Feature Stories

Groundnut cultivation improves incomes for tribal farmers in India

Tribal farmers in Andhra Pradesh, India, have for the first time cultivated groundnut on their lands, leading to improved incomes. They earned about ₹87,500 (US$1,291) to ₹125,000 (US$1,845) per ha while they spent on an average ₹8,000 (US$117) to ₹10,000 (US$147). With technical inputs and training under the Rythu Kosam project of the Government of Andhra Pradesh, these farmers successfully produced foundation seeds from the breeder seeds of improved groundnut varieties provided by ICRISAT.

Seven villages were chosen as part of the pilot project and at least 30 farmers identified in each village. A farmer from Lakkonda village, East Godavari district, was extremely pleased with the outcome and said that he and his wife could earn ₹40,000 within three months by cultivating the groundnut variety provided by ICRISAT. “We spent only on seeds and did not hire any worker during the cultivation,” he pointed out. He said more and more farmers in his area were showing interest in groundnut cultivation.

Located in a rainfed region, the smallholder farmers with just 1 to 2 ha land, cultivate cotton, tapioca, cashew, mango and some vegetable crops, depending on rains and seasonal streams for irrigation. During rabi (post rainy) 90% of the farms are fallow due to lack of irrigation. The region receives an average annual rainfall of 1200 mm and it varies from 770 mm to 1850 mm. The soil is red clayey type. Most farmers here follow traditional cultivation practices and do not apply fertilizers. Pesticides are used only when the pest attack is serious. Major constraints include low productivity, low income and low resource use efficiency along with low seed replacement rate for agriculture and horticulture crops.

For piloting groundnut varieties 10 to 15 progressive farmers were identified from 2 villages, Rajampalem and Lakkonda, and improved groundnut variety breeder seeds sown in 5 ha area. These were improved groundnut varieties, ICGV91114, ICGV0351 and ICGV0350 with a duration of 95-120 days. In this short period, the farmers obtained high yields (2 to 4 tons per ha) for ICGV91114 variety, 5 tons per ha for ICGV350 variety and 4-5 tons per ha for ICGV351 variety. Farmers retained some for their use and sold the rest of the seeds to other farmers in the neighboring villages.

Finger millet was grown in 2 ha while pigeonpea was grown in 15 ha area. Pigeonpea varieties, ICPH2740,
Project: Transforming Agriculture and Allied Sectors through the Primary Sector Mission - RYTHU KOSAM
Investor: Government of Andhra Pradesh
Partners: Government of Andhra Pradesh, Acharya NG Ranga Agricultural University, Dr YSR Horticultural University, Sri Venkateswara Veterinary University, private industries such as KUBOTA India, Mahindra and Mahindra, John Deere, Science for Society, Jain Irrigations, etc. national and international agricultural research institutes and ICRISAT.

ICP8863 (Maruti), ICPL87119 (Asha) and ICPL161 with varying crop duration between 135-180 days were distributed to farmers.

Following the baseline survey and soil testing some of the interventions undertaken were: soil-test based micronutrient application for all crops; improved seed/varietal replacement with machine transplantation (PPP mode); crop diversification with pigeonpea, groundnut and finger millet; Broad-Bed Furrow method introduced to improve soil moisture; integrated pest management; kitchen garden and aerobic composting; and Gliricidia plantation.

Village: Yarlagadda
Major crops: Rainy (cotton, tapioca, cashew and mango) Post rainy (maize 10% fallow 90%)
Irrigation source: Small creek
Soil: Red sandy soil

Yarlagadda village, though not one of the project villages, was found to be ideal for piloting the rabi groundnut, as they have an irrigation source, ideal soil type and farmers interested in cultivating groundnut – for the first time – in their land.

About 13 ha land, belonging to 15 farmers, was brought under groundnut cultivation. The farmers were given 2 tons of breeder seed (K6 and K9 varieties obtained from Agriculture Research Station, Kadiri) and they obtained a yield of 25 tons of foundation seeds.

The crop cutting experiments conducted by ICRISAT showed that the crop productivity in these fields varied from 1.9 to 2.4 tons per ha for K9 and from 2 to 3.2 tons per ha for K6 variety, which is nearly twice the average productivity of Anantapur district.

ICRISAT helped the farmers register with the AP Seed Certification Agency, who monitored and certified the foundation seed upon harvest. The foundation seeds were procured by the AP Seed Cooperation Ltd at a rate 20% higher than the market rate. While the farmers could obtain ₹ 45-50 per kg in the market, the AP Seed Cooperation Ltd., bought the seeds at ₹ 60 per kg.

Kadabala Bobbili, a tribal farmer who had taken up cultivation in two acres with K6 variety is very happy as he obtained very high yield in this season. He said, “I was able to get more than two tons with K6 variety.” He added that he would preserve some of the foundation seed for the next season. He expressed happiness that he could get high yield with this variety without investing in irrigation.

An important aspect to note is that 90% of the tribal farmers follow tradition cultivation methods and do not apply any fertilizers in their fields.
More than 180,000 households were reached with new technologies that increased the production of sorghum and millets by up to 150% across 11 countries in Asia and sub-Saharan Africa. The recently concluded Harnessing Opportunities for Productivity Enhancement (HOPE) of Sorghum and Millets project, supported by Bill & Melinda Gates Foundation, involved 50 partners led by ICRISAT from 2009-2015.

Some of the major milestones include:

- 49 cultivars released by the project countries (25 sorghum; 13 pearl millet; and 11 finger millet)
- 183,421 farm households reached with new production technologies
- 8,579 tons of seed produced under the program (6,251 tons of sorghum; 2,084 tons of pearl millet; and 244 tons of finger millet)
- 178,447 mini-packs of seed distributed initially at no cost, but at the beginning of the second year a partial cost recovery approach was implemented. The packs were sold to farmers primarily through field days, seed-producing farmers and local agro-dealers
- 50 researchers received advanced degree training with HOPE support (15 PhD and 35 MSc degrees completed)
- 3,280 National Agricultural Research Systems (NARS) scientists took part in HOPE-sponsored short courses

“The project provided additional evidence that it is indeed possible to increase production of sorghum and millets in some of the most resource-poor areas of sub-Saharan Africa and India. Working with a number of national and regional research organizations, development partners, private sector, and farmers organizations, HOPE developed, promoted and diffused excellent technology packages that provide a 50% increase in net benefits, while enhancing the capacity of 11 partner countries on two continents,” said Dr Stefania Grando, Director – Science Quality and Strategy, ICRISAT, who led the project.

Country specific outputs:

In Eastern and Southern Africa there was a 83% adoption rate of improved sorghum cultivars in Ethiopia. There was also a 45% yield advantage from improved varieties by using microdosing and tied ridges and five sorghum cultivars and seven finger millet varieties were released by partners in Ethiopia. In Eritrea, there was a 60% sorghum productivity gain from the package of improved practices. In Kenya, U-15 finger millet variety was released by a partner and two sorghum cultivars were released by partners in South Sudan. Also 17% productivity gains were registered in finger millet in Tanzania and 25 finger millet lines with drought potential were selected for regional trial and evaluation in Uganda.

For West and Central Africa, Mali recorded productivity gains of 129% in sorghum and 50% in pearl millet from the package of improved practices. Also 4,000 farmers were involved in Integrated Striga and soil fertility/water management Farmer Field Schools. In Burkina Faso 13 farmer organizations were trained in seed marketing, and in Niger pearl millet varieties ICRI-Tabi, Mil de Siaka and ICMV-IS 89305 were selected for wider dissemination and testing. Nigeria recorded productivity gains from package of improved practices of 21% in sorghum and 150% in pearl millet.

In South Asia seven pearl millet cultivars were released by partners in India (three each in the states of Rajasthan and Haryana and one in Gujarat). Also 220 kg of breeder seed of preferred open pollinated varieties were produced. Seeds of four released sorghum varieties were distributed for cultivation over 10,180 ha, benefiting 25,200 Indian farmers. In addition, identified farmers preferred pearl millet hybrids (nine for Rajasthan, four for Gujarat and four for Haryana) for dissemination.

“Using integrated value chain interventions we were able to achieve our goals to help thousands of smallholder farmers in the harsh drylands of sub-Saharan Africa and four Indian states. Not only was the project able to deliver improved crop varieties but also increased farmers’ access to markets to buy what they need and to sell their produce at competitive market prices,” said Dr David Bergvinson, Director General of ICRISAT.
“Sorghum and pearl millet are major staple food crops in many countries of West and Central Africa. Several technologies including improved varieties of sorghum and pearl millet along with the associated crop management and agronomic practices were generated during the first phase of the project. During the second phase, intensification of research and development activities, and a more in-depth understanding and tackling major obstacles to the uptake of these technologies will be explored for a wider scaling-up,” said Dr Ramadjita Tabo, ICRISAT Regional Director West and Central Africa.

“Farmers access to improved varieties will be enhanced through a more effective and efficient national registration and release of varieties and seed legislation in the three project countries, namely Burkina Faso, Mali and Nigeria,” he added.

According to Dr Bergvinson, “The project has proved that with the right information, farmers are able to make more informed choices, which lead to increased incomes and improved livelihoods. Demand-driven research that empowers farmers to realize their full economic potential will be key in realizing the UN Sustainable Development Goals.”

The success has led to the second phase of the project which was recently launched in Ethiopia. There will be more focused attention on helping farmers in six sub-Saharan Africa countries – Burkina Faso, Mali, Nigeria, Tanzania, Ethiopia and Uganda, cope with the effects of drought, and reduce poverty, hunger and malnutrition. There will be a strong focus on further building the pipeline of improved varieties as well as strengthening the seed systems.

The countries involved in the first phase of the HOPE project are: Mali, Burkina Faso, Niger and Nigeria in West and Central Africa focused on increasing farm-level productivity of two staple crops of the region, sorghum and pearl millet; Eritrea, Ethiopia, Kenya, South Sudan, Tanzania and Uganda where sorghum and finger millet were the focus; and in India the focus was on raising the productivity of pearl millet in the states of Rajasthan, Haryana and Gujarat and improving post-rainy season sorghum in Maharashtra.

Pioneering digital agricultural application to help farmers cope with climate change

A new sowing application for farmers combined with a Personalized Village Advisory Dashboard will help farmers pick the right sowing time, thus helping them avoid uncertainty due to climate change. This is being piloted in the Indian state of Andhra Pradesh.

The sowing app will help farmers achieve optimal harvests by advising on the best time to sow crops depending on weather conditions, soil and other indicators.

The sowing application utilizes powerful artificial intelligence to interface with weather forecasting models provided by USA based aWhere Inc. and extensive data including rainfall over the last 45 years as well as 10 years of groundnut sowing progress data for Kurnool district. This data is then downscaled to build predictability and guide farmers to pick the ideal sowing week. When combined with other data collected from, it can create rich datasets that can be processed to build predictive models for the farmers.

Similarly, the Personalized Village Advisory Dashboard provides an instant overview across several environmental factors that determine a
healthy crop yield. In the pilot that has been recently launched, information will be sent to farmers about the sowing date via SMS in Telugu. Data collected manually from farms in 13 districts of the state by ICRISAT field officers has been uploaded to Microsoft’s Azure Cloud. Using powerful Business Intelligence (BI) tools, this dashboard provides important insights around soil health, fertilizer recommendations, and seven days’ weather forecast derived from the world’s best available weather observation systems and global forecast models. This data is then downscaled for the highest possible accuracy at the village level, to transform how smallholder farmers tackle climate change to drive effective decision-making.

This has been made possible through a partnership between ICRISAT, Microsoft and the Andhra Pradesh government. The pioneering digital tools are released by ICRISAT with development undertaken by Microsoft. The Personalized Village Advisory Dashboard has been especially developed to enable officials of Andhra Pradesh Primary Sector Mission (APPSM) – Rythu Kosam, to better manage large-scale programs.

“Bringing a lot of scattered data together and developing an analytical tool that is comprehensive and gives accurate predictions to the farmers, is urgently needed. We are excited to work with Microsoft to enhance incomes and improve the lives of small holder farmers, and this is going to boost our digital agriculture initiative in a big way,” said Dr David Bergvinson, Director General of ICRISAT.

ICRISAT has adopted Microsoft Cortana Intelligence Suite including Machine Learning (ability of computers to learn without being specifically programmed) and Power BI, to empower farmers and government officials with technology, and promote digital farming practices in the state.

Commenting on this development, Mr Anil Bhansali, Managing Director, Microsoft India (R&D) Pvt. Ltd., said, “We are pleased to support ICRISAT to drive impact for farmers through our technology. Agriculture is a crucial economic contributor in India, and the implementation of advanced analytics in agriculture will help streamline and strengthen farming practices. The Sowing App and Personalized Village Advisory Dashboard are developed to provide powerful cloud-based predictive analytics to empower farmers with crucial information and insights to help reduce crop failures and increase yield, in turn, reducing stress and generating better income. We firmly believe in the potential of Microsoft Azure Machine Learning and Power BI to bring efficiencies not only in agriculture, but also in healthcare, education, and beyond. This is a significant start for digital agriculture and can reap benefits in multiple ways as governments and stakeholders discover the potential for technology to unlock and offer multiple solutions for farmers.”

ICRISAT is providing technical backstopping to Rythu Kosam, which is aimed at positioning the state among the best three performing states by 2022. This technical input involves the establishment of pilot sites of learning in 13 districts of 10,000 ha each; upgrading soil analysis laboratories; technical support for planning; as well as adopting an Inclusive Market-Oriented Development (IMOD) strategy to benefit smallholder farmers through public-private partnerships; and promoting private investments in the state.

Water4Crops – reuse of treated wastewater delivers higher crop yields

The safe reuse of wastewater for agricultural purposes is showing higher crop yields and reducing the amount of pollutants in wastewater by 30-92%. The reuse of treated wastewater to irrigate fields has shown increased yields of up to 40% in vegetables such as okra, brinjal and chilly as compared to those irrigated by fresh water. These results have been achieved under the European Union and Government of India funded project Water4Crops project.

These results were shared by EU and Indian government at the recent three-day review and planning meeting, titled Integrating Bio-treated Wastewater Reuse with Enhanced Water Use Efficiency to Support the Green Economy in EU and India.

Water4Crops is one of the largest EU-India collaborative projects. Through its 7th Framework Program, the European Commission in 2012 supported the four-year Water4Crops-EU project with a EUR 6 million funding. In the same year, the Department of Biotechnology, Government of India provided EUR 3 million for a twin project, Water4Crops-INDIA.
Mr YS Chowdary, Minister of State, Ministry of Science & Technology and Ministry of Earth Sciences, Government of India, highlighted the importance of treated wastewater for addressing the issues of sanitation and health in rural areas as well as meeting the demand of scarce water resources for agriculture to improve the livelihoods.

H.E. Tomasz Kozlowski, the Ambassador of the European Union to India, said, “The EU and India have similar objectives in the area of research policies – in particular a focus on innovation and on common societal challenges such as health, water and energy. Water is clearly a worldwide challenge and therefore its management requires new approaches and technologies. This is an area where the EU has significant experience and we are happy to work together with India. This project is a good example of how top-level research organizations from several European countries have joined forces with their counterparts in India to develop concrete solutions that benefit both sides. We continue this partnership with India through the Water Forum.”

These results have great potential to be included in Swatch Bharat (Clean India) Mission in reducing pollution and overcoming health hazards by ensuring the safe disposal of wastewater in agriculture.

“We are delighted that the European Commission’s Framework Program 7 (FP7) and the Department of Biotechnology initiative, have promoted the sharing of research and technologies among participating consortia in India and Europe for the benefit of the common people. We believe that working together globally will provide implementable solutions to the challenges that India faces,” said Mr Vijay Raghavan, Secretary, Department of Biotechnology, Ministry of Science and Technology, Government of India.

The EU Consortium includes 21 partners from eight countries and an Indian consortium of 11 research and development partners led by the ICRISAT.

“A bilateral project like Water4Crops in the area of wastewater treatment has strengthened the collaboration between partners from India and EU. This has also led to the development of technologies and shared knowledge across the regions,” said Dr Antonio Lopez, Project Coordinator, Water4Crops, Europe.

Dr Suhas P Wani, Project Leader and Director, Asia Region, ICRISAT said, “This technology of treated domestic wastewater is finding acceptance amongst the rural people and has good potential to scale-up in the country to address the issues of health and sanitation in rural areas as well as meeting the water demand for agriculture.”

The Indian consortium partners have demonstrated the use of constructed wetlands as decentralized wastewater treatment systems for both industrial and municipal wastewater. At the SABMiller factory in Sangareddy, Telangana, and KCP Sugar and Industries Corporation Ltd in Lakshimpuram, Andhra Pradesh, wetlands were constructed to treat the effluent coming from effluent treatment plants. Similarly, constructed wetlands were used to effectively treat municipal wastewater at multiple locations in the Indian states of Telangana, Andhra Pradesh, Maharashtra, Uttar Pradesh, and Karnataka.

Under the project work, many wetland plant species, such as Canna indica, lemon grass (Cymbopogon), napier (Pennisetum perpureum X Pennisetum americarnum), para grass (Urochloa mutica), typha (Typha latifolia), water hyacinth (Eichhornia crassipes), water lettuce (Pistia stratiotes) and a weed species Agaratum conyzoides, have been identified for purifying the wastewater. They will also be helpful in reducing the nutrient load in the free-water-surface and sub-surface constructed wetlands.

Based on the pilot sites at ICRISAT-India and other locations, a total of 28 watershed sites are now supported by various corporates under Corporate Social Responsibility (CSR) projects as well as the Government of Karnataka’s Bhoo Samrudhi program and Andhra Pradesh Primary Sector Mission (APPSM) Rythu Kosam, where a Decentralized Wastewater Treatment (DWT) approach is being implemented and popularized.

Project: Water4Crops - India
Investor: Department of Biotechnology, Government of India
Partners: The Energy and Resources Institute (TERI), UAS Dharwad, UAS Bengaluru, MSSRF, NEERI, Euro India Research Centre (EIRC), JISL, SABMiller, Ugar Sugar, PRAJ Matrix, Larsen & Toubro (L&T) and ION Exchange from India and 22 partners from EU.

CGIAR Research Program: Water, Land and Ecosystems (WLE)

Nigerian farmers beat high temperatures with dry-season groundnut varieties

Farmers in northern Nigeria are switching over to groundnut production in the hottest months of the year. From an initial six farmers cultivating the improved groundnut variety in the 2012 dry season, today there are over 5000 farmers in northern Nigeria involved in groundnut production.

Unlike vegetables and fruits grown in the dry season, the groundnut produced during this period coincides with a peak in demand for groundnut seeds, so seed growers can tap a ready market. In addition, the groundnut crop residues provide a good source of income to farmers at a time when the price of fodder is highest. Also, the groundnut is not affected by market glut as is the case with fruits and vegetables during this period.

“I am a farmer and public servant for about 35 years now. Since this dry season groundnut was introduced 3 years ago, I got about 200 bags of groundnut last year, in addition to the fodder which I use for feeding my animals,”
Participants during the farmers’ field visit appreciating groundnut variety Samnut24.
New initiative started to popularize hybrid pigeonpea for self-sufficiency

Mr Shobhana K Pattanayak, Secretary, Agriculture, Department of Agriculture Cooperation & Farmers Welfare (DoAC & FW), Government of India, has called on all value chain actors including farmers, seed companies, private sector and research organizations to find a joint solution to resolve all hurdles and issues that are preventing Indian farmers from meeting their demand for hybrid pigeonpea seeds and other pulses.

At the request of the Government of India, ICRISAT recently hosted a high-level planning meeting at its headquarters in Hyderabad, which was chaired by Mr Pattanayak.

Over forty participants including farmer representatives, government officials from five State Departments (Andhra Pradesh, Telangana, Maharashtra, Karnataka and Odisha), state agricultural universities and eight seed companies involved in the production of hybrid seeds came together and started a new initiative to explore ways of making India self-sufficient in the production of pulses, in particular hybrid pigeonpea.

At a time when India is keen to be pulse self-sufficient and is committed to overcome the under supply and export costs, popularization and increasing the uptake of hybrid pigeonpea across India was recognized as one of the key solutions during the deliberations.

“We want to hear from all the sectors on what is stopping the popularization of hybrid pigeonpea and what can be done about it. We need to popularize the pigeonpea hybrids in major pigeonpea producing states of India, and this action plan has to address the issue of seed production and availability of hybrid seeds to the farmers. The solution needs to have all the parties playing a part,” said Mr Pattanayak.

“In order to meet its ever-growing demand for pulses, India needs to achieve self-sufficiency in pulses. We need to make pulses production more profitable by reducing production costs through mechanization, using hybrids and minimizing the post-harvest losses.” said Dr David Bergvinson, ICRISAT Director General during his address to participants via video conference from USA.

Reiterating ICRISAT’s extensive research in pulses, Dr Bergvinson said that hybrid pigeonpea is the world’s only hybrid amongst the legumes, which was developed by ICRISAT along with its partners in research over the last 30 years. But despite being hailed as a great scientific breakthrough and huge success, uptake is nowhere near what it could be.

Looking at the success of some farmers who have cultivated hybrid pigeonpea and market demand, ICRISAT has seen a huge surge in enquiries for hybrid pigeonpea, and scientists have received over 700 phone calls from Indian farmers in the last three weeks asking for seeds.

Mr Manik Kadam a farmer from Donoda village of Maharashtra, who took part in the deliberations, was proud to say that he has successfully growing ICRISAT’s pigeonpea hybrids for the last 5 years.

“Hybrid pigeonpea gives yield of over 3.0 tons per hectare as compared to local varieties’ yield of 1.7 to 2 tons per hectare; it has helped to increase my income. Also compared to local varieties, hybrids like ICPH 2740, ICPH 3762 are resistant to diseases, hence reducing the cost involved in pesticide spraying,” said Mr Kadam.

With regular monitoring and guidance from ICRISAT scientists, Mr Kadam is now an expert in hybrid pigeonpea technology and has become a popular farmer in his region, attracting other farmers and agriculture officers to see his hybrid fields.

Mr Sanjay Lohiya, Joint Secretary, DoAC & FW stressed the need to harness the potential of hybrid pigeonpea to achieve pulse self-sufficiency and said that we need to discuss all aspects of hybrids including seed cost, target areas suitable for hybrid cultivation and workout the plan by leveraging ongoing schemes of the Government of India.

He also said that since there are government incentives in the form of subsidies for seed production and seed distribution, a cluster-based approach for demonstrating the potential of pigeonpea hybrid needs to be prepared along with the road map and this is the best opportunity to popularize pigeonpea hybrid.

Dr Suhas P Wani, Director, Regional Program for Asia at ICRISAT presented the challenges and
opportunities for harnessing the potential of hybrid pigeonpea in different Indian states and proposed a detailed road map for covering the large areas during the year 2016 and as well as plans to produce hybrid seeds and also the parental lines needed for scaling-up the pigeonpea hybrid cultivation.

ICRISAT and state officials chalked out the detailed strategy for the rainy season of 2016 for popularizing hybrid pigeonpea cultivars in different states as well as the plans for seed production to cover larger areas during 2017-18. The detailed work plan till 2018 aims to cover an area of over three million hectares under pigeonpea cultivation.

**Global team cracks ancestor genome of groundnut**

A scientific breakthrough on the DNA sequencing of groundnut promises the development of improved groundnut varieties with enhanced traits such as increased pod and oil yield; drought and heat tolerance and greater disease resistance. Other significant traits this could help develop include aflatoxin-free, nutrition-rich and allergen-free varieties. The breakthrough also provides insights into geocarpy - a unique reproductive process of the groundnut, oil biosynthesis and allergens.

A team of 51 scientists from 9 institutes from China, India, USA and Australia, including ICRISAT, have decoded the complete DNA sequencing of the ancestor of the groundnut, the diploid A-genome (Arachis duranensis). The findings have been published in the prestigious journal *Proceedings of the National Academy of Sciences (PNAS)*, USA, (Read here).

“This study has not just provided the full genome sequence to help plant breeders across the globe develop more productive and more resilient groundnut varieties in a faster manner, but also provides us an insight to geocarpy, a reproductive process where the flowers grown on the stem go inside the soil and pod formations occur,” said Dr Rajeev Varshney, Co-Coordinator of Genome Sequencing Project and Research Program Director, Genetic Gains program, ICRISAT.

Congratulating the team on this breakthrough, Dr David Bergvinson, Director General, ICRISAT said, “This will provide an efficient road map for sustainable and resilient groundnut production for improved livelihoods of smallholder farmers particularly in the marginal environments of Asia and sub-Saharan Africa.”

This study presents the draft genome of the groundnut A-genome progenitor containing 50,324 protein-coding gene models. Analysis of the complete DNA sequencing suggests that the groundnut lineage was affected by at least three sets of chromosomes since the origin of flowering plants or eudicots. The research expands the knowledge of understudied areas of plant biology and human impacts on plants and also offers millions of structural variations that can be used as genetic markers for the development of improved groundnut varieties through genomics-assisted breeding.

While highlighting the importance of this discovery in the Indian context, Dr Trilochan Mohapatra, Director General, Indian Council of Agricultural Research (ICAR) said, “Rich in protein and edible oil, groundnut is central to the financial and nutritional well-being of hundreds of millions of farmers and consumers across India, China, Africa and South America. The novel genes identified are going to enhance crop productivity and quality and thereby increase farmer incomes.”

“In addition to the discovery of responsible genes for oil formation in seed and allergens affecting human health, genome sequencing has also provided genes and millions of genetic markers to accelerate development of superior groundnut varieties with high pod and oil yield, greater resistance/tolerance to biotic and abiotic stresses and other nutritional traits”, said Dr Manish Pandey, Scientist - Groundnut Genomics and Lead author from ICRISAT on the research paper.

Dr Xuan Qiang Liang from the Crops Research Institute of Guangdong Academy of Agricultural Sciences and Dr Shanlin Yu from the Shandong Peanut Research Institute from China, the other two co-coordinators of the sequencing project are excited to see the completion of the project. They have been working on cracking this DNA along with others including Dr Varshney, Dr Andrew Paterson, Regents Professor and Head, Plant Genome Mapping Laboratory, University of Georgia, USA and Dr Shuping Wang, Director, Shandong Shofine Seed Company, for the last four years.

While expressing his happiness, Dr Liang said, “It has been a pleasure for us to work with ICRISAT and other institutes
from China and USA to reach this important milestone in peanut research.”

“The genome sequence and established partnership during the course of the project will be helpful for peanut improvement in China and other countries” added Dr Yu.

Groundnut is one of ICRISAT’s mandate crops, along with chickpea, pigeonpea, sorghum, pearl millet and finger millet. ICRISAT led a global research partnership in decoding the genome sequence of pigeonpea in 2011, and of chickpea in 2013; it is currently leading the genome sequencing of pearl millet. These high-quality genome sequencing efforts have put ICRISAT in select advanced research institutes of the world.

Watch video here.

Involving IT startups to revolutionize farming

Digital agriculture gets a boost with the launch of a strategic partnership between T-Hub, the startup incubator in Telangana State and ICRISAT. The areas that will be explored in the collaboration include:

- The setting up of an incubation hub for agriculture.
- Partnerships and synergies across the innovation spectrum.
- Sponsoring agricultural related programs, events and workshops.

Ways in which ICRISAT can become a partner in T-Hub’s Accelerator program in the agriculture domain, which provides a very rigorous course with high-level mentorship to start-up entrepreneurs.

“Food and life sciences demands are of the highest need in the country. It’s also a time when science innovations in the area of big data and analytics are intersecting with each other to change the technology landscape. It is with this motive that we are keen to innovate and push the boundaries in the AgriTech space. The T-Hub and ICRISAT engagement model is a unique one, designed to challenge and bring change to the agriculture landscape in India,” says Jay Krishnan, Chief Executive Officer of T-Hub.

Under this partnership, an international Agricultural Innovation Program will be launched and the initiative will begin by sourcing AgriTech startups from Israel. Both, ICRISAT and T-Hub will provide mentoring, access to agriculture-centric research, business models and market access. To facilitate a lot of this, ICRISAT is setting up an innovations and creative space for entrepreneurs and other stakeholders. The plan is to create a dynamic Agricultural Innovation Platform in Hyderabad that will help to substantially improve the lives of farmers not just in India but around the world.

“We are very excited about this close partnership and the enormous potential it has. This is a unique collaboration that brings together ICRISAT’S expertise in agriculture across the value chain and T-Hub’s vibrant and extensive network of entrepreneurs that have varied skills and creative capabilities. We will span multiple programs covering agriculture as the core domain and technology innovation which will create impact on a large scale. We also plan to run multiple collaborations including theme based hackathons and acceleration programs,” says Dr. David Bergvinson, Director General of ICRISAT.

Indian farmers and agricultural value chain actors need access to comprehensive information: weather forecasts, ideal dates for planting and other farm operations, appropriate crop varieties, potential return on investment and more. But this information is often difficult to access, analyze, and communicate in a timely and accessible format to farmers. Digital entrepreneurs can play a crucial role in gathering, analyzing and disseminating that information to farmers in a more accessible medium. Timely access to this information could increase food production and help farmers overcome the challenges of extreme climate variability.

T-Hub is a unique public-private partnership between the government of Telangana, three of India’s premier academic institutes (International Institute of Information Technology - Hyderabad, Indian School of Business and National Academy of Legal Studies and Research) and key private sector leaders.

The Memorandum of Understanding (MoU) was signed on 31 May between the two organizations to foster a collaborative environment to help entrepreneurs at T-Hub leverage their skills to improve the lives of smallholder farmers in the drylands of South Asia and sub-Saharan Africa.

Mr Jay Krishnan, CEO T-Hub and Dr Carberry, exchange signed MoU.
Workshop

Improving country-specific nitrous oxide emission factors from agricultural soil management

To design and implement greenhouse gas (GHG) mitigation strategies and low emissions development strategies, representatives from seven Asian countries met recently to develop country-level roadmaps for emission factor development and improvement.

A regional workshop on “Improvement and development of emission factor for nitrous oxide (N\textsubscript{2}O) from agricultural soil management” saw participants from Bangladesh, India, Indonesia, Nepal, Philippines, Thailand and Vietnam focus on:

- Applying the Intergovernmental Panel on Climate Change (IPCC) guidelines and methodologies for developing country-specific emission factor for N\textsubscript{2}O emissions from agricultural soil management;
- Understanding how to conduct actual measurements of N\textsubscript{2}O from agricultural soil management, including data analysis and calculations;
- Identifying potential publications or other sources of country-specific data needed to develop emission factors; and
- Identifying on-going national, regional and international projects/initiatives on N\textsubscript{2}O measurements that could foster future networking and collaboration on emission factor development.

Emission factor is defined as the coefficient of GHG emissions or removals per unit of human activity. Country-specific emission factors help improve the accuracy of GHG emission estimates.

Day 1 of the workshop covered N\textsubscript{2}O emission factor; IPCC guidelines and United Nations Framework Convention on Climate Change (UNFCCC) GHG inventory system. On day 2, participants were trained on GHG sampling techniques through manual and automated chamber system, sampling protocol, laboratory analysis and emission factor calculation. On day 3, participants visited the field research site, where manual and automated GHG sampling protocols were demonstrated and the groups undertook field GHG sampling. On the final day, participants from each country developed roadmaps for emission factor improvement.

Resource persons included, Dr Amnat Chidthaisong and Dr Sirintornthep Towprayoon, King Mongkut’s University of Technology Thonburi, Thailand; Dr Phongthep Hanpattanakit, Srinakharinwirot University, Thailand; Dr Tek Sapkota, CIMMYT-India; Dr Pradipta Ranjan Pradhan, ICRISAT-India. This workshop is aligned to the GHG emissions work lead by Dr Pradhan in Innovation Systems for the Drylands and supported by the CCAFS South Asia regional program.

ICRISAT research program, Innovation Systems for the Drylands, hosted the four-day workshop which was support by the USAID Low Emissions Asian Development (LEAD) Program during 14-17 June at ICRISAT-India. A total of 28 participants attended the workshop representing academics, researchers and government officials. The workshop was a combination of guided lectures, practical exercises and a field visit to understand data requirements and to perform field measurements for emission factor estimation.

Participants at the regional workshop.
Enhanced legumes production in Lao PDR through cross-country learning

Cross-country collaboration between Lao PDR, Vietnam, Nepal and India is leading to inclusion of legumes in crop rotation for soil nutrient sustainability as well as in the largely cereal-based daily diets of Lao PDR people which is leading to enhanced nutrition security. Researchers from Lao PDR received seeds of improved groundnut varieties and mung bean and learnt the sustainable intensification technologies of production for these two crops from their counterparts in Vietnam.

During a recent annual review meeting of the International Fund for Agricultural Development (IFAD) grant project, the project achievements were highlighted:

**Major achievements during 2012-13 to 2015-16:**
Intercropping with grain legumes was a key strategy identified to improve productivity and sustainability of rainfed agriculture in the project countries. Through farmer-participatory field trials, the productive intercropping options identified to intensify and diversify rainfed cropping systems in these regions were:

- Groundnut with maize in Lao PDR, Nepal and Vietnam
- Pigeonpea with maize in Nepal
- Pigeonpea with soybean in Madhya Pradesh, India

Other initiatives implemented included ridge planting systems; seed treatment; integrated pest management (IPM); integrated crop management (ICM); integrated nutrient management (INM); adoption of improved crop varieties and production technologies; promoting community-based seed production groups and market linkages. Drought forecasting as well as drought adaptation and mitigating strategies for the target regions are important components of the project.

Country specific achievements for the period of 2012-13 to 2015-16 cropping seasons are highlighted below.

**Vietnam:**
- To ensure seed supply of improved varieties, 24 tons groundnut (L 23 and L 26 varieties) and seven tons of soybean (NAS-S1 variety) seed was produced at the research stations
- Farmers were linked with a local seed company in Cao Bang which purchased 500 tons of groundnut seed from the farmers benefiting them to the tune of US$120,000
- 808 farmers participated in seed production of improved varieties in their fields subsequently and produced 547 tons seed of groundnut (L 23 and L 26), mungbean (DX 208 and DXVN 7) and soybean (DT 26 and NAS-S1)

**Lao PDR:**
- 110 tons of groundnut seed (Thainan 9 and KKU 6 varieties) was produced by 88 farmers including 18 women
- 285 farmers (43% women) received training in production technologies and intensive practices of mungbean, soybean and groundnut
- 60 farmers (52% women) witnessed new improved technologies on farmers’ fields

**Nepal**
- 227 farmers produced 16 tons of chickpea (Avrodhi and KPG 173-4 varieties), bean (PB 0001, KBL 2 and KBL 3 varieties), pigeonpea (ICPL 88039 variety), lentil (Sagun, KPG 59, Khajura 1, Simal, ILL 7723, ILL 3738, RL 13, RL 4 and RL 6 varieties) and soybean (Pooja variety) on their fields through community based seed production system
- 426 farmers (52% women) were trained in seed production technologies of legumes and value addition
- 126 farmers (55% women) visited fields of other farmers who practiced improved technologies during four field days

**India**
- 432 farmers produced 19.2 tons of breeder seed and 8 tons TL seed of improved chickpea, pigeonpea and lentil
varieties, 3,971 farmers (50% women) received training in improved legume production technologies
- 1,941 farmers (45% women) participated in field visits and workshops to see and learn improved technologies in various crops

Other activities:
- Cross-country learning: Two scientists and two technical staff from Lao PDR received training in Vietnam at Center for Technology Transfer and Extension, VAAS on production technologies and intensive practices of mungbean, soybean and groundnut
- ICRISAT trained technical staff from all six locations in value addition in legumes in a training session conducted at ICRISAT-India
- ICRISAT trained four scientists (two each from Laos and Vietnam) in production technologies of chickpea, pigeonpea and groundnut. The participants also received training on mungbean production technology through the World Vegetable Center (AVRDC) on the campus during the same period.

At the review meeting, climate change effects in project sites were highlighted as a growing concern, particularly less water availability. Over 10,000 ha of rice area suffered from low water availability in Vietnam last year, which was not witnessed earlier over such a large extent. Dr Nguyen Hong San, Vice President, Vietnam Academy of Agricultural Sciences (VAAS) noted that in the wake of these climate change scenarios, there is an urgent need to move away from low net-income earning rice crop to high net-income alternative crops in upland areas. Climate resilient grain legumes are the best alternative crops for these regions. Dr Wani, Research Program Director-Asia, ICRISAT, urged the partners to document the success stories of the project and make them available on the project website to facilitate cross-learning.

Dr Nguyen Thanh Tung, Country Presence Officer, IFAD Vietnam, said that IFAD is looking forward for continued partnerships to achieve enhanced productivity of legumes and resilience to climate change scenarios through the linkages established between researchers, partners and farmers.

In Rajasthan, India, it was observed that improved varieties/hybrids crops have contributed significantly to intensification of crop production in the target areas. The NGO Mitigating Poverty in Western Rajasthan (MPOWER) is the project partner in Rajasthan. The improved varieties are contributing to enhanced crop yield and net income to farmers. Simple interventions like seed coating of Molybdenum in pigeonpea, intercropping of pigeonpea with soybean and ridge-planting of pigeonpea have contributed to significant yield increase in the project sites of Madhya Pradesh state in India.

The four-year IFAD grant project (2012-13 to 2015-16) “Sustainable Management of Crop-based Production Systems for Raising Agricultural Productivity in Rainfed Asia” is implemented in Nepal (western mid-level hills region), India (Jharkhand, Madhya Pradesh and Rajasthan), Lao PDR (northern and southern areas) and Vietnam (Ha Tinh and Cao Bang provinces). This project has received a one year no-cost extension (2016-17).

IFAD grant projects are linked to IFAD loan projects in their respective countries. Grant projects, through pilot projects develop scaleable technologies that the loan projects adopt and upscale in the respective regions.

The fourth annual review meeting was held from 25-27 May at VAAS, Hanoi, Vietnam. The participants included Dr Hong Son, Ms Thi Thu Trang Nguyen, Ms Thanh Huong Dao and Dr NT Chinh from VAAS, Vietnam; Dr Vinh Vansi from SNRMPEP, Lao PDR; Dr Netra Hari Ghimire from NARC, Nepal; Dr Ashok Tikle and Dr HS Yadava from RVSKV, India; Mr Brij Kishore from MPOWER, India; and Dr Suhas P Wani, Dr Pooran Gaur, Dr Sameer Kumar, Dr P Janila and Dr Srinivasan from ICRISAT. The progress was reviewed and the work plans for 2016-17 were prepared.

Project: Sustainable Management of Crop-based Production Systems for Raising Agricultural Productivity in Rainfed Asia
Investor: International Fund for Agricultural Development (IFAD)
Partners: Project activities are implemented by various partners in different countries:
- Lao PDR: Sustainable Natural Resource Management and Productivity Enhancement Project (SNRMPEP);
- Nepal: Nepal Agricultural Research Council (NARC);
- Vietnam: Vietnam Academy of Agricultural Sciences (VAAS);
- India: Jharkhand Tribal Development Society (ITDS) and Birsa Agricultural University (BAU) in Jharkhand; Rajmata Vijayaraje Scindia Krishi Vishwavidyalaya (RVSKV) in Madhya Pradesh; and
- State Project Management Unit of Mitigating Poverty in Western Rajasthan (MPOWER), in Rajasthan.

CGIAR Research Program: Grain Legumes
Systems thinking and crop modeling skills enhanced using APSIM

A recent crop modelling workshop titled “Cropping System Analysis of Smallholder Agriculture Using APSIM” is an effort to establish crop modeling skills in the West and Central Africa.

Understanding the context and resource constraints that smallholder farmers face in the region calls for ‘systems thinking’ and analytical tools such as crop and household modelling are key in targeting and understanding the potential impact of interventions in a climatically risky environment. The training was aimed at scientists who are novices, as well as those who are intermediate users of the Agricultural Production Systems Simulator (APSIM), to advance their crop modeling skills.

The workshop provided participants with the background theory and applied experience to build on the existing cropping systems modeling knowledge and interpretation. Skills learnt will be useful when designing new cropping systems or ex-ante analysis of altering technology on resource constraints and adaptation to changing climate. Understanding and application of crop systems modelling and ability to interpret outputs will be improved which result in more informed decisions on cropping systems responses.

The welcome address was presented by Professor Jibrin M Jibrin, Director, Centre for Dryland Agriculture (CDA), while Professor Muhammad Yahuza Bello, Vice-chancellor, Bayero University Kano (BUK) presented the opening address during which he noted that crop models are decision support tools for modern agricultural practices. Introductory speeches were by Dr Hakeem Ajeigbe, Country Representative Nigeria & Principal Scientist, Agronomy, and Dr John Dimes, Resource Person. Participants received certificates from Dr Anthony Whitbread, Director, ICRISAT Innovation Systems, ICRISAT, at the end of the workshop.

The 5-Day training workshop held from 30 May to 3 June, was organized by the Centre for Dryland Agriculture (CDA), Bayero University Kano (BUK) Nigeria, in collaboration with ICRISAT. A total of 26 trainees participated in the workshop including participants from Niger, Mali and Sierra Leone.
Sweet sorghum complementing ethanol production in sugar mills

To help the government achieve the national ethanol blending targets of 20% by 2017, private sugar mills and the public sector research institutes are collaborating with ICRISAT to identify and test sweet sorghum varieties suitable for ethanol production. A total of seven sugar mills are associated with ICRISAT in this 3-year project.

At the first Annual Review cum Work Planning meeting many sweet sorghum hybrids were identified as suitable for ethanol production. As part of the project the agronomy for achieving higher yields is being perfected. Participants compared the economics of ethanol production from both sugarcane and sweet sorghum and highlighted the advantage of sweet sorghum over sugarcane. They all expressed interest in strengthening the collaboration and offered land for trials and usage of their distilleries for quantifying ethanol production.

<table>
<thead>
<tr>
<th>No.</th>
<th>Partner</th>
<th>Promising Cultivars</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Madhucon Sugar and Power Industries, Telangana</td>
<td>ICSV 25308, ICSV 25306, ICSSH 28, Phule Vasundhara and ICSV 12012</td>
</tr>
<tr>
<td>2</td>
<td>Shree Ganesh Khand Udyog Sahakari Mandli Limited, Gujarat</td>
<td>ICSSH 28, Phule Vasundhara, ICSV 25306, CSH 22 SS</td>
</tr>
<tr>
<td>3</td>
<td>Kisan Sahkari Chini Mills Ltd, Uttar Pradesh</td>
<td>Phule Vasundhara and ICSV 25306</td>
</tr>
<tr>
<td>4</td>
<td>Salem Co-operative Sugar Mills Limited, Tamil Nadu</td>
<td>ICSSH 28, ICSV 12012, CSH 22 SS</td>
</tr>
<tr>
<td>5</td>
<td>Core Green Sugars, Karnataka</td>
<td>ICSSH 28, ICSV 12012, ICSV 25308 and ICSV 25306</td>
</tr>
</tbody>
</table>

Achievements for Year 1:

- A big mill test was successfully conducted at Madhucon Sugars, Telangana without changing any of the mill settings. The test showed a primary brix (sugar content of a solution) of 15° which is close to sugar cane.
- Bagasse utilization is critical in sweet sorghum value chain and one of the possible uses of bagasse is through composting. Among the ten microbial strains studied for their efficiency in composting, three strains (Myceliophtora thermophila ATCC-48104, Aspergillus awamori and Bacillus subtilis) were found to enhance bagasse composting, with more than 65% of the bagasse getting degraded within 60 days in rice straw as well as farm yard manure amended treatments. Microbial treatments enhanced micronutrient contents of the composted bagasse.
- The results from planting dates experiments indicated that brix content of sweet sorghum at harvest was influenced by dates of sowing, the stem girth varied with the cultivar, while plant height was affected by both dates of sowing and cultivar. The fermentation efficiency was high (>90%) for juice from two genotypes ICSV-93046 and ICSV-25306 varieties.
- More than 100 sugar mill staff and sweet sorghum farmers trained in the project for achieving higher yields in sweet sorghum.

Work plans for Year 2

- In the multilocation trials a new trial will be formulated by adding 4 new entries making a total of 11 entries. ICRISAT and Indian Institute of Millets Research (IIMR) to contribute the entries and the trial guidelines along with seed material.
- Big mill test will be conducted at Ganesh Sugars in 2016 rainy season with IIMR and ICRISAT supplying the seed.
- Ratooning experiment and date of sowing experiment will be conducted in 2016
- Juice quality assessments of selected sweet sorghum genotypes and establishing their fermentation efficiencies; assessing the water requirement per unit of ethanol and effluent analysis
- The effect of microbes on sweet sorghum bagasse will be validated and the compost produced in year 1 will be tested in glass house and field
- Capacity building programs will be conducted (1 in each target state)

The meeting was held at ICRISAT on 30 May and attended by 31 scientists and managers including Dr Vilas A Tonapi, Director, IIMR, Mr JP Singh, Chief Cane Advisor, National Federation of Cooperative Sugar Factories, participants from Jawaharlal Nehru Technological University, Hyderabad, private sugar mills and ICRISAT.

Project: Commercialization of sweet sorghum as a complementary feedstock for ethanol production in the sugar mills of Maharashtra, Tamil Nadu and Gujarat
Investor: Department of Biotechnology, Govt of India
Partners: IIMR, Jawaharlal Nehru Technological University, Hyderabad, National Federation of Co-operative Sugar Factories, sugar mills and ICRISAT
CGIAR Research Program: Dryland Cereals
Unlocking the full potential of genetics gains

Strategies to integrate activities across research programs, and promoting collaboration and integration among scientists, were some of the key aspects discussed during the recently held Planning and Strategy Meeting of the Genetic Gains Research Program. This objective was to harness synergies for efficient use of resources, and assess needs and opportunities to develop a road map for the Genetic Gains Research Program in collaboration with other research programs.

The three regional programs – Western and Central Africa; Eastern and Southern Africa and Asia – highlighted how they can contribute by identifying 3-5 research focus areas planned by theme and crop wise research activities. Every region emphasized on strengthening the data management strategy.

Proceedings and revised work plans of the scientists would be developed based on the discussions of this meeting. It was also decided to go for joint proposal development and funding opportunities.

Dr David Bergvinson, Director General, ICRISAT, addressing the gathering via videoconferencing from Seattle, emphasized on the need to figure out a mechanism to unlock the full potential of the Genetic Gains Research Program that went beyond traditional yield improvement and trait identification, to identifying better markets and improved nutrition for smallholder farmers.

An overview of the Genetics Gains Research Program provided the participants an insight into different activities across the themes namely: Genebank, Genomics and Trait Discovery, Cell, Molecular Biology and Genetic Engineering, Pre-breeding, Forward Breeding, Seed Systems and Statistics, Bioinformatics and Data Management. This enabled participants across regions have a better understanding and look for opportunities to integrate and share resources. It was decided that each theme will work in close coordination with the regional programs.

Participants from across the regions were split into two groups, Cereals and Legumes, to brainstorm on how a particular theme will contribute towards enhancing genetic gains. The groups identified the following: key research areas for each theme, focus traits and gaps, long- and short-term goals and approaches for better integration across themes and research programs.

For ICRISAT mandate crops the following were identified as opportunities to bridge the gaps: disease resistance; drought resistance; iron/zinc enhancement; fodder quality; adaptation to low levels of soil Phosphorous; nutritional quality traits; mechanical harvesting; oil content; etc.

Other common issues identified across the regions were primarily in seed systems: low participation of private sector; a need to understand the functioning of the informal seed systems; low seed replacement rate, etc.

The 2-day meeting held during 25-26 May at ICRISAT-India was attended by more than 80 participants from across the regions.
Forging multi-sectoral partnerships to tackle malnutrition in Kenya

Exploring how best to approach multi-sectoral collaboration and how to develop a comprehensive, robust nutrition strategy that is in line with the priorities of the Kenyan government were the issues explored at a two-day workshop recently.

The multi-sectoral partnership with agriculture, health and education sectors, is being used in Kenya to mainstream nutrition into agricultural development with the aim to reduce malnutrition in the country. This is being attempted through a range of activities, from developing and promoting production and consumption of nutritious crops such as millets, sorghum and legumes; bio-fortification, to partnering with stakeholders to mainstream health, agriculture, nutrition education and women empowerment.

The workshop brought together nutritionists and behavior change communications specialists from different agencies and government programs in the country. Some outcomes of the workshop include:

- Project team to engage more stakeholders at the national nutrition sector coordination platform and support the coordination structures in the counties for nutrition programs
- Ministry representatives promised to engage in all opportunities that they identified, and that contribute to their priorities at national and county level
- Nutrition actors promised to conduct joint planning of activities in the same areas
- Project team will engage private sector to enhance market linkages and create the demand pull for nutritious products.

“Our desire is to have a coordinated approach so that we can leverage at points of convergence and engage where there was divergence so as to contribute to improving nutritional status of women and children in Feed the Future Zones of Influence in the country,” said Ms Esther Omosa, Senior Nutrition Specialist, Kenya Accelerated Value Chain Development Program (AVCD), who facilitated the workshop.

In his opening remark, Dr Iain Wright, Deputy Director General, ILRI, stressed that determinants of malnutrition are multifaceted, ranging from individual health status; household access to safe, nutritious, and diverse foods; water, sanitation, and hygiene (WASH); to feeding and caring practices; and family size and birth intervals. “In the past, many nutrition initiatives have been vertical programs implemented through isolated delivery systems; however, there has been a recent recognition that multi-factorial causation is best addressed with multi-sectoral interventions,” he said.

The AVCD project seeks to address the underlying causes of malnutrition through nutrition sensitive interventions in 21 counties in Kenya. The aim is to improve the nutritional status of women of reproductive age and children below 5 years through:

- Increase investment in agriculture and nutrition related activities
- Improved access to diverse and quality food and
- Improved utilization of maternal and child health and nutrition services

Representatives from government programs presented priorities in the different ministries and departments. There was an opportunity to learn about and from the nutrition programs in the country, funded by USAID. AVCD implementing partners, International Potato Center (CIP), International Livestock Research Institute (ILRI) and ICRISAT shared their planned activities and sought feedback from the participants.

The workshop held at ILRI Nairobi Campus on 17-18 May was attended by representatives from the United States Agency for International Development (USAID), ILRI, ICRISAT, CIP, Ministry of Health, Ministry of Agriculture, Ministry of Education as well as USAID funded programs including the USAID-Kenya Agricultural Value Chain Enterprises (KAVES), Nutrition and Health Program Plus (NHP plus) and Kenya—Integrated Water, Sanitation, and Hygiene Project (KIWASH).

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Rehabilitating laboratories in Central African Republic

In order to rehabilitate laboratories that were completely damaged by the 2012-2014 civil war in the Central African Republic, seven participants from the Central African Republic Institute of Agricultural Research (ICRA) were trained at ICRISAT-Niger on seed production and soil analysis.

The training in the soil lab included both theory and practice on: 1) Basic chemistry concepts; 2) Soil and plant material sampling; 3) Sample preparation; 4) Reagent preparation; 5) Determination of soil PH; and 6) Safety. The training in the gene bank included: i) Technical itinerary for groundnut seed production; ii) Varietal characterization ii) Criteria for production of seeds of good quality; and iii) Measure of humidity and germination tests.

In the seed unit the participants learnt how to determine varietal purity, seed certification, and handling, processing and packaging of seeds. The participants visited private seed enterprises and the laboratory of the national seed certification office.

The training was given by Mr Paul Buckner, Consultant, Seed systems, ICRISAT-Niger; Mr Hassane Y Bissala, Scientific Officer, Genebank and Mr Illo Amadou, Senior Soil Lab Supervisor. Prior to the training, an evaluation of ICRA training and facilities needs was carried out by Mr Amadou in September 2015.

As part of the ICRA groundnut breeding and seed unit rehabilitation process, an order of 840 kg of foundation seeds of seven groundnut varieties (Fleur 11; JL24; ICG9199; ICG47023; ICG13395; ICG8443; and ICG13415) has been placed. The seeds will be multiplied in the coming rainy season.

Tribal farmers’ trained in pigeonpea cultivation

Farmers from tribal regions of Telangana, India, attended a training program on modern crop production techniques in pigeonpea organized by the ICRISAT Agribusiness and Innovation Platform (AIP) recently.

A detailed session on the package of practices for best yields in pigeonpea was held. During the training, the farmers interacted with Dr Sameer Kumar, Senior Scientist, Pigeonpea Breeding, on crop production practices and the problems of pigeonpea cultivation. The discussion included comparing economics of cotton and pigeonpea cultivation and it was suggested that pigeonpea can be more profitable than cotton if due care is taken. The farmers were updated on the benefits of using improved seed varieties like Maruti and Asha, which had better yields and economic returns.

Their queries on the challenges they face in crop production due to wilt disease, fog, erratic weather, etc., resulting in reduced yields, were addressed and solutions provided by ICRISAT scientists. Farmers also explained that most of the time they are forced to sell due to lack of storage facilities and for financial reasons. It was suggested that processing to make dal (spilt pigeonpea) can be explored, so that farmers can earn higher income. The group saw the demonstration of the dal mill (processing unit) where the technicalities and the functionalities of the mill were explained. It was also proposed to form Farmer Producer Organization (FPO) which will have collective bargaining power. AIP offered to assist them in the FPO formation.

The group was briefed on market linkage opportunities and the various storage techniques available. In the process, positive case studies were shared, such as the good package of practices followed by the farmers at Tandur, where the crop is sown over large areas.

AIP will work closely with the Integral Tribal Development Agency (ITDA), Utnoor, to provide necessary support to these farmers. Proposed interventions are:
Project: Sustainable agricultural development through value addition and linking tribal farmers to markets in Adilabad district of Telangana - transitioning tribal farmers from traditional to modern agriculture

Investor: Integrated Tribal Development Agency (ITDA), Utnoor, Adilabad district, Telangana, India

- Provide on-field crop and seed production support;
- Establish processing units (dal mills);
- Provide training on the handling of processing units; and
- Provide marketing knowhow and market linkages for better price realization.

A group of 30 pigeonpea farmers visited ICRISAT on 20 May. The tribal regions are some of the most backward regions, and the farming systems practiced are largely traditional, using local indigenous seeds which have low yields, thereby resulting in a not-so-profitable agricultural outcome.

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**Seed inspectors trained on seed quality control in Malawi**

In a bid to strengthen seed quality control mechanism in Malawi, 112 para seed inspectors from government and the private sector were trained in three groups, as part of the Feed the Future Malawi Improved Seed Systems and Technologies (FtF-MISST) project.

Dr Wilkson Makumba, Director Agricultural Research, Department of Agricultural Research Services said, “Despite being one of the leading institutions in Africa, the expansion of the seed industry has over-stretched the government’s seed certification control services.”

The Malawi seed industry has grown exponentially over the past few years. In 2000, there were only three registered seed companies and currently there are 23 companies with the informal seed sector expanding even faster, making it hard for the 25 government seed inspectors to carry out effective inspections.

Speaking at the graduation ceremony, Dr Peter Carberry, Deputy Director General – Research, ICRISAT, highlighted the fact that good inspection enhances quality of seed and hence well trained and qualified seed inspectors play a crucial role. “So far 112 para seed inspectors have been trained from government, farmer associations and private seed companies. This is highly commendable. I am sure that they will help the government seed inspectors in maintaining the seed quality that reaches the farmers,” he said.

The weeklong training program was the third such training, held at the ICRISAT-Malawi and attended by 44 inspectors. The graduation ceremony saw 112 inspectors receiving their completion certificates.

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Project: Feed the Future - Malawi Improved Seed Systems and Technologies (FtF-MISST) project
Investor: USAID
Partners: International Institute for Tropical Agriculture (IITA), International Potato Centre (CIP), International Maize and Wheat Improvement Centre (CIMMYT) and ICRISAT
Announcements

20th Annual Conference of Asian Science Park Association

The 20th Annual Conference of Asian Science Park Association (ASPA), “Innovation sharing & collaborative opportunities in S&T for advancement in Asia & Asia Pacific”, is being organized in India for the first time in the last two decades.

The major themes are:

- Industrial R&D: Next Generation Policy Reform
- Technology Transfer Office and its role in Technology Commercialization
- Science and Technology Parks: Opportunities for Startups for value-added services
- Technology Based Business: Role of Business Incubation, Co-Business Incubation and Spin-offs
- Translational Research Platform: A new way of product development
- Challenges and Opportunities in Public-Private Collaborations in Asia

The Annual Conference is being jointly organized by ICRISAT and Hyderabad Convention Visitors Bureau (HCVB).

Conference date: 19-22 October 2016
Venue: Hyderabad International Convention Centre (HICC), Hyderabad, India.
For more information see here.

Africa Food Prize – Nominations invited

The Africa Food Prize, recognized extraordinary individuals or institutions whose contributions to African agriculture are forging a new era of sustainable food security and economic opportunity for all Africans. Building on the values and principles established by the Yara Prize, the Africa Food Prize puts a spotlight on achievements and innovations that can be replicated across the continent to eliminate hunger and poverty and provide a vital new source of employment and income.

Due date: Nominations must be received by 24 June 2016

To find out more see here:
Nomination information for the Africa Food Prize – English
Nomination information for the Africa Food Prize – French
Web Updates

Identifying climate-smart sorghum lines for Mali

*Ms Madina Diancoumba, PhD student, ICRISAT*

Although numerous Malian sorghum landraces are well adapted to biotic and abiotic stresses due to their photoperiod sensitivity and good grain quality, their production remains low compared to the potential yield. We interpret this is due to the difficulty of breeding sorghum cultivars that can deal with complex abiotic stress, such as drought prevailing in the region, complex interactions among genotypes (G), management (M), and environments (E), the temporal and spatial variability in rainfall and the low-input farming systems.

Small farmers don’t give up on Pendo groundnut in Tanzania

*Dr Emmanuel Monyo, Theme Leader - Seed Systems, Genetic Gains Program, ICRISAT-Kenya*

Annual groundnut production in Tanzania doubled from 340,770 tons in 2008 to 810,000 tons in 2012, and smallholder farmers as part of the Tropical Legumes II project largely contributed to this growth. Smallholder farmers hold the key to agriculture all over the world, and it is no different in Tanzania. Here, the Jipe Moyo group (which means ‘don’t give up’) formed in 2011 as a savings and loans group, has discovered the benefits of cultivating groundnut variety Pendo.

Our crops and croplands feed livestock

*Dr Peter Carberry, Deputy Director General-Research, ICRISAT*

Can Africa’s growing demand for red meat be met by better utilizing cropland resources and the available feed/forage technologies produced in the mixed crop-livestock systems of the dry Semi-Arid Tropics?

The answer came to me when I recently undertook an extended trip in southern Africa where I visited farmer and National Agricultural Research Systems or NARS collaborators of ICRISAT scientists Martin Moyo in Zimbabwe and Sabine Homann-Kee Tui in Mozambique.

On gender and plant breeding

*Dr Eva Weltzien-Rattunde, Ex Principal Scientist, on her work at ICRISAT*

This blog post is one of several in which we aim to tell the story of how plant breeding research and variety development makes a difference to the lives of the rural poor, especially women. Whilst a majority of the world’s smallholder farmers are women, gender norms often prevent them from being recognized for both their role in and contributions to agriculture.

We are keen to read about your work, scientific thoughts and experience. Your contributions to the blog are most welcome. Write to Smitha Sitaraman (S.SITARAMAN@CGIAR.ORG).
Digital Agriculture Initiatives

Read exciting stories about ICRISAT’s initiatives in using drones to gather information across large areas; voice message based agro-advisory; and using phablets to gather and upload field data and share information with farmers are here.

We would love to hear of any of your project initiatives that use information technology tools to improve lives of farmers and make agriculture profitable and sustainable. Do write to Amit Chakravarty at A.Chakravarty@cgiar.org.

Vlog on the IYP page

Farmer access to varieties is crucial

Watch Dr K Ramasamy, Vice Chancellor, Tamil Nadu Agricultural University, India, talk about how, pulse researchers need to focus on reaching farmers’ and increasing their incomes rather than only on increasing productivity. Biofortification is another area that should be explored to deal with nutritional deficiencies among children in India, as well as developing need-based varieties.

http://www.icrisat.org/farmer-access-to-varieties-is-crucial/

Visits

US Ambassador to Niger and Minister of Agriculture visit ICRISAT research station

Updates on the extensive ongoing research work at ICRISAT Niger and past achievements were shared with Ms Eunice S Reddick, US Ambassador to Niger, and His Excellency Mr Albade Abouba, Niger State Minster of Agriculture and Livestock who visited Sadore research station on 20 May and 23 May respectively.

The two visitors appreciated the potential of the center in terms of facilities and research achievements. They particularly acknowledged the importance of the Sadore regional gene bank and expressed interest in the pearl millet biofortification improvement program.

The US Ambassador instructed her staff to organize a similar visit for the USAID-Senegal Sahelian regional office which will meet in Niamey, Niger, in September 2016. In the past, similar visits were found to be enriching and have led to successful exchanges and partnerships. For example, a visit organized in January 2007 led to the development of a USAID-commissioned CLUSA (The Cooperative League of the USA)-ICRISAT project from 2008-2011.

At the end of his visit, His Excellency Mr Abouba, recalled the objective of the government to reach the zero hunger goals by 2020 and emphasized the importance of research for achieving that goal. The government will soon organize a meeting with all stakeholders to discuss the role of science in agricultural research for development and the way forward for dissemination of technologies.
Awards

Best Research Scholar award to ICRISAT’s PhD scholars

Six PhD Research Scholars from ICRISAT’s Learning Systems Unit (LSU) received the ‘Best Research Scholar’ Award from the Indian Academic Researchers Association (IARA), Tamil Nadu. The awards were given on the basis of the Masters and PhD research projects, as well as their scientific publications. The Award ceremony was held on 21 May at Bharthidasan University, Tamil Nadu, India.

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<tr>
<th>No</th>
<th>Awardee</th>
<th>ICRISAT Supervisors</th>
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<tr>
<td>1</td>
<td>Mr Sunil Chaudhari</td>
<td>Dr P Janila, Senior Scientist, Groundnut Breeding</td>
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<td>2</td>
<td>Mr Satbeer Singh</td>
<td>Dr SK Gupta, Senior Scientist, Pearl Millet Breeding</td>
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<td>3</td>
<td>Mr Rajendragouda Patil</td>
<td>Dr HD Upadhyaya, Head, Genebank</td>
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<td>4</td>
<td>Mr K Sivasakthi</td>
<td>Dr. Vincent Vadez, Theme Leader, System Analysis for Climate Smart Agriculture</td>
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<td>Ms M Tharanya</td>
<td>Dr. Vincent Vadez, Theme Leader, System Analysis for Climate Smart Agriculture</td>
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<td>6</td>
<td>Ms G Karthika</td>
<td>Dr Stefania Grando, Director - Science Quality and Strategy and Dr. Vincent Vadez, Theme Leader, System Analysis for Climate Smart Agriculture</td>
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ICRISAT congratulates the awardees and wishes them a great scientific future.

New Projects

Climate Services Partnership – Senegal: Climates Information Services For Increased Resilience And Productivity In Senegal (Cinsere)

Principal Investigator: Robert Zougmore

Period: Apr 2016 – Sep 2016

Investor: USAID through CIAT

Synopsis: The primary goal of this project is to increase resilience and productivity of targeted Senegalese farming and pastoralist communities, including members of both sexes, in the Feed the Future (FTF) Zone of Influence in the face of climate variability and change, through the improved provision, communication, and use of climate information and services. A secondary goal defined by USAID is to increase understanding of how to supply relevant and effective climate and weather information to the fishery sector and livestock sector.

Evaluating The Prevalence Of Aflatoxin Contamination In The Soils Of The Target Districts In Malawi” Under The Usaid Funded-Project United In Building And Advancing Life Expectations (Ubale)

Principal Investigator: S Anitha

Period: 2016 – 2019

Investor: Catholic Relief Services (Crs)

Synopsis: ICRISAT, in collaboration with UBALE partners, will contribute to USAID’s Feed the Future (FTF) agenda through targeted research on aflatoxin control in farmers’ fields, post-harvest handling, and off-farm value chains. This work will focus on groundnuts as an FTF target crop and UBALE value chain.

The research addresses the FTF agenda of improving the aflatoxin content for attracting investment in value chains to developing markets and will leverage tools introduced by ICRISAT researchers in the region. ICRISAT will investigate whether raising awareness in marketing associations on the constraints that aflatoxin poses to marketability results in improved practices for aflatoxin control, and better prices for aflatoxin-free products. This research provides an important bridge between USAID’s FTF agenda and its Food for Peace activities, including opportunities for the work in Malawi to inform practice elsewhere around the world. This research will build on the baseline aflatoxin levels determined as part of the capacity building work, and take place during the 2018/2019 season.

ICRISAT Happenings | June 2016 | 1730 | 23
Great read this week. Particularly the microdosing of fertiliser. This is very important for it makes this unaffordable commodity available to the very poor. However, the application details or modalities need sorting out for it to be viable. Like I keep saying most of the farming communities are highly labor constrained. Nevertheless, this is encouraging and I believe it is doable.

Dr Charles Mutinda
Principal Maize Breeder, KALRO Embu

Reader’s Comments
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Dr Charles Mutinda
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Sad news
Mr. Dékoro Dembélé, Scientific Officer, Grain Legumes, ICRISAT-Mali, his father and his nephew passed away on 4 June in a car accident on the Segou region road. A fourth passenger in their car was seriously injured and is currently hospitalized.

Mr. Dembélé joined ICRISAT on 25 February 2008 as Scientific Officer. Prior to this, he worked with CIRAD Program at ICRISAT/CIRAD Mali as Research Technician and as Scientific Officer, after completing diplôme d’études approfondies (DEA) studies at Montpellier, France. He received the BEST SCIENTIFIC OFFICER award from ICRISAT in 2014. He is survived by his wife and 3 young children. Our prayers are with the bereaved family.