एनआरआरआई सूचना-पत्र
NRRI Newsletter

हर कदम, हर डगर
किसानों का हमसफर
भारतीय कृषि अनुसंधान परिषद
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विषयसूची/CONTENTS

MAIN CAMPUS

Events

68th Republic Day

On the occasion of 68th Republic Day, Dr. Himanshu Pathak, Director, ICAR-NRRI, Cuttack hoisted the National Flag and recalled the heroic deeds of all freedom fighters and urged that we must not allow those actions to fade away from our memories and work hard to redeem our pledge stated as fundamental duties in our constitution. He said we live in historical city of Cuttack – the birth place of great leader of Indian freedom movement Netaji

मुख्य संस्थान परिसर

आयोजन

68वाँ गणतंत्र दिवस

भाकृअनुप-एनआरआरआई, कटक के डॉ.हिमांशु पाठक, निदेशक ने 26 जनवरी 2017 को संस्थान में आयोजित 68वें गणतंत्र दिवस समारोह के अवसर पर राष्ट्रीय ध्वज फहराया तथा सभी स्वतंत्रता संग्राम सेनानियों को याद करते हुए संस्थान के सभी सदस्यों का आह्वान करते हुए कहा कि हमें उन वीरों की महान गाथा को अपने हृदय में सँजोए रखना चाहिए और हमारे संविधान में मूलकर्त्तव्यों के रूप में वर्णित अपने राष्ट्र के प्रति दायित्वों के निर्वहन के लिए सतत प्रयत्न करना चाहिए। उन्होंने कहा कि हम ऐतिहासिक कटक नगर में रहते हैं जो भारत के

Subhash Chandra Bose, hence greater responsibility rests on us to serve the country. He also stated that we vow to the slogan Jai jawan, Jai Kisan, Jay Vigyan. We are working for the Kisan – the soldiers of Indian soil who feed the nation. The Republic Day was marked by patriotic songs in Hindi and Odia, sung by school children.

स्वतंत्रता संग्राम के अमर नायक नेजाती सुभाष चंद्र बोस की जन्मस्थली है, अतः देशसेवा का दायित्व हमारे ऊपर अधिक है। उन्होंने यह भी कहा कि हम जय जवान, जय किसान, जय विज्ञान के नारे की शपथ लेते हैं। हम किसान के लिए काम करते हैं जो भारत भूमि के सैनिक हैं और जो पूरे देश का भरण-पोषण करते हैं। गणतंत्र दिवस समारोह के अवसर पर स्कूल के बच्चों ने हिंदी एवं ओड़िआ में देशभक्ति के गीत गाये।

25th Dr. Gopinath Sahu Memorial Lecture

The Lecture was jointly organized by Association of Rice Research Workers (ARRW), Dr. Gopinath Sahu Memorial Trust and National Rice Research Institute, Cuttack on 17 January 2017. Dr. V Rabindrababu, Director, IIRR, Hyderabad delivered the memorial lecture on "Present Scenario and Future Prospects of Rice in India". Dr. Himanshu Pathak, Director, NRRI, Cuttack presided over the function.

Dr. V Rabindrababu, Director, IIRR, Hyderabad delivering the memorial lecture

25वां डॉ.गोपीनाथ साहु स्मारक व्याख्यान

चावल अनुसंधान कार्यकता संघ, डॉ.गोपीनाथ साहु स्मारक न्यास एवं राष्ट्रीय चावल अनुसंधान संस्थान, कटक के संयुक्त सहयोग से 17 जनवरी 2017 को 25वां डॉ.गोपीनाथ साहु स्मारक व्याख्यान कार्यक्रम आयोजित किया गया। डॉ.वी.रबींद्रबाबू, निदेशक, भारतीय चावल अनुसंधान संस्थान, हैदराबाद ने 'भारत में चावल का वर्तमान परिदृश्य एवं भविष्य में संभावनाएँ' शीर्षक पर स्मारक व्याख्यान दिया। डॉ.हिमांशु पाठक, निदेशक, भाकृअनुप-एनआरआरआई, कटक ने इस कार्यक्रम की अध्यक्षता की।

National Productivity Week

The ICAR-National Rice Research Institute, Cuttack celebrated National Productivity Week–2017 from 12 to 18 February 2017. In the inaugural function of the National Productivity Week Celebration, Er. Kishor Bhusal, Assistant Director, National Productivity Council, Regional Centre, Bhubaneswar delivered a special lecture on the theme of the year "From Waste to Profit through Reduce, Recycle, Reuse". Speaking on the occasion, Er. Bhusal emphasized on the use of treated sewage water for irrigation purpose in agricultural crops. The inaugural function was presided over by Dr. AK Nayak Director (I/c) and enlightened the audience about the tremendous potential of rice straw recycling. Dr. SD Mohapatra, Chairman, National Productivity Week Celebration–2017 Committee(NPWCC) welcomed the guest and all the dignitaries and briefed about the week-long events of the National Productivity Week – 2017.

Dr. Himanshu Pathak, Director, NRRI delivering a talk in valedictory session

राष्ट्रीय उत्पादकता सप्ताह

भाकृअनुप-राष्ट्रीय चावल अनुसंधान संस्थान, कटक में 12 से 18 फरवरी 2017 के दौरान राष्ट्रीय उत्पादकता सप्ताह मनाया गया। राष्ट्रीय उत्पादकता सप्ताह समारोह के उद्घाटन के अवसर पर राष्ट्रीय उत्पादकता परिषद के क्षेत्रीय केंद्र, भुवनेश्वर के सहायक निदेशक इंजीनियर किशोर भुसाल ने 'कम प्रयोग, पुनर्चक्रण एवं पुनर्प्रयोग के द्वारा लाभ' पर आधारित वार्षिक शीर्षक पर एक विशेष व्याख्यान दिया। अपने संबोधन में इंजीनियर भुसाल ने कृषि फसलों में सिंचाई के लिए उपचारित सीवेज पानी के प्रयोग पर बल दिया। डॉ.ए.के.नायक, प्रभारी निदेशक ने उद्घाटन समारोह की अध्यक्षता की तथा धान पुआल के पुनर्चक्रण की प्रबल क्षमता के बारे में सभा को बताया। राष्ट्रीय उत्पादकता सप्ताह-2017 समिति के अध्यक्ष, डॉ.एस.डी.महापात्र ने अतिथियों एवं सभी गणमान्य व्यक्तियों का स्वागत किया तथा राष्ट्रीय उत्पादकता सप्ताह-2017 की सप्ताह भर की घटनाओं के बारे में जानकारी प्रदान की।

क्लारिवेट एनालिटिक्स के क्षेत्रीय प्रबंधक श्री आलोक झा ने 14 फरवरी 2017 को 'उद्धरण के माध्यम से

On 14th February 2017, a special lecture was delivered by Shri Alok Jha, Regional Manager, Clarivate Analytics on the topic entitled "Research Assessment and Research quality through citation". On the next day, Dr. Adam H Price, Professor, Plant Molecular Genetics, Institute of Biological and Environmental Sciences, University of Aberdeen, UK delivered a lecture on "Accurate Genetic Mapping in rice at last".

A field awareness programme on the vermicomposting of rice straw was organised in the NRRI premises. A series of events, *viz*., Debate, Slogan and Quiz competition were organized for the student and staff of the institute.

Valedictory function of the National Productivity Week Celebration-2017 was graced by Dr. Himanshu Pathak, Director, NRRI. He delivered a special talk on 'Projects for People: A Logical Framework' on the occasion. Dr. Rahul Tripathi, member of the committee briefed about the series of events organized as a part of the celebration. Prizes for the winners of different competitions were distributed. The programme was ended with the remarks of Director and a formal vote of thanks by Dr. KA Molla.

ICAR sports tournament for Eastern Zone

The ICAR sports tournament for Eastern Zone (TEZ 2016) was successfully organized by the ICAR- National Rice Research Institute, Cuttack from 6 to 9 March 2017 at its premises. A total of 375 participants from thirteen ICAR institutes of Eastern Zone participated in the march-past. The ICAR Sports Tournament for Eastern Zone (TEZ 2016) was declared open by Dr. Himanshu Pathak, Chief Guest and Director, ICAR-NRRI, Cuttack on 6 March 2017 at the sports complex of the institute. The Director emphasized that when competitions are held, it given birth to team spirit. Hence, let an ambience of team spirit pervade over all ICAR Institutes. The closing ceremony of TEZ 2016 was graced by Shri Chhabiliendra Roul, IAS, Additional Secretary, DARE and Secretary, ICAR as Chief Guest. Shri Roul hailed the efforts of the institute for organizing the event successfully and appreciated the sportsman spirit shown by all the participants during the tournament. He also declared that the council is planning to reorganize Sports event as Sports and Cultural event in

अनुसंधान मूल्यांकन तथा अनुसंधान गुणवत्ता' विषय पर एक विशेष व्याख्यान दिया। दूसरे दिन, डा. एडम.एच.प्राइस, प्रोफेसर, प्लांट मोलिक्यूलर जेनेटिक्स, जैवविक एवं पर्यावरण विज्ञान संस्थान, यूनिवर्सिटी ऑफ अबेरडीन, इंग्लैंड ने 'आखिर में चावल का सटीक आनुवंशिक चित्रण' विषय पर एक व्याख्यान दिया।

एनआरआरआई के परिसर में धान पुआल के वर्मीकंपोस्टिंग पर एक प्रक्षेत्र जागरूकता कार्यक्रम आयोजित किया गया। घटनाओं के श्रृंखला में, संस्थान के विद्यार्थिओं एवं कर्मचारियों के लिए वाद-विवाद, स्लोगन एवं प्रश्नोत्तरी प्रतियोगिताएँ आयोजित की गईं।

डॉ.हिमांशु पाठक, निदेशक, एनआरआरआई, कटक राष्ट्रीय उत्पादकता सप्ताह के समापन समारोह के मुख्य अतिथि थे। उन्होंने इस अवसर पर 'आम जनता के लिए परियोजनाएँः एक तार्किक संरचना' विषय पर एक विशेष व्याख्यान दिया। डॉ.राहुल त्रिपाठी, इस समिति के सदस्य ने समारोह के भाग के रूप में आयोजित की गई घटनाओं के बारे में जानकारी प्रदान की। विभिन्न प्रतियोगिताओं के विजेताओं को पुरस्कृत किया गया। निदेशक महोदय के संबोधन के बाद कार्यक्रम समाप्त हुआ। डॉ कुतुबुद्दीन मोला ने धन्यवाद ज्ञापन किया।

भाकृअनुप-पूर्वी क्षेत्र खेलकूद प्रतियोगिता

राष्ट्रीय चावल अनुसंधान संस्थान, कटक ने 6 से 9 मार्च 2017 के दौरान अपने परिसर में भाकृअनुप पूर्वी क्षेत्र खेलकूद प्रतियोगिता का सफलतापूर्वक आयोजन किया। पूर्वी क्षेत्र में स्थित परिषद के तेरह विभिन्न संस्थानों के कुल 375 प्रतिभागियों ने इस खेलकूद प्रतियोगिता में भाग लिया। डॉ.हिमांशु पाठक, निदेशक, एनआरआरआई, कटक जो आयोजन समारोह के मुख्य अतिथि थे, ने 6 मार्च 2017 को संस्थान के खेल परिसर में आयोजित इस खेलकूद प्रतियोगिता के शुभारंभ की घोषणा की। निदेशक ने जोर दिया कि जब प्रतियोगिताएँ आयोजित की जाती हैं तो यह टीम भावना को जन्म देती हैं। इसलिए सभी भाकृअनुप संस्थानों में टीम भावना का माहौल होना चाहिए। कृषि अनुसंधान एवं शिक्षा विभाग के अपर सचिव एवं भारतीय कृषि अनुसंधान परिषद के सचिव श्री छबिलेन्द्र राऊल, भारतीय प्रशासनिक सेवा इस प्रतियोगिता के समापन समारोह के मुख्य अतिथि थे। श्री छबिलेन्द्र राऊल ने संस्थान द्वारा प्रतियोगिता को सफलतापूर्वक आयोजित हेतु सराहना की तथा प्रतियोगिता के दौरान सभी प्रतिभागियों द्वारा प्रदर्शित खेल भावना की भी प्रशंसा की। उन्होंने यह घोषणा की कि परिषद इस खेलकूद प्रतियोगिता को खेलकूद एवं सांस्कृतिक प्रतियोगिता में रूपांतरित करने की योजना बना रही है

which participants of cultural activities will also be competing with each other. Dr. Himanshu Pathak, Director, NRRI thanked the Chief Guest, the participants and all the staff of NRRI who contributed towards the successful organization of the tournament. Dr.(Mrs) Jatinder Kishtwaria, Director, ICAR-CIWA, Bhubaneswar and Dr. JK Sundaray, Director (Acting), ICAR-CIFA, Bhubaneswar also graced the occasion. The ICAR-NRRI was adjudged the overall champion of the tournament, while the ICAR-IVRI, Izatnagar bagged the runner-up trophy. Shri PK Parida of ICAR-NRRI was adjudged as the Best Athlete (Men) while Ms. Sibna Mols, ICAR-CIFRI was adjudged as the Best Athlete (Women).

Training Programme

Comprehensive Agribusiness Incubation Programme (CAIP) was organised by NRRI-Agribusiness Incubation Centre (ABI), Cuttack from 30 January to 4 March 2017 for 23 participants of Odisha.

A one week training programme on "Quality Paddy Seed Production" was organised by NRRI-Agribusiness Incubation Centre, Cuttack from 28 to 31 March 2017 for 12 participants of Gwalior, Madhya Pradesh. Dr. GAK Kumar, PI, ABI coordinated both the programmes.

Visitors

During the period under report, a total of 2369 visitors including 1430 farmers, 351 farmwomen, 489 students and 99 Agriculture Officers from different states of India *viz.*, Odisha, West Bengal, Jharkhand, Maharashtra and Tripura were given agro advisory services.

NRRI REGIONAL STATION, HAZARIBAGH

CRURRS, Hazaribag organized a one day workshop on "Rice Seed Production for Jharkhand" on 6 January 2017. Dr. JS Chauhan, the then ADG (Seeds) graced the occasion as Chief Guest. Participants of the workshop included representatives of major Seed production agencies of Jharkhand. The proceedings and recommendations are being finalized for communicating

जिसमें सांस्कृतिक कार्यकलापों में भी आपस में प्रतिस्पर्द्धा होगी। डॉ.हिमांशु पाठक, निदेशक, एनआरआरआई ने मुख्य अतिथि, सभी प्रतिभागियों तथा संस्थान के सभी कर्मचारियों को धन्यवाद दिया जिन्होंने इस खेलकूद प्रतियोगिता को सफलतापूर्वक आयोजित करने में योगदान किया। इस समापन समारोह के अवसर पर भुवनेश्वर स्थित भाकृअनुप-सीआईउब्ल्यूए के निदेशक डॉ.(श्रीमती) जतींद्र किष्टवरिया तथा भाकृअनुप-सीआएफए के कार्यकारी निदेशक डॉ.जे.के.सुंदरराय भी उपस्थित थे। भाकृअनुप-एनआरआरआई को इस प्रतियोगिता में समग्र रूप से चैंपियन का खिताब मिला जबकि भाकृअनुप-आईवीआरआई, इज्जतनगर को रनर्स-अप की ट्राफी मिली। भाकृअनुप-एनआरआरआई के श्री पी.के.परिड़ा को पुरुष वर्ग में खेल का सर्वश्रेष्ठ खिलाड़ी तथा महिला वर्ग में भाकृअनुप-सीआईएफआरआई के शीबना मोल की सर्वश्रेष्ठ खिलाड़ी घोषित किया गया।

प्रशिक्षण कार्यक्रम

एनआरआरआई, कटक में 30 जनवरी से 4 मार्च 2017 के दौरान एनआरआरआई-एबीआई द्वारा 'व्यापक कृषि व्यवसाय इनक्यूबेशन कार्यक्रम' विषय पर एक प्रशिक्षण कार्यक्रम आयोजित किया गया जिसमें ओडिशा के 23 प्रतिभागियों ने भाग लिया।

एनआरआरआई, कटक में 28 से 31 मार्च 2017 के दौरान एनआरआरआई-एबीआई द्वारा 'गुणवत्ता धान बीज उत्पादन' विषय पर एक पांच दिवसीय प्रशिक्षण कार्यक्रम आयोजित किया गया जिसमें मध्य प्रदेश के ग्वालियर से 12 प्रतिभागियों ने भाग लिया। डॉ.जी.ए.के.कुमार, प्रधान अन्वेषक, एबीआई ने दोनों प्रशिक्षण कार्यक्रमों का समन्वयन किया।

आगंतुक

इस अवधि के दौरान, भारत के विभिन्न राज्यों जैसे ओडिशा, पश्चिम बंगाल, झारखंड, महाराष्ट्र एवं त्रिपुरा से 1430 किसानों, 351 महिला किसानों, 489 विद्यार्थियों तथा 99 कृषि अधिकारियों सहित कुल 1430 आगुंतकों ने एनआरआरआई का दौरा किया एवं उन्हें परामर्श सेवा दी गईं।

एनआरआरआई क्षेत्रीय केंद्र, हजारीबाग

सीआरयूआरआरएस, हजारीबाग द्वारा 6 जनवरी 2017 को 'झारखंड के लिए धान बीज उत्पादन' पर एकदिवसीय प्रशिक्षण कार्यक्रम का आयोजन किया गया। डॉ. जे.एस.चौहान, सहायक उप महानिदेशक (बीज) इस अवसर पर मुख्य अतिथि थे। झारखंड के प्रमुख बीज उत्पादन अभिकरणों के प्रतिनिधियों ने इस कार्यशाला में भाग लिया। राज्य सरकार के नीति निर्माताओं को इस कार्यशाला के कार्यवृत्त एवं संस्तुतियां की जानकारी प्रदान

to state policy (seed production) makers. A technical bulletin titled *"Upland Rice Technologies: A Brief Overview"* was released by the Chief Guest.

A one day workshop cum training programme on "Validation and promotion of IPM in rice in Tribal region of Jharkhand" was organized in two villages namely, Darua (Java Tari) and Bhadaulia (Bajha) on 27 March 2017. About 60 farmers participated in the programme. Dr. Someshwar Bhagat, Dr. Somnath Roy and Mr. Sawan Oraon organized the workshop.

करने की दिशा में कार्रवाई को अंतिम रूप दिया जा रहा है। इस मौके पर मुख्य अतिथि ने 'ऊपरीभूमि धान प्रौद्योगिकियां : एक संक्षिप्त विहंगावलोकन' शीर्षक तकनीकी बुलेटिन का विमोचन किया।

दारुआ (जावा तारी) एवं भदालुआ (भज) नामक दो गांवों में 27 मार्च 2017 को 'झारखंड के अनुसूचित जनजाति क्षेत्र में चावल फसल में समेकित नाशकजीव प्रबंधन का मान्यकरण एवं प्रचार' विषय पर एकदिवसीय कार्यशाला एवं प्रशिक्षण कार्यक्रम आयोजित किया गया। इस कार्यक्रम में लगभग 60 किसानों ने भाग लिया। डॉ.सोमेश्वर भगत, डॉ.सोमनाथ राय तथा श्री सावन ओरांव ने इस कार्यशाला का आयोजिन किया था।

NRRI REGIONAL STATION, GERUA

Scientists of RRLRRS, Gerua participated in the Scientific Advisory Committee meeting of Krishi Vigyan Kendra (KVK) of six districts, *viz*., Bongaigaon, Baksa, Barpeta, Darrang, Udalguri and Nalbari. Neck blast is a major problem in *boro* rice cultivation. As leaf blast incidence has already been noticed in certain pockets in Bongaigaon district, KVKs were advised to remain alert against incidence of neck blast disease in *boro* rice. It was also suggested to include CR Dhan 909 in their cropping system in OFTs and FLDs.

RRLRRS, Gerua in collaboration with District Agriculture Officer, Ampati, South West Garo Hills, Meghalaya organized two days' farmers training programme on 'Integrated rice-fish farming system' during January 19 & 20, 2016 for five progressive farmers from Meghalaya.

One day exposure visit of eighteen progressive farmers of Nabarun Agricultural Producers and Marketing Cooperative Society Limited was organized at RRLRRS, Gerua on 28 March 2017 in order to update the farmers with improved production technologies.

एनआरआरआई क्षेत्रीय केंद्र, गेरुआ

आरआरएलआरआरएस, गेरुआ के वैज्ञानिकों ने बोंगाइगांव, बक्सा, बारपेटा, दरांग, उदलगिरि एवं निलगिरि समेत छह जिलों के कृषि विज्ञान केंद्रों की वैज्ञानिक सलाहकार समिति की बैठक में भाग लिया। इस क्षेत्र में बोरों चावल की फसल में गला प्रध्वंस एक प्रमुख समस्या है। चूंकि बोंगाइगांव जिले के कुछ इलाकों में पत्ता प्रध्वंस का प्रकोप देखा जा चुका था, बोरो चावल में पत्ता प्रध्वंस के प्रकोप के विरुद्ध सतर्क रहने के लिए कृषि विज्ञान केंद्रों को सलाह दिया गया। उन्हें ऑफ फार्म परीक्षण तथा अग्रिम पंक्ति प्रदर्शनों में सीआर धान 909 की खेती करने के लिए सुझाव दिया गया।

मेघालय के पश्चिम गारो हिल्स के अमपटी जिले के जिला कृषि अधिकारी के सहयोग से आरआरएलआरआरएस, गेरुआ ने 'समेकित धान-मछली खेती प्रणाली' पर 19 एवं 20 जनवरी 2017 के दौरान एक दो दिवसीय किसान प्रशिक्षण कार्यक्रम आयोजित किया जिसमें मेघालय के पांच प्रगतिशील किसानों ने भाग लिया।

आरआरएलआरआरएस, गेरुआ में 28 मार्च 2017 को उन्नत उत्पादन प्रौद्योगिकी से अवगत कराने हेतु नवरूण कृषि उत्पादक एंव मार्केटिंग सहकारिता संघ लिमिटेड के अठारह प्रगतिशील किसानों के लिए एक दिवसीय भ्रमण कार्यक्रम आयोजित किया गया।

KRISHI VIGYAN KENDRA

Santhapur, Cuttack

Training

A total number of seven training programmes were conducted on the topics 'Scientific cultivation methods on Urd and Mung', 'Vermicompost production through

कृषि विज्ञान केंद्र

संथपुर, कटक

प्रशिक्षण

तेंतुलीगरडी (तिगिरिया), जोडुमु एवं नुआगांव (बडम्बा), अभयपुर (टांगी-चौद्वार), सुंदरदा (नियाली) तथा मंगराजनुर (बडम्बा) के 175 किसानों, महिला किसानों एवं ग्रामीण युवकों को शामिल करते हुए 'वैज्ञानिक पद्धति

women SHGs', 'Use of small tools and implements for farmwomen', 'Pest and diseases management in Groundnut' and 'Dairy farming and management for higher income generation' involving 175 number of farmers/farmwomen and rural youths of Tentuliragadi (Tigiria), Jodumu and Nuagaon (Badamba), Abhaypur (Tangi-Choudwar), Sundarda (Niali) and Mangarajpur (Baramba) villages.

Field Day

KVK-Cuttack, Santhapur organized a field day on groundnut on 22 February 2017 under cluster demonstration-oilseed at Jodumu village of Baramba block. Under this programme groundnut variety Devi was demonstrated in farmers' field with recommended package of practices. The demonstration covered 104 farmers and 16 ha area. A total of 75 participants including the AAO, Baramba and farmers of nearby villages were also present on this occasion. Farmers associated with this programme shared their views on the impact of recommended technology on crop performance. The other participants also presented their opinion and feedback on the variety introduced along with enquiry about the package of practices to be followed to get the best produce.

Field day on cluster demonstration of groundnut variety Devi

Scientific Advisory Committee meeting

The 18th Scientific Advisory Committee meeting of KVK Cuttack, Santhapur was held on 15 March 2017 at its campus under the chairmanship of Dr. Himanshu Pathak, Director, ICAR-NRRI, Cuttack. The meeting was attended by the members, invited guests and SMSs of KVK Cuttack.

Smt. Sujata Sethy, SMS (Home Science) & OIC, KVK Cuttack welcomed the chairman and the members and presented the action taken report (ATR) of last SAC meeting along with a brief presentation of report

SAC meeting of KVK, Cuttack in progress

से मूंग एवं उड़द की खेती', 'महिला स्वयं सहायता दलों के माध्यम से वर्मीकंपोस्ट उत्पादन', 'ग्रामीण महिलाओं के लिए छोटे औजारों एवं उपकरणों का प्रयोग', 'मूंगफली में नाशककीटों एवं रोगों का प्रबंधन' तथा अधिक आय के लिए डेयरी पालन एवं उसका प्रबंधन' पर सात प्रशिक्षण कार्यक्रमों का आयोजन किया गया।

प्रक्षेत्र दिवस

कृषि विज्ञान केंद्र, संथपुर ने 22 फरवरी 2017 को बडम्बा प्रखंड के जोडुमु गांव में तेलबीज क्लस्टर प्रदर्शन के अंतर्गत मूंगफली पर एक क्षेत्र दिवस आयोजित किया। इस कार्यक्रम में किसानों के खेतों में संस्तुत खेती पद्धतियों सहित 'देवी' किस्म की मूंगफली की प्रदर्शन खेती की गई। यह प्रदर्शन 104 किसानों के 16 हेक्टयर के क्षेत्र में किया गया। इस अवसर पर आस-पास के गांवों के कुल 75 किसान तथा बडम्बा के सहायक कृषि अधिकारी उपस्थित थे। इस कार्यक्रम से जुड़े हुए किसानों ने संस्तुत प्रौद्योगिकी को अपनाने पर फसल की निष्पादन के प्रभाव पर अपनी प्रतिक्रियाएँ प्रस्तुत कीं। अन्य किसानों ने भी खेती की गई किस्म पर तथा अच्छी उपज प्राप्त करने हेतु अपनाए जाने वाले संस्तुत खेती पद्धतियों के बारे में अपनी-अपनी राय व्यक्त की और प्रतीक्रियाएं दिया। कृषि विज्ञान केंद्र, संथपुर के प्रभारी अधिकारी तथा विषयवस्तु विशेषज्ञों ने कटक जिले के सभी चौदह प्रखंडों में ज्ञानदाता व्यक्तियों के रूप में इन प्रशिक्षण कार्यक्रमों में वर्णन किया। ओडिशा सरकार के कृषि विभाग द्वारा प्रायोजित एवं राष्ट्रीय कृषि विकास योजना के तहत उप निदेशक, कृषि, कटक द्वारा प्रत्येक प्रखंड के 40 कृषक साथियों के लिए इन प्रशिक्षण कार्यक्रमों का आयोजन किया गया था।

वैज्ञानिक सलाहकार समिति की बैठक

कृषि विज्ञान केंद्र, संथपुर, कटक की 18वीं वैज्ञानिक सलाहकार समिति की बैठक 15 मार्च 2017 को भाकृअनुप-एनआरआरआई, कटक के निदेशक डॉ.हिमांशु पाठक की अध्यक्षता में आयोजित की गई। इस बैठक में समिति के सदस्यगण, आमंत्रित अतिथि तथा कृषि विज्ञान केंद्र, कटक के विषयवस्तु विशेषज्ञ उपस्थित थे। श्रीमती सुजाता सेठी (गृहविज्ञान) एवं कृषि विज्ञान केंद्र, कटक के प्रभारी ने समिति के अध्यक्ष महोदय तथा सदस्यों का स्वागत किया तथा पिछली वैज्ञानिक सलाहकार समिति बैठक के कार्रवाई रिपोर्ट एवं कृषि विज्ञान केंद्र, कटक की उपलब्धियों पर एक संक्षिप्त

on achievements of KVK Cuttack. The activities namely trainings, OFTs, FLDs etc., taken up during 2016-17 and proposed activities of 2017-18 in the area of Home Science, Soil Science, Plant Protection and Animal Science were presented by the concerned Subject Matter Specialists of the KVK. After presentation discussion was held and suggestions for improvement were sought.

The Chairman made his critical observations after listening to each member present in the meeting. The overall suggestions of the chairman, other members and invited guests were recorded for taking appropriate actions. At the end of the meeting Dr. DR Sarangi, SMS (Soil Sc.) proposed vote of thanks.

Training-cum-Awareness Programme on PPV & FR Act, 2001

To bring awareness among farming community on the benefits of the 'Protection of Plant Varieties and Farmers' Right Act, 2001' and facilitating registration of farmers' varieties, KVK Cuttack organized a Training-cum-Workshop on the above theme at Tentuliragadi, Tigiria on 27 March 2017. About 120 farmers and farmwomen from Athagarh, Baramba, Banki II, Narasinghpur, Tangi Choudwar and Tigiria blocks of Cuttack district, line department officials and subject matter experts of KVK actively participated in this programme.

Dr. BC Patra addressing the gathering

The Chief Guest, Dr. BC Patra, Principal Scientist, ICAR-NRRI, Cuttack discussed about the PPV&FR Act and its benefits for the farmers. He also elaborated the importance of preserving the landraces of plant varieties especially rice and horticultural crops. Shri Prafulla Kumar Mati, DAO, Tigiria and guest of honour advised the farming community to register and preserve the local landraces to meet future possibility of extracting desirable characters/ genes from them. Shri Devi Prasad Prusty, AAO, Tigiria discussed about the futuristic approach and need of desirable genes to combat climatic change.

The participating farmers/farmwomen inspired the visitors by putting up an exhibition displaying seeds of about 89 indigenous varieties of rice, pulses, oilseeds, and

प्रस्तुतिकरण पेश किया। वर्ष 2016-17 के दौरान प्रशिक्षण, ऑफ फार्म परीक्षण, अग्रिम पंक्ति प्रदर्शन आदि कार्यकलाप आयोजित किए गए तथा 2017-18 में गृहविज्ञान, मृदाविज्ञान, पौध सुरक्षा एवं पशुविज्ञान पर कार्यकलाप आयोजन करने के लिए कृषि विज्ञान केंद्र के संबंधित विषयवस्तु विशेषज्ञों ने प्रस्ताव रखा। विभिन्न प्रस्तुतिकरणों पर विचार-विमर्श करने के बाद सुधार हेतु सुझाव रखे गए। बैठक में उपस्थित प्रत्येक सदस्य के प्रस्तुतिकरणों एवं सुझावों को सुनने के बाद अध्यक्ष महोदय ने अपनी महत्वपूर्ण टिप्पणियां रखीं। बैठक के अंत में डॉ.डी.आर.सडंगी, विषयवस्तु विशेषज्ञ (मृदाविज्ञान) ने धन्यवाद ज्ञापन किया।

पौध किस्म सुरक्षा तथा किसान अधिकार अधिनियम, २००१

पौध किस्म सुरक्षा तथा किसान अधिकार अधिनियम, 2001 के लाभों के बारे में किसान समुदाय में जागरूकता लाने तथा किसानों के किस्मों की पंजीकरण कराने हेतु, कृषि विज्ञान केंद्र, कटक ने इस विषय पर 27 मार्च 2017 को तेंतुलीरगड़ी, तिगिरिया में एक प्रशिक्षण-सह-कार्यशाला आयोजित किया जिसमें कटक जिले के टांगी-चौद्वार, आठगढ़, बडम्बा, बांकी-2 नरसिंहपुर एवं तिगिरिया प्रखंड के लगभग 120 किसान एवं महिला किसान, विभाग के संबंधित अधिकारीगण तथा कृषि विज्ञान केंद्र के विषयवस्तु विशेषज्ञों ने भाग लिया।

भाकृअनुप-एनआरआरआई, कटक के बी.सी.पात्र, प्रधान वैज्ञानिक इस कार्यक्रम के मुख्य अतिथि ने पौध किस्म सुरक्षा तथा किसान अधिकार अधिनियम के बारे में तथा किसानों को मिलने वाले लाभों के बारे में विचार-विमर्श किया। उन्होंने पौध किस्म सुरक्षा एवं किसान अधिकार अधिनियम के बारे में वर्णन किया तथा इससे किसानों को मिलने वाले लाभ के बारे में बताया। उन्होंने पौध किस्मों विशेषकर धान एवं बागवानी फसलों की भूमिजातियों के संरक्षण की महत्व पर जोर दिया। श्री प्रफुल मैती, जिला कृषि अधिकारी, तिगिरिया एवं विशिष्ट अतिथि ने किसान समुदाय को पंजीकरण कराने तथा भावी समस्याओं का सामना करने के लिए स्थानीय भूमिजातियों से वांछित लक्षणों एवं जीनों का उद्धरण करने के लिए सलाह दिया। श्री देवी प्रसाद प्रुष्टि, सहायक कृषि अधिकारी, तिगिरिया ने एक भावी प्रस्ताव के बारे में तथा जलवायु परिवर्तन से सामना करने के लिए वांछित जीनों की आवश्यकता पर विचार-विमर्श किया। इस अवसर पर प्रतिभागी किसानो एवं महिला किसानों ने धान, दलहन, तेलबीज तथा सब्जियों के 89 देशी किस्मों पर एक प्रदर्शनी आयोजित करते हुए इस अधिनियम के उद्देश्य को मजबूत बनाया। श्रीमती सुजाता सेठी, प्रभारी

vegetables and strengthened the objective of the Act. Smt. S Sethy, OIC, KVK Cuttack welcomed the participants and Dr. DR Sarangi proposed vote of thanks. Experts from KVK Cuttack, namely, Dr. M Chourasia and Dr. RK Mohanta coordinated the event.

Visit of Dignitaries to KVK

Dr. VS Pahil, National Consultant, NFSM, GOI along with DDA and officials of Directorate of Agriculture, Govt. of Odisha visited Seed hub programme site at Salepur cluster on 31 January 2017.

Jainagar, Koderma

Training Programmes

Krishi Vigyan Kendra, Koderma conducted nine training programs on the topics *viz.*, Scientific cultivation of Mushroom (24 March 2017), Nutritional Kitchen gardening (13 February 2017), Storage of food grain in local condition (21 March 2017), Scientific cultivation of summer green gram (15 March 2017), Development and management of commercial Agro-forestry plants (22 February 2017), Scientific technique of training and pruning agro forestry orchards (14 February 2017), Livestock management in relevance to climate change and Production of clean milk (23 March 2017). A total of two hundred and thirty participants attended these programmes.

On-Campus training on 'Scientific Dairy Management' was conducted from 20 to 22 March 2017 which was attended by sixteen farmers. A one day training program was organized on 'Leadership development in SHG' on 25 March 2017. It was attended by 25 farmers.

KVK-Koderma organized one day on-station training program on Food preservation involving 25 farmwomen on 9 January 2017 under NICRA project. Three On-Farm training programmes *viz.*, Insect & pest management in chickpea crop on 1 March 2017 (36 farmers), Integrated nutritional management in wheat crop on 13 March 2017 (34 farmers), Management of milch cow in summer season (35 farmers) on 20 March 2017 at Chopnadih under NICRA project.

KVK-Koderma organized one day training programme on value addition (food grains) and possibility of putting tribal cousins to value chain on 17 January 2017 in village Bandarchakawa involving tribal families (about 60 consisting of farmers and farmwomen) of the three tribal villages *viz.*, Katio, Banarchachawakwa, Simalgundi of Block Domchach (Koderma) under TSP.

अधिकारी, कृषि विज्ञान केंद्र, कटक ने प्रतिभागियों का स्वागत किया तथा डॉ.डी.आर.सडंगी ने धन्यवाद ज्ञापन किया। कृषि विज्ञान केंद्र, कटक के विशेषज्ञ डॉ.एम.चौरासिया तथा डॉ.आर.के.महांता ने कार्यक्रम के सभी कार्यों का समन्वयन किया।

कृषि विज्ञान केंद्र में विशिष्ट अतिथियों का परिदर्शन

डॉ.वी.एस.पाहिल, राष्ट्रीय परामर्शदाता, एनएफएसएम, भारत सरकार ने उप निदेशक, कृषि एवं कृषि निदेशालय, ओडिशा सरकार के अधिकारियों के साथ सालेपुर क्लस्टर के बीज केंद्र कार्यक्रम का 31 जनवरी 2017 को परिदर्शन किया।

जयनगर, कोडरमा

प्रशिक्षण कार्यक्रम

कृषि विज्ञान केंद्र, कोडरमा ने 24 मार्च 2017 को मशरूम की वैज्ञानिक खेती, 13 फरवरी 2017 को पौषणिक वाटिका, 21 मार्च 2017 को स्थानीय स्थिति में खाद्यान्न का भंडारण, 15 मार्च 2017 को ग्रीष्मकालीन मूंग की वैज्ञानिक खेती, 22 फरवरी 2017 को कृषि-वानिकी पौधा का व्यावसायिक विकास एवं प्रबंधन, 14 फरवरी 2107 को कृषि वानिकी ऑर्किड्स का वैज्ञानिक प्रशिक्षण एवं उनकी कटाई, 23 मार्च 2017 को जलवायु परिवर्तन की प्रासंगिकता में पशुधन प्रबंधन तथा शुद्ध दुग्ध उत्पादन पर कुल नौ प्रशिक्षण कार्यक्रमों का आयोजन किया। इन कार्यक्रमों में कुल दो सौ तीस प्रतिभागियों को प्रशिक्षित किया गया।

वैज्ञानिक तरीके से डेयरी प्रबंधन पर 20 से 22 मार्च 2017 तक किसानों के केंद्र में एक प्रशिक्षण कार्यक्रम आयोजित किया गया जिसमें सोलह किसानों ने भाग लिया। स्वयं सहायता दल में नेतृत्व विकास पर 25 मार्च 2017 को एकदिवसीय प्रशिक्षण कार्यक्रम आयोजित किया गया जिसमें 25 किसानों ने भाग लिया।

कृषि विज्ञान केंद्र, कोडरमा ने एनआईसीआरए परियोजना के अंतर्गत 9 जनवरी 2017 को खाद्य सरंक्षण पर एक प्रशिक्षण कार्यक्रम आयोजित किया जिसमें 25 महिला किसानों ने भाग लिया। एनआईसीआरए परियोजना के अंतर्गत चोपानडीह के किसानों के खेतों में 1 मार्च 2017 को 'चना में नाशककीट एवं नाशकजीव प्रबंधन' पर एकदिवसीय प्रशिक्षण कार्यक्रम आयोजित किया गया जिसमें 36 किसानों ने भाग लिया, 13 मार्च 2017 को गेंहू फसल में समन्वित पौषकत्तव प्रबंधन पर प्रशिक्षण कार्यक्रम आयोजित किया जिसमें 34 किसानों ने भाग लिया तथा 20 मार्च 2017 को ग्रीष्म मौसम में दुधारू गाय के प्रबंधन पर प्रशिक्षण कार्यक्रम आयोजित किया जिसमें 35 किसानों ने भाग लिया।

कृषि विज्ञान केंद्र, कोडरमा ने बंदरचकवा गांव में 17 जनवरी 2017 को खाद्य अनाजों के मूल्य वर्द्धन पर एकदिवसीय प्रशिक्षण कार्यक्रम आयोजित किया जिसमें डोमचाछ प्रखंड के काटियो, बंदरचकवा एवं सिमालगुंडी गांवों के 60 अनुसूचित जनजाति कृषक परिवारों का प्रशिक्षित किया लिया।

RESEARCH NOTES

CRMS 53A: A new CMS line developed at NRRI

Mid-early duration cytoplasmic male sterile lines are need of the hour to invigorate climate resilience rice hybrids developmental process. Efforts made earlier identified the popular rice variety Satabdi as maintainer of the WA cytoplasm (CMS). Hence, to generate a CMS line under genetic background of Satabdi, crosses between CRMS 31A (WA-CMS used as female parent) and Satabdi under recurrent back-cross fashion were made and evaluated. After seven recurrent backcrosses with Satabdi, the male sterile line named as CRMS 53A was developed. It has semi dwarf plant height (85-90 cm), promising out crossing features like spikelets opening during flowering, substantial panicle and dual stigma exertion with long slender grains. This has observed to be a very good combiner, having more than 20% out crossing ability. Thus, it will be of use in development of mid to medium duration hybrids with enhanced seed production ability.

RL Verma, JL Katara, BC Patra, RK Sahu, S Samantaray, B Hembram and ON Singh, NRRI, Cuttack

Identification and validation of rice disease responsive candidate gene based microsatellite markers (cgSSR)

Candidate gene based Simple Sequence Repeat (SSR) (cgSSR) markers are advantageous over genomic SSR as they have a better possibility of linkage with important trait governing loci and therefore, cgSSR are treated as valuable genomic resources for marker assisted breeding.

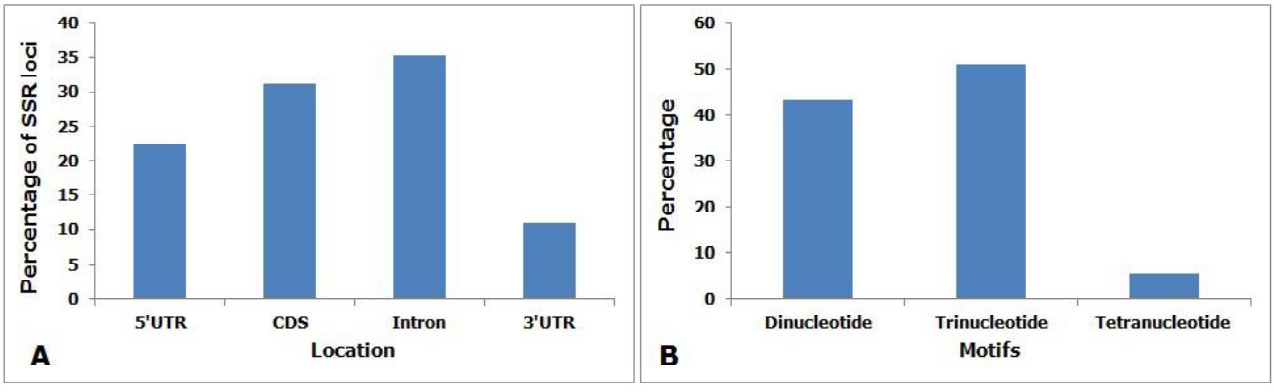

Fig 1. Frequency and distribution of cgSSRs from disease responsive genes in rice. A) Percentage of SSR motifs found in different locations and B) Percentage of different types SSR motifs in disease responsive genes

The study was undertaken to identify microsatellite motifs from all reported rice disease responsive gene sequences and subsequently to develop novel SSR markers. A total of 296 rice candidate genes responsive to different diseases and pests were selected on the basis of extensive literature survey. Among those, a total of 177 genes were found to contain SSR motifs. Tri-nucleotide motif was found to be predominant followed by di- and tetra-nucleotide (Fig. 1B). Most of the motif was found in the intron region followed by CDS, 5'UTR and 3'UTR (Fig. 1A). Chromosome 1 was found to contain highest number of disease responsive genes containing SSR motifs. For validation purpose, we designed and synthesized primers for 35 SSR motifs. Genotyping of 25 different rice genotypes (tolerant/susceptible for different diseases) were done using the novel disease responsive cgSSR markers. Polymorphism information content (PIC) value for those primer pairs ranged from 0.07 to 0.4. Dendrogram generated from the analysis exhibited three clusters containing 12, 8 and 5 genotypes, respectively. Principal Coordinate Analysis (PCoA) distinctly separated each two rice genotypes. On the whole, the novel cgSSR markers developed and validated in the study could be utilized in marker assisted pyramiding of disease responsive genes for rice resistance breeding.

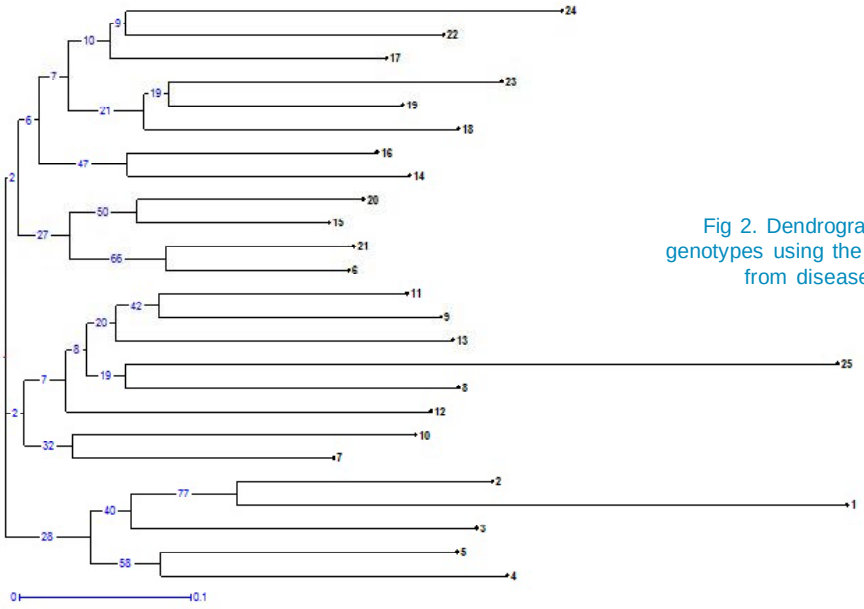

Fig 2. Dendrogram generated for 25 rice genotypes using the cgSSR markers developed from disease responsive genes

KA Molla, M Azharudheen TP, Soham Ray, ON Singh
NRRI, Cuttack

Validation of new source of tolerance to sheath blight in *Oryza rufipogon* accessions using molecular markers

True resistant source against sheath blight of rice, caused by the fungus *Rhizoctonia solani* Kuhn, need to be identified from the wild rice species since such a resistant source is not available in the cultivated rice germplasm. Being a quantitative trait governed by polygenes, sheath blight tolerance in rice is expressed in constant interaction with the environmental conditions. Hence, to establish the true resistance of an accession and to utilize it in breeding programmes, screening needs to be repeated multiple times over different locations and environmental conditions. A more reliable and time saving method will be a combination of phenotyping of sheath blight tolerance along with molecular screening of the germplasm resources. In the present study, gene sequence based SSR markers were designed for twenty one biotic stress responsive genes which are non-specifically expressed under various biotic stress situations in rice. Eighteen wild rice (*Oryza rufipogon*) accessions along with tolerant check CR 1014 and susceptible check Swarna were genotyped using the designed primers. Phenotypic data for sheath blight tolerance of the twenty genotypes were correlated with the sequence variations in the biotic stress responsive genes in order to validate the utility of these markers.

The resultant dendrogram (Fig 3) shows that two moderately resistant wild rice accessions, AC 100444 (SES score, 2.30) and AC 100015 (SES score, 2.70) and one tolerant accession, AC 100005 (SES score, 3.40) were grouped in the

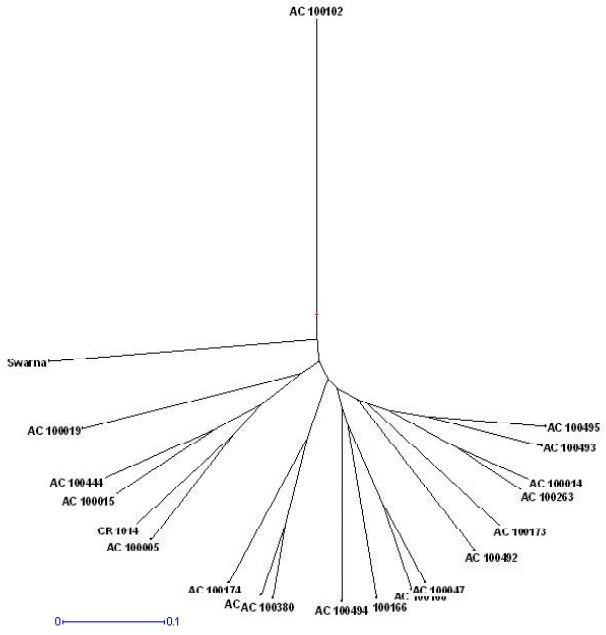

Fig 3. Dendrogram representing the relationships among *Oryza rufipogon* accessions having varying phenotypes for sheath blight tolerance

same sub-clade along with CR 1014 (SES score, 2.70). One susceptible accession, AC 100019 (SES score, 5.20) also included in the same subclade, indicating that the accession may carry tolerant alleles for sheath blight. The results confirmed the true resistance nature of the wild rice accessions, AC 100444 and AC 100015; hence they can be utilized in breeding programmes. The study also validated the efficacy of the designed markers in differentiating germplasm accessions having contrasting phenotypes for sheath blight tolerance.

M Azharudheen, KA Molla, LK Bose, MK Kar, S Lenka and ON Singh
NRRI, Cuttack

Will specific group of AM fungi prefer low phosphorous tolerant rice cultivars?

Arbuscular mycorrhizal (AM) fungi play an important role in most of the terrestrial ecosystems, forming mutually beneficial symbiotic association with the roots of around 80% of vascular plants and increasing phosphate uptake apart from enhancing plant growth under some of the biotic and abiotic stresses. In general, the conventional agriculture mainly depends on the input of inorganic phosphorus fertilizer and the same time the output of mineral phosphorus is predicted to reach a peak around 2030, afterwards could take a downward turn, as forecasted by many researchers. Under these critical conditions, one of the most important targets would be to breed the rice cultivars that require less phosphorus. Some studies has proved that AM fungi can deliver the main route for plant P supply and it can translocate P over considerable distances (1-15 cm) from roots through P transporters located in their external hyphae. In view of above, the AM fungal association was studied in 72 different rice cultivars including two low P tolerant checks *viz*., Kasalath and Dular, which were raised in P deficient soil (< 6.0 – 8.0 ppm). The AM fungal root colonization was recorded in the range of 20 - 90 %, where as it was 80 - 90 % in Kasalath and Dular cultivars. These two varieties have the dominant unique type of vesicle forming AM fungal colonization (Fig 4), which was not observed in many low P tolerant varieties. This observation clearly indicates that some genera of AM fungi may prefer the specific rice genotype of rice. It is well known fact that Kasalath and Dular possess the protein kinase gene *pstol* for phosphorus-deficiency tolerance, thus these varieties having a unique kind of AM root colonization in P deficient soil needs further in-depth investigation.

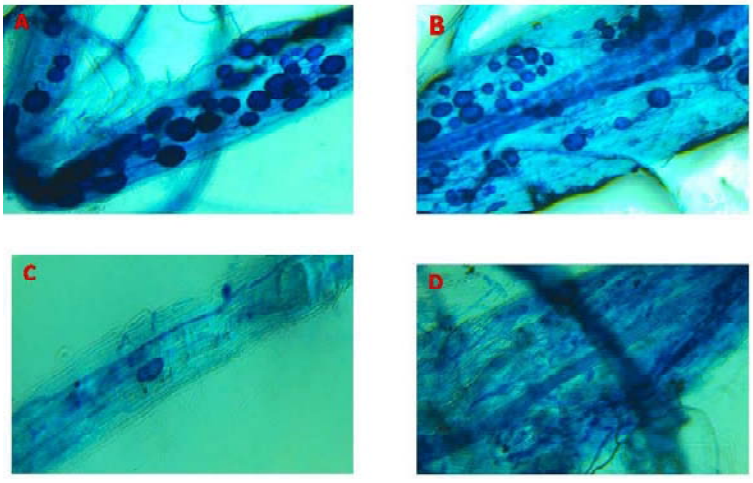

Fig 4. AM fungi root colonization in different low phosphorous tolerant rice cultivars (A. Kasalath; B. Dular; C. AC1002019; D. AC100095)

P Panneerselvam, Upendra Kumar,
A Anandan, C Parameswaran and AK Nayak
NRRI, Cuttack

Appearance of rice ragged stunt like disease in the farmers' field of Odisha

During *kharif* 2015-16, some abnormal growth of rice plants was reported from Aanarpur village of Nimapada block, Puri district. After inspecting the field, it was observed that around 20% of the rice plants were affected in which most of the tillers was dwarfed and few elongated like grass but with typical nodes and internodes. The top leaves especially the flag leaf was twisted with vein thickening and the panicle partially or fully remained inside the boot with nodal branching of tillers (Fig. 5a & b), which are also the typical symptoms of rice ragged stunt disease. In the following year i.e. *kharif* 2016-17, the similar

Fig. 5 a & b. Infected plant showing typical symptom of rice ragged stunt disease

symptom was observed in a large area of the farmer's field of Vatli, Baragarh district of Odisha, where around 30% of the field was affected with similar symptomatic plants. In both the cases association of brown plant hopper, which is also a vector of Rice Ragged Stunt Disease was observed.

AK Mukherjee, T Adak, PC Rath, MK Bag, Raghu S,
S Lenka, SSC Pattanaik and M Jena
NRRI, Cuttack

Seedling blight problem in upland rice ecosystem

Seedling blight of rice was observed in the upland direct seeded rice ecology and irrigated upland nursery beds of NRRI farm in moderate to severe form. The disease caused 30-70% loss under direct seeded plots and seedbeds. It causes pre-emergence seed rot and post-emergence seedling blight. The base of the stem and root of the diseased plants were dark in colour and often has a frosty appearance due to the mycelial growth of the causal fungus. Sclerotia were found attached to the roots and base of the diseased seedlings. Infected young seedlings first show retarded growth, followed by yellowing and withering of the leaves; then die slowly (Fig. 6 & 7).

The causal organism was identified as *Sclerotium rolfsii* Sacc (Fig. 8). It grows luxuriantly on many culture media, producing white aerial mycelium and abundant sclerotia. The mycelim has numerous clamp connections. Sclerotia are spherical to ellipsoid and 0.5-0.8 mm in diameter. The sclerotia are initially white and becoming tan to brown colour later. The climatic conditions are variable for disease development. Severe disease symptom was observed at 25-35 °C, maximum development being at 30 °C. Studies have indicated that the disease is severe in irrigated upland rice nurseries during cloudy weather with an intermittent temperature between 25 and 32 °C.

Fig 6. Infected seedlings in nursery

Fig 7. Completely dead seedlings

Fig 8. Pathogen: *Sclerotium rolfsii*

Fungicides and *Trichoderma* isolates have been tested. The results indicated that SAAF 75% WP (Carbendazim 12% + Mancozeb 63%) and Nativo 75% WG (Trifloxystrobin 50% + Tebuconazole 25%) are effective against the pathogen. All the Trichoderma isolates found effective against pathogen by completely inhibiting the mycelia growth and lysis of the pathogen mycelium. Since the pathogen is soil borne, the management of the disease by bio-control agents like *Trichoderma* spp. either by seed treatment or soil application in nurseries will control the disease.

Raghu S, S Lenka, Totan Adak, AK Mukherjee and M Jena
NRRI, Cuttack

Screening of Assam rice collection genotypes for resistance against brown plant hopper, *Nilaparvata lugens* (Stål.)

Brown plant hopper (BPH), *Nilaparvata lugens* (Stål.) is one of the destructive insect pests of the entire rice growing ecosystem and causes considerable yield losses. Identification of resistant cultivars is of paramount importance, as the insect pest is quickly changing its behaviour from time to time and the earlier released resistant rice varieties showing susceptibility to the pest. The use of resistant rice varieties is the most economical and efficient method for controlling the BPH. Keeping this objective in view, 200 Assam rice collections (ARC) genotypes were screened against BPH by standard seed box screening technique (SSST) in the greenhouse in order to confirm the resistance and susceptibility. Out of 200 ARC genotypes evaluated for resistance against BPH, 2 genotypes (ARC 5768, ARC 5769) were found resistant, 28 genotypes were moderately resistant and 170 genotypes were susceptible. The resistant genotypes would be useful as donors in rice breeding

Fig 9. Standard seed box screening technique for BPH

programme to develop BPH resistant varieties. Considering the high prospective of these new sources of resistance, a detailed investigation of various biochemical and genetics factors that impart resistance need to be confirmed in the near future with the help of molecular markers (Fig 9).

Guru Pirasanna Pandi G, M Jena, Basana Gowda G,
NK Patil, BC Marndi and T Adak
NRRI, Cuttack

Use of molecular markers in identification and characterization of resistance to rice blast

Rice blast disease caused by *Magnaporthe oryzae* is one of the most destructive disease causing serious yield losses to rice in different parts of the world. The objective is to know the resistance through screening and studying the genetic diversity of eleven major blast resistance (R) genes *viz.*, *Pib*, *Piz*, *Piz-t*, *Pik*, *Pik-p*, *Pik-h*, *Pita/Pita*-2, *Pi2*, *Pi9*, *Pi1* and *Pi5* using linked molecular markers of eighty released rice varieties by National Rice Research Institute, Cuttack (NRVs). Out of 80 varieties evaluated for leaf blast in uniform blast nursery, nineteen varieties (23.75%) were found resistance; twenty-one were moderately resistant (26.25%), while forty varieties (50%) were susceptible. The blast resistance genes in NRVs varied from four to eleven. The genetic frequencies of the eleven blast resistance genes varied from 18.75 to 100%. For cluster analyses, at 53% level of genetic similarity coefficient, eighty NRVs were grouped into two major clusters. The polymorphism information content value for twelve markers varied from 0 to 0.37. Out of twelve markers, simply four markers, 195R-1, *Pita3*, YL155/YL87 and 40N23r correspond to three broad spectrum R genes *viz.*, *Pi9*, *Pita/*

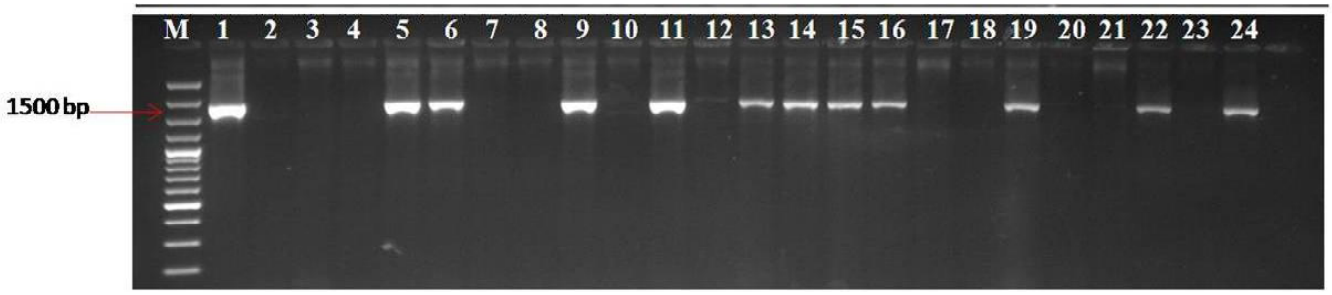

Fig 10. Agarose gel photograph of 22 NRVs, to know the presence or absence of 1500 bp of *Pik-h* blast resistance gene amplified with gene based marker

Pita2 and *Pi5* were significantly associated with the blast disease, which explained the phenotypic variance from 3.5% to 7.7%. Similarly, the population structure analysis and principal component analysis grouped the eighty NRVs into two sub-groups with one admixture. The present study would help to formulate strategies for improvement of blast resistance in India as well as around the world (Fig 10).

MK Yadav, Aravindan S, U Ngangkham,
HN Shubudhi, M K Bag, T Adak, S Munda, S Samantaray and M Jena
NRRI, Cuttack

Evaluation of farmers' varieties collected from different parts of Odisha for sheath blight resistance

Farmers' varieties (607 numbers) collected from different parts of Odisha, and conserved in the Gene Bank of NRRI, Cuttack were screened for their biotic stress resistance. These varieties were evaluated for reaction to sheath blight pathogen, *Rhizoctonia solani* Kuhn in a field trial at National Rice Research Institute, Cuttack during *kharif* 2014, 2015 and 2016 using Standard Evaluation System on 0-9 scale for sheath blight. Each variety was planted in two lines (14 plants in each line) and after each ten varieties, Swarna, being a highly susceptible variety was taken as check for comparison. All the plants of farmers' varieties and the check Swarna at maximum tillering stage were artificially inoculated. The data on disease incidence and subsequent spread were collected from the date of first incidence of the disease till grain maturity stage. Out of 607 farmers' varieties, none showed resistant reaction, whereas, 47 (7.7%) were found to be moderately resistant (Table 1). These promising farmers' varieties can be used as donors for breeding rice varieties for sheath blight resistance.

Table 1. Evaluation of farmers' varieties against sheath blight pathogen

SES Score	Sheath blight reaction	Farmers' varieties showing moderately resistant reaction
1- 3	Moderately resistant (MR)	Koraput-Kundra-Assam Chudi, Ngrh-Baigana Manji, Ganjam-Basumati Dhana, Sundargarh-Jaisar-Bhajana, Bhundi-B, Biradia Bankoi, Champeisiali-D, Dhusura, Dubaraj-S, Gangabhalu, Ganjamgedi, Bolangir-Gelhei Kanthi, Kendrapada-Haladigundi, Kandhamal-Jhalaka, Bolangir-Jhilli, Ngrh-Khandapada-Kadalia Champa, Kadel Kera, Kakudi Manji-G, Mbj-Kala Champa, Kalaketiki, Kandhamal-Kala Krushna, Rajamani-K, Kedrapada- Kalama, Kalkati-D, Kansapuri Majhlijhuli, Khandi Ratanchudi, Latamahu, Laxmi Vilash, Raigada-Local Basumati, Smb-Machhakanta, Magra-P, K-Langigarh-Mahipal, Mayurkantha-K, Kandhamal-Mugdi, Jajpur-Mugudi, Pateni-R, Rajamani-K, Ranga Luchai, Boudh-Ranisiali, Kandhamal-Barapali-Ratanchudi, Saria-B, Sathia (Kalasathia), Sita Bhoga-J, Tiki Masuri, Tulasimali
Note: Ngrh-Nayagarh, Mbj-Mayurbhanj, Smb-Sambalpur		

S Lenka, BC Marndi, BC Patra, AK Mukherjee, MK Bag and MK Yadav
NRRI, Cuttack

A Rapid Method to distinguish between low and high protein rice grains

NRRI has recently developed a high protein (10.3%) rice, CR Dhan-310, in the background of variety Naveen. As protein content is not a phenotypic trait, it is desirable to suggest a simple and rapid method to differentiate between the parent Naveen (7.5% protein) and its high protein variety CR Dhan-310. It was found that the xanthoproteic test, (qualitative test) can be used for confirming the presence of protein in samples and easily distinguish between two varieties. The procedure involves treating powdered rice grains taken in a test tube with 1 ml of concentrated nitric acid. The rice grains turn yellow, the colour intensity being more in high protein rice grains. This was followed by heating the test tube on a low flame burner and addition of 40% alkali to neutralize the acid, which resulted in change in colour from yellow to orange, the high protein rice sample exhibiting a more intense orange colour than Naveen. The photograph (Fig. 11) depicts the colours developed in brown rice samples of Naveen, CR Dhan-310 and CR Dhan-311 (another high protein rice, 10.2% protein). Thus the high protein rice varieties can be easily distinguished from the low protein rice with the help of the xanthoproteic test as the former gives more intense orange colour than the latter.

Nabaneeta Basak, Awadhesh Kumar, K Chattopadhyay and SG Sharma
NRRI, Cuttack

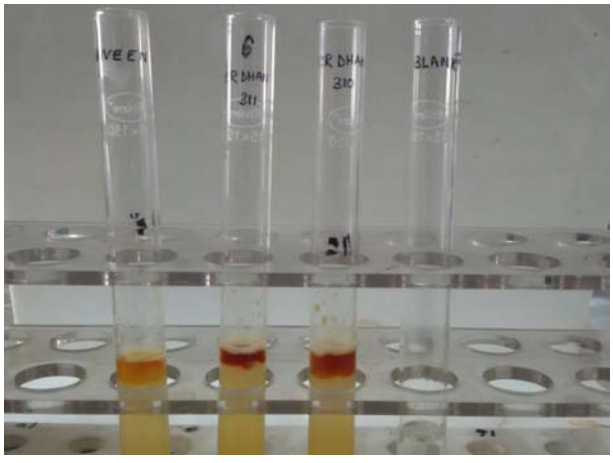

Fig 11. Difference in intensity of colour development as a method to distinguish protein content in contrasting varieties of rice

Resistant Starch could be decisive in determining the Glycemic Index of Rice cultivars

Starch hydrolysis begins in the mouth with the action of salivary á-amylase and continues in the small intestine with involvement of other enzymes. However, the resistant starch (RS) which normally comprises <3% of cooked rice escapes digestion and therefore, its calories are unavailable for use by cells. RSs are categorized into five types based on their resistance to enzymatic digestion. Rice contains type 5 RS, wherein amylose forms complex with lipids making it thermally more stable. The more RS, slower is the digestion of rice and lower is the glycemic index (GI), which is indicative of the ability of food to raise the blood sugar level. The GI of rice is known to be relatively high compared to other starchy foods. It was revealed that increased RS content in rice grain is mediated by soluble starch synthase (SSIIIa), which requires high level expression of granule bound starch synthase (*gbssI*). In this study, biochemical analysis was done to determine the GI, RS and amylose content (AC) in rice from different ecologies. Large variation in the value of GI (60.07-70.36), RS (0.35-2.57%) and AC (03.79-23.32%) was observed. Among the genotypes studied, Mahsuri

showed lowest GI (60.07) and highest RS (2.57%). The highest value for GI (70.36) was found in Abhishek with relatively low RS (0.83%). *O. brachyantha* had the lowest RS content (0.35%) with relatively high GI (68.84). A significant negative correlation (r = -0.688) was also observed between GI and RS. Expression analysis of *gbssI* was carried out in developing grains of three rice genotypes (Mahsuri, Abhishek and Vandana) differing widely in GI, RS and AC. There was dramatic increase in the expression levels of the gene in the middle stage of grain development in all the three genotypes. Maximum expression of the gene was, however, observed in Mahsuri at middle stage showing a positive correlation between RS content and *gbssI* expression in the rice cultivars studied. These findings emphasize upon the need to identify and develop rice genotypes with high RS, amylose and low GI which may be suitable for consumption by people suffering from diabetes, obesity and colon diseases.

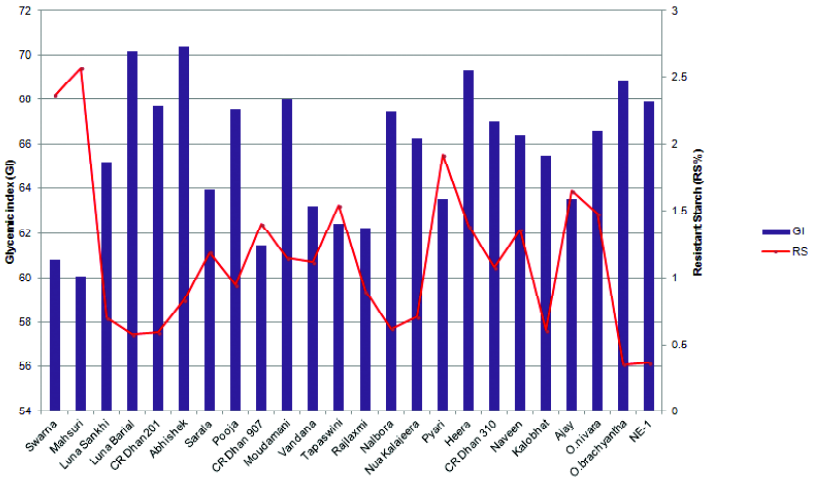

Fig 12. GI and RS values of different rice varieties

A Kumar, N Umakant, Parameswaran C, SG Sharma
NRRI, Cuttack

Database of wild rice germplasm (*Oryza nivara*)

Database of annual wild rice species *Oryza nivara* has been developed as per the descriptors. Thirteen quantitative characters have been included in the database and they are grain length (mm), grain breadth (mm), grain length/breadth ratio, awn length (cm), hundred grain weight (g), days to 50% flowering, leaf length (cm), leaf width (cm), ligule length (cm), culm length (cm), culm number, culm diameter and panicle length (cm).

The distribution of panicle length (PL) has been shown in fig 13. Out of the total accessions, 6.7% have PL from 10-15 cm, 26.4% accessions show PL between 15-20 cm and 25-30 cm each, 19.1% accessions PL varies between 02-25 cm and 25-30 cm each and 2.3% accessions fall under the range 35-40 cm. In total, 91% accessions are classified under 15-35 cm panicle length and only 9% beyond this range.

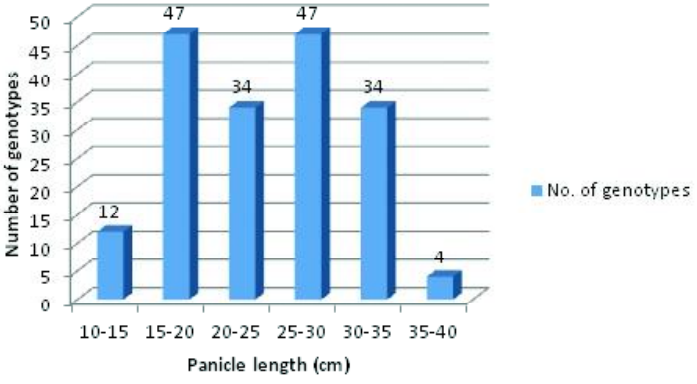

Fig 13. Number of genotypes with panicle length (cm)

NN Jambhulkar, BC Patra, GAK Kumar, LK Bose and ON Singh
NRRI, Cuttack

Determining Optimum planting date in Rice-Rice (Ratoon) sequence for higher production in flood-prone lowlands

Large tracts of flood-prone lowlands in Assam remain submerged for three to four months during rainy season making it almost impossible to grow two crops of rice in a year. Farmers practice pre-*kharif* early *ahu* rice–fallow–rapeseed cropping pattern. There are rice varieties having good ratooning ability. These varieties, if managed properly, can produce even up to 50% of grain yield in ratoon crop with 50-60% less labour than the main rice crop. By practicing rice ratooning in areas where rice is the main crop, an additional crop of rice can be taken with minimum labour and inputs and in a very short period. RRLRRS, Gerua identified 'Naveen' a mid-early duration, high yielding rice variety which produces additional 40% grain yield in less than two months, if grown as ratoon rice, after main crop of early *ahu* rice. Thus, an experiment was conducted for two consecutive years with rice variety 'Naveen' to assess optimum time of

Table 2. Production efficiency, productivity and days to maturity of rice-rice (ratoon) as influenced by date of planting and nitrogen management

Treatment	Main rice crop (early *ahu*)		Ratoon rice crop			Maturity (days)	
	Straw yield (t ha^{-1})	Grain yield (t ha^{-1})	Straw yield (t ha^{-1})	Grain yield (t ha^{-1})	% grain yield of the main crop	Main rice crop	Ratoon rice crop
Planting dates							
5th Feb	5.67	5.26	2.82	2.06	39.2	152	60
15th Feb	6.45	5.82	2.95	2.29	39.3	148	59
25th Feb	6.36	5.91	3.27	1.96	33.2	144	57
Nitrogen management							
Control	5.96	5.52	2.82	1.87	33.8		
25% N	6.21	5.67	3.02	2.18	38.5		
50% N	6.34	5.80	3.18	2.26	39.0		

planting of the main crop so as to have good yield in ratoon crop & to ascertain optimum dose of fertilizers for rice ratoon crop. Performance of N aveen was assessed with three dates of planting, *viz.*, 5th Feb, 15th Feb and 25th Feb for the main crop and three doses of nitrogen (0, 25% and 50% recommended doses of N). It was observed that 15th Feb was optimum time for planting of the main crop to obtain maximum yield from ratoon with the highest production efficiency. Ratoon crop was harvested within two months of the harvest of the main crop. However, both 25% and 50% recommended doses of nitrogen caused significantly higher grain yield than control and were *at par*. Thus, only 25% nitrogen application in ratoon crop was sufficient to obtain good ratoon grain yield, which was almost 40% of the main early *ahu* crop yield.

T Singh, BS Satapathy and K Saikia
RRLRRS, ICAR-NRRI, Gerua (Assam)

Registration of microbial culture

Two microbial cultures were registered with Microbial Type Culture Collection (MTCC), CSIR-Institute of Microbial Technology (IMTECH), Chandigarh.

Bag MK, Yadav MK and Mukherjee AK. 2016. *Ustilaginoidea virens* (NRRI-FSm-1) MTCC 12622, CSIR, IMTech, Chandigarh.

Bag MK, Yadav MK and Mukherjee AK. 2016. *Sarocladium oryzae* (NRRI-ShR-1) MTCC 12623, CSIRI, MTech, Chandigarh.

Sequences Submitted to NCBI, New York

Bag MK, Yadav M, Swain H and Mukherjee AK. 2016. *Ustilaginoidea virens* isolate Gene Bank accession KX243272 https://www.ncbi.nlm.nih.gov/nuccore/KX243272.

Bag MK, Yadav M, Swain H and Mukherjee AK. 2016. *Ustilaginoidea virens* isolate Gene Bank accession KX243273 https://www.ncbi.nlm.nih.gov/nuccore/KX243273.

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Bag MK, Yadav M, Swain H and Mukherjee AK. 2016. *Sarocladium oryzae* isolate Gene Bank accession KX243275 https://www.ncbi.nlm.nih.gov/nuccore/KX243275.

Participation in Symposia/Seminars/ Conferences/Trainings/Workshops/ Meetings/Visits

Drs. D. Maiti and Amrita Banerjee attended the National Conference on "Diagnosis and management of plant diseases: Integrated approaches and recent trends" organized by the Indian Phytopathology Society at ICAR-Research Complex for NEH, Umiam, Meghalaya from 9 to 11 January 2017.

Dr. H Pathak, Director, NRRI, Cuttack attended a meeting on Biotic Stresses of Paddy and ICAR preparedness for their management and discussion with DDG (CS) on AICRIP at IARI, New Delhi on 12 January 2017.

Dr. H Pathak, Director, NRRI, Cuttack attended NEWS project meeting and SCON meeting at IARI, New Delhi on 13 January 2017.

Dr. Naveenkumar B Patil attended 21 Days Training programme on 'Stored Grain Pest Detection, Identification and Phytosanitary Treatment (MBR & AlP fumigation)' at NIPHM, Hyderabad from 2 to 23 January 2017.

Dr. SM Prasad attended the Review Workshop of cluster demonstration of oilseed and pulses for KVKs of Odisha at OUAT, Bhubaneswar on 24 January 2017.

Dr. NN Jambhulkar attended a Workshop of Nodal Officers of ICAR Research Data Repository for Knowledge Management at NASC Complex and IASRI, New Delhi from 24 to 25 January 2017.

Dr. H Pathak, Director, NRRI, Cuttack attended the Selection Committee Meeting at ASRB, New Delhi from 30 January to 2 February 2017.

Dr. P Samal attended State Credit Seminar of Odisha State at Mayfair Lagoon, Bhubaneswar on 3 February 2017.

Dr. Yogesh Kumar attended Scientific Advisory Committee meetings (SAC) of KVK, Holy Cross, Hazaribagh on 8 February 2017.

Dr. H Pathak, Director, NRRI, Cuttack attended the Brainstorming Session on "Role of Plant Breeding and Genetics in Meeting Sustainable Development Goals" and also receive the award at Dr. BP Pal Auditorium at IARI, New Delhi on 11 February 2017.

Dr. H Pathak, Director, NRRI, Cuttack attended Hills Rice Workshop at NBPGR, New Delhi on 13 February 2017.

Dr. H Pathak, Director, NRRI, Cuttack attended the Directors' Conference at NASC Complex, New Delhi from 14 to 15 February 2017.

Dr. H Pathak, Director, NRRI, Cuttack attended the seminar at SATSA, Kolkata on 19 February 2017.

Dr. H Pathak, Director, NRRI, Cuttack attended the 13th Agricultural Science Congress 2017 at UAS, Bangalore on 21 February 2017.

Dr. P Samal attended the 13th Agricultural Science Congress 2017 at UAS, Bangalore from 21 to 24 February 2017.

Dr. H Pathak, Director, NRRI, Cuttack attended & Co-chair in Inter Drought-V Conference at CRIDA, Hyderabad on 22 February 2017.

Dr. H Pathak, Director, NRRI, Cuttack attended Brainstorming Workshop on NICRA Project: Thus Far and Way Forward meeting at NASC, New Delhi on 23 February 2017.

Dr. H Pathak, Director, NRRI, Cuttack attended meeting of Indo-UK Project at IARI, New Delhi on 25 February 2017.

Dr. S Lenka visited and monitored in the tribal village Gacherigaon of Tumudibandha Block, Dist. Phulbani along with team of Scientists and Extension Officers from 24 to 25 February 2017 on "Unique farming technique adopted for doubling the rice production in the Region".

Dr. DR Sarangi attended a programme on Stakeholders Workshop on Doubling of Farmers Income at Conference Hall of ATMA, Cuttack on 28 February 2017.

Drs. PC Rath and S Lenka attended the 9th National Seminar on "Water resources management in the context of climate change for growing India" at OUAT, Bhubaneswar from 27 February to 1 March 2017.

Drs. PC Rath, AK Mukherjee and NN Jambhulkar attended a meeting on AICRIP Bifurcation organized at IIRR, Hyderabad from 1 to 5 March 2017.

Dr. RK Mohanta attended the CEC meeting of Animal Nutrition Society of India at ICAR-NDRI, Karnal on 3 March 2017.

Drs. NP Mandal and Yogesh Kumar attended the Scientific Advisory Committee (SAC) meeting of KVK, Koderma on 7 March 2017 at KVK, Jainagar, Koderma.

Dr. H Pathak, Director, NRRI, Cuttack attended the meeting of National Steering Committee for Agriculture Sector in TNA project at TIFAC, DST, Government of India, New Delhi on 20 March 2017.

Dr. H Pathak, Director, NRRI, Cuttack attended 1st meeting of the Cadre Review of Scientific Strength of ICAR Institutes at DG Committee Room, Krishi Bhawan, New Delhi on 21 March 2017.

Dr. DR Sarangi attended one day review meeting on Pulse Seed Hub Programme held at ATARI, Jabalpur on 22 March 2017.

Drs. S Lenka and PC Rath attended the "World Water Day, 2017 (Theme-Waste water)" at Department of Botany and Biotechnology, Ravenshaw University, Cuttack organized by Indian Climate Congress-SCET, Cuttack on 22 March 2017.

Dr. Yogesh Kumar attended Scientific Advisory Committee meeting organised by Doordarshan Kendra at Ranchi, Jharkhand on 24 March 2017.

Dr. Yogesh Kumar participated in Kisan Gosthi at IINRG, Namkum, Ranchi on 10 February 2017.

Dr. Yogesh Kumar attended Kisan Gosthi at All India Radio, Hazaribag, Jharkhand on 27 March 2017.

Dr. D Maiti attended meeting called by the DG, ICAR to finalize Master Plan for IARI-J at Krishi Bhavan, New Delhi on 7 March 2017.

Publications

Research Papers

Anupam A, Imam J, Quatadah Syed M, Anantha MS, SP Das, M Variar and NP Mandal. 2017. Genetic structure and diversity of rice germplasm using drought and blast linked markers of Tripura state of Northeast India. *Rice Science*. **24**(1): doi.org/10.1016/j.rsci.2016.

Bag MK, Mukherjee AK, Sahoo RK and Jena M. 2016. Impact of false smut [Ustilaginoidea virens (Cooke.) Tak.] disease on rice seed health. *Indian Phytopathology*. **69**(4s): 256-257.

Bag MK, Yadav MK, and Mukherjee AK. 2017. Changing Disease Scenario with Special Emphasis on False Smut of Rice. *SATSA Mukhapatra- Annual Technical issue*. **21**: 219-224.

Bhaduri D, Purakayastha TJ, Patra AK, Singh M and Wilson BR. 2017. Biological indicators of soil quality in a long-term rice–wheat system on the Indo-Gangetic plain: combined effect of tillage–water–nutrient management. *Environmental Earth Sciences.* **76**(5): 202.

Bhattacharjya S, Bhaduri D, Chauhan S, Chandra R, Raverkar KP and Pareek N, 2017. Comparative evaluation of three contrasting land use systems for soil carbon, microbial and biochemical indicators in North-Western Himalaya. *Ecological Engineering*. **103**: 21-30.

Bhattacharyya P, Roy KS, Nayak AK, Shahid M, Lal B, Gautam P and Mohapatra T. 2017. Metagenomic assessment of methane production-oxidation and nitrogen metabolism of long term manured systems in lowland rice paddy. *Science of the Total Environment*. **586**: 1245-1253.

CV Singh and RK Singh. 2017. Influence of intercrops and row ratios on weed suppression and performance of upland rice (*Oryza sativa* L.) under different weed regimes. *International Journal of Applied & Natural Sciences.* **6** (2): 75-82.

Dash AK, Rao RN, Rao G, Verma RL, Katara JL, Mukherjee AK, Singh ON and Bagchi TB. 2016. Phenotypic and marker-assisted genetic enhancement of parental lines of Rajalaxmi, an elite rice hybrid. *Frontiers Plant Science*. **7**: 1005. doi: 10.3389/fpls.2016.01005.

Gautam P, Lal B, Tripathi R, Baig MJ, Shahid M, Maharana S, Bihari P and Nayak AK. 2017. Impact of Seedling Age and Nitrogen Application on Submergence Tolerance of *Sub1* and Non-*Sub1* Cultivars of Rice (*Oryza sativa* L.). *Journal of Plant Growth Regulation*. 1-14.

Imam J, Mandal NP, Variar M and Shukla P. 2016. Allele mining and selective patterns of Pi9 gene in a set of rice landraces from India. *Frontiers Plant Science*. **7**: 1846. doi: 0.3389/fpls.2016.01846.

Imam J, Shukla P, Mandal NP and Variar M. 2017. Microbial interactions in plants: Perspectives and applications of proteomics. ***Current Protein & Peptide Science.*** *Vol.* **18** **doi:** 10.2174/ 1389203718666161122103731.

Jyoti Kumari, Bag MK, Pandey S, Jha SK, Chauhan SS, Jha GK, Gautam NK and Dutta M. 2016. Phenotypic diversity in pearl millet landraces of India and identification of trait specific germplasm for efficient use in crop improvement. *Crop & Pasture Science*. **67**: 1223-1234. doi.org/10.1071/CP16300.

Kumar A, Nayak AK, Pani DR and Das BS. 2017. Physiological and morphological responses of four different rice cultivars to soil water potential based deficit irrigation management strategies. *Field Crops Research.* **205**: 78-94.

Kumar R, Kumawat N, Kumar S, Kumar R, Kumar M, Sah RP, Kumar U and Kumar A. 2017. Direct seeded rice: Research stratagies and opportunities for water and weed management. *Oryza*. **53(4)**: 354-365.

Kumar U, Berliner J, Adak T, Rath PC, Dey A, Pokhare SS, Jambulkar NN, Panneerselvam P, Kumar A, Mohapatra SD. 2017. Non-target effect of continuous application of chlorpyrifos on soil microbes, nematodes and its persistence under sub humid tropical rice-rice cropping system. *Ecotoxicology and environmental safety.* **135**:225-235.

Kumar U, Panneerselvam P, Govindasamy V, Vithalkumar L, Senthilkumar M, Banik A and Annapurna K. 2017. Long-term aromatic rice cultivation effect on frequency and diversity of diazotrophs in its rhizosphere *Ecological Engineering*. **101**: 227-236.

Kumar U. 2017. Diazotrophic Microbes in Rice: A Boon to Save Nitrogen Fertilizers. *EC Microbiology*. **6** (1):1-3.

Lal B, Gautam P, Panda BB, Raja R, Singh T, Tripathi R, Shahid M and Nayak AK. 2017. Crop and varietal diversification of rainfed rice based cropping systems for higher productivity and profitability in Eastern India. *PloS one*. **12**(4): e0175709.

Mallick PK, Prasad SM, Pourouchottamane R and Mohanta RK. 2017. Comparative performance of non-descript goats and their crossbreds with Beetal: a field study. *Indian Veterinary Journal.* **94**(3): 71–73.

Mazumdar SP, Ghosh D and Nayak AK. 2017. Soil aggregation and distribution of carbon in a sandy loam

soil of Trans Gangetic plains under integrated nutrient management practices in rice-wheat cropping system. *Indian Journal of Soil Conservation*. **45**(1): 45-51.

Mishra VK, Srivastava S, Jha SK, Sharma DK, Damodaran T, Singh YP and Nayak AK. 2017. Temperature induced changes in wheat (*Triticum aestivum*) growth and yield under salt affected environment of Indo-gangetic plains. *Arid Land Research and Management*. 1-16.

Mohanty S, Swain SK, Sethi SK, Dalai PC, Bhattachrayya, P, Kumar A, Tripathi R, Shahid M, Panda MM, Kumar U, Lal B, Gautam P, Munda S and Nayak AK. 2017. Crop establishment and nitrogen management affect greenhouse gas emission and biological activity in tropical rice production. *Ecological Engineering*. **104**: 80-98.

Mukherjee AK, Mukherjee PK and Kranthi S. 2016. Genetic similarity between cotton leaf roll dwarf virus and chickpea stunt disease associated virus in India. *The Plant Pathology Journal (Korea)*. **32**(6): 580-583.

Panneerselvam, P and Saritha B. 2017. Influence of AM fungi and its associated bacteria on growth promotion and nutrient acquisition in grafted sapota seedling production. *Journal of Applied and Natural Science*. **9**(1): 621-625.

RK Singh and CV Singh. 2017. Studies on response of mustard varieties to different sowing dates under alluvial soils of indo-gengetic plains. *International Journal of Applied & Natural Sciences*. **6** (3): 9-14.

Saha A, Bhaduri D, Pipariya A and Ghosh RK 2017. Linear and nonlinear sorption modelling for adsorption of atrazine onto activated peanut husk. *Environmental Progress & Sustainable Energy*. **36**(2): 348-358.

Radio/TV Talks

Dr. PC Rath delivered a radio talk on "*Dhan o Chaula ku Saiti Rakhibe Kipari*" which was broadcasted by AIR Cuttack on 15 February 2017 in Krushi Sansar Programme.

Dr. DR Sarangi delivered a radio talk on "cûUòe CaðeZû aé¡ò _ûAñ Wûfò RûZúd `if" *(Cultivation of Pulses for Improving Soil Health)* which was broadcasted by AIR Cuttack on 7 March 2017 in Krishi Sansar programme.

Award

Dr.(Mrs.)Amrita Banerjee received the Crop & Weed Science Society Young Scientist Award on the occasion of International Symposium on "Eco-efficiency in Agriculture & Allied Research" at BCKV, WB from 20 to 23 January 2017.

Sahoo B, Garg AK, Mohanta RK, Bhar R, Thirumurgan P, Sharma AK and Pandey AB. 2016. Nutritional value and tannin profile of forest foliages in temperate sub-Himalayas. *Range Management and Agroforestry*. **37**(2): 228-232.

Sarangi DR, Jena D and Chatterjee AK. 2016. Assessment of critical limit of zinc for rice, groundnut and potato in red and laterite soils of Odisha. *Oryza*. **53**(3): 276-281.

Shahid M, Nayak AK, Puri C, Tripathi R, Lal B, Gautam P, Bhattacharyya P, Mohanty S, Kumar A, Panda BB, Kumar U and Shukla AK. 2017. Carbon and nitrogen fractions and stocks under 41 years of chemical and organic fertilization in a sub-humid tropical rice soil. *Soil and Tillage Research* . **170**: 136-146.

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Technology Bulletin

CV Singh, NP Mandal and D Maiti. 2017. Upland Rice Technologies: A Brief Overview. *ICAR-CRURRS (NRRI) Technology Bulletin Series* 2017, No. 1, pp. 62.

रेडियो/वार्ता

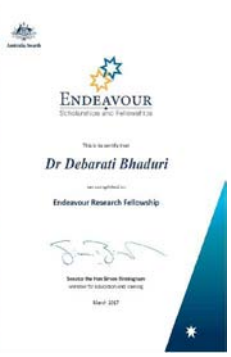
डॉ.पी.सी. रथ ने 15 फरवरी 2017 को आकाशवाणी, कटक के कृषि संसार कार्यक्रम में 'धान एवं चावल का भंडारण कैसे करें' विषय पर एक रेडियो वार्ता दिया।

डॉ.डी.आर. सडंगी ने 7 मार्च 2017 को आकाशवाणी, कटक के कृषि संसार कार्यक्रम में 'मृदा स्वास्थ्य में सुधार हेतु दलहन की खेती' विषय पर एक रेडियो वार्ता दिया।

पुरस्कार

डॉ.(श्रीमती) अमृता बैनर्जी को बिधानचंद्र कृषि विश्वविद्यालय, पश्चिम बंगाल में 'कृषि तथा संबंद्ध अनुसंधान में पर्यावरण-क्षमता' विषय पर आयोजित + ÆÉ® ë É] Ê {ÉÉ® ê ÉÆÉÉn ù¨ Éâ¡ ò° É± É B ´ÉÆÆ É® ¢éi É´ ÉÉ® ù विज्ञान संघ यंग वैज्ञानिक पुरस्कार मिला।

Dr. Debarati Bhaduri pursued her postdoctoral research under Endeavour Research Fellowship-2016 (funded by Australia Awards, Department of Education & Training, Australian Govt.) at Terrestrial Carbon Research Group, University of New England, Armidale (NSW), Australia under supervision of Prof Brian R. Wilson during September 2016 to February 2017.



डॉ.देवारती भादुड़ी ने इन्डेवर रिसर्च फैलोशिप-2016 के अंतर्गत (ऑस्ट्रेलिया सरकार के शिक्षा एवं प्रशिक्षण विभाग के ऑस्ट्रेलिया पुरस्कार द्वारा वित्तपोषित) ऑस्ट्रेलिया के यूनिवर्सिटी ऑफ न्यू इंग्लैंड के टेरेस्ट्रियल कार्बन रिसर्च ग्रूप में प्रोफेसर ब्रियान आर.विलसन के मार्गदर्शन में सितंबर 2016 से फरवरी 2017 के दौरान अपना पोस्टडॉक्टराल अनुसंधान पूरा किया।

Foreign Deputation

Dr. H Pathak, Director, NRRI participated in the workshop on 'Opportunities for Diversification in Rice Based Systems' at Bangkok, Thailand from 28 to 29 March 2017.

Institute Seminar

Dr. NN Jambhulkar delivered an institute seminar on "KRISHI: Knowledge based Resources Information Systems Hub for Innovations in Agriculture" on 19 January 2017.

Dr. SG Sharma, Head, Plant Physiology & Biochemistry, NRRI, Cuttack delivered a seminar on "Rice-Quality, Nutrition and Beyond" at CRURRS, Hazaribagh on 4 February 2017.

Promotion/ Financial Benefits

Dr. B Lal, Scientist has promoted to the next higher RGP of Rs.7000/- w.e.f. 28 September 2014 under CAS.

Dr. RL Verma and Dr. (Mrs.) Sushmita Munda, Scientist has promoted to the next higher RGP of Rs.7000/- w.e.f. 27 April 2015 under CAS.

Shri Torit Baran Bagchi, Scientist has promoted to the next higher RGP of Rs.7000/- w.e.f. 11 May 2015 under CAS.

Shri Dhaneswar Muduli, LDC has granted financial benefits to the next higher GP w.e.f. 9 May 2014 under MACP.

Confirmation of Service

The service of Dr. Kutubuddin Ali Molla, Shri Manoj Kumar Yadav and Shri Aravindan S, Scientist was confirmed w.e.f. 1 January 2016.

The service of Shri Alok Kumar Panda and Shri Ajaya Kumar Naik, Technician was confirmed w.e.f. 2 December 2015.

विदेश प्रतिनियुक्ति

डा.हिंमाशु पाठक, निदेशक एनआरआरआई ने 28 से 29 मार्च 2017 के दौरान बैंकाक, थाईलैंड में 'धान आधारित प्रणालियों में विविधकरण' पर आयोजित एक कार्यशाला में प्रतिभागिता की।

संस्थान सेमिनार

डॉ.एन.एन.जांभूलकर ने 19 जनवरी 2017 को 'कृषिः कृषि में नवीन अवधारणाओं के लिए ज्ञान आधारित अनुसंधान सूचना प्रणाली हब' पर आयोजित एक संगोष्ठी में व्याख्यान दिया।

डॉ.एस.जी.शर्मा, अध्यक्ष, पौध शरीरक्रियाविज्ञान प्रभान ने 4 फरवरी 2017 को सीआरयूआरआरएस, हजारीबाग में 'चावल-गुणवत्ता, पौषकतत्व एवं इसके परे' पर आयोजित संगोष्ठी में व्याख्यान दिया।

प्रोन्नति

डॉ.बी.लाल, वैज्ञानिक को सीएएस के अंतर्गत आरजीपी रु.7000 में 28 सितंबर 2014 से पदोन्नति मिली।

डॉ.आर.एल.वर्मा, वैज्ञानिक तथा डॉ.(श्रीमती) सुष्मिता मुंडा, वैज्ञानिक को सीएएस के अंतर्गत आरजीपी रु.7000 में 27 अप्रैल 2015 से पदोन्नति मिली।

श्री तडित बरल बाग्ची, वैज्ञानिक को सीएएस के अंतर्गत आरजीपी रु.7000 में 11 मई 2015 से पदोन्नति मिली।

श्री धनेश्वर मुदुली, निम्न श्रेणी लिपिक को एमएसीपी के अंतर्गत उच्चतर ग्रेड वेतन में 9 मई 2014 से पदोन्नति मिली।

सेवा में पुष्टि

डॉ.कुतुबुद्दीन अली मोला, वैज्ञानिक, श्री मनोज कुमार यादव, वैज्ञानिक तथा श्री अरविंदन एस. वैज्ञानिक की दिनांक 1 जनवरी 2016 से सेवा में पुष्टि की गई।

श्री आलोक कुमार पंडा तथा श्री अजय कुमार नाएक, तकनीशियन की दिनांक 2 दिसंबर 2015 से सेवा में पुष्टि की गई।

Transfer

Shri SK Jena, AAO transferred from NRRI, Cuttack to RRLRRS, Gerua w.e.f. 31 January 2017.

Dr. SM Prasad, Principal Scientist (Agronomy) transferred from NRRI, Cuttack to CRURRS, Hazaribag on 1 February 2017.

Shri SK Das, AAO transferred from CRURRS, Hazaribag to NRRI, Cuttack on 1 March 2017.

Dr. P Bhattacharrya, Principal Scientist (Soil Science) transferred from CRIJAF, Barrackpore, Kolkata to NRRI, Cuttack on 8 March 2017.

Dr. Rupankar Bhagawati, Sr. Scientist (Plant Pathology) transferred from ICAR Research Complex for NEH Region, Arunachal Pradesh to RRLRRS, Gerua on 10 March 2017.

स्थानांतरण

श्री एस.के.जेना, सहायक प्रशासनिक अधिकारी का एनआरआरआई, कटक से आरआरएलआरआरएस, गेरुआ में 31 जनवरी 2017 को स्थानांतरण हुआ।

डॉ.एस.एम.प्रसाद, प्रधान वैज्ञानिक (शस्यविज्ञान) का एनआरआरआई, कटक से सीआरयूआरआरएस, हजारीबाग में 1 फरवरी 2017 को स्थानांतरण हुआ।

श्री एस.के.दास, सहायक प्रशासनिक अधिकारी का सीआरयूआरआरएस, हजारीबाग से एनआरआरआई, कटक में 1 मार्च 2017 को स्थानांतरण हुआ।

डॉ.पी.भट्टाचार्या, प्रधान वैज्ञानिक (मृदाविज्ञान) का सीआरआईजेएएफ, बैराकपुर, कोलकाता से एनआरआरआई, कटक में 8 मार्च 2017 को स्थानांतरण हुआ।

डॉ.रुपांकर भगवती, वरिष्ठ वैज्ञानिक (पादप रोगविज्ञान) का आईसीएआर रिसर्च कांप्लैक्स फार एनईएच रिजन, अरूणाचल प्रदेश से आरआरएलआरआरएस, गेरुआ में 10 मार्च 2017 को स्थानांतरण हुआ।

Retirement

Shri KC Bhoi, Technical Officer retired on 31 January 2017.

Dr. RK Sarkar, Principal Scientist and Shri RP Sah, Technical Officer retired on 28 February 2017.

Shri KC Bhoi

सेवानिवृत्ति

श्री के.सी. भोई, तकनीकी अधिकारी 31 जनवरी 2017 को सेवानिवृत्त हूए।

डॉ.आर.के.सरकार, प्रधान वैज्ञानिक तथा श्री आर.पी.साह, तकनीकी अधिकारी 28 फरवरी 2017 को सेवानिवृत्त हुए।

Dr. RK Sarkar with staff

निदेशक की कलम से
From Director's Desk

Farm Mechanization in Eastern India: Key to Enhancing Productivity and Profitability

Indian agriculture has made significant progress in the last five decades. However, past some years stagnating net sown area, reduction in per capita land availability, climate change and land degradation are posing serious challenges to it. With all these challenges, India has the herculean task of ensuring food security for the most populous country by 2050 with one of the largest malnourished population. Besides, farming in future has to be multi-functional and ecologically sustainable so that it can deliver ecosystem goods and services as well as livelihoods to producers and society. Hence farming should effectively address local, national and international challenges of food, water and energy insecurity; issues related to climate change; and degradation of natural resources. Farm mechanization can play a key role in addressing these challenges for large as well as small-holder farmers.

Farm machinery and equipment provide a package of technology to (i) increase land productivity by improved timeliness of operations, reduced crop losses and improved quality of agro-produce; (ii) increase efficiency of inputs used through their efficient measurement and placement; (iii) increase labour productivity by using labour saving and drudgery reducing devices, and (iv) reduce cost of cultivation. Improved agricultural tools and equipment are estimated to contribute to the food and agricultural production in India by savings in seeds (15-20%), fertilizers (15-20%), time (20-30%), and labour (20-30%); and also by increase in cropping intensity (5-20%), and productivity (10-15%) (IASRI, New Delhi). International and national experiences have established the benefits of engineering inputs in terms of enhanced productivity by about15% and reduction in cost of production by 20%, apart from increase in cropping intensity (20%), timeliness in farm operations and drudgery reduction (Source: Thakur TC, Indian J. Fert. 8:11-126, 2012).

Presently, India is the largest manufacturer of tractors in the world accounting for about one third of the global production. India also has a big network of agricultural machinery manufacturers. However, there is wide variation among the states at the level of agricultural

पूर्वी भारत में प्रक्षेत्र मशीनीकरण:उत्पादकता एंव लाभप्रदता बढ़ाने का महत्वपूर्ण साधन

विगत पांच दशकों में भारतीय कृषि में उल्लेखनीय प्रगति हुई है। फिर भी, पिछले कुछ वर्षों में कुल बोए जाने वाले क्षेत्र में स्थिरता, प्रति व्यक्ति भूमि उपलब्धता में कमी, जलवायु में परिवर्तन एवं मृदा के स्वास्थ्य में गिरावट जैसी गंभीर चुनौतियों का सामना करना पड़ रहा है। इन सभी चुनौतियों के बावजूद, 2050 तक सबसे अधिक जनसंख्या वाले देश के लिए जहां एक बड़ी जनसंख्या कुपोषण से ग्रस्त है, खाद्य सुरक्षा सुनिश्चित करने का अत्यंत कठिन कार्य भारत को करना है। इसके अतिरिक्त, भविष्य में कृषि को बहु-कार्यात्मक और पारिस्थितिकी रूप से संपोष्य होना होगा जिससे कि यह समाज को पारिस्थितिकीय तथा वस्तु एवं सेवाएँ (ईजी एंड एस) तथा उत्पादकों को आजीविका प्रदान कर सके। इसलिए कृषि को खाद्य, जल एवं ऊर्जा असुरक्षा की स्थानीय, राष्ट्रीय एवं अंतरराष्ट्रीय चुनौतियों का जो कि जलवायु परिवर्तन एवं प्राकृतिक संसाधनों की अवनतियों से जुड़े हुए हैं, का प्रभावी ढंग से समाधन करना होगा। बड़े और छोटे भूमिवाले किसानों के लिए इन चुनौतियों के समाधन करने में प्रक्षेत्र मशीनीकरण महत्वपूर्ण भूमिका निभा सकती है।

कृषि में मशीनीकरण एवं उपकरणों को प्रयोग निम्नलिखित उद्देश्यों के लिए तकनीकों का एक पैकेज है। i) कृषि कार्यों में बेहतर समयबद्धता से भूमि उत्पादकता में वृद्धि, फसल नुकसानों में कमी तथा कृषि-उत्पाद की गुणवत्ता में वृद्धि, ii) कुशल कार्यक्षमता एवं उनके उपयोग के माध्यम से दक्षता में वृद्धि, iii) श्रम की बचत एवं कड़ी मजदूरी को कम करने वाले उपकरणों के प्रयोग द्वारा श्रम उत्पादकता में वृद्धि, iv) खेती लागत का कम होना। बेहतर कृषि औजारों एवं उपकरणों के प्रयोग द्वारा बीज (15-20%), उर्वरक (15-20%), समय (20-30%) एवं श्रम (20-30%) में बचत द्वारा तथा फसल गहनता (5-20%) एवं उत्पादकता में (10-15%) बढ़ोतरी द्वारा भारत के खाद्य और कृषि उत्पादन में महत्वपूर्ण रूप से योगदान करने का अनुमान है (आईएएसआरआई, नई दिल्ली)। राष्ट्रीय एवं अंतरराष्ट्रीय अनुभवों से यह पता चला है कि मशीनीकरण से लगभग 15 प्रतिशत उत्पादकता में वृद्धि हुई तथा लागत में लगभग 20 प्रतिशत कमी हुई और फसल गहनता में लगभग 20 प्रतिशत वृद्धि हुई, खेती संचालन कार्यों में समय मिला एवं मड़ी मजदूरी में कमी आई। (स्रोतः ठाकुर टी सी, इंडियन जर्नल ऑफ फर्टिलाइजर. 8:11-126, 2012).

वर्तमान में, भारत पूरे संसार में ट्रैक्टरों का सबसे बड़ा निर्माता है तथा वैश्विक ट्रैक्टर उत्पादन में इसका योगदान लगभग एकतिहाई है। भारत कृषि मशीन उपकरणों का भी सबसे बड़ा नेटवर्क है। किंतु, कृषि मशीनीकरण

mechanization. The highest concentration of tractors is in northern India for land preparation. After liberalization and with development of research prototypes of machines manufacturing got a big boost particularly in Haryana, Punjab, Rajasthan, Madhya Pradesh and Uttar Pradesh. Combine manufacturing is concentrated mainly in Punjab. About 700-800 combines are sold annually. Combine harvesting of wheat, paddy and soybean is well accepted by farmers.

The estimated levels of mechanization of various farm operations in India are: 40% for tillage, 30% for seeding/planting, 37% for irrigation and 48% for threshing of wheat, 5% for threshing of rest of the crops and 35% for plant protection (CIAE, Bhopal). Machinery is also important to harness available moisture at the time of tillage and sowing, hence dry land areas also experienced growth in farm machinery. Farm machines like rotavator, ferti-seed-drill, raised bed planter and laser leveler boost water use efficiency of little water/moisture that is available; thereby enhancing productivity in dry land areas. There is a strong linear relationship between power available and agricultural productivity.

Farm mechanization is low in the rice-based farming systems in eastern India. In West Bengal, Bihar Odisha and Jharkhand, the availability of farm power is 1.25, 0.80, 0.60 and 0.60 kW ha^{-1}, respectively which is less than that of the average farm power availability of India (1.5 kW ha^{-1}) and involvement of the draught animals and human muscle power as the major power sources for agriculture (http://farmech.dac.gov.in). However, it is picking up and many of the small and big farm-machineries are now in sight in eastern India. Even combine, though in small way is also being used to harvest rice crop in some parts of eastern India. An urgent need is to develop gender-friendly mechanical transplanter and weeder to reduce the drudgery of farm-women.

The population dynamics of Indian agricultural workers shows that by 2020, the population of agricultural workers in the country will be about 230 million of which 45 % will be the female workers. Women in rural India play a major role in shaping the economy of the country. In Indian agriculture, women perform four different types of roles *viz*., as a worker (a source of power), as an operator (a controller), as a manager (a farmer) and as an entrepreneur (a business person). At present, most of the Indian women carry out the role of workers only. To make them capable for other roles, it is necessary to design machines suitable to them and upgrade their skill for operating these machines. Also for the roles of manager and entrepreneur, their knowledge base will have to be suitably updated.

The small farms can be mechanized with improved manual tools and self-propelled farm equipment on individual ownership basis or high capacity farm machinery on custom hiring basis. There is a need to innovate custom service or a rental model by institutionalization for high cost farm machinery and can

के स्तर पर राज्यों में काफी विविधता है। उत्तर भारत में भूमि तैयारी के लिए ट्रैक्टरों का सर्वाधिक प्रयोग होता है। उदारीकरण के बाद एवं मशीनों के अनुसंधान प्रोटोटाइप के विकास सहित विशेष रूप से हरियाणा, पंजाब, राजस्थान, मध्य प्रदेश एवं उत्तर प्रदेश में बड़ी मात्रा में मशीनों का निर्माण होने लगा। कंबाइन मशीन निर्माण का केंद्र पंजाब बना। वार्षिक लगभग 700-800 कंबाइन मशीन बिक जाते हैं। किसान गेहूं, धान एवं सोयाबिन फसलों की कंबाइन कटाई पंसद करते हैं।

भारत में विभिन्न कृषि संचालनों के यांत्रिकरण के अनुमानित स्तर इस प्रकार हैं-जुताई के लिए 40 प्रतिशत, बुआई/रोपाई के लिए 30 प्रतिशत, सिंचाई के लिए 37 प्रतिशत तथा गेहूं के दौनी के लिए 48 प्रतिशत, अन्य फसलों के लिए 5 प्रतिशत तथा पौध सुरक्षा के लिए 35 प्रतिशत (सीआईएई, भोपाल)। जुताई एवं बुआई के समय में उपलब्ध नमी के उपयोग के लिए मशीनों का प्रयोग महत्वपूर्ण है, अतः शुष्कभूमि क्षेत्रों में भी फार्म मशीनरी की वृद्धि हुई है। फार्म मशीन जैसे रोटावेटर, फर्टी-सीड-ड्रील, उत्थित बेड प्ररोपक एवं लेजर लेवलर खेत में उपलब्ध जल/नमी के कुशल प्रयोग में बढ़ावा देते हैं जिससे शुष्कभूमि क्षेत्रों में उत्पादकता की वृद्धि होती है। उपलब्ध शक्ति तथा कृषि उत्पादकता के बीच एक मजबूत संबंध है।

पूर्वी भारत में चावल-आधारित खेती प्रणालियों में फार्म मशीनीकरण बहुत कम है। पश्चिम बंगाल, बिहार, ओडिशा एवं झारखंड में फार्म शक्ति की उपलब्धता क्रमशः 1.25, 0.80, 0.60 एवं 0.60 किलोवाट प्रति हैक्टेर है जो भारत की औसत फार्म शक्ति उपलब्धता (1.5 किलोवाट प्रति हैक्टेर) की तुलना में कम है तथा कृषि में पशुओं एवं मानव श्रम की भागीदारी प्रमुख रूप से है। (http://farmech.dac.gov.in) किंतु, अब पूर्वी भारत में छोटे एवं बड़े फार्म मशीन के प्रयोग होने लगे हैं। यहां तक कि कंबाइन मशीन लेकिन छोटे स्तर पर पूर्वी भारत के कुछ भागों में धान फसल की कटाई के लिए प्रयोग किए जा रहे हैं। महिला किसानों की कड़ी मजदूरी को कम करने के लिए उनकी सुविधानुसार यांत्रिक प्ररोपक के विकास की अत्यंत आवश्यकता है।

भारतीय कृषि श्रमिकों की जनसंख्या में गतिशीलता दर्शाती है कि 2020 तक देश में कृषि श्रमिकों की जनसंख्या लगभग 230 मिलियन तक हो जाएगी जिसमें 45 प्रतिशत महिला श्रमिक होंगे। भारत के ग्रामीण क्षेत्रो में महिलाएँ देश की अर्थव्यवस्था को आकार देने में एक महत्वपूर्ण भूमिका निभाती हैं। भारतीय कृषि में, महिलाओं की चार अलग-अलग भूमिकाएँ होती हैं जैसे एक श्रमिक के रूप में (शक्ति का स्रोत), एक संचालक के रूप में (नियंत्रक), एक प्रबंधक के रूप में (किसान) तथा एक उद्यमकर्ता के रूप में (व्यापारी)। वर्ममान में, अधिकांश भारतीय महिलाएँ केवल श्रमिकों की भूमिका निभाती हैं। उन्हें अन्य भूमिकाएँ के लिए सक्षम बनाने हेतु उनकी उपयुक्तता के लिए मशीनों की डिजाइन एवं इन मशीनों को संचालन करने के लिए उनके कौशल में सुधार करना आवश्यक हो गया है तथा एक प्रबंधक एवं उद्यमकर्ता की भूमिका के लिए उनका ज्ञान आधार भी उपयुक्त तरीके से अद्यतन होना चाहिए।

छोटे खेतों को उन्नत हस्तचालित औजारों एवं स्वचालित फार्म उपकरण द्वारा व्यक्तिगत स्तर पर या कस्टम हायरिंग के आधार पर उच्च क्षमता वाली फार्म मशीनरी से मशीनीकृत किया जा सकता है। उच्च लागत वाले खेत मशीनरी के लिए संस्थानीकरण द्वारा कस्टम सेवा या रेंटल मॉडल को नया

be adopted by private players or Governmental organizations in major production hubs.

As energy and water are becoming scarce, technology using less energy and saving water and conserving soil moisture will become popular on Indian farms in years to come. Similarly, the farm inputs particularly seed, fertilizer and agrochemical are becoming costlier day by day, the machines for precise application of these inputs will be in demand. The policy interventions required to overcome the constraints are incentives for saving of water, carbon credits for climate change mitigation, subsidy and incentive for installation of resource conserving infrastructure, trainings to farmers for skill development, public awareness generation, development of effective, low-cost, environment-friendly herbicides, accurate weather forecasting, development of post-harvest facilities and refining of technologies to make them simple, cheap and effective.

बनाने की आवश्यकता है जिससे कि इसे प्रमुख उत्पादन केंद्रों में सरकारी संगठनों या निजी कंपनियों द्वारा अपनाया जा सके।

चूंकि ऊर्जा एवं जल की कमी होती जा रही है, इसलिए आने वाले वर्षों में भारतीय खेतों में कम ऊर्जा एवं कम जल तथा मृदा नमी के संरक्षण के उपाय अधिक लोकप्रिय होंगे। इसी प्रकार, खेती के लिए निवेश विशेषकर बीज, उर्वरक एवं कृषिरसायन के मूल्यों में निरंतर वृद्धि हो रही है, इसलिए इन निवेशों के सटीक प्रयोग के लिए मशीनों की मांग में वृद्धि होगी। समस्याओं का सामता करने के लिए जल बचत, जलवायु परिवर्तन की दर को कम करने लिए कार्बन उत्सर्जन में कमी, संसाधन को संरक्षित करने वाले अवसंरचना की स्थापना हेतु सब्सिडी एवं प्रोत्साहन, कौशल विकास हेतु किसानों को प्रशिक्षण, जन जागरूकता को बढ़ावा, कम मूल्य के पर्यावरणमित्र शाकनाशियों का विकास, मौसम का सटीक पूर्वानुमान, कटाई के उपंरात प्रयुक्त होने वाली सुविधाओं का विकास एवं उनकी तकनीकी को सरल, सस्ता और प्रभावी बनाने के लिए उनमें लगातार परिष्कार जैसी नीतियों की आवश्यकता है।

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