Leadership additions

ICRISAT welcomes Mr Sanjay Agarwal as its new Board member

Mr Sanjay Agarwal, Secretary, Department of Agriculture, Cooperation and Farmer’s Welfare, Government of India, who took on the mantle from Dr SK Pattanayak, is the current ex-officio member of the ICRISAT Governing Board.

At a brief meeting in Delhi, Mr Agarwal assured his total support to ICRISAT and appreciated its research activities. ICRISAT’s leadership comprising of Drs Peter Carberry, Director General (Acting) and Arabinda Padhee, Director, Country Relations and Business Affairs, welcomed him and reiterated their commitment to agricultural research in Asia and sub-Saharan Africa.

At the recently-concluded ICRISAT Board meeting, Dr Pattanayak was given a warm farewell on his retirement and was lauded for being instrumental in 2018 being designated as the ‘National Year of Millets’.

ICRISAT’s leadership acknowledged his immense contribution, calling him an ‘incredible supporter’ and a great friend of ICRISAT.

Dr David Bergvinson steps down as DG; Dr Peter Carberry to be DG for an interim period

This is to announce that Dr David Bergvinson stepped down as Director General of the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), effective 24 October 2018.

Since joining ICRISAT in January 2015, Dr Bergvinson has played a critical role in giving a new direction to ICRISAT’s work in Asia and sub-Saharan Africa, leading a demand-driven innovation agenda for the drylands for over three years. ICRISAT wishes Dr Bergvinson success in his future endeavors.

Dr Bergvinson extended his thanks to the talented ICRISAT staff and partners, and the support of donors and governments for the privilege of working with them to make a difference in the lives of millions of smallholder farm families in the drylands of Asia and Africa.

Dr Peter Carberry has been appointed to the Director General position for an interim period of 12 months effective 24 October 2018, while the recruitment of a new DG is undertaken. The Board recorded its appreciation and thanked Dr Carberry for his exemplary leadership in steering ICRISAT during the recent past.
Farmers across Karnataka in India will now be able to combat crop diseases with the touch of a screen. Plantix, an Android smartphone app that can detect pests, diseases and also identify nutrient deficiencies, was launched in the local language Kannada.

Speaking at its launch in Bengaluru, India, Karnataka’s Agriculture Minister Mr NH Shivashankar Reddy said, “Plantix can be a game-changer for agriculture, even in remote corners of the state. It is heartening to see the use of smartphone technology to benefit farmers.”

Plantix, developed by German startup Progressive Environmental and Agricultural Technologies (PEAT), uses deep learning to detect more than 300 diseases, from images of crops uploaded by farmers. Besides diagnosis, the automatic image recognition app geo-tags uploaded images to monitor crop health across regions. Large-scale data is made available to users through maps. Detection is followed by detailed and easy-to-understand diagnostic suggestions. ICRISAT has been working with technology solution providers such as PEAT for profitable and sustainable farming across the value chain, specifically for smallholder farmers.

“Plantix is one great example of harnessing the power of the digital agriculture revolution,” he said.

“We are honored that the Government of Karnataka officially launched Plantix. We believe that it is the absolute promise when governments, CGIAR institutions and startups join forces to work together. That is the synergy that can give farmers the support they deserve,” said Ms Simone Strey, CEO, PEAT.

Underlining the importance of the app, Dr Sreenath Dixit, Principal Scientist and Theme Leader at ICRISAT Development Center, said the app would empower smallholder farmers of Karnataka. “Plantix can enable farmers in identifying and managing crop pests and diseases through advisories and weather-related information. An integrated community-level interaction feature in the app will further help us support them better,” he added.

Plantix has grossed 3.8 million downloads and has been rolled out in over 10 languages. The Kannada language version of the app can be downloaded from Google Play.
Global scientists join forces to battle Fall Armyworm in India

India’s first FAW live tracking tool and farmer advisories to assist in risk mitigation of smallholder farmers

Over 30 scientists from global agricultural research institutes have joined forces to combat the spread of Fall Armyworm (FAW) in India. Equipped with a real-time tracking tool, they are set to take on the highly invasive pest with an early warning system for farmers and policymakers alike.

The Farmer app Plantix Pest Tracker, receives 20,000 images every day from across India, and the data is used to derive insights by tethering all coordinates to a 10 km radius. Scientific staff from the Progressive Environmental and Agricultural Technologies (PEAT), Centre for Agriculture and Bioscience International (CABI), and ICRISAT, are leading the efforts with support from State governments and other research partner institutions.

With confirmed attacks on Maize, Sorghum, Pearl millet, Finger millet, Little millet and Foxtail millet in Telangana, Andhra Pradesh, Karnataka, Maharashtra, Odisha, Gujarat, West Bengal and Tamil Nadu, since July 2018 the FAW is fast emerging as a major threat to food security and livelihoods of millions of smallholder farmers in India. Native to Eastern and Central North America, and South America, it was spotted on the African continent two years ago. Highly destructive of more than 80 plant species it has since cost billions of dollars in crop losses. Along with partners, ICRISAT has been actively involved in global efforts to combat this pest with digital technology the latest addition to this.

“We were able to identify thousands of incidents with a high likelihood - just within the past month. Through our database, we are able to generate an early warning system for farmers who might be at risk. Based on this, we already sent push notifications to nearly 50,000 of our users through our Plantix app,” says Simone Strey, Chief Executive Officer (CEO) of PEAT.

Both Crop Protection and Digital Agriculture teams have been receiving proactive support from Government of Andhra Pradesh with continuous participation from scientists, experts, and the extension workers of the Department of Agriculture in documenting FAW cases via the Plantix app. Furthermore, the shared project between CABI and PEAT in Tamil Nadu also focuses on the occurrence of FAW.

“It is very valuable to have a live tracking system that is freely available for all stakeholders, especially to Governments who coordinate the response to new invasions. This is a logical next step of our ongoing cooperation,” says Roger Day, Program Executive, Action on Invasives, CABI.

“Real-time tracking of the pest is crucial to the fight as infestation levels may increase. We are, therefore conducting further studies on the pest’s biology and their diets under lab conditions at ICRISAT,” says Dr Kiran Sharma, Deputy Director General-General Research ICRISAT.

For management of the pest ICRISAT scientists have suggested use of bio-control agents like Entomopathogenic fungi — *Beauveria bassiana*, *Nomuraea releyi*, *Metarhizium anisopliae* during early stages of the crop. Insecticide recommendations include application of Dimethoate 30% EC (2ml/lit of water) and, Chlorpyrifos 50% +Cypermethrin 5% EC (2ml/lit). If the incidence is high, then Emamectin Benzoate 5 % SG 0.4g/lit or spinosad 45 SC 0.4ml/lit or Chlorantraniliprole 9.3% + Lambda Cyhalothrin 4.6% ZC (Ampligo) @ 0.4ml/liter of water or Flubendiamide @0.3ml/lit needs to be applied.

This work contributes to UN Sustainable Development Goals
Trainings and Workshops

Training on digital seed roadmap use enables delivery of quality seeds to smallholder farmers

Timely access to quality seeds by smallholder farmers is a major enabler for agriculture in sub-Saharan Africa and Asia. Farmers with the appropriate variety of seeds and related packages can reap substantial rewards in terms of improving food security and reducing poverty. Seed roadmaps play a crucial role in enabling national governments, small seed producers, and the private sector in planning, producing, tracking and delivering quality seeds to smallholder farmers.

Read more

Future forward

Drones fly in to change the way we work in research fields

Data collection in agriculture research fields is all set to become cheaper, rapid and more precise with the foray of drones. Worldwide, agri-researchers are increasingly opting for modern tools to speed up efforts to feed a growing planet and meet the Global Goal of ‘No hunger’ by 2030.

The future of drones in agriculture is a subject undergoing intense study. In line with it a working group formed by the CGIAR Platform for Big Data in Agriculture gathered in Zanzibar, Tanzania, for a brainstorming session cum hands-on workshop on how to use drones for breeding and other crop data collection applications.

The working group discussed use cases to help real-time monitoring of crop health and farming operations, spraying or dusting pesticide, fertilizer application, crop monitoring, recording of morphological traits such as plant height and flowering, etc. Ideas discussed included crop surveys ranging from weekly/daily to hourly based on research needs and how the information can be used to prepare a time-series animation i.e. imagery that can show changes in the crop, revealing trouble spots or opportunities for better crop management.

The hands-on exercises were on two different kinds of drones, namely fixed wings (senseFly - eBee) and quadcopter (DJI- Phantom). eBee has the ability to cover a long flight path and give an overall view of the field in a very short time, whereas DJI-Phantom can fly low and give greater crop details.

The CGIAR Big Data Platform and Excellence in Breeding Platforms are continuously working to bring direct application and use case of drones to agricultural research fields and ICRISAT is actively engaged and coordinating with these platforms. At the meet, Dr Abhishek Rathore, Theme Leader – Statistics, Bio-Informatics & Data Management, ICRISAT, emphasized the need for a smart data ecosystem for drones, which can store, clean, analyze and feed data to the breeding data management system through application program interfaces. Most institutions agreed and are also planning to bring such systems and platforms into routine use.

The event held in September was assisted by WeRobotics and Tanzania Flying Lab. Several experts and participants from various CGIAR institutes, agriculture research institutes and universities attended.

Dr Abhishek Rathore tries his hand at flying a drone at the workshop in Zanzibar, Tanzania.

Theme Leader – Statistics, Bio-Informatics & Data Management, ICRISAT, emphasized the need for a smart data ecosystem for drones, which can store, clean, analyze and feed data to the breeding data management system through application program interfaces. Most institutions agreed and are also planning to bring such systems and platforms into routine use.

The event held in September was assisted by WeRobotics and Tanzania Flying Lab. Several experts and participants from various CGIAR institutes, agriculture research institutes and universities attended.

This work contributes to UN Sustainable Development Goals
Collaborative knowledge sharing for data scientists

**CGIAR-wide skill development program on bioinformatics and biometrics**

Bioinformatics, biometrics and data science practitioners from several CGIAR centers converged on a multi-institutional workshop to update themselves on the latest trends. These skill upgrades would help scientists to communicate their research data clearly and effectively to their target audience.

The goal of the workshop ‘Annual Collaborative Workshop for Bioinformatics & Biometrics Community of Practice (CoP) under Excellence in Breeding (EiB) Platform-Module 5’ was to bring colleagues from across the CGIAR research centers closer to recent developments in technology through skill development.

Genomic selection (GS) and genomic prediction (GP), and web application development using R Shiny were the two integral components of the workshop. Professor Jean-Luc Jannink and Dr Marnin Wolfe from Cornell University were resource persons for GS and Mr Omar E Benites and Mr Ivan Perez from the International Potato Centre for R Shiny.

Over a period of six days – divided into two sessions of three days each – the participants picked up the latest technology updates in the above topics, discussed use cases of GS/GP with real-time test data, learned various strategies and statistical models for the GS including review of field trial data and its analysis, and gained hands-on experience in developing and hosting dashboards using Shiny, among other activities.

The workshop, held during 23-29 September 2018 in Amsterdam, The Netherlands, was organized by Dr Abhishek Rathore, EiB Module 5- Bioinformatics & Biometrics CoP Coordinator & Theme Leader, Statistics, Bioinformatics and Data Management, ICRISAT. The workshop was funded by EiB Module 5 and has support from EiB-Module 5 Leader, Dr Kelly R Robbins. Twelve representatives from the Africa Rice Center, International Potato Center, International Institute of Tropical Agriculture, International Livestock Research Institute and International Rice Research Institute participated in this workshop.
Media release

Committed to alleviating malnutrition, India declares minimum levels for iron and zinc in pearl millet

The Indian Council of Agricultural Research (ICAR) has established minimum levels of iron and zinc in pearl millet to be bred into national varieties. The news comes during the National Year of Millets and as the Government of India articulates its vision for a Kuposhan Mukt Bharat (Malnutrition – Free India) by 2022. In India, 59% of children under five and 54% of pregnant women are anemic, while 38% of children in the same age group are stunted. Diets deficient in iron and zinc are a major cause of anemia and stunting, respectively.

For resource-poor farming families or rural communities who rely on staple crops like pearl millet for much of their diet, nutrient-enriched versions of these crops present a cost-effective, sustainable strategy to improve nutrition. Biofortification, which uses conventional breeding to increase micronutrient levels of food crops, helps address preventable deficiencies of key vitamins and minerals like iron, vitamin A and zinc. This hidden hunger often results from diets lacking in diversity or essential nutrients. The Indian government has therefore committed to reaching vulnerable populations with this agricultural-nutrition innovation.

HarvestPlus works with partners to develop and distribute biofortified varieties of these staple crops. “Including biofortified pearl millet in the Public Distribution System’s mid-day meal scheme for pregnant and lactating women, as well as the Integrated Child Development Services’ school feeding program, will both further trigger the demand for these nutritious grains and improve nutritional outcomes,” says HarvestPlus India Country Manager Mr Binu Cherian. These distribution channels allow the biofortified iron pearl millet to reach millions.

Due to its ability to grow well in dry climates, pearl millet is a staple crop for over 90 million people across the world. In India, it is consumed by households primarily in the form of breads and porridges. About 9 million hectares of Indian farmland are dedicated to pearl millet with 8.3 million tonnes of annual production.

The pearl millet biofortification program supported by HarvestPlus researched how iron and zinc levels vary among different varieties. “ICRISAT has over ten years of experience breeding biofortified varieties of pearl millet,” says breeder and biofortification project leader Dr M Govindaraj, “and with support from HarvestPlus we have further enhanced the levels of iron in our varieties.” In a nutrition efficacy study, eating biofortified pearl millet resolved iron deficiency in 65% of school-aged children after only six months. It also improved their cognitive abilities such as memory and attention, and skills essential for optimal performance at school.

To improve varieties released, the All-India Coordinated Research Project on Pearl Millet (ICAR-AICRP on Pearl Millet) encouraged National Agricultural Research Systems to begin breeding programs for micronutrients along with higher yields in 2014. Since then, three biofortified hybrids and varieties including Dhanashakti have been released and adopted in India, while three more hybrids were identified for imminent release. In 2016, ICRISAT and ICAR-AICRP-Pearl Millet jointly published the status of iron and zinc content among released hybrids in India. “Based on this evidence, at the 52nd Annual Meeting of the Pearl Millet Improvement Project in 2017, it was agreed that all pearl millet varieties would be bred to contain a minimum 42 parts per million (ppm) of iron and 32 ppm of zinc,” says Dr C Tara Satyavathi, Coordinator of ICAR-AICRP on Pearl Millet.

“This commitment will further strengthen the biofortification program and accelerate product development in India, to improve the nutritional status of poor households,” says Dr Wolfgang Pfeiffer, Director of Research and Development at HarvestPlus.

This activity was carried out as part of the CGIAR Research Program Agriculture for Nutrition and Health (A4NH) and the CGIAR Research Program on Grain Legumes and Dryland Cereals (GLDC).

This work contributes to UN Sustainable Development Goals
Wilder and stronger: India-Myanmar pigeonpea program gets new research boost

**Pre-breeding utilizes wild species with tolerance to climate change, diseases and pests**

The largest producer of pigeonpea (*Cajanus cajan*) in the world, India could increase its production three times, provided there are varieties resistant to diseases and adapted to climate change. Pre-breeding scientists at the ICRISAT are exploring possible solutions sourced from the wild species of *Cajanus*. A project funded by the Global Crop Diversity Trust (GCDT), will evaluate promising pre-breeding lines in India and Myanmar, bringing them one step closer to cultivation.

“It is critical to bring in beneficial traits that are not present in domesticated pigeonpea, and the pre-breeding work at ICRISAT holds great promise,” says Dr Benjamin Kilian, Plant Genetic Resources Scientist from the GCDT.

“Our goal of increasing the livelihood and nutrition security of smallholder farmers moves forward, and pre-breeding has hastened the process of reaching better crop varieties to farmers,” states Dr Peter Carberry, Director General, ICRISAT.

It has taken several years of research for scientists to evaluate wild pigeonpea species and identify those with promise of resistance/tolerance to biotic and abiotic stresses, including sterility mosaic disease, Fusarium wilt, pod borer and salinity.

“Pigeonpea has a narrow genetic base. The varieties currently grown by farmers have little resilience to recurrent or new diseases and insect-pests,” says Dr Shivali Sharma, Principal Investigator and Theme Leader – Pre-breeding, ICRISAT. “We find some wild species have adapted to several of these stresses. Leveraging these traits for cultivation can benefit livelihoods and nutrition.”

“This project will develop new material as well as take the available material to the farmers, so that they can produce more and generate better incomes with the new climate-resilient pigeonpea varieties,” according to Dr Rajeev K Varshney, Research Program Director – Genetic Gains at ICRISAT.

Field-level activities in multiple agro-ecologies and socio-economic settings (different locations) will be carried out by ICRISAT in collaboration with the following national and international partners: i) Professor Jayashankar Telangana State Agricultural University – Regional Agricultural Research Station, Palem and ii) Regional Agricultural Research Station, Warangal; iii) Acharya NG Ranga Agricultural University – Regional Agricultural Research Station, Tirupati (all in India); and iv) the Department of Agricultural Research (DAR), Yezin, Myanmar.

This new two-year project holds promise to improve livelihoods and nutrition security of the most-at-need communities in south-east Asia and in Africa.

This work is part of the initiative “Adapting Agriculture to Climate Change: Collecting, Protecting and Preparing Crop Wild Relatives” which is supported by the Government of Norway. The project is managed by the Global Crop Diversity Trust with the Millennium Seed Bank of the Royal Botanic Gardens, Kew, UK and implemented in partnership with national and international genebanks and plant breeding institutes around the world. For further information, visit the project website: [http://www.cwrdiversity.org/](http://www.cwrdiversity.org/).

This work contributes to UN Sustainable Development Goals
Center of Excellence to support farmers for better climate resilience and early pest/disease warning

Climate change, plant diseases and insect pests cause an estimated annual loss of US$ 8.6 billion, posing a huge challenge for smallholder farmers. This is where the Center of Excellence on Climate Change Research for Plant Protection (CoE-CCRPP), set up by the Department of Science and Technology (DST) at ICRISAT, could make a difference.

“Modern crop protection tools can make agriculture more sustainable and climate-resilient,” said Dr Akhilesh Gupta, Adviser & Head, Climate Change Programme & SPLICE, Department of Science & Technology (DST), launching new activities of the CoE-CCRPP at ICRISAT.

Dr Mangala Rai, former Director General, Indian Council of Agricultural Research (ICAR), in his inaugural address, emphasized the need to critically assess potential impacts of climate change on insects and pathogens and their interactions with host plants.

Development of a forewarning model to alert policymakers and farmers, real-time structured surveillance for insect pests and diseases using GPS-tagging, besides predictions on future climate scenarios for 2030 and 2050, are some new activities on which the Center will focus. Hot spots identified in the process and GIS-based risk maps (spatial and temporal) will be developed for targeted diseases and insect/pests.

“Providing advanced information and tools is important to strengthen resilience of smallholder farmers. DST has taken several important measures in this regard and we are very happy to partner in this initiative,” said Dr Peter Carberry, Director General (Acting), ICRISAT.

The Center’s results will be shared with policy-makers for efforts towards climate-resilient agriculture. The Center consortium includes scientists of the Indian Institute of Rice Research; University of Agricultural Sciences, Raichur; ICAR-Indian Agricultural Research Institute; Punjab Agriculture University, Ludhiana; Tamil Nadu Agricultural University, Coimbatore; and CGIAR Centers.

Current estimates of climate change indicate possible increases in global mean annual temperatures in the order of 1°C by 2025 and 3°C by 2100. Coupled with variability in rainfall pattern and increase in global precipitation levels, this could result in new diseases/insect pests, increased risk of invasion by migrant diseases and insect pests and accelerated insect pathogen development.

“Research on these changing patterns in plant diseases and insect pests will induce shifts in the regional priority, strengthen location-specific crop breeding programs under climate stress conditions and help us identify climate-smart and pest-resistant crop cultivars,” says Dr PM Gaur, Research Program Director-Asia, ICRISAT.

According to Dr Mamta Sharma, Project Coordinator of this initiative, “The CoE-CCRPP will identify potential distribution of target diseases and insect pests under future climate scenarios at zonal, regional and state levels”. The CoE-CCRPP outcomes will be available for scientists and integrated pest management (IPM) practitioners to develop country-specific strategies to ultimately support the greater resilience of smallholder farmers.

This work contributes to UN Sustainable Development Goals

Open top chambers (OTCs) and Free-air CO₂ enrichment (FACE) facility for climate change research on plant protection at ICRISAT.
A motorized groundnut thresher is reducing drudgery for women farmers in rural Nigeria. Introduced in 2015, over 50 threshers have already been distributed to farmer groups and cooperatives. Recently at the National Agricultural Seeds Council (NASC) fair, Chief Audu Innocent Ogbeh, Federal Minister of Agriculture and Rural Development, Nigeria, was impressed by its demonstration and ordered four more units to benefit women in Cross River State.

Nigeria produces 7% and 29% of the world’s and Africa’s total groundnut production respectively. In West and Central Africa, groundnut is a key cash crop for smallholder farmers. While on-farm operations are primarily carried out by men, post-harvest operations are mostly done by women and children. Shelling groundnut (for seeds, grains or both) is not only an expensive operation, it eats into a substantial chunk of women’s valuable time.

In 2015, working with the Agricultural Engineering Program of the Institute for Agricultural Research (IAR), ICRISAT, identified an appropriate motorized groundnut thresher that would cut down the time and effort needed to shell groundnuts. The performance parameters of the thresher are shown below:

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Estimated Performance Indicators</th>
</tr>
</thead>
<tbody>
<tr>
<td>Output</td>
<td>120 kg/hour</td>
</tr>
<tr>
<td>Shelling efficiency</td>
<td>98%</td>
</tr>
<tr>
<td>Cleaning efficiency</td>
<td>97%</td>
</tr>
<tr>
<td>Grain damage</td>
<td>&lt;3 %</td>
</tr>
<tr>
<td>Scattered grain</td>
<td>4%</td>
</tr>
</tbody>
</table>

Against this background, the NASC invited ICRISAT to the 2018 National Agricultural Seeds Fair at Abuja as a panelist in a conference ‘Enhancing Improved Seed Adoption towards Achieving Food Security and Wealth Creation’ and as an actor in the seed industry. ICRISAT’s stall displayed improved varieties of sorghum, millet and groundnut; processed products; dissemination materials; and the motorized groundnut thresher.

Impressed by the performance of the motorized groundnut thresher, Chief Ogbeh instructed Dr Philip Ojo, Director General of NASC to work together with ICRISAT to supply four threshers to underprivileged women and children of Cross River State. A video describing long hours of groundnut threshing by women and children from this region is frequently being aired on national television.

ICRISAT offered the groundnut thresher to the Seed Processing Unit of NASC after the seed fair, which was held during 3-4 October 2018.

The ICRISAT delegation to the conference and seed fair was led by Dr Michael Boboh Vabi, Country Project Manager of the USAID-funded Groundnut Technology Upscaling Project.

For more on ICRISAT’s work in Nigeria, click here.
For more on ICRISAT’s work on groundnut, click here.

Project: Increasing Groundnut Productivity of Smallholder farmers in Ghana, Mali and Nigeria
Partners: Institute for Agricultural Research (IAR) of the Ahmadu Bello University (ABU); Centre for Dryland Agriculture (CDA) of the Bayero University, Kano (CDA/BUK); National Agricultural Seeds Council (NASC); Federal University of Agriculture, Markudi (FUAM); Green Sahel Agricultural and Rural Development Initiative (GSARDI); Catholic Relief Services (CRS); Women Farmers Advancement Network (WOFAN); Kano Agricultural and Rural Development Authority (KNARDA); Jigawa Agricultural and Rural Development Authority (JARDA); Kebbi Agricultural and Rural Development Authority (KARDA); Sokoto Agricultural Development Project (SADP); and Katsina Agricultural and Rural Development Authority (KTARDA)
CGIAR Research Program: Grain Legumes and Dryland Cereals

This work contributes to UN Sustainable Development Goals
Focus on partnerships and innovation at CRP GLDC meetings

A renewed focus on innovation and establishing new partnerships was high on the agenda at the recent joint meeting of the Research Management Committee (RMC) and the Independent Advisory Committee (IAC) of the CGIAR Research Program on Grain Legumes and Drylands Cereals (CRP-GLDC) which took place at ICRISAT in Hyderabad, India, 17-19 October 2018.

Dr. Peter Carberry, Director General (Acting) and the Director of CRP-GLDC, pointed out the opportunities through GLDC to improve the capacity of systems to innovate and develop knowledge for breeding and trait discovery programs. He briefed the IAC-RMC members on the progress made by the program since its launch in February this year.

IAC Chair Dr. Ian Barker said that the GLDC portfolio has an important basket of crops to help vulnerable communities, emphasizing the importance of strengthening partnerships with various stakeholders to achieve GLDC strategic objectives.

At the meeting, the leaders of GLDC’s five Flagship Programs and cross cutting initiatives, including gender and youth, and capacity development, provided a detailed overview of various activities that are currently underway in 13 priority countries in Africa and held discussions to identify their research priorities and the portfolio of activities for the next year.

The joint meeting emphasized on the importance of strengthening partnerships.
Food and Agriculture Organization endorses India’s proposal for an International Year of Millets

The Government of India has led the initiative for an International year of Millets, through the UN system, and garnered support from many countries.

The FAO Committee on Agriculture (CoAG) forum accepted the proposals for an International Year of Millets and slotted it for 2023. In December 2018, the FAO Council and the United Nations General Assembly (UNGA) will adopt it before a formal declaration.

This will be a major success for popularizing millets that can play a key role in overcoming malnutrition and health concerns like diabetes. It will also be important as an adaptation measure for climate change in the drylands and important for smallholder and marginal farmers.

Efforts to bring millets in the forefront began in early October 2017 during the Committee on Food Security event in Rome. ICRISAT organized a series of meetings at FAO to identify the process to follow and promote the idea with FAO departments and the Indian Embassy in Rome.

Prime Minister Modi also spoke out in strong support for millets.

Although it was recognized that achieving an International Year in such a short span (it can typically take five years) would be a “miracle”, the GoI, ICRISAT, the CGIAR, IIMR, Professor M S Swaminathan and others pursued the cause.

ICRISAT started the spadework for an international year of millets as part of its Smart Food movement, with an initial summary pitch.

Smart Food is a global initiative that defines food as Smart if it fulfills all three criteria of being ‘good for you, good for the planet and good for the smallholder farmer’. Millet and sorghum were selected as first priorities in the Smart Food efforts.

The Smart Food movement aims to ‘mainstream’ select smart foods as staples in their traditional countries – infusing diversity in diets and on the farm.

By focusing on staples, Smart Food can make a major breakthrough in malnutrition and rural poverty, and be more sustainable on the environment.

Following this initial step, ICRISAT wrote the first case for the Government of India (GoI) highlighting how millets are good for you, the planet and the farmer.

It also worked with governments in its host countries in Africa to gather support letters from a number of countries, while the CGIAR worked with countries in Europe and northern Africa.

In November 2017, the Government of India’s Union Agriculture Minister, Mr Radha Mohan Singh, wrote to the FAO Director-General, Mr Jose Graziano da Silva, requesting the inclusion of the proposal in the UN General Assembly agenda for International Year of Millets in 2018.

Communications with Kofi A Annan, former Secretary-General of the United Nations, led to his supportive letter to ICRISAT stating that, “Millets have multiple benefits as they contribute to food and nutrition security for millions of people in the semi-arid tropics of Asia and Africa, generate market opportunities for farmers, and are a critical solution to climate change.”
Drought and disease: Twin targets for pearl millet breeders

A report from a field day for scientists

Developing pearl millet varieties resistant to drought and disease is the need of the day, say pearl millet scientists from India and abroad. During a couple of field days at ICRISAT recently, pearl millet scientists from across Brazil, India, Iran, Kenya and Niger came together to share ideas and select genetic material for their crop breeding programs. The scientists had the opportunity to go through about 15,000 pearl millet breeding plots, check out germplasm accessions maintained by the gene bank and pre-breeding materials, observe disease nurseries, learn about seed parent/restorer/forage/biofortification breeding programs and interact with breeders at ICRISAT.

Valuable feedback from the participants highlighted the following as high-priority areas for pearl millet breeders to focus on in the near future:

▪ Developing extra-early and drought-tolerant hybrid parents, especially for the A1 zone (arid regions with low rainfall)
▪ Accelerating identification and development of blast-resistant cultivars to combat the rapidly advancing threat of blast disease
▪ Developing long panicle breeding materials in dwarf genetic backgrounds coupled with early-maturing traits
▪ Increasing mechanization in pearl millet cultivation.

Dr C Tara Satyavathi, National Coordinator, AICRP (All India Coordinated Research Project) on Pearl Millet, said, “With 2018 being declared India’s National Year of Millets, we need to concentrate our efforts on boosting productivity, disease resistance and biofortification in pearl millet.”

Mr Daniel Bonamigo from ATTO Adriana, Brazil, apprised the group on the status and prospects of pearl millet in Brazil, appealing to experts for solutions to some challenges and for ideas for improvement.

Dr RS Mahala, Chair, Hybrid Parents Research Consortium (HPRC), underlined the goal of making pearl millet profitable to farmers. There were suggestions for introducing more mechanization for pearl millet farmers to tackle labor shortage. High labor costs significantly increase the cost of production.

In another presentation, Ms Nasser Aichatou, Managing Director of Ainoma Farms, Niger, explained how they have successfully created a thriving seed production company, aided by materials from ICRISAT over the past several years. She hoped to expand seed production outside Niger, by forming consortia similar to HPRC in India.

The participants were highly impressed with the genetic diversity on display and the meticulous way material had been organized. A few suggested that pedigree and passport information as well as biofortification details be mentioned for breeding lines, as these would help breeders select the right material. They also appreciated the cytoplasmic diversification of genetic material for seed parents and restorer parents in the program.

Speaking about pearl millet’s status as an “underutilized crop”, Dr Jan Debaene, Global Head, Breeding, ICRISAT, highlighted its immense market potential that the private and public sector seed companies should take note of.

Over 103 participants, including scientists and representatives of private and public sector seed companies, attended the Pearl Millet Scientists Field Day held during 3-4 October at ICRISAT, India, organized by Dr SK Gupta, Principal Scientist, Pearl Millet, ICRISAT, and his team.

The Pearl Millet Improvement Program is mapped to the CGIAR Research Program - Grain Legumes and Dryland Cereals (GLDC).
New case studies are powerful examples of gender-responsive plant and animal breeding

Adoption and impact of new crop varieties and animal breeds depend on the tangible benefits these provide for the women and men involved in their production, consumption, processing and marketing. It is therefore important for breeders to understand and respond to the needs, priorities, and constraints that women and men assign to crop and animal products along the entire value chain. What steps can be taken for a breeding program to be gender-responsive and to ensure that breeding products have more equitable outcomes?

Many breeding programs, both within and outside CGIAR, recognized long ago the need for crop and animal breeding programs to consider gender differences, and have understood that if they overlook traits important to women farmers and consumers, they will not only further disempower these women, but also can aggravate household food insecurity and poverty.

However, breeding programs still do not have practical methods and decision-support tools that can be used routinely and can indicate how to be more gender-responsive and to understand the changes and the implications in breeding schemes. In addition, without convincing evidence—exemplified by case studies across commodities and countries—our arguments for gender-responsive research are often disregarded and dismissed.

Read more at https://goo.gl/nezoKt

Blog by Stefania Grando
Honorary Fellow, ICRISAT, India and International Consultant

The slum gurus of Nairobi – can agribusiness make a difference?

Busy. That’s the first word that comes to your mind as you wind your way through Eastleigh. It is the neighbourhood of one of Africa’s oldest slums, Majengo, Eastleigh is also home to one of the biggest business centers, in Nairobi, Kenya, involving business of over 600 million dollars every month. “You can find everything in Eastleigh,” laughs Clive Wanguthi, as I wonder how to describe him – local guide, community worker, leader, activist or preacher – perhaps, all of these. Weaving his way expertly through the milling crowd, Clive cautions, “Stay ahead of me, I want to ensure that you are safe.” Indeed, after getting nearly hit by two vehicles, I take his advice and stay more cautious, which is somewhat difficult, given the riot of activity around. “You can’t be too careful here.” A street-side store with the cheeky name of ‘Donald Trump’ blares its wares, while gold jewelry in little trays gleam at you for a song in dim lanes. Lines of steaming chapatti-beans food stalls and glowering gun-toting cops assail your senses, as Clive calls out an ‘As-salaam-alaikum’ every few seconds to an acquaintance. Everyone is busy.

Read more at https://www.icrisat.org/the-slum-gurus-of-nairobi-can-agribusiness-make-a-difference/

Blog by Jayashree Balasubramanian
Lead - Communications and Library Strategic Marketing & Communication
In the media

The women finger millet advocates of Western Kenya

Women in Kakamega and Busia counties of Western Kenya are going against the grain. They are turning their backs on the commonly planted grains of sorghum and maize and on commercial sugarcane, and replacing them with a grain that not only better meets the nutritional needs of the family but also fulfils economic and agronomic requirements in a time of climate change.

The women are planting finger millet

Finger millet hardly needs an introduction in Western Kenya. The crop is native to the highlands of Kenya, Uganda and Ethiopia and has been widely grown traditionally in Eastern and Southern Africa and South Asia for hundreds of years. It is now considered a minor crop in many of these areas. But perhaps not for long, according to the women who grow it and a woman who works to improve it.

Read more at https://www.icrisat.org/the-women-finger-millet-advocates-of-western-kenya/

New project

Title: Enhanced awareness and knowledge of approaches to Climate Smart Agriculture (CSA) technologies and practices in Borno, Adamawa and Yobe State, Nigeria

Funder: Food and Agricultural Organization of the United Nations (FAO)

Period: 5 September - 30 November 2018

Principle Investigator: Dr Robert Zougmore, ICRISAT-Mali
New publications

High-density genetic map using whole-genome re-sequencing for fine mapping and candidate gene discovery for disease resistance in peanut
Published: 2018, Plant Biotechnology Journal. pp. 1-14. ISSN 1467-7644
http://oar.icrisat.org/10624/

Can genomics deliver climate-change ready crops?
Authors: Varshney RK, Singh VK, Kumar A, Powell W and Sorrells ME
Published: 2018, Current Opinion in Plant Biology (TSI). ISSN 1369-5266
http://oar.icrisat.org/10625/

Impact of ICRISAT Pearl Millet Hybrid Parents Research Consortium (PMHPRC) on the Livelihoods of Farmers in India, Research Report No 75
Authors: Venkata Rao N, Rao KPC, Gupta SK, Mazvimavi K, Kumara Charyulu D, Nagaraj N, Singh RN, Singh SS and Singh SP
Published: 2018, Technical Report. ICRISAT
http://oar.icrisat.org/10626/

Who are those people we call farmers? Rural Kenyan aspirations and realities
Authors: Verkaart S, Mausch K and Harris D
Published: 2018, Development in Practice, 28 (4). pp. 468-479. ISSN 0961-4524
http://oar.icrisat.org/10627/

Genomics, genetics and breeding of tropical legumes for better livelihoods of smallholder farmers
Published: 2018, Plant Breeding, pp. 1-137. ISSN 0179-9541
http://oar.icrisat.org/10632/

Innovative Partnership Approach to Chickpea seed production and Technology Dissemination: Lessons from Ethiopia
Authors: Chichaybelu M, Geleta T, Girma N, Fikre A, Estete M and Ojiewo CO
Published: 2018, Ethiopian Journal of Crop Science, 6 (2). pp. 1-18. ISSN 2072-8506
http://oar.icrisat.org/10633/

Assessing the Competitiveness of Smallholders Chickpea Production in the Central Highlands of Ethiopia
Authors: Fereke S, Fikre A and Ahmed S
Published: 2018, Ethiopian Journal of Crop Science, 6 (2). pp. 51-65. ISSN 2072-8506
http://oar.icrisat.org/10635/

Agronomic and Economic Evaluation of Wheat-Chickpea Double Cropping on the Vertisol of Takusa, North Western Ethiopia
Authors: Jemberu T, Fikre A, Abeje Y, Tebably B, Worku Y and Jorgi T
Published: 2018, Ethiopian Journal of Crop Science, 6 (2). pp. 67-78. ISSN 2072-8506
http://oar.icrisat.org/10636/

Genetic Variability and Heritability in Ethiopian Grasspea (lathyrus sativus L.) Accessions
Authors: Abate A, Mekbib F, Fikre A and Ahmed S
Published: 2018, Ethiopian Journal of Crop Science, 6 (2). pp. 79-94. ISSN 2072-8506
http://oar.icrisat.org/10637/

Heat Tolerance Responses of Chickpea (Cicer arietinum L.) Genotypes in the Thermal Zone of Ethiopia, a Case of Werer Station
Authors: Mola T, Alemayehu S, Fikre A, Ojiewo CO, Alemu K and Degefu T
Published: 2018, Ethiopian Journal of Crop Science, 6 (2). pp. 95-118. ISSN 2072-8506
http://oar.icrisat.org/10638/

Phenotypic Characteristics and Preliminary Symbiotic Effectiveness of Rhizobia Associated with Haricot Bean Growing in Diverse Locations of Southern Ethiopia
Authors: Wolde-meskel E, Degefu T, Gebo B, Fikre A, Amede T and Ojiewo CO
Published: 2018, Ethiopian Journal of Crop Science, 6 (2). pp. 119-139. ISSN 2072-8506
http://oar.icrisat.org/10639/

Groundnut (Arachis hypogaea L.) and cowpea (Vigna unguiculata L. Walp) growing in Ethiopia are nodulated by diverse rhizobia
Authors: Degefu T, Wolde-meskel E, Ataro Z, Fikre A, Amede T and Ojiewo CO
http://oar.icrisat.org/10641/

Morphophysiological diversity of rhizobia nodulating pigeon pea (Cajanus cajan L. Milsp.) growing in Ethiopia
Authors: Degefu T, Wolde-meskel E, Adem M, Fikre A, Amede T and Ojiewo CO
Published: 2018, Journal of Biotechnology, 17 (6). pp. 167-177. ISSN 1684-5315
http://oar.icrisat.org/10642/
Productivity and Water Use Efficiency of Sorghum [Sorghum bicolor (L.) Moench] Grown under Different Nitrogen Applications in Sudan Savanna Zone, Nigeria

Authors: Ajeigbe HA, Akinseye FM, Ayuba K and Jonah J

http://oar.icrisat.org/10643/

Post-harvest management and associated food losses and by-products of cassava in southern Ethiopia

Authors: Parmar A, Fikre A, Sturm B and Hensel O

Published: 2018, Food Security (TSI), 10 (2). pp. 419-435. ISSN 1876-4517
http://oar.icrisat.org/10645/

Urban Environmental Governance in India: Browsing Bengaluru

Authors: Raju KV, Ravindra A, Manasi S, Smitha KC and Srinivasan R

http://oar.icrisat.org/10647/

Standard Operating Procedures for Groundnut Breeding and Testing

Authors: Janila P, Manohar SS, Deshmukh DB, Chaudhari S, Papaiah V and Variath MT

Published: 2018, Documentation. ICRISAT.
http://oar.icrisat.org/10653/

Stability Analysis in Chickpea Genotype Sets as Tool for Breeding Germplasm Structuring Strategy and Adaptability Scoping


Published: 2018, Ethiopian Journal of Crop Science, 6 (2). pp. 19-37. ISSN 2072-8506
http://oar.icrisat.org/10654/

Antixenosis and antibiosis mechanisms of resistance to pod borer, Helicoverpa armigera in wild relatives of chickpea, Cicer arietinum

Authors: Golla SK, Rajasekhar P, Sharma SP, Hari Prasad KV and Sharma HC

Published: 2018, Euphytica (TSI), 214 (88). pp. 1-16. ISSN 0014-2336
http://oar.icrisat.org/10655/

Integrated Management of Dry Root Rot Caused by Rhizoctonia bataticola in Chickpea

Authors: Deepa, Sunkad G, Sharma M, Mallesh SB, Mannur DM and Sreenivas AG

Published: 2018, International Journal of Current Microbiology and Applied Sciences, 7 (04). pp. 201-209. ISSN 2319-7706
http://oar.icrisat.org/10656/

Distribution and Severity of Dry Root Rot of Chickpea Caused by Rhizoctonia bataticola in Parts of North Karnataka

Authors: Deepa, Sunkad G, Sharma M, Mallesh SB, Mannur DM and Sreenivas AG

http://oar.icrisat.org/10657/

Genome Sequencing and Analysis of the Peanut B-Genome Progenitor (Arachis ipaensis)


http://oar.icrisat.org/10659/

Genome-Wide Identification and Analysis of Arabidopsis Sodium Proton Antiporter (NHX) and Human Sodium Proton Exchanger (NHE) Homologs in Sorghum bicolor


Published: 2018, Genes (TSI), 9 (5) (236). pp. 1-18. ISSN 2073-4425
http://oar.icrisat.org/10660/

Molecular mapping and inheritance of restoration of fertility (Rf) in A4 hybrid system in pigeonpea (Cajanus cajan (L.) Millsp.)

Authors: Saxena RK, Patel K, Sameer Kumar CV, Tyagi K, Saxena KB and Varshney RK

Published: 2018, Theoretical and Applied Genetics (TSI). pp. 1-10. ISSN 0040-5752
http://oar.icrisat.org/10661/

Quantitative trait loci (QTLs) for water use and crop production traits co-locate with major QTL for tolerance to water deficit in a fine-mapping population of pearl millet (Pennisetum glaucum L. R.Br.)

Authors: Traranya M, Kholova J, Sivasakthi K, Seghal D, Hash CT, Raj B, Srivastava RK, Baddam R, Thirunalsundari T, Yadav R and Vadez V

Published: 2018, Theoretical and Applied Genetics (TSI). pp. 1-21. ISSN 0040-5752
http://oar.icrisat.org/10662/
Characterization of West and Central African accessions from a pearl millet reference collection for agromorphological traits and Striga resistance
Authors: Sattler FT, Sanogo MD, Kassari IA, Angarawai II, Gwadi KW, Dodo H and Haussmann BIG
Published: 2018, Plant Genetic Resources: Characterization and Utilization (TSI), 16 (3). pp. 260-272. ISSN 1479-2621
http://oar.icrisat.org/10664/

Genetic structure of wild pea (Pisum sativum subsp. elatius) populations in the northern part of the Fertile Crescent reflects moderate cross-pollination and strong effect of geographic but not environmental distance
http://oar.icrisat.org/10665/

Customized information delivery for dryland farmers
Authors: Chakravarty A, Sumanthkumar V and Patil MD
http://oar.icrisat.org/10666/

A novel mitochondrial orf147 causes cytoplasmic male sterility in pigeonpea by modulating aberrant anther dehiscence
Published: 2018, Plant Molecular Biology (TSI), 97 (1-2). pp. 131-147. ISSN 0167-4412
http://oar.icrisat.org/10667/

Complexity in technology choices and market access for pigeonpea growers in Semi-Arid Tropics of India
Authors: Kumar R, Vikraman S and Elias Khan P
http://oar.icrisat.org/10668/

Post-harvest evaluation of selected hybrids to maize weevil Sitophilus zeamais resistance
Authors: Khakata S, Nzuve FM, Chemining’wa GN, Mwimali M, Karanja J, Harvey J and Mwololo JK
Published: 2018, Journal of Stored Products and Postharvest Research, 9 (3). pp. 16-26. ISSN 2141-6567
http://oar.icrisat.org/10669/

Genetic dissection of photosynthetic efficiency traits for enhancing seed yield in chickpea
Published: 2018, Plant, Cell & Environment. ISSN 0140-7791
http://oar.icrisat.org/10670/

Influence of diazotrophic bacteria on nodulation, nitrogen fixation, growth promotion and yield traits in five cultivars of chickpea
Authors: Gopalakrishnan S, Srinivas V, Vemula A, Samineni S and Rathore A
Published: 2018, Biocatalysis and Agricultural Biotechnology, 15. pp. 35-42. ISSN 1878-8181
http://oar.icrisat.org/10672/

Identification of Ideal Locations and Stable High Biomass Sorghum Genotypes in semiarid Tropics
Published: 2018, Sugar Tech (TSI), 20 (3). pp. 323-335. ISSN 0972-1525
http://oar.icrisat.org/10673/

Nutrition education, farm production diversity, and commercialization on household and individual dietary diversity in Zimbabwe
Authors: Murendo C, Nhau B, Mavimavi K, Khanye T and Gwara S
http://oar.icrisat.org/10674/

Social media and communication by scientists: M. S. Swaminathan on Twitter
Authors: Jayashree B
Published: 2018, Current Science (TSI), 114 (9). pp. 1-6. ISSN 0011-3891
http://oar.icrisat.org/10675/

Markets, institutions and policies: A perspective on the adoption of agricultural innovations
Authors: Orr A
Published: 2018, Outlook on Agriculture (TSI). pp. 1-6. ISSN 0030-7270
http://oar.icrisat.org/10676/

Linking Food Security with Household’s Adaptive Capacity and Drought Risk: Implications for Sustainable Rural Development
Authors: Sam AS, Abbas A, Surendran Padmaja S, Kaechele H, Kumar R and Müller K
Published: 2018, Social Indicators Research (TSI). pp. 1-23. ISSN 0303-8300
http://oar.icrisat.org/10677/
State of the Knowledge for Gender in Breeding: Case Studies for Practitioners
Authors: Tufan H A, Grando S and Meola C
http://oar.icrisat.org/10678/

Mapping Grain Iron and Zinc Content Quantitative Trait Loci in an Iniadi-Derived Immortal Population of Pearl Millet
Authors: Kumar S, Hash CT, Nepolean T, Mahendrakar MD, Satyavathi C, Singh G, Rathore A, Yadav R, Gupta R and Srivastava RK
Published: 2018, Genes (TSI), 9 (5) (248). pp. 1-17. ISSN 2073-4425
http://oar.icrisat.org/10679/

Effects of biochar and gypsum soil amendments on groundnut (Arachis hypogaea L.) dry matter yield and selected soil properties under water stress
Authors: Nguluwe M, Mweetwa AM, Phiri E, Njoroge SMC, Chalwe H, Shitumbanuma V and Brandenburg RL
http://oar.icrisat.org/10681/

Yield gap analysis and entry points for improving productivity on large oil palm plantations and smallholder farms in Ghana
Authors: Rhebergen T, Fairhurst T, Whitbread AM, Giller KE and Zingore S
Published: 2018, Agricultural Systems (TSI), 165. pp. 14-25. ISSN 0308521X
http://oar.icrisat.org/10683/

Efficient plant regeneration protocol for finger millet [Eleusine coracana (L.) Gaertn.] via somatic embryogenesis
Authors: Alex N, Cecilia M, Mathew N, Asunta M, Henry O and Wilton M
http://oar.icrisat.org/10685/

Facing climate variability in sub-Saharan Africa: analysis of climate-smart agriculture opportunities to manage climate-related risks
Authors: Zougmore RB, Partey ST, Ouedraogo M, Torquebiau E and Campbell BM
Published: 2018, Cahiers Agricultures (TSI), 27 (3). pp. 1-9. ISSN 1166-7699
http://oar.icrisat.org/10687/

Additive yield response of chickpea (Cicer arietinum L.) to rhizobium inoculation and phosphorus fertilizer across smallholder farms in Ethiopia
Published: 2018, Agriculture, Ecosystems & Environment (TSI), 261. pp. 144-152. ISSN 01678809
http://oar.icrisat.org/10688/