Glycemic acid (GI) studies revealed low GI in Dhanrasi (59.3) and Sampada (56.8) rice varieties.
- Lines with good kernel elongation after cooking (16 to 20 mm) were generated from the crosses

Vasumathi/IET 19492,

Pusa 1121/IET 18990, Sugandhamati/IET 19492, IET 18033/
IET 18004 and IET 18033/ IET 19492 etc.

- Three land races/wild rices of North eastern region viz., Punshi, Moirang-Phou- Khokngangbi and Thangjing-Phou were found to be resistant.
Research achievements

with score 3 in Uniform Blast Nursery.

- Genetic studies revealed quantitative nature of sheath blight tolerance. Employing SSRs putative quantitative trait loci were identified in the donor, RP
2068-18-3-5. A single minor QTL was detected on chromosome 5 with 7.8% phenotypic variance. Studies on grain chalkiness indicated decrease in amylose
content

while amylopectin increased with the increase in chalky area percentage. The grain density was less in varieties cultivated at high temperature.

Hybrid Rice
- DRRH-92 successfully completed two years of testing in AICRIP trials (IHRT-MS).

It is a high yielding hybrid with MS grain type having BPT 5204 grain type quality traits and medium duration. It showed yield superiority over the checks on in Zone III & VI.

- IET No 25352 (RP 5933-1-19-R-2) derived from
partial restorer improvement programme was promoted to AVT-1 medium duration trial. The IET 25352 registered yield superiority over best check in zone IV with 34.63% and
Research achievements in zone V with 12.18% and ranked third in the trial.

- In the station trial during kharif 2015, 10 promising hybrids viz APMS 6A/TCP-583, APMS 6A/TCP-647, IR 68897A/TCP-
643, APMS 6A/19-18R, IR 79156 A/19-18R, APMS 6A/7-65R, APMS 6A/PRP-78, IR 79156 A/PRP 78, APMS 6A/PRP 123 and IR 79156 A/AR 9-21R were identified.
In the biotic & abiotic resistance breeding for parental line improvement, two popular maintainer lines viz IR58025B and APMS6B were fortified with BB (Xa21) and blast (}
Research achievements

*Pi2*

resistance genes; attempts are being made to transfer the major drought tolerance QTL, qDTY12.1 and the low P tolerant QTL into the genetic background of the improved version of the elite restorer line, RPHR1005R, possessing Xa21 + Pi54.
Biotechnology

- Promising Bt transgenic IR64 lines with Cry1Ac and BPT 5204 transgenic lines with DREB1A are under evaluation of transgene integration through Thermal Asymmetric Interlaced Polymerase Chain
Reaction (TAIL-PCR).

- A sucrose synthase locus LOC_Os2g58480 was identified as polymorphic in two mapping populations viz Rasi / Vibhava and BPT5204/PTB1, and expression studies revealed its association with yield per se.

- A set of hyper-variable genomic and EST-SSR markers (n = 36),
GATA motif specific SSR markers (n = 14) and hyper-variable genomic SSR markers (n = 52) have been identified to be highly
informative with respect to assessment of parental genetic diversity and prediction of heterosis in the hybrids.

- Targeting a 20-bp polymorphism in the candidate gene for WA-CMS trait, *WA352*, located in the mitochondrial genome of rice, a robust, co-dominant
functional marker, named RMS-3-WA352 has been developed and validated among all the WA-CMS lines and maintainer lines of rice.

- In a study on wild abortive-cyttoplasmic male sterility (WA-CMS), a co-dominant marker was developed named RMS-PPR9-1, targeting an indel polymorphism in fertility restorer gene $Rf4$

, $viz$

., $PPR9$.  

- Ten SNP markers were dev
eloped by targeting four key genes playing important role in starch biosynthesis through KASPER assay. These SNP markers were validated in 100 indica genotypes
and high allele call rate (95.31%) was achieved with distinct classes.
Crop Production

Agronomy

- The total labour input saving was 21–25% in Mechanised System of Rice Intensification (MSRI) as
compared to SRI. MSRI and SRI performed similarly with respect to B:C ratio.

- Leaf Color Chart (LCC) based nitrogen management practice resulted significantly higher gross returns, net returns and B:C ratio as compared to other
nitrogen management practices except Soil Test Crop Response (STCR) based nitrogen management practice.

- The major nutrient uptake in grain and straw increased with increase in fertilizer dosage along with addition of biofertilizers. The highest uptake of major nutrients was at 125% RDF.
Biofertilizers and lowest with 75% RDF.

- In bio-fortification screening trial,

lines- BLVR 86, 70, 349, RPHP 105, 106 were promising with respect to growth and yield parameters.
Soil Science

- Grain yield performance and several NUE indices indicated that the genotypes Tulasi, Rasi and Vikas from early; KRH2 and Varadhan from medium and Dhanrasi from long duration group were the most. GSR lines viz.

., HUANGHUAZHAN, TME 80518, and IRRI 105
exhibited efficiency at sub-optimal N level (N0) and responded to applied N (N 100).

- NO emissions were significantly reduced from the rice field by use of all the three nitrification inhibitors namely, Dicyandiamide (DCD),
Neem Coated Urea (NCU) and Karanjinas compared with urea. Total N\textsubscript{2}O–N emissions were the highest with urea (0.73 kg/ha) followed by
Karanjin + Urea (0.62 kg/ha). The highest inhibition of total N\textsuperscript{2}O emission (53\%) was recorded from plots treated with Urea + DCD.

- The inoculation with \textit{Gluconacetobacter diazotrophicus} was found to improve the seedling leaf water content (39.4\%) and reduced
electrolyte loss (58.1%) under water deficit stress in comparison with uninoculated seedlings which showed 27.4% and 61.6%, respectively.
Inoculation was also found to improve the recovery of plants after resuming irrigation.

**Plant Physiology**

- Correlation and regression studies indicated that $P_n$
is positively associated with carboxylation efficiency, gs and ETR.

The positive association with ETR and
PN indicate that this parameter can be used to screen a large number of genotypes as measuring ETR is faster. The PN was significantly
associated with TDM and grain yield.

- Multiple regression analysis based on lm (Lindeman, Merenda and Gold) metric indicated that the carboxylation efficiency \( \frac{P_N}{C_i} \) contributed more than 30%. 

\[ >30\% \]
Research achievements

to the

R
to value of 0.86 followed by transpiration (14%) and ETR(11%).

- Based on the ideotype breeding experiments in rice, it was found that KRH-2, PHB-71 and 13-7 (hybrids cluster), Jaya, Swarna and Sampada (indica cluster) and TJP-27,


TJP- 197 and TJP-139 (tropical japonica cluster) can serve as potential donors to get increased grain yields with good grain quality and ideal morpho-physiological traits associated with grain yield.
Crop Protection

Entomology

- Of various breeding lines and germplasm accessions evaluated against hoppers, PTB 33, RP 2068, T12 and IC216750 were highly resistant to
BPH, 
*Nilaparvata lugens* 

- The entries M O1, IC75864 and IC215298 were resistant to WBPH, *Sogatella furcifera*. 

- The back cross inbred line RP55 88-B-B-B-63 developed from *O. glaberrima* recorded low damage for stem borer,
Scirpophaga incertulas suggesting antibiosis as one of the mechanisms of resistance.

- RP5588-B-B-B-32 derived from O. glaberrima and a BPT mutant been identified as a new source of resistance to Asian rice gall
midge, *Orseolia oryzae* with nil damage under greenhouse.

- Thirteen Backcross Inbred Lines (BILS) derived from a cross between Swarna (*O.sativa*) and a wild accession *O. nivara* – 81848, 11 mutant lines and 7 germplasm entries recorded low damage by leaf folder,
Cnaphalocrocis medinalis.

- A newer insecticide BCS CL 735 07 SC 200 was found effective in reducing the damage by stem borer, S. incertulas and leaf folder, C. medinalis in rice under field conditions.

- Lemongrass, eucalyptus, oregano and
Camphor oils at 0.2% significantly reduced stem borer (S. incertulas) and leaf folder, C. medinalis damage and their efficacy was comparable.
with insecticide rynaxypyr. Olfactory response of BPH, \textit{N.lugens} to various oils revealed that eucalyptus oil at 10µl and neem oil at 20
µl were highly repellent to female hoppers. In EAG test, highest reaction (repellent) by hispa, *Dicladispa armigera* was recorded in eucalyptus oil followed by camphor and rosemary oils.

- The mean parasitisation of brown planthopper, *N. lugens* eggs near a border of yellow marigold, orange marigold and Gaillardia was
significantly higher when compared to parasitisation without flower border. Laboratory studies on biology of Anthocorid predator revealed that the bug was predominantly an egg predator on BPH, *N. lugens*.

- The pink stem borer (PSB), *Sesamia inferens* lure resulted in cumulative catches of PSB. Entomopathogenic nematode
(EPN), *Heterorhabditis indica* significantly reduced white ear damage caused by the yellow stem borer in field evaluation. An indigenous
EPN,

isolate

Drr-Ma3 was identified as *Metarhabditis amsactae* based on morphological and molecular characterization.

- Two genotypes (LD24 and Khao Pahk Maw) showed highly resistant reaction to rice
root-knot nematode

*Meloidogyne graminicola*. Nematode analyses in SRI system revealed that the total nematode abundance was more in SRI compared to the normal transplanted system.
Pathology

- The blast resistant genes like $Pi_1$
  
  $Pi_2$
  
  and

  $Pi_{54}$
  
  were introgressed into elite cultivar Samba Mahsuri and Introgressed
Research achievements

- Sheath blight tolerant lines *viz.* SM-801, Ngonolasha, Wazuho, phek, Gumdhan, BG-380-2, RP-2068-18-3-5, Phougak and Thangmoi were identified from
North Eastern India.

- Among the cultivars evaluated under glass house conditions on three different sowing dates viz., early, mid and late for false smut disease, the genotype HKR 47 showed high number of smut balls (10 Nos.)

- Isolated microbial antagonists viz.

, Fluorescent

*Pseudomonas* sp,

*Trichoderma viride,* Penicillium*
Research achievements

Aspergillus sp. and Aspergillus sp. and these were tested for their antagonistic activity against Rhizoctonia solani under in vitro conditions and found effective in suppressing the growth of the fungus.

- Pyramiding of Xa21 and Xa38 in background of Samba Mahsuri and
APMS6B is being carried out and lines are at BC 4 F 1 (Samba Mahsuri) and BC 3 F 1 (APMS6B).
- Genotyping and phenotyping of BB isolate
392
*Xoo* strains have been completed and categorized into 22 pathotypes.

- The combination fungicide ICF-110 (tricyclazole 45% + hexaconazole 10% WG) 1.0g/l was identified as
an effective molecule to reduce the blast and sheath blight disease of rice.

Transfer of Technology
- The major threats to sustainable rice production technologies in Chattisgarh plain zone as perceived by farmers are non-availability of resistant varieties, poor drainage, nutrient deficiency, slow seed replacement, labour problems, non-availability of micro nutrients and biofertilizers in time and increased cost of tubewells.
- Gender dimensions study in
farmers indicated that the major work related to agriculture was predominantly decided by male members of the family. Regarding the climate change they perceived that in Ranga Reddy district 2013 was a good year for rice cultivation, followed by 2014 as average and 2015 as a bad year in which rice
area was reduced by 40% and 75%, respectively.

- The video extension module studies in Telangana and Rice check programme studies in Tamil Nadu indicated that in both these provinces, impact of
knowledge interventions was found to be significant when blended with field demonstrations.

- Adequate training in the agri business related area, effective marketing strategies, extension efforts such as technology demonstration and dissemination strategies, value addition initiatives were the critical success factors.
Research achievements

in

the

public-private partnership in agricultural extension and advisory services.

- The baseline study in village Ankushapur District Karimnagar revealed that though farmers are aware of IPM
as a concept, they are not aware of the important IPM components to be followed in rice.
Research achievements