

ICAR-CENTRAL RICE RESEARCH INSTITUTE, CUTTACK

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**EVENTS** 

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#### CONTENTS

Republic Day	î
Launch-workshop of the New Plan Scheme	2
ADG (Seeds & FFC), ICAR Visited Farmers' Field	
ICAR-CRRI Signs MoU with Private Seed Company	3
Farm Innovators Day	3
Institute Management Committee Meeting	!
Workshop on Rice Production	5
CRRI-NABARD Interaction Meet	ć
Exhibition	
Training and Workshop	7
Visitors	
CRRI REGIONAL STATION, HAZARIBAG	
Front Line Demonstrations (FLDs)	8
IRRI-NFSM (STRASA) Sponsored Demonstration	8
Kisan Mela	
Farmers Training	9
Visit of Hon'able Shri Yaswant Sinha	9
CRRI REGIONAL STATION, GERUA	
DG, ICAR Inaugurates Office Building at Gerua	9
KRISHI VIGYAN KENDRA	
Santhapur, Cuttack	
Jainagar, Koderma	12
RESEARCH NOTES	
Five rice varieties and one hybrid were released	
Comparative transcriptome analysis of rice genotypes	14
Frequency and fertility restoration efficiency	
Evaluation of introgression lines	10
Characterization of salt-tolerant diazotrophs	
Identification of causal organism of brown spots	
Synthesis and characterization of silver nanoparticles	
Persistence of fipronil in soil under rice ecosystem	
Delineation of site specific nutrient management	
Optimum time of planting of boro rice in Assam	20
OTHERS	
Participation in Symposia/Seminars/ Conferences	2
Publications	
Awards/Recognition	24
Radio/TV Talk	25
Institute Seminars/Lecturers	
Promotion	25
Retirement	20
ICAR Inter-Zonal Sports Tournament	20
FROM DIRECTOR'S DESK	

#### **MAIN INSTITUTE CAMPUS**

**Events** 

#### **Republic Day**

On the occasion of 66th Republic Day, Director, Dr. T Mohapatra, unfurled the tricolor. In his address, Director highlighted the significant achievements of CRRI and the need to meet the challenges in future. The celebration was attended by staff with their family members and students of CRRI High School. Patriotic songs were presented by school students that enthralled the gathering.

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### Launch-workshop of the New Plan Scheme on "Incentivizing Research in Agriculture"

A new 12th Plan Scheme on "Incentivizing Research in Agriculture" comprising of projects on rice yield under low light, C<sub>3</sub>-C<sub>4</sub> intermediate pathway in *Poaceae*, genetic modifications to improve biological nitrogen fixation, molecular genetic analysis of resistance/tolerance to different stresses and semen sexing in cattle has been sanctioned by the ICAR. The scheme was launched in presence of Prof. SK Datta, Deputy Director General (Crop Sciences), ICAR, New Delhi on 13 January 2015 at Central Rice Research Institute, Cuttack. The Launch-workshop was also attended by Dr. JS Chauhan, Additional Director General (Seeds), ICAR, New Delhi and PIs and Co-PIs of different component projects. Dr. T Mohapatra, Director, CRRI and the Coordinator of the Scheme gave a brief account of the scheme. There are 24 partner Institutions and 142 scientific personnel as PI and Co-PIs involved in this scheme. There was a detailed discussion on the work plan and activities of each component projects. Central Rice Research Institute, Cuttack, the Coordinating unit will have the responsibility of getting the projects periodically monitored and evaluated. For this purpose, a committee of experts will be constituted by the Deputy Director General (Crop Sciences), ICAR, New Delhi. There will be half yearly group meetings involving PIs and Co-PIs under each project. All the groups will meet once in year for a detailed discussion of progress. Prof. Datta advised all concerned to take their components in the project seriously and deliver the results.



Prof. SK Datta addressing on the occasion

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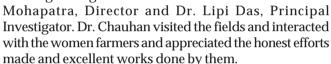
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Prof. Datta releases brochure of the project

### ADG (Seeds & FFC), ICAR Visited Farmers' Field

Dr. JS Chauhan, ADG (Seeds & FFC), ICAR, New Delhi visited Sankilo village of Cuttack, Odisha on 14 January 2015 to see various research and developmental activities being undertaken by CRRI under the institute project "Designing and Testing of Gender Sensitive Approaches in Rice Farming" along with Dr. T



## ICAR-CRRI Signs MoU with Private Seed Company

A Memorandum of Agreement was signed with Bioseed Research India, Hyderabad on 14 January 2015

in presence of ADG (Seeds & FFC), ICAR, New Delhi and Director, ICAR-CRRI for commercial seed production of late duration rice hybrid CR Dhan 701. This will support spread of the hybrid in coming years in the country.



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## **Farm Innovators Day**

ICAR-Central Rice Research Institute (ICAR-CRRI), Cuttack observed "Farm Innovators Day and BGREI Scientists-Farmers Interaction Meet" on 27 January 2015 in its premises. Apart from central and state government officials, the programme was attended by over 250 innovative/progressive farmers and state department officials from 29 districts of Odisha. Shri Ranglal Jamuda, IAS, Special Secretary, DAC, MOA, Govt. of India graced the occasion as Chief Guest and inaugurated the event. He emphasized on 'Seed, Soil and Water' for sustaining agricultural production in the state. The Guest of Honour Dr. PK Meherda, IAS, Commissioner-cum-Director, Dept. of Agriculture and Food Production, Govt. of Odisha said that progress in agriculture sector was impossible without seeds of improved varieties. technologies, farm machineries and efforts of our farmers.

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Shri Ranglal Jamuda, IAS, Special Secretary, DAC, MoA, Govt. of India and Chief Guest of the function addressing the audience

Dr. T Mohapatra, Director and Chairman highlighted the significant achievements of the institute, specially the recently released varieties and their suitability for diverse ecologies. He spoke on the objectives of the porogramme, inspired the farmers and summarized the suggestions for taking further actions.

The technical session included presentations on i) rice varieties for varied ecologies and adverse situations; ii) problem soils and their management; iii) new practices of crop protection technology; iv) quality aspects of rice for remunerative market price; and v) socio-economic and development issues in rice. The innovative/progressive farmers presented their views, innovative experiences and difficulties faced by them in agriculture. The Deputy Directors of Agriculture (DDAs) and other Agriculture Officers also shared their view points, followed by a lively and fruitful interactive session by scientists-farmersextension officers. The Chief Guest felicitated 32 innovative rice farmers from all the districts on the occasion with trophy and certificate. Three extension bulletins on 'CRRI rice varieties for diverse ecologies', 'Rice nematodes and their management', and 'Agro-



A farmer visiting the exhibition stall



Dr. PK Meherda, IAS, Commissioner-cum-Director, Dept. of Agriculture and Food Production, Govt. of Odisha and Guest of Honour speaking on the occasion

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An innovative farmer being awarded by the Chief Guest

climatic characterization for crop planning in water stress prone area of Ganjam' were released by the dignitaries. An exhibition displaying CRRI technologies and implements was also organized on the occasion. Dr. BN Sadangi welcomed the guests and dignitaries and Dr. Amal Ghosh offered the vote of thanks, while Dr. Lipi Das and Dr. SK Mishra coordinated the programme.

### **Institute Management Committee Meeting**

The XXVII<sup>th</sup> Institute Management Committee (IMC) meeting of the CRRI was held on 31 January 2015 at Cuttack under the Chairmanship of Dr. T Mohapatra.

Director. CRRI. The members present were Dr. (Mrs) N Sarala, National Professor, DRR, Hyderabad. Dr. PK Das, Dean of OUAT. Research. Bhubaneswar. Dr. SG Sharama, Head, Crop **Physiology** Biochemistry Division, CRRI. Shri NVRN Murty. Finance & Accounts Officer, CIFA. Bhubaneswar. Shri UK Parida and Shri Kulamani Rout. Ex-MLA. Bari-Derabish, Kendrapara. Dr. BN Sadangi, Head,

Social Science Division, CRRI, Dr. ON Singh, Head, Crop Improvement Division, CRRI, Dr. (Mrs) U Dhua, Head(I/ c), Crop Protection Division, CRRI, Shri SR Khuntia, Chief Finance & Accounts Officer, CRRI and Shri BK Sinha, Senior Administrative Officer, CRRI as Member Secretary also attended the meeting. Matters related to infrastructure development and budgetary provisions for construction works and production of seeds of CRRI varieties in farmers' field were discussed.

### **Workshop on Rice Production**

The institute organized a "Workshop on Rice Production" on 6 March 2015 at the 'Institute for Management of Agricultural Extension' (IMAGE), Bhubaneswar in the side line of the state "Krishi Mahotsav" celebrated from 5 to 8 March 2015 at Bhubaneswar. The workshop was attended by over hundred rice farmers from various districts of Odisha. apart from fifty state Agriculture Officers and scientists from CRRI. The main objective of the workshop was to understand their problems in rice production and suggest recommendations. The workshop was inaugurated by Dr. T Mohapatra, Director, CRRI and Shri A Sethi, Director, IMAGE. Addressing the gathering in the opening session, Shri Sethi said that the workshop is an excellent platform to bridge the existing information gap in order to empower the ultimate users, i.e., "farmers". Dr. T Mohapatra,

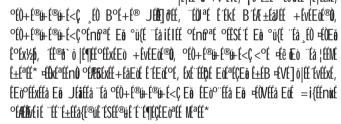
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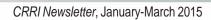
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IMC meeting in progress

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Director and Chairman emphasized on 'crop diversification' in view of the frequent natural disasters like drought, cyclone and flood being received by the state almost every year.

The technical session deliberations by CRRI scientists Drs. AK Nayak, U Dhua, PC Mohapatra, SK Pradhan and SD Mohapatara were followed by "Scientists-Farmers-Extension Officers" interaction on problems and issues concerning rice

production. The major concerns raised were on supply of quality seeds in time, irrigation infrastructure, establishment of rubber sheller in each block and waiving of electricity charges in farming operations. The Director distributed ten 2-kg paddy seed mini kits of eight newly released CRRI varieties suitable for various rice ecologies to the Deputy Directors of Agriculture (DDAs)/their representatives of the state for demonstration. The workshop was coordinated by Dr. BN Sadangi, Head, Social Science Division and Dr. SK Mishra, Senior Scientist.

#### **CRRI-NABARD Interaction Meet**

A CRRI-NABARD Interaction-cum-Exposure Meet was organized on 26 March 2015 in the institute in collaboration with NABARD Regional Office, Bhubaneswar, which was attended by four DGMs, over thirty District Development Managers-cum-AGMs (DDMs/AGMs) of NABARD from Odisha, all HODs and scientists of the institute. Shri SK Kale, CGM, NABARD, Bhubaneswar in his presidential address highlighted the activities and achievements of NABARD in augmenting



Shri SK Kale, CGM, NABARD, Bhubaneswar speaking on the occasion



Guests on the Dais listening to the participants

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NABARD officials visiting the Farming System Models of the Institute

agricultural production in the state through its credit support in rural sector, promotional activities, regulatory roles and supervisory mechanisms. Gracing the occasion as the Chief Guest and inaugurating the meet, Director, CRRI Dr. T Mohapatra said that rice is core to the development of the country, more so in eastern parts of the country and particularly in Odisha. He emphasized on NABARD's role in farm mechanization, custom hiring, and value-chain establishment. All the HODs presented a brief account of disseminable technologies on rice for the benefit of the NABARD officials. In afternoon, the officials visited the research farm including three ricebased farming system models developed by the institute. The programme was coordinated by Dr. BN Sadangi, Head, Social Science Division and Dr. SK Mishra, Senior Scientist.

#### **Exhibition**

CRRI participated in the 'Global Social Science Conference-2015' on "Management of Sustainable Livelihood Systems" jointly organized by International Society of Extension Education (INSSE), Nagpur, Odisha Society of Extension Education (OSEE), Bhubaneswar and Orissa University of Agriculture and Technology (OUAT) at OUAT, Bhubaneswar from 14 to 17 February 2015. Mr. P Jana, Assistant Chief Technical Officer, Mr. BD Ojha, Sr. Technical Assistant and Mrs. R Gayatri Kumari, Sr. Technical Assistant represented the institute.

CRRI participated in the Eastern Zone Regional Agriculture Fair on 'Rural Livelihood Security for Eastern Plains of India' at Central Potato Research Station, Patna, Bihar from 19 to 21 February 2015. Dr. SM Prasad, PC, KVK, Santhapur, Mr. P Kar, Assistant Chief Technical Officer and Mr. P Jana, Assistant Chief Technical Officer represented the institute.

CRRI participated in the Odisha State Agriculture Fair 'Krishi Mahotsav-2015' at Janata Maidan, Chandrasekharpur, Bhubaneswar from 5 to 8 March 2015. Mr. P Jana, Assistant Chief Technical Officer, Mr. BD Ojha, Sr. Technical Assistant and Mr. AK Parida, Sr. Technical Assistant represented the institute.

## **Training and Workshop**

One Trainers Training Programme on "Hybrid Rice Production Technology" sponsored by the State Institute for Management of Agriculture" (SIMA), Lucknow was organized for 30 state Extension Functionaries from 16 to 20 March 2015. Dr. Lipi Das and Dr. SK Mishra, Senior Scientists coordinated the programme.

One Exposure-cum-Training Programme on "Rice Production Technology" sponsored by Centre for Agriculture and Rural Development (CARD), New Delhi was organized for 24 progressive farmers of Ahmadabad district of Gujarat from 23 to 24 March 2015. Dr. SK Mishra, Senior Scientists coordinated the programme.

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#### **Visitors**

During the period under report, a total of 2057 visitors including 1637 farmers, 262 farmwomen, 70 students and 88 Agriculture Officers from different states of India *viz.*, Odisha, Gujarat, Chattishgarh, Madhya Pradesh, Meghalaya, Rajasthan, West Bengal and Uttar Pradesh. They were taken around various experimental plots, demonstrations, agricultural implement workshops, net houses and O*ryza* museum in the institute.

### **CRRI REGIONAL STATION, HAZARIBAG**

#### **Front Line Demonstrations (FLDs)**

Early drought tolerant varieties grown under direct seeding yielded, on an average, 50-100% additional yield over locally cultivated varieties in unbunded and bunded uplands of Jharkhand under Front Line Demonstrations. Ten FLDs of Sahabhagidhan and CR dhan 40 were conducted in six villages of Hazaribag (Morangi, Tumba, Daso Khap and Bahera) and Chatra districts (Ureli and Tilra) covering 10 ha area during *kharif*, 2014. The highest grain yield of variety Sahabhagidhan (35.7 q/ha) was recorded in Bahera village of Hazaribag district.

## IRRI-NFSM (STRASA) Sponsored Demonstration (Rice-Chickpea Rotation)

Deshichickpea variety JG 14 was demonstrated under rice fallow covering 10.63 ha area in four villages of districts Chatra (village Sonpura), Deoghar (village Titmoh) and Khunti (villages Bhursha and Marangatu) for enhancing cropping intensity and livelihood food security under IRRI-NFSM programme during rabi, 2014-15.

#### Kisan Mela

One Kisan gosthi on "Jharkhand main khadyan badhotri ke liye fasal saghanta ko badhaba dena" was organized at CRURRS Hazaribag on 13 January 2015. The gosthi was chaired by Sister Joseline, Director, Holly Cross Society (Hazaribag) and co-chaired by Dr. Mukund Variar, Officer-In-charge, CRURRS, Hazaribag. Shri PN Tripathi, Joint Director (Agri.), Government of Jharkhand graced the gosthias special guest and shared his experiences and outlined the agricultural schemes presently operative in the state. Shri BB Nayak, DDM (NABARD); Shri SK Singh, District Agricultural Officer (Hazaribag); Dr. Anuranjan, Project Director (ATMA); Dr. RK Singh, Programme Coordinator, KVK (Holly Cross), Hazaribag; all scientists of CRURRS Hazaribag and KVK, Koderma participated. About 300 farmers from eight villages of Hazaribag, Chatra and Koderma districts attended the mela.

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#### **Farmers Training**

Under tribal sub-plan, three farmers training programmes on *'Enhancement of crop production and their management under rainfed upland condition in tribal area'* were organised on 23, 25 and 27 March 2015 in the districts of Deoghar (village-Titmoh, block-Madhupur), Khunti (NBJK training centre, Khunti) and Hazaribag (CRURRS, Hazaribag), respectively for enhancing the production and productivity of cereals, pulses, oilseed crops under rainfed upland cropping intensity of the state. These training programmes aimed at improving the livelihood of tribal farmers inhabiting the selected villages.

#### Visit of Former Cabinet Finance Minister Hon'able Shri Yaswant Sinha

Shri Yaswant Sinha visited CRURRS, Hazaribag on 6 February 2015. The OIC briefed him about the on-going activities of the station stressing on our efforts to improve the livelihood of the resource poor farmers cultivating rice in unfavourable environments. Shri Sinha assured to provide necessary support for strengthening the activities at the station and the new ICAR institutions proposed to be established in the district of Hazaribag (IARI-Jharkhand).

### **CRRI REGIONAL STATION, GERUA**

## DG, ICAR Inaugurates Office Building at RRLRRS-CRRI, Gerua

Dr. S Ayyappan, Hon'ble Secretary, DARE & Director General, ICAR visited Regional Rainfed Lowland Rice Research Station (RRLRRS), Central Rice Research Institute (CRRI), Gerua (Assam) on 8 March 2015. Dr. Ayyappan inaugurated the newly constructed Office-cum-Laboratory building of RRLRRS, Gerua. He interacted with the staff of the regional station and the scientists from

other ICAR institutes/regional centres located nearby and provided his valuable guidance and suggestions for greater collaboration, more joint meetings and bringing out a newsletter for the North East under KIRAN (Knowledge Innovation Repository of Agriculture in the North East) platform.

Altogether 238 farmers from different districts of Assam participated in a farmers' meet out of which 96 were farmwomen. Since

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Hon'ble DG addressing the stakeholders gathering

inauguration day coincided with the International Women's Day, progressive farmers. particularly farmwomen, were felicitated and provided with 5 kg mini of rice variety 'Chandrama' to mark the occasion. Hon'ble DG. ICAR in his address emphasized upon adoption of rice-based farming and cropping system for sustainable food and nutritional security. Dr. T Mohapatra, Director, CRRI highlighted the rice and ricebased technologies available with CRRI to cater to the



Hon'ble DG takes note of traditional rice germplasm

needs of the rice farming community and urged the farmers to remain in touch with different research and extension institutions located in the region in order to update with recent technological developments and to harness their benefits. Dr. SV Ngachan, Director, ICAR Research Complex for North Eastern Hill Region, Umiam (Meghalaya) emphasized upon crop diversification and utilization of rice fallow with inclusion of short duration pulses and oilseed crops for higher crop productivity and farm income. Dr. DK Sarma, Director, National Research Centre on Pig, Rani (Assam) suggested integration of piggery in rice-based production system for ensuring high income level to rice farmers. On the occasion, four progressive farmers including two farm women expressed their happiness on the performance of rice varieties, namely Chandrama and Naveen in their locality and advised fellow farmers for adoption of the technologies available with CRRI. Dr. KB Pun, Officer In-Charge, RRLRRS, Gerua, who along with his colleagues organized the events, offered vote of thanks.

#### KRISHI VIGYAN KENDRA

### Santhapur, Cuttack

#### **Training Programme**

Eight off-campus training programmes were conducted on "Production Technology of oyster mushroom", "Value addition of locally available seasonal vegetables", "Improved production technology of green gram and black gram", "IPM in black gram and green gram", "Integrated farming (Fish + duck + livestock)" and "Dairy farming and management for higher income generation" at village Odisingha, Jodum (Narsinghpur), Mangarajpur, Gobardhanpur and Pankalo (Badamba), Guali (Tangi-Choudwar) and Andhoti (Barang), respectively for 200 farmers, farmwomen and rural youth.

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One collaborative training programme on "Scientific Cultivation of fruit crops and its scientific ripening technology" was organized by Samagra Agribusiness Pvt. Ltd., Hyderabad at Hotel Grand Residency, Cuttack on 5 March 2015 in which Sri Bani Singh, Deputy Director, National Horticulture Board, Bhubaneswar, Shri CS Rao, Member, National Horticulture Board, Ministry of Agriculture, GOI and Dr. AK Das, HOD, Horticulture and Fruit Science, OUAT attended the programme. Forty three farmers and rural youth from different blocks of Cuttack district participated in this programme.

#### **Front Line Demonstrations (FLDs)**

Five Front Line Demonstrations entitled "Demonstration of incubated bio-fertilizers (PSB an Azotobacter @ 5 kg/ha) in cauliflower", "Demonstration of foliar spray of zinc EDTA (0.5 g/lit. water) on quality and yield of cabbage", "Demonstration of management of downy mildew in cabbage", "Demonstration of oyster mushroom" and "Demonstration of dual purpose coloured synthetic poultry bird Banaraja (220 no.)" were organized for 73 farmers/farmwomen of Uchhapada (Tangi-Choudwar), Mangarajpur (Badamba), Murgakul (Cuttack Sadar), Jodum (Narsinghpur) and Abhaypur (Tangi-Choudwar), respectively. FLD pulses on green gram (var. SML 668) in 5.4 ha and black gram (var. PU 31) in 6.0 ha was also conducted involving 12 and 16 farmers, respectively of Cuttack district.

#### **On Farm Trials (OFTs)**

Four On Farm Trials entitled "Assessment of seed treatment with molybdenum @ 3 g/kg seed) and Rhizobium @ 250 g/acre seed on yield of green gram", "Assessment of two foliar sprays (30 and 40 DAS) of boron @ 0.3 per cent (3 g/lit. water) on yield of groundnut", "Assessment of metalyxil + carbendazim against late blight of potato" and "Assessment of performance evaluation of mineral supplements on milk yield of nondescript cows" were started at Mangarajpur (Badamba), Andhoti (Barang), Uchhapada, Kadei, Gurujang and Ganeswarpur (Tangi-Choudwar) and Khadibila (Niali) for 15 farmers each. Shri DR Sarangi conducted three field visits to record data on OFTs and also on FLDs implemented in rabi and Post-rabi on groundnut, green gram and cauliflower in Tangi-Choudwar block.

#### **Animal Health Camp**

Two Animal Health Camp-cum-ASCAD Training Programme were organized in collaboration with BVO, Tangi-Choudwar and AVAS, Choudwar at village Gurujang and Guali (Tangi-Choudwar) on 21 February 2015 and 20 March 2015 in which 414 animals were diagnosed and treated and 50 no. of villages participated in the training.

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#### **Swachh Bharat Mission**

Three cleanliness awareness programmes were conducted for school children of Mangarajpur U.P. School, Badamba, Jodum Nodal U.P. School, Narsinghpur and Haridapal U.P School, Safa, Tangi-Choudwar involving more than 600 school children and 16 teachers.

#### **Mahila Mandal Meeting**

One Mahila Mandal Meeting was organized on 24 February 2015 at village Panchagaon, Tigiria in which 72 farmwomen took part.

#### **Krishak Goshthies**

Two Krishak Goshthies were organized at Andhoti (Baranga) and Tentuliaragadi (Tigiria) on 16 and 25 February 2015 in which 30 and 54 farmers and farmwomen participated, respectively.

#### **Farmers Field Schools**

Four farmers field schools were organized in collaboration with Central Integrated Pest Management Centre, Bhubaneswar at village Murgakul and Chanchapada (Cuttack Sadar) for vegetables and at villages Mangarajpur and Pankala (Badamba) for groundnut involving 30 farmers each.

#### Visit of Dignitaries

Dr. TR Athare, Scientist, ZPD Unit, Zone VII, Jabalpur and Dr. YV Singh, Principal Sci. Division of Agronomy, IARI, New Delhi visited the KVK as well as the field activities at Sankilo (Nischintakoili) and Mangarajpur (Badamba), respectively on 6 and 9 February 2015.

### Jainagar, Koderma

#### **Training Programme**

KVK, Koderma conducted 13 training programmes participated by 355 participants to improve the skill and knowledge of farmers, rural youths and extension functionaries. The training programmes were conducted on 'Production technology of mushroom', 'Grading packing and marketing of marigold', 'Scientific methods of training pruning of fruits plants', 'Scientific method for preservation of yam and garlic', 'Scientific cultivation of zero tillage wheat', 'Formation and management of SHG', 'Scientific cultivation of rabi pulses', 'Protected cultivation of vegetable', 'Protected cultivation of high value vegetable like tomato, capsicum etc.', 'Scientific cultivation of rabi oil seed crops', 'Scientific method for preservation of seasonal mix vegetable', 'Plant protection in potato' and 'Post harvest management of potato'.

Conducted a training programme for 100 farmers and extension personnel on 'Protecting Plant Varieties & Farmers' Right Act' on 18 January 2015 at KVK, Koderma. The training was inaugurated by Dr. Mukud Variar, OIC, CRURRS, and attended by Mr. UK Dubey, Dy. Registrar, PPV & FRA regional office, Ranchi, scientists of CRURRS along with KVK staff. In total 45 samples of various crops

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 *i.e.* rice, maize, finger millet, wheat, black gram, green gram, etc. were collected from farmers.

#### **On-farm Trials (OFTs)**

KVK, Koderma conducted OFTs on Papaya entitled "Evaluation of various papaya cultivars for Koderma district'. Three improved cultivars Pusa Dwarf, Pusa Nanha and Sinta were tested at 45 farmers' field in 6 villages of Koderma district.

Another OFT to enhance the profitability in offseason vegetable production entitled "Evaluation of effect of different dates of transplanting of bitter gourd" was conducted on 15 farmers field covering 6 villages of Koderma district.

#### **Exhibition**

KVK, Koderma participated in kisan melas organized by ATMA Koderma at Jainagar, Merkacho, Satgaonva & Koderma on 6, 10, 13 and 22 February, respectively and Koderma on 19 March 2015. xťa<°f'ťa¦tíMť f±tªtí\* feð°ffxífá°fävífxí, "feð<Ç V'ťf®j Mðký =cni, "fæf +ffni ; ð°f±ffáeð eð±f 45 xf"fvífa°fæffxðif feðB MB\*

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#### **RESEARCH NOTES**

## Five rice varieties and one hybrid were released by State Seeds Sub-Committee on Agricultural Crops

CR Dhan 101 (Ankit): Developed from the cross IR 78875/IR 78877 is suitable for cultivation in upland areas of Odisha. It has maturity duration of 110 days, plant height of 100 cm, medium slender grain and has average grain yield capacity of 3.98 t/ha. This variety has moderate tolerance to leaf blast, neck blast, sheath blight, brown spot, stem borer, leaf folder and green leaf hopper.

SK Pradhan, ON Singh, SR Barik, SK Dash, LK Bose and Padmini Swain CRRI. Cuttack

CR Dhan 203 (Sachala): Developed from the cross IR 78877/ IRRI 132 is suitable for cultivation in Odisha under aerobic situation. It has maturity duration of 110 days, plant height of 110 cm, long slender grain and average grain yield capacity of 4.05 t/ha. This variety has moderate tolerance to leaf blast, sheath rot, brown spot, stem borer and leaf folder.

SK Pradhan, ON Singh, DK Nayak and A Anandan CRRI, Cuttack

CR Dhan 206 (Gopinath): Developed from the cross Brahmananakhi/NDR 9930077 is suitable for cultivation in Odisha under aerobic situation. It has maturity duration of 115 days, plant height of 105 cm, short bold grain and average grain yield capacity of 3.95 t/ha. This variety has moderate tolerance to leaf blast, brown spot, sheath rot, stem borer and leaf folder.

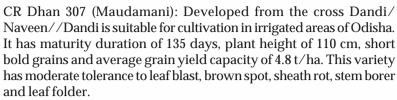
SK Dash, S Singh, SK Pradhan, P Swain, L Behera, MK Kar, SD Mohapatra J Meher, S Lenka HN Subudhi, and ON Singh CRRI, Cuttack











SK Pradhan and Nakula Barik CRRI, Cuttack



CR Dhan 408 (Chakaakhi): Developed from the cross CR 149-5010-228/T1242, is suitable for cultivation in shallow lowland areas of Odisha in *kharif* season. It has maturity duration of 165 days, plant height of 135 cm, long bold grain and has average grain yield capacity of 4.8 t/ha. This variety has moderate tolerance to leaf blast, neck blast, brown spot, bacterial leaf blight, sheath rot, stem borer, leaf folder and WBPH.

SK Pradhan, SSC Pattanaik, L Behera, S Lenka, BB Panda, Nakula Barik and A Ghosh, CRRI, Cuttack



CR Dhan 701: This hybrid developed from CRMS 31 A/CRL-22 R, is suitable for cultivation in irrigated and shallow lowland areas of Odisha in both *kharif* and *rabi* season. It has maturity duration of 142 days, plant height of 120 cm, medium slender grain and has average grain yield capacity of  $6.0\,\mathrm{t/ha}$ . This hybrid has moderate tolerance to brown spot, sheath blight, RTD and GLH.

RN Rao, SSC Pattnaik, GJN Rao, RL Verma, JL Katara, ON Singh and T Mohapatra CRRI, Cuttack

## Comparative transcriptome analysis of rice genotypes differing in tolerance to anaerobic germination using RNA-Seq

Unregulated flooding during germination in rice often leads to reduced seed viability, plant vigor and concomitant economic losses. Natural variation in genotypes of rice exists for tolerance to anaerobic germination. The present investigation was undertaken with an objective of understanding the differential responses of two rice varieties, Naveen (susceptible to anaerobic germination) and AC 41620 (tolerant to anaerobic germination) at the global transcription level post 48 h of anoxic stress during germination. RNA sequencing using the Illumina HiSeq2000 platform revealed a total of 108,575,418 raw reads from four samples which were preprocessed to generate 95,956,532 high quality reads (Q>25) and aligned to *indica* reference genome. As a general observation, differentially regulated genes were more in case of tolerant genotype, AC 41620 (1130 DEGs), compared to susceptible genotype, Naveen (930 DEGs) (Fig 1. A). Comparison of transcriptome profiles revealed that 604 genes were uniquely up-regulated and 164 genes were uniquely downregulated in tolerant genotype, AC 41620, while the corresponding numbers of genes in case of susceptible genotype, Naveen were 520 and 60, respectively (Fig 1. B). Several transcription factors were highly expressed in both genotypes under stress. Five most highly represented classes were AP2-EREBP, bHLH, MYB, WRKY and NAC (Fig 1. C). However, in case of AC41620, a few transcription factor families were also uniquely induced (Fig 1. D). Pathway analysis using MAPMAN revealed that genes involved in light reaction, calvin cycle, starch metabolism and anaerobic respiration were either over-represented or highly expressed in tolerant AC 41620 whereas expansins were found to be highly expressed in Naveen. Singular enrichment analysis of biological processes in AgriGO (http://bioinfo.cau.edu.cn/ agriGO/analysis.php) suggests more elaborative activation of pathways related to stress, photosynthesis and carbohydrate metabolism in tolerant genotype, AC 41620, whereas in susceptible genotype, Naveen, signatures of DNA

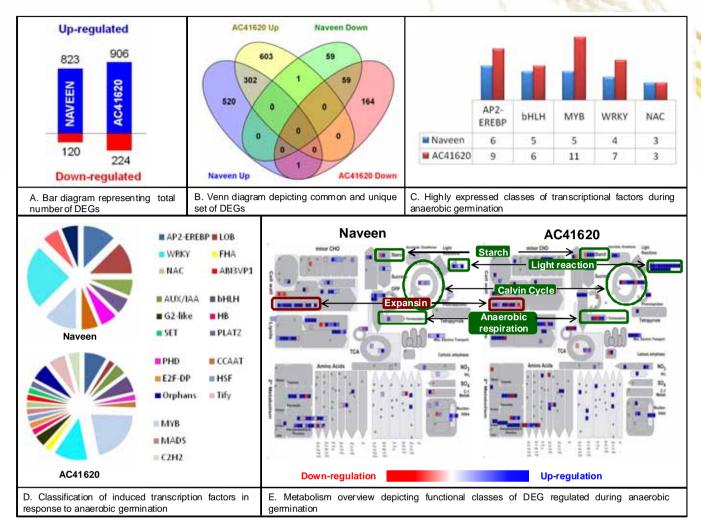


Fig 1. Differential gene expression of rice genotypes Naveen and AC41620 during aerobic germination

metabolism was evident. Pathways related to secondary metabolism seems to be active in both the genotypes (Fig 1. E). The DEGs and transcription factors identified in the present study will serve as a useful genomic resource for extending our understanding of molecular mechanism of anaerobic germination in rice.

J Vijayan, S Senapati, A Ray, S Ray, K Chattopadhyay, RK Sarkar and T Mohapatra CRRI, Cuttack

### Frequency and fertility restoration efficiency of Rf3 and Rf4 genes in rice

Increasing the yield of rice is necessary in order to provide food for expanding world population. The yield potential of hybrid rice is 15-20% more as compared to improved varieties. One of the important requirements for full exploitation of heterotic potentials in rice is the availability of diverse genotypes as parents possessing good combining ability. Identification of new parental lines and the catagorization as restorer or maintainer are important for the development of new hybrids.

In this study, 570 rice varieties released for different ecologies in India were screened for the presence of fertility restorer genes (*Rf3* and *Rf4*) using linked markers. Categorization of varieties based on the allelic constitution at the two marker loci revealed that 13% contained dominant functional alleles of both *Rf3* and *Rf4* (*Rf3Rf3Rf4Rf4*), 6% varieties carried only *Rf3* dominant functional allele (*Rf3Rf3rf4rf4*), 50% had only *Rf4* dominant functional allele (*rf3rf3Rf4Rf4*) and 31% possessed recessive alleles of both the genes (*rf3rf3fr4rf4*). This result showed predominant occurrence of dominant allele of *Rf4* (63%) as compared to that of *Rf3* (19%). Based on the allelic status of the two restorer genes, 570 varieties were divided into four groups viz., Group-I (*rf3rf3rf4rf4*), Group-II (*Rf3Rf3Rf4Rf4*), Group-III (*Rf3Rf3Rf4Rf4*) and Group-IV (*rf3rf3Rf4Rf4*). Ten varieties from each group were randomly choosen and test crossed with two different CMS

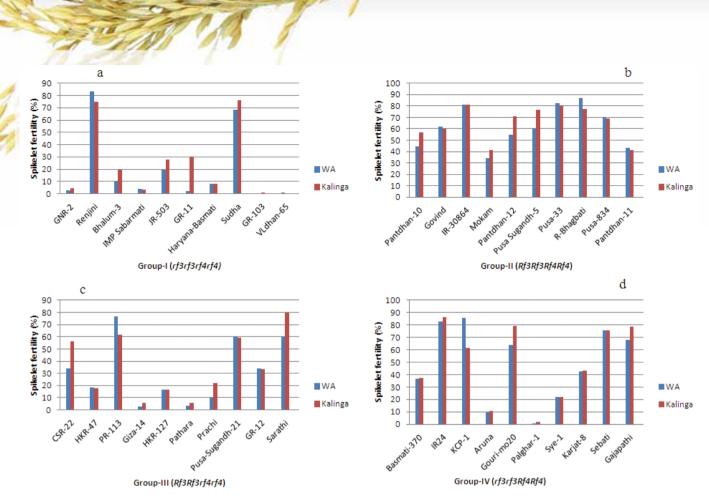


Fig 2 (a-d). Fertility restoration analysis of four groups constituted based on allelic combination at Rf3 and Rf4 loci. a): Group-I (rf3rf3rf4rf4), b): group-II (Rf3Rf3Rf4Rf4), c): group-III (Rf3Rf3rf4rf4) and d): group-IV (rf3rf3Rf4Rf4). Variety names and spikelet fertility percentage are depicted along the horizontal and vertical axis respectively.

lines, *viz.*, CRMS31A (containing WA cytoplasm) and CRMS32A (containing Kalinga cytoplasm). All the resultant F<sub>1</sub>s along with parental lines were evaluated for spikelet fertility. Diverse fertility restoration patterns were observed among the four groups as shown in (Fig 2). Comparison of fertility restoration of WA and Kalinga CMS showed that most of the varieties in all four groups behaved more or less similar. However, some of the varieties differed in their ability to restore fertility of the two CMS lines (Fig 2). The presence of dominant alleles of both the restorer genes was more effective in fertility restoration. The efficacy of *Rf4* is relatively more than *Rf3*. In contrast, two varieties carrying recessive alleles of both of the restorer genes were also able to restore fertility indicating involvement of other fertility restorer gene(s) apart from *Rf3* and *Rf4*. The varieties viz. GNR-2, Improved Sabarmati, GR-103, VL Dhan-65 and Palghar-1 were found to be effective maintainers and IR-30864, Pusa-33, R-Bhagbati, IR24 and Sebati as effective restorers, which could be used for hybrid rice development employing CMS technology.

JL Katara, RL Verma, D Nayak, U Ngangkham, S Ray, L Behera, HN Subudhi, S Samantaray, ON Singh and T Moahapatra CRRI, Cuttack

## Evaluation of introgression lines carrying drought and blast QTLs (qDTY12.1+Pi2)

Ten introgression lines (qDTY12.1+Pi2) in the background of rice variety Vandana along with parent were evaluated in drought stress and non-stress conditions under direct seeding in uplands. The same set was also screened for blast resistance in uniform blast nursery (UBN) under artificial epiphytotic condition. The drought stress trial experienced 20 days of stress period corresponding to flowering to grain filling stage. Four ILs *viz.*, CRR747-16-3-B, CRR747-12-4-B, CRR747-12-3-B and CRR747-16-5-B significantly out yielded the recurrent parent Vandana under stress condition and there was no significant difference under non-stress condition (Table 1). These ILs showed 33.4 to 60.6 % yield advantage over recurrent parent Vandana under stress condition. The introgression lines have same flowering duration as that of recurrent parent Vandana but were slightly taller in stature. In the UBN the introgression lines did not show any

infection and scored as '0' for leaf blast disease (SES), whereas the parent Vanadana was scored '4'. The ILs developed, will have an impact on the yield stability of Vandana in the drought and blast-prone areas of rainfed uplands and will serve as a breeding stock for the further improvement of upland rice in breeding programs.

Table 1: Performance of Vandana drought & blast QTLs (qDTY12.1+Pi2) introgression lines under stress & nonstress conditions

	Days to 50% Flw.		Plant hei	ght (cm)	Grain yield	Leaf blast score (SES)	
Entry	Stress	NS	Stress	NS	Stress	NS	
CRR747-3-6-B	60	64	89.3	99.4	1219	2517	0
CRR747-3-7-B	63	64	84.7	110.9	388	2750	0
CRR747-3-8-B	63	66	88.5	110.4	938	2333	0
CRR747-16-1-B	63	65	93.0	107.4	1200	2750	0
CRR747-16-2-B	62	64	87.5	106.7	919	1750	0
CRR747-16-3-B	63	65	91.3	110.4	1656	2667	0
CRR747-12-1-B	64	66	87.3	102.8	938	1767	0
CRR747-12-3-B	61	65	95.9	108.9	1375	2417	0
CRR747-12-4-B	59	64	93.3	109.2	1469	2650	0
CRR747-16-5-B	63	66	89.8	108.3	1388	2350	0
Vandana	64	65	85.0	97.7	1031	2517	4
5%LSD	1.3	2.6	4.8	6.6	255	610	

NS= Non- stress

NP Mandal and M Variar CRURRS (CRRI), Hazaribag

## Characterization of salt-tolerant diazotrophs from rhizosphere of diverse rice ecology

Soil samples were collected from three diverse rice ecologies i.e. upland (BAU, Ranchi & CRURRS, Hazaribag), lowland (CRRI, Cuttack) and shallow lowland (RRLRRS, Gerua). All together, 78 distinct rhizobacteria were isolated from rhizospheric soils of above regions. Among them, 38 salt-tolerant (15% NaCl) diazotrophic rhizobacteria were screened and tested for other PGP traits. Out of them, three isolates (CA54, GH47 and HR12) showed wide range of functional diversity (carbon-source utilization) and PGP traits. Finally, eleven salt-tolerant polyvalent PGPR were identified though 16S-rDNA sequencing. Out of eleven, two isolates (RM19 and HR62) identified as *Brevibacterium halotolerans*; eight isolates (CA54, GH47, CA66, CA68, GH21, HR40, HR58 and HR61) belonged to different species of genus *Bacillus* and one isolate (RM77) identified as *Pantoea agglomerans*. *In silico* restriction (with *HaeIII*) of 16S sequences of all identi-

Table 2. Frequency and cutting site of HaeIII^in 16S-rDNA sequence of salt-tolerant isolates

Salt-tolerant isolates	Identity	NCBI* accession no.	Frequency of cutting (no.)	Cutting site position (bp)
CA54	Bacillus stratosphericus	KM261757	4	27, 486, 1083, 1105
CA68	Bacillus sp.	KM261761	5	95, 552, 586, 1151, 1173
GH21	Bacillus aerophilus	KM261759	2	94, 551
GH47	Bacillus aerius	-	5	266, 493, 725, 809, 960
HR40	Brevibacterium halotolerans	KM261762	4	442, 476, 1042, 1064
HR58	Bacillus cereus	KM261763	3	442, 1037, 1059
HR61	Bacillus anthresis	KM261764	4	101, 558, 1155, 1177
HR62	Bacillus altitudinis		2	92, 549
RM77	Bacillus stratosphericus	KM261765	8	101, 281, 349, 559, 593, 754, 1071,1275
CA66	Pantoea agglomerans	KM261758	4	97, 554, 1152, 1174
RM19	Brevibacterium halotolerans	-	2	93, 550

<sup>\*</sup> NCBI: National Center for Biotechnology Information, New York, USA

<sup>^</sup> HaeIII: Restriction enzyme of Haemophilus aegyptius

fied isolates showed distinct diversity among them. The PGP-efficacy of salt-tolerant isolates (CA54, GH47 and HR12) was performed in salt-sensitive rice variety (Naveen) for growth promotion at both ambient salt (0 dS/m) and elevated salt (2 dS/m) conditions. All the strains significantly increased the shoot and root length, fresh and dry weight as compare to control (Table 2).

U Kumar and TK Dangar CRRI, Cuttack

## Identification of causal organism of brown spots produced on rice leaves at CRRI, Cuttack

There was incidence of brown spot after cyclone. Samples were collected during last fortnight of October 2013. The associated pathogen was isolated by host tissue transplant method. DNA was extracted, ITS region was amplified and sequencing was done. Pair-wise alignment between a query and database sequences was conducted using NCBI-

BLAST. Phylogeny reconstruction by boot strap test was done in MEGA4 for identifying the organism.

The evolutionary history was inferred using the UPGMA method. The optimal tree with the sum of branch length = 10.14158900 is shown. The percentage of replicate trees in which the associated taxa clustered together in the bootstrap test (500

replicates) are shown next to the branches. The tree is drawn to scale, with branch lengths in the same units as those of the evolutionary distances used to infer the phylogenetic tree. *Cochliobolus miyabeanus* was the pathogen associated with the samples collected during this study.

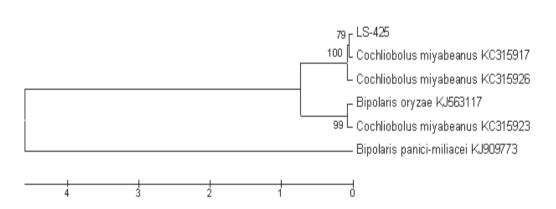


Fig 3. Evolutionary relationship of six taxa

Urmila Dhua and AK Mukherjee CRRI, Cuttack

# Synthesis and characterization of silver nanoparticles

Biosynthesis of silver nanoparticles (Ag-NPs) mediated by plant extracts has been undertaken. 1mM silver nitrate solution was mixed with different ratio of plant extract at different temperature and at different time. The reduction of silver was monitored by using the UV-Vis spectral analysis. The color of the mixture turned light brown in 48 h and became dark brown after 72 h indicative of the formation of Ag-NPs. Strong surface plasmon resonance of Ag-NPs was

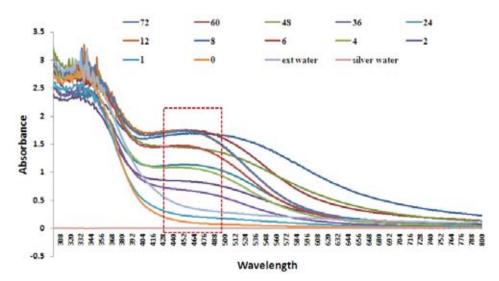


Fig 4. Ultraviolet-visible spectra of synthesized nanoparticles at different time intervals

centered at 420-480 nm (Fig 4). Particle sizes of synthesized Ag-NPs were ranged between 36-107 nm during different time intervals. The zeta potential was found to between -14.16 to -29.45 mV. The negative value of zeta potential shows repulsion among the particles and thus increasing the stability of nanoparticles. IR spectra showed distinct peaks at 3432, 2924, 2853, 1638, 1165 and 1037 cm<sup>-1</sup>. Presence of metabolites in plant extract may be acted as capping agent. This will improve the stability of synthesized nanoparticles. Role of these silver nanoparticles will be further tested for there pesticidal effects.

Totan Adak, AK Mukherjee, Berliner J and Somnath S Pokhare CRRI, Cuttack

#### Persistence of fipronil in soil under rice ecosystem

Fipronil (5-amino-3-cyano-1-(2, 6-dichloro-4-trifluoromethylphenyl)-4-trifluoromethyl sulfinyl pyrazole) is a broad spectrum insecticide for the management of the yellow stem borer and leaf folder in rice. Persistence of fipronil (Regent

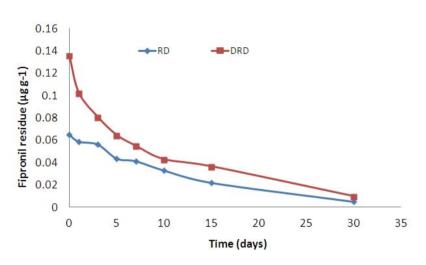


Fig 5. Persistence of fipronil in rice soil

0.3G) at recommended dose (RD) @ 75g a.i./ha and at double the recommended dose (DRD) @ 150 g a.i./ha was studied. For residue analysis, soil samples were collected at 0, 1, 3, 5, 7, 10, 15 and 30 days after application of the insecticide. Initial residue recovered was 0.065 ug/g for the recommended dose and was 0.136 ug/g for double the recommended dose. After 30 days of study, total fipronil residue recorded less than 0.005 ug/g for recommended dose. Overall, total fipronil persisted in rice cultivated soil with 23 days half life for the recommended dose @ 75g a.i./ha. Whereas, half life of fipronil was 19 days at double the recommended dose @ 150 g a.i./ha.

Totan Adak, Berliner J, Somnath S Pokhare and Mayabini Jena CRRI, Cuttack

## Delineation of site specific nutrient management zones for paddy cultivated area around the Bhitarkanika mangrove ecosystem of India

The present study aims at dividing the study area which spreads around the Bhitarkanika sanctuary and includes nearly two hundred fifty five inhabited villages under the administrative jurisdiction of Rajnagar block in Kendrapada district of Odisha, into homogenous management zones based on soil fertility and other physicochemical properties. A grid soil sampling pattern was adopted and soil samples were collected. Soil pH, EC, Available K (AK), Available P (AP), Available N (AN), Soil organic carbon, DTPA extractable Fe, Zn, Cu and Mn were analyzed. First step in delineating MZs was to analyze the descriptive statistics of the above soil variables and distribution of these properties was tested for normality using the skewness and kurtosis significance test. Subsequently, correlation analysis was performed between all the soil properties. Then, semi-variance calculations and semi-variogram model fitting were performed using the ArcGIS 10. The fitted models were then used in an ordinary kriging procedure to estimate different properties

Table 3: Principal component analysis and loading coefficients for the first three principal components

	PC1	PC2	PC3
AP	0.823	0.057	0.026
EC	0.822	0.281	0.013
AK	0.8	0.019	0.029
pН	0.696	0.473	-0.046
Zn	0.549	-0.419	0.525
Mn	0.319	0.016	-0.493
SOC	-0.086	0.788	0.359
Fe	-0.566	0.422	-0.314
Cu	-0.316	0.011	0.624
AN	-0.392	0.224	0.258

EC: Electrical Conductivity; AK: Available Potassium; AP: Available Phosphorous; AN: Available Nitrogen; SOC: Soil Organic Carbon; Fe, Zn, Cu and Mn represent DTPA extractable Iron, Zinc, Copper and Manganese in soil, respectively.

at non-measured points as interpolated values for mapping. The cross-validation analysis was conducted for evaluating kriging interpolation bias and accuracy.

Further, principal component analysis (PCA), which is a dimension reduction technique, was performed. In the present study, PCs with Eigen values >1.0 were selected to develop the management zone classes. Finally, AN, AP, AK, Mn, Zn, Fe and Cu were selected and the fuzzy kmean was used to divide the field into different unique management zones (Table 3). Based on the procedure described, three homogeneous MZs were produced finally (Fig 6).

Rahul Tripathi, Mohammad Shahid, R Raja, Sangita Mohanty, B Lal,
Priyanka Gautam, Anjani Kumar and AK Nayak
CRRI, Cuttack

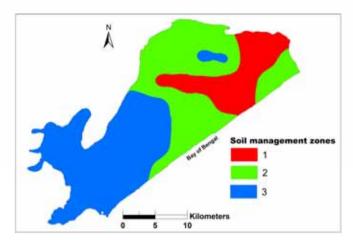


Fig 6. Soil management zones developed on the basis of fuzzy cluster algorithm

#### Optimum time of planting of boro rice in Assam

Field experiments were conducted at the research farm of RRLRRS, Gerua (Assam) during *boro* seasons of 2012-13 and 2013-14 to find out the optimum time of planting of *boro* rice in the north eastern region. Performance of two rice varieties, *viz.*, Chandrama and Naveen were tested under 5 different dates of transplanting ( $5^{th}$ ,  $15^{th}$  and  $25^{th}$  January,  $5^{th}$  and  $15^{th}$  February) during *boro* season. Age of seedlings at the time of transplanting was 45 days. The crop transplanted on the  $5^{th}$  January yielded the lowest (5.02 and 4.53 t/ha during 2012-13 and 2013-14, respectively) which might be due to low temperature during early vegetative stage. Thereafter, gradual rise in temperature might have resulted into higher values of growth and yield attributing characters. Grain yield was the highest - 6.45 t/ha in 2012-13 and 6.26 t/ha in 2013-14 – in the crop transplanted on the  $25^{th}$  January. Thereafter, the varieties had non-significant yield differences up to  $15^{th}$  February. Chandrama recorded significantly higher grain yield (6.77 and 5.60 t/ha) over Naveen (5.08 and 5.10 t/ha) which was due to higher values for yield attributing characters especially more number of filled grains per panicle but Chandrama took 20 to 25 days more than Naveen to mature (Table 4). Thus, the optimum time of transplanting for both varieties was found to be the  $25^{th}$  January or the second fortnight of January. Naveen under all the dates of planting took approximately 150 days to mature and could be harvested by the last week of May. Thus, it can escape flash floods from May-end onwards. Chandrama took around 170-175 days to mature and had the risk of facing flash floods in crop planted on later two dates.

Table 4: Performance of rice varieties under different dates of planting during boro season

Treatment (Date of	Effective tillers per hill (no.)		Panicle length (cm)		Filled grains per panicle (no.)		Straw yield (t/ha)		Grain yield (t/ha)	
planting)	2012-13	2013-14	2012-13	2013-14	2012-13	2013-14	2012-13	2013-14	2012-13	2013-14
5 <sup>th</sup> Jan	11.43	9.92	22.78	23.87	129.37	111.58	5.00	5.32	5.02	4.53
15 <sup>th</sup> Jan	10.97	10.33	23.13	23.94	138.97	122.53	5.80	6.30	5.80	5.28
25 <sup>th</sup> Jan	10.47	11.18	23.61	23.58	144.80	132.62	6.60	6.92	6.45	6.26
5 <sup>th</sup> Feb	10.50	10.73	23.22	25.18	139.95	125.83	6.40	6.35	6.23	5.46
15 <sup>th</sup> Feb	10.83	11.30	23.51	25.81	130.07	127.43	6.60	6.76	6.13	5.22
CD (p=0.05)	NS	0.49	NS	1.30	14.10	8.18	0.72	0.92	0.96	0.78
[Variety]										
Chandrama	10.65	10.80	22.91	24.23	150.89	128.24	6.80	7.10	6.77	5.60
Naveen	11.03	10.60	23.99	24.72	123.57	119.76	5.40	5.60	5.08	5.10
CD (p=0.05)	NS	0.58	0.88	0.47	10.90	8.11	0.52	0.65	0.68	0.32

T Singh, BS Satapathy and KB Pun RRLRRS (CRRI), Gerua

### Participation in Symposia/Seminars/ Conferences/Training/Workshop/Meeting/ Visits

Mr. A Kumar attended Soil and Water Networking National workshop at IIT, Kharagpur from 4 to 7 January 2015, jointly organized by IIT Kharagpur and The University of Sydney.

Dr. Yogesh Kumar delivered a lecture on 'Way to increase cropping intensity in rainfed drought prone rice systems' in the training programme on Crop Management Module for Agro-climatic zones with special reference to rainfed area organized by Soil Conservation Training Centre, DVC, Hazaribag on 7 January 2015.

Dr. T Mohapatra, Director, CRRI attended the Curtain Raising Programme of DRR Golden Jubilee Celebrations at DRR, Hyderabad on 9 January 2015.

Dr. VK Singh participated in VII Annual Convention and National Seminar on Sustainable Rural Livelihood: Technological & Institutional Perspective, presented a research paper entitled 'Farmer-led innovation of Sugarcane Cultivation for rural prosperity in Koderma, Jharkhand' at Division of Agricultural Extension Education, Sher-e-Kashmir University of Agricultural Sciences & Technology of Jammu Main Campus, Chatha Jammu from 8 to 10 January 2015.

Mr. Bhoopendra Singh attended Winter School on "Recent advances in Crop Management under protected Cultivation" at Centre for Protected Cultivation Technology, IARI, New Delhi from 26 Dec 2014 to 15 Jan 2015.

Dr. P Samal attended a meeting regarding preparation of policy report on *kharif* crops for the 2015-16 season at Krishi Bhavan, New Delhi on 16 January 2015.

Mr. Manish Kumar attended in National Conference on "Indigenous Innovation and Foreign Technology Transfer in Fertilizer Industry: Needs, Constraints and Desired Simplification" and poster presented on the topic of 'Effect of potash on potato production and productivity' organized by the Society of Fertilizers and Environment and Raman Centre for Applied and Interdisciplinary Sciences in collaboration with ICAR- CRJAF, Kolkata on 17 January 2015.

Dr. VK Singh participated and presented progress report of KVK, Koderma and highlighted the future plan of work for last quarter at BAU, Ranchi on 23 January 2015. Dr. VK Singh participated in meeting of KVKs of Jharkhand and other ICAR institutes at IINRG, Ranchi on 24 January 2015.

Drs Mukund Variar and Dipankar Maiti attended and delivered lead lectures on Blast of rice and AM-fungi for upland rice respectively in National Symposium on "Advances in Phytopathological Research in Globalized Era with Reference to Eastern Region" at Dept. of Botany, Ranchi University on 29 January 2015.

Dr. Yogesh Kumar delivered a lecture on 'Frontier Technology for profit maximization in rice' in '*Agriculture Varta*' organized by CSR unit, TATA Steel, Jamshedpur, Jharkhand on 29 January 2015.

Dr. Totan Adak Attended National Symposium on "Agrochemicals for Food and Environment Safety" and presented a paper on 'Effect of rice husk biochar and fly ash on fipronil sorption' at IARI, New Delhi from 28 to 30 January 2015.

Dr. Mukund Variar attended the SAC of KVK Nawada (8-9 January) and KVK, Hazaribag (9 February 2015) as ICAR representative.

Drs. KB Pun and T Singh attended Scientific Advisory Committee meeting of Krishi Vigyan Kendra, Assam Agricultural University, Nalbari on 30 January 2015.

Dr. SM Prasad attended and delivered a talk on "Production technology of potato" in a farmers training programme organized by Project Director, Watershed, Cuttack at village Mangarajpur, Tangi-Choudwar on 4 February 2015.

Dr. T Mohapatra, Director, CRRI attended the XII Agricultural Science Congress at NDRI, Karnal from 3 to 6 February 2015. Drs. B Mondal, Lipi Das, T singh and Smt. Sujata Sethy participated and presented a paper during the Agricultural Science Congress-2015 on 'Credit demand by small-scale rice farmer in Odisha: An assessment' and 'Sustainable livelihood security for small holder framers', respectively.

Dr. RK Mohanta attended HRD programme for scientists of Home Science, Animal Science and Fisheries in KVKs of Odisha at OUAT, Bhubaneswar from 6 to 8 February 2015.

Dr. MK Bag attended and presented a paper on "Management of rice sheath blight disease through strobilurins compound: a new generation bio-rational fungicide" in Agriculture and Technology sub-congress of 10<sup>th</sup> All India Peoples' Technology Congress at Rajabazar Science College, Calcutta University, from 6 to 7 February 2015.

Dr. VK Singh attended in SAC meeting of KVK (Holy Cross), Hazaribag on 9 February 2015.

Dr. M Sahid attended International Conference on "Natural Resource Management for Food Security and Rural Livelihoods" at New Delhi from 10 to 13 February 2015 and presented a paper entitled "Transformation of Zn in rice soil and its availability and uptake to rice crop under flooded and aerobic moisture regime".

Drs. Dipankar Maiti and CV Singh attended the Farm School organized by ATMA at Hazaribag as resource persons and delivered lectures to the Extension personnel on 'Rice IPM' (12 February 2015) and 'Rice production technology' (13 February 2015), respectively.

Dr. T Mohapatra, Director, CRRI attended an Interaction and Inspiration Programmeof Odisha Bigyan Academy for +2 Science Lecturers and Students of Odisha and delivered a lecture on "Food Security" at Utkal University, Vanivihar, Bhubaneswar on 12 February 2015.

Dr. T Mohapatra, Director, CRRI attended a workshop in the training institute of Agriculture Department and delivered a lecture on "Women's Role and Responsibility in Managing Natural Resources" at Training Institute, Minor Irrigation & Water Use, Baramunda, Bhubaneswar on 13 February 2015.

Dr. Yogesh Kumar delivered a lecture on 'Cultivation of rice, pulses and oilseeds crops in Jharkhand' in the *Kisan Mela* organized by RK Mission Research Farm, Angada, Ranchi on 13 February 2015.

Dr. T Mohapatra, Director, CRRI attended the  $4^{\rm th}$  International Global Social Science Conference-2015 and

Drs. BN Sadangi, SK Mishra and Lipi Das participated and presented papers in the Global Social Science Conference (GSSC-2015) on the theme "Management of Sustainable Livelihood Systems" at OUAT, Bhubaneswar from 14 to 17 February 2015.

Dr. T Mohapatra, Director, CRRI attended the Agricultural Genomics Symposium and delivered a lecture on "Our Experience in Rice Genomics: Structure to Function" at TNAU, Coimbatore on 16 February 2015.

Dr. Yogesh Kumar delivered a talk on 'Traditional plant varieties in crop improvement' at Krishi Vigyan Kendra (Koderma), Jainagar, Jharkhand on 18 February 2015.

Dr. T Mohapatra, Director, CRRI attended the 5<sup>th</sup> International Conference on Next Generation Genomics and Integrated Breeding for Crop Improvement and delivered a lecture on "Exploring Salinity Tolerance in Rice by Genome wide Approaches" at ICRISAT, Hyderabad from 19 to 20 February 2015.

Dr. SM Prasad attended Regional Agricultural Fair, 2015 from 19 to 21 February 2015 at CPRS, Patna and delivered a talk on "Rice varieties suitable for different ecologies of Eastern India and their production technologies".

Dr. Yogesh Kumar delivered a lecture on 'Improved varieties of rice suitable under DSR and cultivation of *rabi* pulses and oilseed crops under rice fallow area in Jharkhand' in the '*Kisan Mela*' organized by Dept. of Agriculture, Govt. of Jharkhand at block Office, Mandu, Hazaribag, Jharkhand on 20 February 2015.

Dr. T Mohapatra, Director, CRRI attended the 17<sup>th</sup> Indian Agricultural Scientists and Farmers' Congress on "Agri-Innovation for Enhancing Production and Rural Employment" at Bioved Research Institute of Agriculture & Technology, Allahabad from 21 to 22 February 2015.

Dr. T Mohapatra, Director, CRRI attended the 1<sup>7th</sup> Annual Conference of the Society of Statistics, Computer and Applications and delivered a lecture on "Genome wide Analysis using Bioinformatic Tools: Adding Value to Rice Genomic Resources" at Birla Institute of Management Technology, Bhubaneswar on 23 February 2015. Dr. P Samal attended and presented a paper on 'Socioeconomic Aspect of Rice Cultivation in Eastern India'.

Dr. T Mohapatra Director, CRRI attended Institute Management Committee meeting of NRCPB, New Delhi on 23 February 2015.

Dr. KB Pun attended Institute Management Committee meeting of National Centre for Integrated Pest Management, New Delhi on 24 February 2015.

Drs. P Samal attended 17th Annual Conference of Society for Statistics and Computer Applications' at Birla Institute of Management Technology, Bhubaneswar on 23 February 2015 and presented a paper on 'Socioeconomic aspect of rice cultivation in Eastern India'.

Drs. Biswajit Mondal and NN Jambhulkar attended '17th Annual Conference of Society for Statistics and Computer Applications' at Birla Institute of Management Technology, Bhubaneswar from 23 to 25 February 2015. Dr. Mondal presented a paper on 'Measuring the impact of watershed development programmes: scopes and limitations' and Dr. Jambhulkar presented a paper on 'Minimum aberration fractional factorial plans for mixed-level experiments'.

Dr. VK Singh attended in ISEE National Seminar Extension Innovations and Methodologies for Market – Led Agricultural Growth and Development at RVSKVV, Gwalior from 26 to 28 February 2015.

Dr. SM Prasad attended RPSC meeting of AIR, Cuttack on 27 February 2015.

Dr. M Chourasia attended e-pest surveillance training at Salepur block office organized by DAO, Salepur for 50 farmers on 27 February 2015.

Dr. RK Mohanta attended a 3 day training programme organized at Block Office, Tangi-Choudwar for selected farmers/farm women and delivered lectures on "Role of Goat Nutrition in Profitable Goat Farming" on 27 and 28 February 2015.

Dr. Dipankar Maiti attended the workshop organized on 28 February 2015 as a part of National Science Day celebration by the Dept. of Botany, Vinoba Bhave University, Hazaribag and delivered key note address on the focal theme: Developing winning research project proposals.

Dr. Yogesh Kumar participated in project launching workshop on 'Livelihood food security for Churchu block' organized by SUPPORT and CINI at Hotel Canary Inn, Hazaribag, Jharkhand on 3 March 2015.

Dr. T Mohapatra, Director, CRRI attended and delivered a lecture in the First SRM Genetics Congress at Department of Genetic Engineering, SRM University, Kattankulattur, Chennai on 4 March 2015.

Dr SM Prasad attended video conferencing programme at Collectorate, Cuttack on 9 March 2015 on the National Mission of Agricultural Extension and Technology for states of East India (Bihar, Chhatisgarh, Jharkhand, Odisha and West Bengal).

Dr. T Mohapatra, Director, CRRI attended and delivered a lecture at NCIPM, New Delhi on 10 March 2015.

Mr. Bhoopendra Singh attended in BGREI meeting, at ATMA, Koderma, Jharkhand on 11 March 2015.

Dr. SM Prasad attended PUSA Krishi Vigyan Mela 2015 at IARI, New Delhi from 10 to 12 March 2015 along with eleven progressive farmers from different block of Cuttack district.

Drs. PC Rath and S Lenka attended and presented oral research papers on 'Impact of climate change on insect pest of rice in India' and 'Field efficacy of new fungicide molecules against sheath blight disease in rice caused by *Rhizoctonia solani* Kuhn', respectively, in 8<sup>th</sup>National Seminar on climate change impact and sustainable management strategies at Ravenshaw University, Cuttack from 14 to 16 March 2015.

Dr. S Lenka attended the meeting on preparation of Action Plan of BGREI for the year 2015-16 at Directorate of Agriculture and Food Production, Bhubaneswar on 17 March 2015 as a member DLMT for Koraput district of Odisha.

Dr. VK Singh attended two days workshop on 'Attracting and retaining Youth in Agriculture (ARYA) project', at NAARM, Hyderabad from 11 to 12 March 2015.

Dr. VK Singh deliver a talk on 19 March 2015 on 'Leadership development in extension functionaries' in a three days training programme for extension personnel organized by SAMETI, Jharkhand at KVK, Koderma from 18 to 20 March 2015.

Dr. U Kumar delivered a talk on "Beneficial microbes: A sustainable solution for food security "in National seminar at M.S. Swaminathan School of Agriculture (CUTM), Paralakhemundi, Odisha on 28 March 2015.

#### **Publications**

#### **Research/Review Papers**

- Behera BK, Das P, Maharana J, Paria P, Mandal SN, Meena DK, Sharma AP, Jayarajan R, Dixit V, Verma A, Vellarikkal SK, Scaria V, Sivasubbu S, Rao AR and Mohapatra T. 2015. Draft genome sequence of the extremely halophilic bacterium *Halomonassalina* strain CIFRI1, isolated from the East Coast of India. *Genome Announcements*, 3(1): e01321-14.
- 2. Kalra BS, Mondal B and Sarangi A. 2015. Technical efficiency of wheat and paddy farms in irrigated saline environment in Haryana State, India: An assessment. *African Journal of Agricultural Research.* **10**(7): 637-644.
- 3. Kumar V, Singh A, Mithra SVA, Krishnamunrthy SL, Parida SK, Jain S, Tiwari KK, Kumar P, Rao AR, Sharma SK, Khurana JP, Singh NK and Mohapatra T. 2015. Genome-wide association mapping of salinity tolerance in rice (*Oryza sativa*). *DNA Research*, **1**-13. Doi: 10.1093/dnares/dsu046.
- 4. Mondal B and Nalatwadmath SK. 2014. How much is a watershed worth? An assessment. *Indian Journal of Soil Conservation*. **42**(3): 322-327.
- Gangopadhyay PR, Bag KK, Roy MK, Bhardwaj AR and Dutta M. 2015. Evaluation of cucumber germplasm for agronomic traits and disease resistance and estimation of genetic variability. *Indian Journal of Agricultural Sciences.* 85(2): 234-239.
- Prasanna R, Babu S, Bidyarani N, Kumar A, Triveni S, Monga D, Mukherjee AK, Kranthi S, Gokte-narkhedkar N and Adak A. 2015. Prospecting cyanobacteriafortified composts as plant growth promoting and biocontrol agents in cotton. *Experimental Agriculture.* 51(01): 42-65.
- 7. Rath PC. 2014. Field efficacy of granular insecticides against rice gundhi bug and yellow stem borer. *Indian Journal of Plant protection.* **42**(3): 208-210.
- 8. Sadangi, BN, Dash HK, Mishra Sabita. 2014. Involving village level para extension worker (UPEW) to address gender issues in extension. *International Journal of Extension Education*. 10: 45-51.
- 9. Tiwari KK, Singh A, Pattnaik S, Sandhu M, Kaur S, Jain S, Tiwari S, Mehrotra S, Anumalla M, Samal R, Bhardwaj J, Dubey N, Sahu V, Kharshing GA, Zeliang PK, Sreenivasan K, Kumar P, Parida SK, Mithra SVA, Rai V, Tyagi W, Agrawal PK, Rao AR, Pattanayak A, Chandel G, Singh AK, Bisht IS, Bhat KV, Rao GJN, Khurana JP, Singh NK and Mohapatra T. 2015. Identification of a diverse mini-core panel of Indian rice germplasm based on genotyping using microsatellite markers. *Plant Breeding*. DOI: 10.1111/pbr.12252.

#### **Book Chapters**

 Imam J, Mukesh N, Toppo NN, Mandal NP, Kumar Y, Variar M, Bandopadhyay R and Shukla P. 2014. Rice Informatics: A comprehensive overview on application

- of bioinformatics and computational statistics in rice genomics towards an amalgamated approach for improving acquaintance base. *In:* Kavi Kishor PB, Rajib Bandopadhyay and Prashanth Suravajhala (Eds.) *Agriculture Bioinformatics.* Springer, New Delhi, India: 89-107.
- Rath J and Dangar TK. 2014. Osmotolerant microbial resources of saline ecologies of India: Dynamics and potential. *In:* DK Maheswari (Ed) Bacterial diversity in sustainable agriculture: Sustainable development and biodiversity, vol. 1, Springer Int Publ, Switzerland: 265-303.
- Sahoo B, Ranjan A, Mohanta RK and Chandrakar A. 2015. Area specific mineral mixture for optimum livestock health and production. *In*: PK Singh, R Kumar, S Kumar and K Kumar (Eds.) Feed Supplements for Livestock and Poultry. Daya Publishing House, New Delhi: 233-257.

#### **Popular Articles**

- 1. Lenka S, Pradhan SK, Rath PC and Dash SK. 2015. Krushi khetrare rasayanika kitanasaka oushadha prayoga bele sabadhanata. *Krushak Sambad*. February, 2015. 7: 8.
- 2. Mondal B, Sinha MK and Suresh Kumar D. 2014. Microfinance initiatives in India: Current status and way ahead. *Ashwattha*, 8(2&3): 19-23.

#### **Technology Bulletins**

- Dash SK, Pradhan SK, Kar MK, Patnaik SSC, Behera L, Meher J, Anandan A, Marandi BC, Lenka S, Chattopadhyay K, Singh ON and Mohapatra T. 2015. CRRI Rice Varieties for Diverse Ecologies. CRRI Technology Bulletin No. 106, Cuttack, India.
- Singh CV, Mandal NP, Maiti D, Variar M, Kumar Y and Anantha MS. 2015. Production technology for direct seeded rice cultivation in rainfed areas of eastern India. ICAR-Central Rainfed Upland Rice Research Station. CRURRS Technology Bulletin No., Hazaribag, India.

#### **Extension Bulletins**

- 1. Chourasia M, Behera KS, Das KM, Prasad SM, Sahoo TR, Sarangi, DR and Sethy S. 2015. Management of Rice Pest and Diseases. Central Rice Research Institute Extension Bulletin No.4.
- 2. ªŒMEŊĒ ĒŮĒŒŴ SĒŅŪŪĎŮٰǽŅ B"É B°Ē +xĒMĒĒ, BXĒ (ĒŮ "ĒJбĒ, nÒŲŒŪĒVŮ"ĒŪĒD iĒIĒĒ "ŒMĒNŮ ŒŒ®ŪŒŮ 2015\* Ť!ŒŒ¸ĒIĒ ={E®D>Œ iĒIĒĒ "ĒvªĒ'Ē ¦ĒŪĒ "ĒvÆĒKĒ ĒĎ |Ē"ĒŪĒ ĒĒÒ°"ĒĀB ĒÆ=ZĒIĒ =i{ŒNNĒ iĒEOKĒDĒO\* ĒŬKPŪPĒ Ť!ŒŒ¸ĒIĒ ={E®D>Œ ¦ĒŪĒ SŒĒ'DZĒ +xĒŪŒMĒKĒ ĒĎOÙ ½WŒ®DĒMĒ, ZŒ®ŪĒND.
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### **Awards/Recognition**

Dr. T Mohapatra, Director, CRRI received the prestigious NAAS Recognition Award for the Biennium 2013-14 in the 12<sup>th</sup> Agricultural Science Congress at NDRI, Karnal.

Dr. T Mohapatra, Director, CRRI received Lifetime Achievement Award, Indian Genetics Congress 2015 in recognition of outstanding contribution in the field of Plant Genetics at SRM University, Kattankulattur, Tamil Nadu.

Dr. T Mohapatra, Director, CRRI received the Bioved Agri-Innovation Award on the occasion of the 17<sup>th</sup> Indian Agricultural Scientists & Farmers' Congress at Bioved Krishi Prodyogiki Gram, Moharab, Allahabad.

Dr. AK Nayak, Head and Principal Scientist, Crop Production, CRRI has been elected a fellow of the National Academy of Agricultural Sciences (NAAS) - from 1st January 2015.

Dr. Pratap Bhattacharyya, Senior Scientist, Crop Production has been awarded "Dr. K.G. Tejwani Award" for Management of Natural Resources by 'Indian Association of Soil and Water Conservationist' for the Biennium 2012-13.

Dr. RK Mohanta received ANA- Mrs. Saroj Jakhmola Award for Best Ph.D. Thesis in Animal Nutrition for the biennium 2013-14 by Animal Nutrition Association, Izatnagar, Bareilly in the IX Biennial ANA Conference, 2015 organized at College of Veterinary Science, Guwahati, Assam on 22 January 2015.

Dr. VK Singh presented research paper on 'Assessment of Suitable Variety for Direct Seeded Rice (DSR) in Rainfed Condition of Jharkhand', which



Dr. T Mohapatra, Director, CRRI receives Lifetime
Achievement Award



Dr. Pratap Bhattacharyya receives "Dr. KG Tejwani Award"



Dr. RK Mohanta receives the ANA- Mrs. Saroj Jakhmola Award for Best Ph.D. thesis

was adjudged as the best paper and received award in 17th Indian Agricultural Scientists and Farmers' Congress

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on "Agri-Innovation for Enhancing Production and Rural Employment" at Bioved Research Institute of Agriculture & Technology, Allahabad from 21 to 22 February 2015.

Dr. VK Singh, PC, Koderma awarded "Best KVK Scientist Award" 2014 in recognition of outstanding contributions in farm advisory services under Transfer of Technology and Participatory Research by Indian Society of Extension Education, IARI, New Delhi in the ISEE National Seminar at RVSKVV, Gwalior from 26 to 28 February 2015. Dr. VK Singh presented a oral paper entitled, "Weed Control in Direct Seeded Rice in Jharkhand", which received the best paper presentation award.

#### Radio/TV Talk

Dr. Yogesh Kumar delivered a TV talk on "*Jharkhand main dhan ki fasal katne ke bad rabi dalhano ki baigyanik padhati se kheti*" in Krishi Darshan Programme, Doordarshan Ranchi, Jharkhand on 13 January 2015.

Dr. Yogesh Kumar delivered a TV talk on "*Jharkhand main chana avam masur fasal ka utpadan badhane ke tarike tatha lagne wali rogoin va kitoin ka nibaran*" in Krishi Darshan, Doordarshan Ranchi, Jharkhand on 13 January 2015.

Dr. RK Mohanta delivered a talk on "*Adhika Khira Utpadana Pain Dudhiyali Gaiku Santulita Gokhadya* (Balanced feeding for getting more milk from cows)" which was broadcasted by AIR, Cuttack on 9 February 2015.

Smt. S Sethy delivered a talk on "*Phala O Pani Pariba Mulyajukta drabya prastuti* (Value added products from fruits and vegetables)" which was broadcasted by AIR, Cuttack on 11 February 2015.

#### Institute Seminars/Lecturers

Dr. R Raja delivered a lecture on 'Structural genomic characterization of wheat quality loci: Glu B and Ha' on 24 January 2015.

Dr. R Srinivasan, Professor, NRCPB, IARI, New Delhi delivered a special lecture on 'Relevance of transgenic crops' on 9 February 2015.

Dr. J Ali, Sr. Scientist, IRRI, Phillipines delivered a lecture on 'Green super rice' on 25 February 2015.

Dr. SD Mohapatra delivered a lecture on 'Rice Stem borer research: current status and future strategies' on 27 February 2015.

#### **Promotion**

Dr. Ramesh Chandra, Senior Technical Assistant promoted to Assistant Chief Technical Officer w.e.f. 1 January 2009.

Mrs. Jali Das, LDC of RRLRRS, Gerua promoted to UDC w.e.f. 21 February 2015.

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#### Retirement

Shri Akadasi Mallick, T-3 and Shri J Terrom, T-9 retired on 31 January 2015.

Shri Gadadhar Rout, SSS retired on 28 February 2015.

Shri Sarat Kumar Behura, T-5 and Shri SKA Samad, T-5 retired on 31 March 2015.



Shri Mallik with the Director and CRRI staff

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Shri Rout in the midest of the Director and CRRI staff



Shri Behura and Shri Samad along with the Director and CRRI staff

#### **ICAR Inter-Zonal Sports Tournament**

The ICAR-CRRI Sports Contingent participated in the ICAR Inter-Zonal Sports Tournament held at ICAR-NDRI, Karnal from 11 to 14 March 2015. The ICAR-CRRI Kabaddi team maintained its winning streak and retained the championship. In individual events, CRRI won first

and third position in 400 m race (men) and secured second position in 100 and 200 m race (men) and Javelin throw (women). The team also finished third in 800 m race (men) and 4 x 100 m relay race. Dr. R. Raja was the Chief-de-Mission and Shri. R. K. Behera the Manager.



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## Self-Sufficient Sustainable Seed System for Rice (4S4R)

India has nearly 43 million hectare land under paddy cultivation for which it requires roughly 2.0 million tones of quality seed as per varied seed rate required for different varieties. According to Department of Agriculture and Cooperation (DAC), 0.69 million tones of certified seed was available for *Kharif* 2013, which is only about one-third of total seed requirement of the country. While, rest of the requirement is met from farmers' own source. It may be noted that the use of quality seed alone can increase productivity of rice by 15–20%. But the seed replacement rate (SRR) for paddy in India is only 40.42% (2011). In case of Odisha the scenario is even worse; it is only 21.65% as per Seednet Report 2011. Ideally, the SRR should be 100% to exploit the benefits of quality seed.

The formal system of seed production in India involves breeder seed production by ICAR Institutes, SAUs, sponsored breeders and selected NGOs. The foundation and certified seeds are produced by NSC, SFCI, State Seeds Corporation, State Departments of Agriculture and private seed producers, who have the necessary infrastructure facilities. Production of certified seed by NSC and State Seed Corporations is mainly organized through contract growing arrangements with progressive farmers. The seeds produced by the farmers are certified by State Seed Certification Agency. Distribution of certified seeds produced by progressive farmers and procured by NSC, SFCI and other agencies is undertaken through a number of channels i.e. departmental outlets at block and village level, cooperatives, outlets of seed corporations, private dealers etc.

There are certain limitations of the formal seed sector as outlined by Reddy et al., (2007). i) It is based on indents for a limited number, and mostly older varieties and thus is not able to meet the diverse needs of farmers. ii) Not all farmers have access to formal seed sector. iii) The quantity and quality of seed delivered may not be appropriate. iv) The seed production costs and prices are high, v) The timeliness of supply is a major concern. vi) Some policies and regulations, poor organizational linkages and inadequate infrastructure contribute to the problems of the formal system. vii) The formal system cannot quarantee small-farmer seed security at the community and household levels, which is evident from the fact that, more than majority of the food crops in India are sown from seed stocks saved by farmers. viii) The denomination of the seed supplied is not known; it is likely that the seed supplied is a mix of different varieties and not pure types. ix) The logistics are expensive and difficult to organize the seed supply by the government agencies due to high costs and other overheads.

In contrast to formal seed sector, local seed system, if strengthened, can offer solutions to overcome the constraints of formal seed supply system. Local seed system can produce seeds according to local farmers' needs and in right quantity. The cost of production and supply can also be reduced significantly.

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Proper planning for 4S4R in all the rice growing blocks in the country will use remote sensing and weather and agro-ecological information in order to determine the quantum of seed needs and also to delineate areas suitable for seed production. Seed knowledge management portal will serve as the site for all related information about new varieties of rice, areas of suitability, seed needs, seed production and availability status, prices, management information for better seed and crop production etc. This is to be made operational at Block/Panchayat level so that all the stake holders have access to the relevant information.

Success of 4S4R will depend upon creation of basic seed processing and storage infrastructure at Block/Panchayat level through government funding or through Public-Private-NGO-FPO partnership. It can also be created as a part of corporate social responsibility. Another option could be providing adequate credit support along with government subsidy so that farmers/entrepreneurs/FPOs can create such infrastructure.

4S4R has to be truly "by the farmers" and "for the farmers". Farmers, to be successful, will need whole hearted support with regard to credit, foundation seeds of required quality and quantity, and training to produce, process, store and market such seeds. State government organizations, state agricultural universities, rice research institutes such as CRRI etc. are to come forward to provide the foundation seeds, guide/train farmers in crop management and other relevant aspects so that high quality seed is produced. However, involvement of government/other agencies has to be minimized, so that outside interference if any, is eliminated.

It is hoped that there will be further debate/discussion on 4S4R mechanism so that appropriate measures are taken to establish such a system for rice in the country. Once we demonstrate its success in a few Blocks/Panchayats to start with, 4S4R can be replicated in other areas with appropriate planning to harvest its full advantage.

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