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IARI News

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RESEARCH

Inauguration of an Eco-friendly Sewage Water Treatment Plant

Hon'ble Union Minister for Agriculture, Govt. of India, Shri Radha Mohan Singh, and Hon'ble Minister of State for Agriculture & Food Processing Industries, Govt. of India, Dr. Sanjeev Kumar Balyan inaugurated an Innovative Eco-friendly Sewage Water Treatment Plant developed at the Indian Agricultural Research Institute on July 2, 2014.

Note worthy feature of this technology is that it requires just 1% energy and zero-chemicals and thus the environmental stress due to this wastewater treatment technology is 33 times lower than that of a conventional sewage treatment technology. Further it is associated with 50-65% reduced treatment cost and has no skilled manpower requirement.

The facility, spread over 1.42 hectares, is daily capable of treating 2.2 million liters of sewage discharged from the Krishi Kunj Colony adjoining IARI's campus and has a potential to irrigate 132 hectares of IARI farmland. The conjunctive use of treated water with the existing ground water source shall not only build water-levels in the receding ground water aquifers of the IARI but also help improve soil quality and agricultural productivity of the IARI farmlands.

Hon'ble Union Minister for Agriculture, Govt. of India, Shri Radha Mohan Singh, and Hon'ble Minister of State for Agriculture & Food Processing Industries, Govt. of India, Dr. Sanjeev Kumar Balyan inaugurating an Innovative Eco-friendly Sewage Water Treatment Plant

Durum Wheat Variety Identified

A *Durum* wheat variety, HI 8737 was identified for irrigated, timely sown conditions of Central Zone comprising of the states of Madhya Pradesh, Chhattisgarh, Gujarat, Rajasthan (Kota and Udaipur divisions) and Uttar Pradesh (Bundelkhand region) at All India Wheat and Barley Research Workers' Meet held at JNKVV, Jabalpur. It gave an average grain yield of 5.34 t/ha with a potential yield of > 6.7 t/ha, and is rich in β-carotene and essential micronutrients like iron and zinc. It showed resistance to stem and leaf rusts.

A field view and grains of *durum* wheat variety HI 8737

Cabbage Hybrid Identified

Cabbage F1 hybrid KTCBH 81, developed by the IARI Regional Station, Katrain, was identified for release during the XXXI Group Meeting of the AICRP (VC) held at Palampur (H.P.) for zone-I. It has

Cabbage hybrid KTCBH 81

dark green, 12-14 non-wrapping waxy leaves, 22-25 cm plant height and its head is very compact and round in shape. It matures in 60-65 days after transplanting and has very good field staying capacity (25-30 days) after head formation. It has an average yield of 43.5 t/ha.

Development of a Strategy to Produce Cellulases from *Bacillus subtilis*

A strain of *Bacillus subtilis* IARI-SP-1, isolated from soil long term irrigated with effluents of paper and pulp mill, showed high β-1, 4-endoglucanase (2.5 IU/ml) activity. A full length gene of β-1, 4-endonuclease consisting of 1499 nucleotides was amplified and identified through sequence analysis of the amplified product. The ORF encoded for a protein of 500 amino acids with a predicted molecular weight of 55 kDa. The gene was cloned in pET-28a and over expressed in *Escherichia coli* BL21 (DE3). In comparison to wild strain (*B. subtilis*), the transformed *E. coli* exhibited four times increase in cellulase production. Higher enzyme activity was observed in supernatant (8.2 IU/ml) than cell pellet (2.8 IU/ml) suggesting more extracellular production of β-1, 4-endoglucanase. This is being currently exploited for the over-production of cellulase by harvesting it on larger scale and using it as cellulase preparations for hydrolysis of lignocellulosic biomass.

Extruded Snacks from Amaranth, Buckwheat and Barnyard Millet

The Institute developed low calorie and low fat extruded snacks based on Amaranth, buckwheat and barnyard millet. Buckwheat and Amaranth are rich source of proteins with higher lysine content (7.89 ± 0.68 mg/g and 7.79 ± 0.21 mg/g). Extrusion process increased amaranth's phenols and antioxidant activity seven times (396.44 mg/100 g and 23.29 µmol trolox/g, respectively). The manufacture of these products can increase the market demand for these pseudocereals and millets, and shall provide remuneration especially to hilly region farmers where buckwheat is grown in abundance as mid-season crop.

Amaranth-Barnyard Millet Shots

Development of Haploids in *Brassica* Vegetables through Microspore Culture

The Institute's regional station at Katrain regenerated haploid plants of different *Brassica* vegetables like cabbage, cauliflower and brussels sprouts through isolated microspore culture. The protocol for successful microspore culture has been optimized for these crops. This technique will be very useful in rapid development of homozygous inbred lines in highly cross-pollinated crops like cabbage and cauliflower for their use in hybrid breeding. Besides, doubled haploid (DHs) population will be instrumental in development of mapping population for different complex traits and genetic studies in cabbage and cauliflower.

Diagnostic Chip for Plant Viruses and Viroids

The Institute designed a custom made diagnostic chip for all the known plant viruses and viroids for which sequences are available in the database. There are 1572 probe sets for detection of viruses and viroids making a total of 17292 unique probes on chip. Both DNA and RNA viruses can be detected using the same chip. The

Nutrient label forAmaranth-Barnyard Millet Shots and Buckwheat-Amaranth Puffs

Nutrient label	Amaranth-Barnyard Millet Shots			Buckwheat-Amaranth Puffs		
	per 100 g	per serving	% RDA	per 100 g	per serving	% RDA
Calories	365.78	103.7	5.18	334.98	94.97	4.75
Fat (%)	6.5	1.84	2.84	7.00	1.98	3.05
Protein (%)	12.60	3.57	7.14	12.15	3.44	6.89
Calcium (mg)	26.56	2.20	0.22	26.56	7.53	0.75
Iron (mg)	0.29	0.10	0.56	0.29	0.08	0.45

chip can detect many viruses and viroids in crops like chilli, grapevine, tomato, soybean, sugarcane, etc.

Brown Manuring Technology for Weed Management in Maize

Sesbania can be grown with maize and knocked down by 2,4-D, a selective herbicide for maize but, maize unlike rice is a non-tillering crop, any reduction in its population due to initial suppression/competition by *Sesbania* plants would affect maize yield. Brown manuring technique, therefore, needs to be optimized in maize. In a two-year study, a combination of 15 kg *Sesbania* seed and killing *Sesbania* plants at 25 DAS by spraying 2,4-D at 0.50 kg/ha has been optimized, which is better control of broad-leaved and grassy weeds, and would result higher maize yield.

Colour Shade Nets for Improving the Quality of Cut Greens

Two plant species, viz., *Cordyline terminalis* and *Dracaena fragrans* were grown under different coloured shade nets of red, green, black and white of 50% shading intensity, besides outdoor as control to study the effect of coloured netting on different environmental and vegetative parameters. Plants under red and white produced taller plants compared to those of green, black and open. Photosynthetically active radiation (PAR) ranged from 482.60-572.90 µmol/m^2/s in green, 197.62-217.20 µmol/m^2/s in black, 516.90-580.90 µmol/m^2/s in red, 480.80-584.20 µmol/m^2/s in white while in control it ranged from 1233.90-1452.30 µmol/m^2/s. The transmittance was observed to be maximum in red coloured net followed by green and white while, it was minimum under black net. Highest air temperatures were recorded under red and white, while black nets were consistently cooler whereas relative humidity (RH) showed a reverse trend. Plants grown under red and white nets were taller compared to those under green, black and outdoor environment. In general, red coloured shade nets enhanced the overall vegetative vigour (stem length, width and leaf size). Black net reduced the plant vigour relative to others. Coloured netting did not affect the vase and shelf life of cut greens.

Different coloured shade nets, viz., green, black, white and red

EDUCATION

Special Convocation

The Special Convocation of the P.G. School of IARI was held on September 8, 2014 to confer the degree of Doctor of Science (*Honoris Causa*) on Dr. Jose Graziano da Silva, Director-General, Food and Agriculture Organization (FAO) of the United Nations for his tangible contributions in the area of food security, rural development, agriculture, and Zero Hunger Programme. Dr. S. Ayyappan, Secretary, DARE and Director-General, ICAR welcomed the chief guest, dignitaries and participants of the event. He made an illustrative presentation highlighting recent achievements and future research, education and extension thrusts of the ICAR. Prof. M.S. Swaminathan, Emeritus Chairman & Chief Mentor, MSSRF and Dr. R.B. Singh, former President, NAAS addressed the august gathering present on this great occasion. Dr. K. Vijayaragavan, Acting Director, IARI presented the report of the Director. Dr. R.K. Jain, Dean & Joint Director (Education), IARI read out the citation indicating outstanding contributions of Dr. Graziano in the field of food security, agriculture and rural development. Fourteen IARI varieties of different crops and a book entitled 'Climate Resilient Dryland Farming and Watershed Management' were released by the chief guest.

Dr. Graziano delivered the convocation address. Dr. Graziano complimented ICAR, IARI and the Government of India for according top priority to sustainable development in which the approach of more crop per drop is the foremost one, as water is the critical and limiting resource for agriculture. He emphasized that, simply producing more food is not enough, we need to increase production, sustainably, and ensure access to all. Dr. Graziano was also honored with prestigious Fellowship of the National

Prof. M.S. Swaminathan, Emeritus Chairman & Chief Mentor, MSSRF awarding D.Sc. *(Honoris Causa)* degree to Dr. Jose Graziano da Silva, DG, FAO

Academy of Agricultural Sciences (NAAS) which is regarded as think tank of the India on agriculture and related issues. While conferring Fellowship, Dr. R.B. Singh, former President, NAAS highlighted the central role of Dr. Graziano in implementation of Zero Hunger Programme in Brazil which realized unprecedented results. The convocation was followed by an interactive session, where in scientists from NARS system participated. Shri Arvind R. Kaushal, Additional Secretary, DARE and Secretary, ICAR proposed the vote of thanks.

Admissions during Academic Session 2014-15

During the academic year 2014-15, 124 students were admitted to M.Sc., 8 to M.Tech. and 181 to Ph.D. courses which includes 13 international students. For the first time, the courses in the disciplines of Horticulture and Agricultural Engineering have been started in collaboration with Indian Institute of Horticultural Research (IIHR), Bengaluru and Central Institute of Agricultural Engineering (CIAE), Bhopal, respectively.

Teachers' Day Lecture 2014

The P.G. School, IARI and the Genetics Club jointly organized the Teachers' Day Lecture on September 5, 2014 at the Dr. B.P. Pal Auditorium of the Institute. The dignitaries paid tributes to Dr. S. Radhakrishnan, the great philosopher, philanthropist and ex-President of India. Dr. R.K. Jain, Dean and Joint Director (Education), IARI delivered the welcome address and highlighted the significance of the Teachers' Day and the lecture series. Dr. S.A. Patil, former Chairman, Karnataka Krishi Mission and former Director, IARI delivered the Teachers' Day Lecture on 'Role of Teachers in Achieving and Improving the IARI Mandates'. Dr. H.S. Gupta, Director General, Borlaug Institute for South Asia and former Director, IARI chaired the function, which was attended by the staff and students of IARI.

Teaching Programme for M.Sc. Students of ANASTU

The Institute successfully organized a five months modular M.Sc. (Agronomy) course for 21 M.Sc. students of Afghanistan National Agricultural Sciences and Technology University (ANASTU), Kandhar, Afghanistan from March 3 to August 2, 2014. This course was sponsored by the Ministry of External Affairs, Government of India. Dr. R.K. Jain, Dean and Joint Director (Education), IARI was the Course Director and Dr. K.S. Rana, Professor & Acting Head, Division of Agronomy, IARI was the Course Coordinator. Seven courses, namely, Principles of Crop Production; Agronomy of Vegetables and Fruit Crops; Protected Cultivation and Precision Farming; Agronomy of Fodder and Pasture Crops; Dryland Farming, Watershed Management, Climate Change and its Effect on Agriculture; Basic Agricultural Statistics and Designs; and Basic English Literature & Grammar were taught. Most of these modular courses covered both theory and practical classes. This teaching programme was a mega success and very useful for human resource and capacity building for ANASTU. The valedictory function was held on August 2, 2014. Shri Arvind R. Kaushal, Additional Secretary, DARE & Secretary, ICAR was the chief guest. Shri Sanjiv Ranjan, Joint Secretary, Ministry of External Affairs, Government of India also graced the occasion. On this occasion, two publications, namely, 'Advances in Vegetable Agronomy' and 'Agronomy of Horticultural Crops' were released.

Meetings of Institute Research Council

The Institute Research Council–II meetings for the schools of Natural Resource Management, Basic Sciences, Social Sciences, Horticultural Sciences, Crop Improvement and Crop Protection were held from July 24 to September 15, 2014 under the chairmanship of Dr. K. Vijayaragavan, Acting Director, IARI and co-chairmanship of Dr. K.V. Prabhu, Joint Director (Research). In the IRC-II meetings, presentations were made school-wise where-in the heads of divisions presented the overall progress of the research/ teaching/ extension activities of their respective divisions during the year. A presentation of the major thrust areas of the research for XII plan and new in-house research project proposals for the period 2014-19 was also made. Dr. Prabhu emphasized that there is still a need to prioritize and reorient some of the research programmes of the Institute to meet the research targets set for XII Plan. Dr. Vijayaragavan stated that major thrust be given to undertake high quality research in frontier and challenging areas of national importance.

A view of Institute Research Council –II meeting held in the School of Basic Sciences chaired by Director, IARI

EXTENSION

Participation in Exhibitions

The Institute put up an exhibition of IARI technologies and products in the 10th International Agricultural and Horticultural Expo, 2014 organized by NNS Media Group from July 25 to 27, 2014 at Pragati Maidan, New Delhi. IARI stall was awarded with first prize for excellent achievement and best display of technologies/ products.

IARI also arranged an exclusive display arena to exhibit IARI technologies during "Special Convocation" at NASC Complex, New Delhi.

Field Days

The Institute's regional station at Karnal organized a field day on September 23, 2014 at Brass village of Karnal district under the Farmers Participatory Seed Production Programme. Dr. KV Prabhu, Joint Director (Research) visited the field and complimented the efforts of the seed growing farmer Shri Gurcharan Singh and addressed the farmers on this occasion.

A field view of Farmers' Participatory Seed Production Programme

The *Krishi Vigyan Kendra*, Shikohpur also organized a field day on "Rainy Season Vegetables" at Chnadu Budhera village of Gurgaon district on July 28, 2014 in which 28 farmers and 8 farm women participated.

Farmer's Mall Inaugurated

A farmers' Mall was inaugurated by the Hon'ble Member of Parliament, Shri Yogi Adityanath Ji on July 16, 2014 at IARI to facilitate farmers' towards value addition to their farm produce and selling them directly to consumers. The Mall consists of five rooms, where farmers will be able to bring their produce for sale. At the time of inauguration about ten groups of farmers from Delhi, Uttar Pradesh, Haryana and Rajasthan displayed and sold their products.

CAPACITY BUILDING

Trainings

The Institute's Krishi Vigyan Kendra at Shikohpur organized seven vocational training courses

on: "Establishment of Hi-density Fruit Orchards" from July 9 to 16, 2014 and August 2 to 8, 2014 in Kumbhawas and Makdaula villages, respectively, (45 rural youth from Gurgaon district participated); "Establishment of Nutri-farm" from July 28 to August 5, 2014 in Kumbhawas village (20 farm women from Gurgaon district participated); "Protective Cultivation of Vegetable Crops" from August 26 to September 2, 2014 in Daboda village (15 rural youth from Gurgaon district participated); "Plant Protection and Pest Control Services" from August 5 to 14, 2014 at Ikbalpur village of Gurgaon district (20 rural youth participated); "Dairy Farming" from September 5 to 15, 2014 at KVK campus (44 rural youth participated); "Value Addition in Soybean and Pearl Millet" from September 15 to 20, 2014 at Teekli village of Gurgaon district (25 rural women participated); and "Bee Keeping" from September 15 to 24, 2014 at KVK campus (13 rural youth from Gurgaon district participated). The Krishi Vigyan Kendra, Shikohpur also organized an in-service training programme on "Formulation of Low Cost Recipes for Pre-school Children" on September 5, 2014 at Manesar for 21 Anganwari workers of Gurgaon district.

Training on "Establishment of Nutri-farm"

Two trainings on "Skill Development and Exposure Visit of Farmers, Entrepreneurs and Officials" were organized from August 4 to 13 and September 1 to 10, 2014 in which 25 and 20 progressive farmers participated, respectively.

A training programme on "Futuristic Agricultural Extension Approaches and Tools" was organized from September 3 to 23, 2014 at the Division of Agricultural Extension. A total of 25 participants representing state agricultural universities, ICAR institutes and krishi vigyan kendras from 11 states participated in the programme.

The Institute organized a training programme on "Innovations and Agribusiness for Inclusive Agricultural Growth" at the Division of Agricultural Economics from September 9 to 29, 2014. Twenty one participants from ICAR institutes, SAUs and other social sciences institutions attended the programme.

A training programme was organized on "Life Skills and Leadership Development" from September 16 to 20, 2014 for Post Graduate students of IARI. A total of 25 students from different disciplines of IARI participated in the training programme.

The Institute organized two training programmes on "Enhancing Motivation for High Job Performance" for technical officers of IARI from September 22 to 24 and September 25 to 27, 2014. A total of 46 technical officers of IARI participated in the training programmes.

The Institute's regional station at Karnal organised a two-day training-cum-exposure visit on "Maintenance Breeding" from September 26 to 27, 2014 at the Division of Agricultural Extension. A total of 23 participants from 15 states received certificates from the chief guest on successful completion of the training. The Station also organised a training on "Rice Variety Identification" on September 30, 2014, which was attended by senior scientists, exporters and progressive farmers.

MISCELLANEOUS

New Externally Funded Projects Sanctioned

- "Refinement of nursery techniques and capacity building of orchardist in Himachal Pradesh" funded by HPSCST&E. Principal Investigator: Dr. K.K. Pramanick, IARI Regional Station, Shimla.
- "Understanding pasteuria spore attachment for exploitation as a natural control agent of root-knot and cyst nematode crop pests" funded by DST, UKIERI. Principal Investigator: Dr. Sharad Mohan, Division of Nematology.
- "Development of DUS testing guidelines for radish and carrot" funded by PPV&FRA. Principal Investigator: Dr. Amish K. Sureja, Division of Vegetable Science.
- "Improvement of aroma in the high yielding *basmati* rice varieties using conventional and marker assisted selection" funded by AIREA, APEDA. Principal Investigator: Dr. A.K. Singh, Division of Genetics.
- "Genome-wide mining of novel genes/alleles for salinity

tolerance from halophilic archaebacteria" funded by DBT. Principal Investigator: Dr. Rajeev Kaushik, Division of Microbiology.

- "Biotechnology-led socio-economic empowerment of farm women" funded by DBT. Principal Investigator: Dr. J.P.S. Dabas, CATAT.
- "Unraveling the role of different *Fusarium* spp. associated with complex etiology of bakanae disease of rice" funded by DST. Principal Investigator: Dr. (Ms.) Bishnu Maya Bashyal, Division of Plant Pathology.
- "Catalogueing of phytoplasma disease of major crops of North East Region of India and molecular characterization" funded by DST. Principal Investigator: Dr. G.P. Rao, Division of Plant Pathology.

Patents Renewed

- Process for the preparation of mosquito larvicidal formulations based on *Rabdosia melissoindes* ingredients
- A multi/ hyper-spectral data analyzing process for complete quantification, characterization and compression of natural resource specific information
- Polymeric seed coats based on bioactive botanicals.

Patent Filed

- Rapid detection of *Large cardamom chirke* virus
- Insecticidal formulation of novel strain of *Bacillus thuringiensis* AK47.

Contract/ Consultancy Services

- Novozymes South Asia Pvt. Ltd., Bangalore on Agronomic studies of phosphate solubilizing fungi (PSF) based product jumpstart in paddy
- M/s Bayer Crop Science, Mumbai, to generate multilocation supervised field trial on residue and persistence study of metribuzin 70% WPC (Sencor 70 WP) in sugarcane
- M/s R.G. Industries, New Delhi, to generate multilocation supervised field trial data of Orchol-13 on apple crop and soil.

Technologies Commercialized

- Wheat variety HD 3086 licensed to 108 seed companies from Punjab, Haryana, U.P. and New Delhi, the largest number so far w.r.t. any technology of IARI/ICAR
- Pusa Mustard 30 licensed to Ananya Seeds Pvt. Ltd., 832-26th Main Sector-1, HSR Layout, Bangalore (Karnataka)-560102 and Arpan Seeds, Rajasthan
- Nanonutrient (Zn) technologies developed by CAZRI were licensed by ZTM & BPD unit of IARI to Sowbhagya Biotech Plot No. 79, Phase - II, IDA, Cherlapally Hyderabad - 500 051, Andhra Pradesh
- STFR Meter Technology developed by IARI was licensed to Plasti Surge Industries Pvt. Ltd., A-70, M.I.D.C., Amravati (M.S.)-444607 (India) and Nagarjuna Agro Chemicals Pvt. Ltd., G 01, Street No. 6, Uma Nagar, Begumpet, Hyderabad-500016
- VAM Technogy licensed to Patanajli Bio Research Institute (PBRI) Haridwar, Uttarakhand and Sowbhagya Biotech, Plot No. 79, Phase - II, IDA, Cherlapally, Hyderabad - 500051, Andhra Pradesh
- Hybrids of Cauliflower, Pusa Kartik Sankar and Pusa Hybrid 2 were licensed to Ananya Seeds Pvt. Ltd., 832-26th Main Sector-1, HSR Layout, Bangalore (Karnataka)-560102
- Variety of Cucumber, Pusa Barkha was licensed to Ananya Seeds Pvt. Ltd., 832-26th Main Sector-1, HSR Layout, Bangalore (Karnataka)-560102.

Agribusiness Incubation Activities

ZTM & BPD Unit, IARI, is providing Incubation facility to nine (9) start-up companies after thorough scrutinization. Five (5) of them, namely, Jai Biotech, KAD Bioresources, Ananya Seeds, Nature's Lap, and Society for Farmer Development were selected through Ministry of Micro, Small and Medium Enterprises (MSME). Other than MSME, the companies enrolled for Incubation in ZTM & BPD Unit are: AEGIS Agrochemical, Arpan Seed Pvt. Ltd., Urban Farmers Pvt. Ltd., and Unison Agrico.

MoA signing ceremony with industry partners at Virology Auditorium

Corporate Membership

In this quarter, 11 new members have registered and 4 members renewed their registration.

Hindi Chetna Maas, 2014

The Institute celebrated *Hindi Chetna Maas* from September 1 to 30, 2014. Dr. K.V. Prabhu, Joint Director (Research) inaugurated *Hindi Chetna Maas* on September 2, 2014. During the *Maas* various Hindi competitions like poetry recitation, essay writing, noting and drafting, debate and quiz, etc. were organized for all categories of the staff members. A large number of scientific, technical and administrative officials participated in the competitions.

This year many divisions/ establishment of the institute, viz, Nematology, Agricultural Extension, Library Services, Plant Physiology and Seed Science and Technology organized *Hindi Pakhwada/Hindi Divas/Hindi Week* in their respective divisions/establishment. IARI regional stations at Karnal, Katrain and Pusa (Bihar) also organized *Hindi Pakhwada* during this period and different activities were organized to promote the use of Hindi.

Dr. K.V. Prabhu, Joint Director (Research) lighting the lamp at the inauguration of *Hindi Chetna Maas*

Dr. H.S. Gupta, Director, IARI inaugurating the B.P. Pal Art Gallery

B.P. Pal Art Gallery Inaugurated

Dr. H.S. Gupta, Director, IARI inaugurated the B.P. Pal Art Gallery on July 30, 2014 at the Central Library Building of IARI. The Gallery displays the precious painting of renowned artists including B.P. Pal, Kanwal Krishan, Devyani, E.H. Brabester and B. Sen.

Awards/Honours

Dr Pratibha Sharma, Professor, Division of Plant Pathology received the Crystal National Agri Award 2014 for enriching agricultural practices and outstanding contribution to agriculture research from Krishi Anusandhan and Kisan Vikas Foundation, Delhi.

Dr. (Ms.) Ananta Vashisth, Senior Scientist, Division of Agricultural Physics, IARI received 2013 most influential Bioelectromagnetics Journal Paper Citation Award from Bioelectromagnetics-Society of USA.

Visitors from Abroad

During the period July-September 2014, five delegations – one each from Tanzania, Nepal, Japan, Afghanistan and Surinam visited the Institute. Others who visited the Institute include Dr. Ronnie Green, Vice-chancellor, University of Nebraska-Lincoln Institute of Agriculture and Natural Resources, USA; Dr. Dath Mita, Senior Crop Analyst, International Production Assessment Division, USDA; Dr. Narendra N. Das, Research Scientist, Jet Propulsion Lab (NASA), California, USA; Dr. Aliazam Khosravi, Research Counselor of Embassy of Islamic Republic of Iran; and Dr. Masa from Japan.

Dr. Ronnie Green, Vice-chancellor, University of Nebraska-Lincoln Institute of Agriculture and Natural Resources, USA (fourth from left) with IARI team

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