A package of climate-smart technologies implemented by a consortium of CGIAR centers has resulted in significant income gains and increased yields for farmers (see box). The impact of these technologies that save on water and improve soil organic content were shared during a review and planning meeting of the Bhoosamrudhi project for the 2019 rainy (kharif) season.

The Bhoosamrudhi project (2015-2020) was launched at the request of the Karnataka State Government to ICRISAT to lead a consortium of CGIAR institutions.

Interventions and impacts for kharif 2019

Direct Seeded Rice (DSR): As opposed to the traditional system of growing rice from transplanted seedlings, DSR rice is grown from seed sown in the field. This system helps avoid repeated puddling, prevents soil degradation, matures 10-15 days earlier, saves water by 35-40% and reduces production cost. This technology was implemented on 190 ha, benefitting 270 farmers. In Udupi district, the grain yield for DSR was 5,360 kg/ha with a net return of ₹73,288/ha compared to 5,000 kg/ha with a net return of ₹60,237 for traditional practice.

In Dharwad district, the grain yield for DSR was 3,900 kg/ha with a net return of ₹60,000/ha and 3,320 kg/ha with a net return of ₹52,103 for traditional practice, said Dr KH Anantha, Senior Scientist, Natural Resource Management and Project Coordinator, ICRISAT Development Center.

Micronutrient and crop residue application: In Bidar district, the practice of post-harvest burning in sugarcane fields was replaced by a more eco-friendly intervention. A trash shredder was used to incorporate sugarcane residue into the soil which resulted in increased soil organic content of 700 kg/ha per annum. Farmers using the trash shredder also applied micronutrients as prescribed by scientists (borax 2 kg, zinc 5 kg and gypsum 100 kg for every 0.44 ha) and benefitted with increased yields of 5 tons/ha from sugarcane. Using shredded stalks as mulch reduced fertilizer costs and improved moisture conservation in the soil.

Laser land levelling: A total of 111 ha of land was laser levelled in Dharwad, Chikkaballapur and Bidar districts. The treatment ensures a flat table-top like surface which reduces runoff and improves moisture conservation.

Relay planters: 55 seeders fabricated by the International Maize and Wheat Research Centre (CIMMYT) facilitated raising a second crop such as maize, mustard, cowpea and chickpea through relay seeding in standing cotton. This has enabled farmers in the project to cultivate these crops as a buffer, for the cotton crop is susceptible to yield losses in the event of drought.

Livestock management: Dual-purpose maize (NK 6240 and MRM 4070), multi-cut fodder (COFS 29), feed balancing techniques, use of baler-wrapper machines, fodder chaffing and enrichment and sorted semen technology were promoted during the kharif season.
working in India and to operationalize impact-oriented research for development to improve rural livelihoods in four districts – Chikkaballapura, Udupi, Dharwad and Bidar. As part of the project, improved cultivars were introduced to benefit farmers and capacity building programs are being conducted on land management, integrated nutrient and pest management.

An action plan for the upcoming postrainy (rabi) season includes varietal trials of rice, sorghum, chickpea, safflower and sweet corn. More than 400 demonstrations will be held on broad bed and furrow planting, rice fallow cultivation, zero tillage, use of relay planter for intercropping; integrated pest management, fertigation, use of bio-fertilizers, fungicides and weedicides, improved fodder, silage making, veterinary care, horticulture, floriculture, and sericulture.

Shared learnings

**Mechanization:** Dr ML Jat, Principal scientist and Systems Agronomist, CIMMYT, gave a presentation on various farm mechanization techniques and the use of multi-crop planter, laser leveling, relay planters and power tillers. He said that in Karnataka state, 4,035 ha had been laser leveled. A precisely leveled surface leads to uniform soil and moisture distribution resulting in good germination, enhanced input use efficiency and improved crop stand with an increased yield of about 30%. “About 95 laser units are owned by farmers (service windows) and the numbers are growing exponentially,” he said.

Dr Barun Deb Pal, Project Manager, International Food Policy Research Institute (IFPRI) spoke about the benefits of laser land levelling and DSR technology in paddy during a drought year. The findings showed that laser land levelling had the highest adoption rate in 2018 and farmers were slowly moving towards DSR in that drought-hit year. In 2018, there was a 55% adoption rate in laser land leveling. Speaking about the perception on climate variability, impact and adaptation techniques, he said that almost 65% of the farmers had reduced income losses by 66% using laser land levelling technology and 75% of the farmers adopting DSR said they had reduced crop loss during the drought year.

**Horticulture:** Dr PC Tripathi, Principal Scientist, Indian Institute of Horticultural Research (IIHR) said that in July 2019, a scion bank was established. As many as 150 plants were given to each of the four Krishi Vigyan Kendras in the project area to be demonstrated on 0.2 to 0.4 ha. He spoke of demonstrations for fruits such as guava, papaya, avocado, custard apple and vegetables like yard bean, tomato, brinjal and french bean. Special mention was made of the successful cultivation of mushrooms and flowers.

**Livestock integration:** Dr Kiran M, Principal Investigator, Karnataka Veterinary, Animal and Fisheries Sciences University (KVAFSU), Bidar, spoke about an app developed for dairy and fodder information. He also discussed the plan to conduct a one-day training for vets and farmers on animal husbandry and also hold a cleanliness awareness drive in slaughter houses for hygienic meat production.

Pandit G Patil from Bharatiya Agro Industries Foundation (BAIF) said that sorted semen technology which assures 90% production of female calves was introduced in select locations in three Bhoosamrudhi districts: Bidar district has recorded 56.67% artificial insemination, Dharwad 64.44% and Chikkaballapur 66.26%.

The review and planning workshop was attended by CGIAR partners, NARS partners and line departments. Participants included the Deputy Director of Agriculture, GoK, Bengaluru, and scientists from CIMMYT, International Rice Research Institute (IRRI), International Livestock Research Institute (ILRI), International Water Management Institute (IWMI), IFPRI, IIHR, and KVAFSU, Bidar. District level officers of agriculture, horticulture, sericulture and animal husbandry, and farmers from Dharwad, Chikkaballapura, Bidar and Udupi districts also participated in the workshop.

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**Project:** Scaling-up of Bhoosamrudhi Program in Bidar, Dharwad, Udupi and Chikkaballapur Districts in Karnataka (Bhoosamrudhi Phase 2)

**Funder:** Department of Agriculture, Government of Karnataka

**Partners:** ICRISAT, CIMMYT, IWMI, IRRI, ILRI and IFPRI, New Delhi

Govt. of Karnataka - Department of Agriculture (DoA);
Watershed Development Department (WDD); Department of Animal Husbandry (DoAH); Department of Horticulture (DoH); Department of Rural Development and Panchayat Raj; Karnataka State Seeds Corporation (KSSC); University of Agricultural Sciences, Bengaluru, Dharwad, Raichur; University of Agricultural and Horticultural Sciences, Shivamogga; University of Horticultural Sciences, Bagalkote; Karnataka Veterinary, Animal and Fisheries Sciences University, Bidar; ICR-Indian Institute of Horticulture Research (IIHR), Bengaluru; BAIF Institute for Sustainable Livelihoods and Development (BISLD).

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Prior to the meeting, a 3-day vegetable grafting workshop was held at ICRISAT. Five farmers from each of the four Bhoosamrudhi districts were given hands-on training in grafting vegetables like tomato, cooker beet, and chili. The technology helps increase yield, longevity and build disease resistance.
Synergistic impact of public-private partnerships

Sorghum flour with high shelf life hits Nigerian markets

In a first-of-its-kind enterprise in Nigeria, a large-scale flour mill has come up with processed sorghum flour with a shelf life as high as 6 months. Typically, sorghum flour has a short shelf life of less than 3 months. This innovative product is opening new markets, providing jobs to 40,000 people involved in the value chain and freeing up the time of women as processing sorghum flour manually using traditional methods takes 80 minutes.

This has been achieved thanks to a collaboration with ICRISAT scientists identifying the best sorghum varieties for processing and the flour mill perfecting their processing practices to maximize shelf life. It all started in 2016, when Dr Hakeem Ajeigbe, ICRISAT Country Representative, Nigeria, met in his office Mr Alhaji Sani Umar, Deputy Managing Director, Northern Nigeria Flour Mills (NNFM) plc and Mr Sadiq Usman, Deputy Chief Operating Officer, Agro-allied, Flour Mills of Nigeria plc.

“I showed them sorghum flour which encouraged them to go into sorghum processing. We discussed sorghum cultivation practices and the crop’s higher nutritional value compared to cereals like maize and wheat. I gave them nine varieties of sorghum to test the milling quality. This resulted in the selection of SAMSORG 17 – the generic yellow sorghum (Kaura),” recalls Dr Ajeigbe.

The sorghum flour released in Nigerian markets goes by the brand name ‘Dawavita’. It is high in fiber and cooks in 15 minutes. Great news indeed for consumers, especially the women for whom the shelf life of the flour and cooking time determine their choices and decisions on consumption. Like the majority of consumers, Ms Hafsat Ibrahim, extension agent with the State Agricultural Development Programme (ADP) and a consumer from Kano believes that, “it has greatly reduced the difficulties in processing sorghum for meals. In addition, women are able to save time and use it for other domestic activities”.

This innovation is the result of a long-standing collaboration between ICRISAT and NNFM through an innovation platform. NNFM is the leading processor of whole grain staple cereals, providing convenient, nutritive and tasty food at very affordable prices to families in northern Nigeria.

The ‘Dawavita’ mill with an installed capacity of 100,000 metric tons per year is a good example of how a company’s strategic investment to create quality jobs and strengthen the economic power of rural areas can be a game changer. With up to 40,000 people involved (farmers, workers, logistics, traders, inputs, research and extension service providers, etc.) the ‘Dawavita’ mill offers several opportunities that can be exploited by sorghum producers and urban families. “In this regard, the active collaboration between ICRISAT and NNFM, as the main up-taker in the value chain, will be enhanced by the provision of seeds of early maturity Kaura types of sorghum varieties,” said Dr Ignatius Angarawai, ICRISAT Sorghum breeder in Kano, Nigeria.
The guarantee of high quality flour was the result of activities carried out previously under the project – Harnessing Opportunities for Productivity Enhancement (HOPE II), and now the Accelerated Varietal Improvement and Seed Delivery of Legumes and Cereals in Africa (AVISA), and the Agricultural Transformation Agenda Support Program Phase-1 (ATASP-1) in Nigeria. The activities included a sustainable seed roadmap with strong Innovative Platforms, appropriate product development and profiling, training in Good Agricultural Practices on seed production for seed companies, and demonstration of improved technologies with processors and aggregators,” explained Dr Angarawai Ignatius.

More than 300 participants attended the launch of ‘Dawavita’ sorghum flour on 27 August at Bristol Palace Hotel in Kano, Borno State. The women participants in particular were pleased with this new product, a brilliant innovation made possible by ICRISAT and its partners in Nigeria.

| Project: Accelerated Varietal Improvement and Seed Delivery of Legumes and Cereals in Africa (AVISA) (previously under Harnessing Opportunities for Productivity Enhancement (HOPE II)) |
| Donor: Bill & Melinda Gates Foundation |
| Partners: National Agricultural Research Organisation (NARO), Uganda; Institute for Agricultural Research (IAR), Zaria, Nigeria; CSIR-Savannah Agricultural Research Institute (SARI), Ghana; Tanzania Agricultural Research Institute (TARI), Dodoma, Tanzania; Institut d’Economie Rurale (IER), Mali; L’Institut de l’Environnement et de Recherches Agricoles (INERA), Burkina Faso; University of Queensland, Australia and ICRISAT |

| CRP: Grain Legumes and Dryland Cereals (GLDC) |
| Project: Agricultural Transformation Agenda Support Program Phase-1 (ATASP-1) |
| Donor: African Development Bank thru IITA |
| Partners: National Centre for Agricultural Mechanization (NCAM) and ICRISAT |
| CRP: GLDC (Previously this was mapped to - Dryland Systems 50%/Dryland Cereals 50%) |
NARS partners in Asia pick up advanced groundnut breeding lines with market traits for their national trials

Advanced breeding lines which included high-oleic groundnut and those with market-preferred kernel size, shape and color were selected for further trials by National Agricultural Research System (NARS) partners from Bangladesh, Myanmar, India, Laos PDR and Vietnam.

The activity was part of the Groundnut Network Group-Asia (GNG-A) workshop which served as a knowledge-sharing platform for NARS partners with industry partners from the food processing and seed sectors.

Progress on developing ‘Product Profiles’

GNG-A is a multi-stakeholder network engagement for Groundnut Product Profile design, development, testing, advancement and delivery. The concept of designing groundnut ‘Product Profiles’ was introduced at the last GNG-A workshop in 2018 by Dr George Kotch from the CGIAR Excellence in Breeding Platform (EiB) team. Value chain studies on the needs of current and emerging markets were required to guide the design; hence studies were conducted in Gujarat-India and Myanmar for groundnut. Guided by the studies, NARS designed the Product Profiles which are dynamic and are revised when needed, most often based on insights from panel discussions such as the one held at the workshop.

Insights from the panel discussion on ‘What’s new in the groundnut industry?’

**Kernel size** distribution is one of industry criterions. Preferred counts per ounce are 38/42, 40/50 and 50/60 for salted/roasted/fried groundnuts, respectively.

**Easy blanching** (removal of testa from kernels) is a requirement for salted groundnuts.

**Kernel shape and testa color** are important traits for industries. Light tan and rose testa are preferred over dark tan.

**Oil content** is an important criteria for confectionery industries and peanut butter makers. Varieties with low to normal oil content (~45-48%) are preferred. On the other hand, oil millers prefer varieties with higher oil content. Farmer’s usually fetch premium prices for their produce based on oil content.

Challenges faced by the confectionery and export industries include aflatoxin contamination due to poor (pre- and post-harvest) management, lack of on-farm scientific storage facilities at farmer’s field, and mixing of different varieties.

The private groundnut seed business in India, Myanmar and Vietnam are beginning to emerge despite challenges of low seed multiplication ratio; the bulky nature of seed requiring large storage space; and transportation costs. One key opportunity for groundnut business is that the leftover seed, if any, can be sold in commodity markets.

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1The study in Myanmar was supported by the OPEC Fund for International Development (OFID) and Syngenta Foundation for Sustaining Agriculture (SFSA).
Updates on scientific technologies

Updates on using seed chipping for Single-Nucleotide Polymorphism (SNP) genotyping, standardization of calibrations for Near-infrared spectroscopy (NIRS) for single kernel use, 58K SNP array, Target Population of Environments (TPEs) for targeting multi-location testing and biological nitrogen fixation were shared during the workshop.

The field visit for selection of advanced breeding lines by NARS partners included trials with high oleic lines with different growth habits suitable for different agro-ecologies, and seed display to exercise selection for kernel size, shape and color.

The panel discussion was moderated by Dr Kumaracharyulu, Senior Scientist, Agricultural Economics, ICRISAT. The panelists included Mr Tushar Thumar Patel, Director of Khedut Feeds & Foods Pvt. Ltd., Rajkot; Mr Rangachetty, R&D Manager at VNKC Agricom, Ahmedabad; and Dr Hemang Baxi, Bombay Super Hybrid Seeds, Rajkot, India.

Prof PK Agrawal, Vice Chancellor, Odisha University of Agriculture and Technology, emphasized on partnerships to deliver products to smallholder farmers. Dr Janila Pasupuleti, Principal Groundnut Breeder at ICRISAT, said the GNG-A network, since its establishment in 2017, has been building an ecosystem for groundnut breeding modernization.

The GNG-A workshop was held at ICRISAT from 26-27 September.

Ms MarMarNwe, a former collaborator from the Department of Agricultural Research, Myanmar, who is currently helping seed systems in Myanmar as consultant of OFID project, was felicitated for her contributions to groundnut research in Myanmar by Dr Pooran Gaur, Research Program Director-Asia, and Dr SN Nigam (far right), former Principal Scientist-Groundnut at ICRISAT.

Project: Enhancing groundnut productivity and profitability for smallholder farmers in Asia through varietal technologies
Funder: OPEC Fund for International Development (OFID)
Partners: Bangladesh Agricultural Research Institute, Bangladesh; Vietnam Academy of Agricultural Sciences (VAAS)-Vietnam; Department of Agricultural Research ( DAR), Yezin, Nay Pyi Taw, Myanmar; Maize and Cash Crop Research Center, National Agriculture Forestry and Rural Development Research Institute, Laos PDR; Professor Jayashankar Telangana State Agricultural University (PITSAU), Telangana, India; Mahatma Phule Krishi Vidyapeeth (MPKV), Telangana, India.
CRP: Grain Legumes and Dryland Cereals

Training for NARS partners: Ms Lin Trinh (Vietnam), Mr Krisna Chandra Saha and Mr Mukaddasul Islam Riad (Bangladesh) and Mr Khamphanh Xayyalattaking (Laos PDR) completed a two-week training program on “Advances in Groundnut Research and Seed Production Technology”. At the workshop, the trainees got to know first-hand how the groundnut industry works. The program was funded by OFID.
Brisk promotion of improved groundnut and sorghum varieties to take adoption to the next level

Participants at the AVISA National Planning and Stakeholders Engagement Meeting for Tanzania Groundnut and Sorghum Programs.

Five improved varieties of groundnut and three of sorghum with the best market traits were selected for active promotion in Tanzania after discussions with AVISA project partners and all stakeholders along the value chain. This is to build on the adoption to date of improved varieties for 11 of groundnut and 8 of sorghum varieties through the Tropical Legumes project.

Participants agreed to focus on varieties that were selected for their market traits, such as processing characteristics, palatability, nutrition, high yield, early maturity, grain quality (seed color, size and shape), pest and disease tolerance, and utilization and adaptability potential (details in box).

Mr Joseph Nzunda, National Coordinator of Oil Seed Research Program, Tanzania Agricultural Research Institute (TARI), said that the practice of recycling seed and sharing of the same existing varieties amongst farmers was one of the main contributors to the low adoption rate of new groundnut varieties which in turn has deterred seed enterprises from taking up groundnut seed production. Mr Nzunda called on the National Agricultural Research Systems (NARS) in Tanzania to work on improving adoption of improved varieties for the benefit of farmers, agro-dealers and seed companies.

The inadequate availability of sorghum seed was also discussed at the meeting. To enhance the availability of new sorghum varieties, TARI Ilonga and TARI Tumbi said they have submitted four sorghum varieties for National Performance Trials. These varieties are expected to be out in the next two years for use by various stakeholders.

Mr Isaiah Gabriel, Project Coordinator, Syngenta Foundation for Sustainable Agriculture (SFSA), Nigeria, said that public-private partnerships are essential to develop and sustain the seed industry in Africa. “SFSA will increase efficiency and scale, leverage research and innovation, create linkages with seed companies, develop partnerships in promoting the use and adoption of improved seeds, and engage the private sector to achieve AVISA goals,” he said.

“AVISA aims to accelerate the rate of genetic gain in mandate crops to an estimated 1.5% annually; integrate CGIAR/NARS programs through a stage-gate breeding decision and informatics support system; align legume and cereal crop improvement, seed production and delivery systems for gender-responsiveness and end-user demands and preferences; and facilitate increased and equitable rate of varietal turnover,” said Project Coordinator, Dr Chris Ojiewo.

ICRISAT Seed Systems Specialist, Dr Essegbemon Akpo, led the participants in developing a tentative list of seed companies to partner with, and a work plan for each organization involved in the implementation namely – TARI; Agricultural Seed Agency (ASA), Tanzania Seed Trade Association (TASTA); Tanzania Official Seed Certification Institute (TOSCI); NGOs and farmer-based organizations; private seed companies; learning institutions; and farmer groups.
ICRISAT Gender Scientist, Dr Esther Njuguna, said that for gender integration into seed systems, the project is looking for gender partners in Tanzania – a seed company that is building a women/youth program, grain traders and a learning team.

The AVISA National Planning and Stakeholders Engagement meeting for Tanzania Groundnut and Sorghum Programs was held recently and was attended by over 40 participants.

### Priority varieties for groundnuts

<table>
<thead>
<tr>
<th>Attributes</th>
<th>Varieties</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>Mangaka</td>
</tr>
<tr>
<td>Drought tolerant</td>
<td>1</td>
</tr>
<tr>
<td>Disease tolerant</td>
<td>1</td>
</tr>
<tr>
<td>Oil content</td>
<td>2</td>
</tr>
<tr>
<td>Zinc</td>
<td>1</td>
</tr>
<tr>
<td>Iron</td>
<td>2</td>
</tr>
<tr>
<td>Yield</td>
<td>1</td>
</tr>
<tr>
<td>Maturity</td>
<td>2</td>
</tr>
<tr>
<td>Color</td>
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</tr>
<tr>
<td>Shelling ease</td>
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</tr>
<tr>
<td>Market demand</td>
<td>1</td>
</tr>
<tr>
<td>Grain size</td>
<td>2</td>
</tr>
<tr>
<td>TOTAL</td>
<td>15</td>
</tr>
<tr>
<td>AVERAGE</td>
<td>1.3</td>
</tr>
<tr>
<td>RANK</td>
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</tbody>
</table>

### Sorghum varieties to be prioritized in AVISA based on the market demand

<table>
<thead>
<tr>
<th>Type of variety</th>
<th>Advantages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Macia</td>
<td>Early maturity</td>
</tr>
<tr>
<td></td>
<td>Since its short, bird scaring is easier</td>
</tr>
<tr>
<td></td>
<td>Multiple release status (7countries in ESA) so it is easy to commercialize</td>
</tr>
<tr>
<td></td>
<td>High starch</td>
</tr>
<tr>
<td></td>
<td>Used for food and animal feed</td>
</tr>
<tr>
<td>NACO hybrid 1</td>
<td>High starch (over 80% starch extract)</td>
</tr>
<tr>
<td></td>
<td>Low tannin</td>
</tr>
<tr>
<td></td>
<td>High yield</td>
</tr>
<tr>
<td>NACO Mtama 1</td>
<td>Multiple release status hence easy to commercialize</td>
</tr>
<tr>
<td></td>
<td>(Kenya Tanzania, Malawi and south Sudan)</td>
</tr>
<tr>
<td>Tegemeo</td>
<td>Multiple release status (Uganda and Tanzania)</td>
</tr>
<tr>
<td></td>
<td>Its white color is good for brewing</td>
</tr>
<tr>
<td></td>
<td>Low tannin</td>
</tr>
<tr>
<td></td>
<td>Confectionery use (cake, bread, biscuits)</td>
</tr>
<tr>
<td>Wahi</td>
<td><em>Striga</em> tolerant</td>
</tr>
</tbody>
</table>
Steering the seed revolving fund initiative to meet growing farmers’ demand for certified seed

Adoption of new varieties can never be successful until efficient seed delivery systems are in place. To increase the efficacy and impact of the existing ‘seed revolving fund initiative’ for groundnut and sorghum crops a decision to form a steering committee was taken at a recent AVISA project meeting in Tanzania.

The Tanzanian seed sector comprises of a wide variety of stakeholders from the public and private sectors, as well as civil society actors involved in seed production, processing and marketing. Currently, there are more than 100 private seed companies operating in Tanzania. However, only 5.3% of the seed used in Tanzania is certified. When it comes to sorghum and groundnut seed production, very few seed companies are involved.

The proposed steering committee will comprise of representatives from various actors along groundnut and sorghum value chains to oversee the implementation of the initiative’s activities, such as following up on the agreed action plan for 2019-2020; consulting other countries growing groundnuts; and preparing a market intelligence model for the crops to create sustainable and reliable market channels/systems among others.

According to Ms Aline O’Connor and Dr Emmarold Mneney from AgriExperience, a consulting firm focused on developing strong seed systems in sub-Saharan Africa, Tanzania’s private sector seed market is among the fastest growing in East Africa and despite severe climate change effects on agriculture, the country is still relatively attractive as a seed production location. The two noted that there is need for increased efficiency, coordination, and performance of key public institutions in Tanzania to enable a healthy and sustainable private sector-oriented seed sector that delivers a wide range of high quality seed and varieties to farmers and other end users. AgriExperience is funded by the Bill & Melinda Gates Foundation for modernization of State Agencies to enhance the seed sector in Tanzania.

Mr Joseph Nzunda, National Coordinator of Oil Seed Research Program, TARI, said the seed revolving fund

Tanzania’s private sector seed market is among the fastest growing in East Africa and despite severe climate change effects on agriculture, the country is still relatively attractive as a seed production location.

Ms Aline O’Connor and Dr Emmarold Mneney from AgriExperience, a consulting firm
initiative was started in 2016 under the Tropical Legumes III project with groundnut and later included sorghum. The Groundnut Seed Roadmap had over 400 farmer research groups, farmer associations, over 100 individual seed entrepreneurs, private seed companies, non-governmental organizations, and TARI Naliendele sister research institutes. Mr Nzunda expressed his wish to see the seed revolving fund initiative grow in the near future. D Justin Ringo, National Coordinator for Sorghum, TARI, emphasized on breeding sorghum for specific markets.

ICRISAT staff participating in the meeting shared their observations. Seed Systems Specialist, Dr Essegbemon Akpo said that the initiative provides room for seed companies to invest and grow their seed business to bridge the gap of farmers’ access to seed. Principal Scientist-Breeding, Dr Ganga Rao, said that it was important to take up promotion activities to update farmers’ knowledge on improved varieties.

At the meeting, participants reviewed the progress of the seed revolving fund initiative during 2018-2019, deliberated on the strategies to sustainably involve seed enterprises; and developed a joint work plan for 2019-2020. Recommendations included the strengthening of the ASA-TARI-Naliendele collaboration in basic seeds production and training of more ASA staff to supervise groundnut production.

The participants developed two joint work plans for 2019-2020 capturing the activities to be carried out and the timeline. One plan involves Agricultural Seed Agency (ASA), Tanzania Official Seed Certification Institute (TOSCI) and TARI as the stakeholders. According to the plan, the stakeholders will ensure there is supply of breeder seed and foundation seed, create awareness, facilitate training of ASA staff at TARI, develop seed business model with support from seed companies (contract growers), conduct field inspection during flowering and harvesting; and have a timeline for carrying out the activities. The other plan involves seed companies, NGOs, farmer organizations, ASA, agro-dealers, TARI Naliendele, district council and Tanzanian Seed Trade Association (TASTA). The stakeholders in this plan will carry out the following activities:

- Streamline groundnut seed packaging to respond to seed regulation;
- Seed packaging for commercialization;
- Demonstration of variety and complementary technology;
- Situation analysis of groundnut seed market;
- Develop communication materials such as leaflets, posters, and factsheets for information dissemination;
- Conduct field days;
- Participate in agricultural shows and rural seed fairs;
- Link seed companies to development partners for possible funding support;
- Carry out radio advertisements – at least six per year;
- Link major off-takers and farmers – development of at least one business contract between farmers and traders and creation of an inventory of the value chain players.

The AVISA Seed Revolving Fund Review and Planning Meeting for Tanzania Groundnut and Sorghum Partners was held in Arusha in September.

Read more on Seed Systems and Online digital seed catalogue and seed roadmap tool.

Project: Accelerated Varietal Improvement and Seed Delivery of Legumes and Cereals in Africa (AVISA)
Funder: Bill & Melinda Gates Foundation
Partners: ICRISAT (lead), International Center for Tropical Agriculture (CIAT), International Institute of Tropical Agriculture (IITA) and National Agricultural Research Systems partners (NARS) from 7 African countries
CRP: Grain Legumes and Dryland Cereals
Neglected No Longer: Grasspea and Finger Millet Pre-breeding Get a Boost

Two food crops prized for their nutritional value and ability to survive temperature extremes, drought and poor soil are now receiving the attention they deserve. A new project led by the Crop Trust will help improve the productivity of grasspea and finger millet by making more genetic diversity available to breeders.

Plant breeders need genetic diversity in order to improve the yield and nutritional quality of crops and adapt them to changing climatic conditions. But that diversity is limited in cultivated grasspea and finger millet. However, in recent years, pre-breeders working on the Crop Trust’s Crop Wild Relatives Project have expanded that diversity by tapping into wild and ancient domesticated forms of the two crops.

This new project, funded by the Templeton World Charity Foundation, Inc., will allow pre-breeders to continue their work and ultimately contribute to food security, human health, income for rural poor, while protecting the environment. Read more.
The hands that farm the fields and cook the family meals are now taking on bigger ventures by running small businesses that contribute to healthier community diets. To take on the role of ‘nutrition entrepreneurs’ tribal women farmers in Telangana, India, were trained to procure local farm produce, prepare nutritious ready-to-cook/eat products, finance their venture, maintain accounts, supply their products to childcare centers (anganwadis) and market the rest through a co-operative.

Brimming with a newfound confidence, the women farmers say they now know how to run their own businesses. “In addition to learning some nutritious recipes, I have learnt about quality control, food safety management systems and FSSAI certification, book keeping, business planning and how to market what I make,” says Rukum Bai, a farmer from Utnoor who was part of the group that learned to process pigeonpea dal, prepare groundnut bar (chikki) and a ‘Nutri-mix’ comprising of sorghum, millets and pulses. In this region, farmers grow pigeonpea, sorghum and groundnut intercropped with cotton.

The training was inaugurated by Dr Christina Z Chongthu, IAS, Commissioner of Tribal Welfare and Managing Director, Tribal Cooperative Finance Corporation Ltd (TRICOR), Government of Telangana. She briefed the participants of the support extended by the government to tribal farmers, especially women, and encouraged them to make the units self-sustainable in the long run.

Dr Anthony Whitbread, Research Program Director – Innovation Systems for the Drylands, ICRISAT, said the trainings will usher in a big change as they equip the local farming community to take charge of their produce, process it and market it without depending on external service providers.

This is the first out of 2 trainings to be conducted as part of an initiative to enhance the incomes of tribal farmers by establishing small business enterprises in tribal areas and linking them to markets, said Dr Saikat Datta Mazumdar, COO, NutriPlus Knowledge Program. He said that ICRISAT is a Center of Excellence for Tribal Development, recognized by the Ministry of Tribal Affairs, Government of India.

During the training, officials from the Tribal Welfare department, TRICOR and Girijan Cooperative Corporation interacted with the participants and explained about the initiative. Under this initiative, Agribusiness and Innovation Platform (AIP)-ICRISAT shall set up and hand-hold eight processing units in Utnoor, Bhadradhram and Etturnagaram Integrated Tribal Development Agency (ITDA) areas through women-lead Joint Liability Groups (JLGs). Ninety percent of the cost for setting up the processing facility will be met through
subsidies i.e. 60% from the Ministry of Tribal Affairs, 30% by ITDAs and 10% will be borne by the JLGs.

A total of 39 women tribal farmers, who are members of JLGs from ITDA-Utnoor and ITDA-Eturnagaram participated. Training material in Telugu on “Technical and quality manual for the production of nutritious food products-Giri Poshana” was released and distributed to the participants.

AIP organized the 3-day training program on processing, marketing and Small and Medium Enterprises (SMEs) business management from 23-25 September at ICRISAT. The second program, which will train 50 women tribal farmers, will be held at ICRISAT from 15-17 October 2019.

For flyer on the project click [here](#).

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**Project:** Setting up of eight (8) processing units in ITDAs of Utnoor, Eturnagaram and Bhadrachalam through Joint Liability Groups (JLGs) of Telangana

**Funder:** Tribal Cooperative Finance Corporation Ltd (TRICOR), Tribal Welfare Department, Government of Telangana.

**Partners:** ICRISAT, Ministry of Tribal Affairs, Tribal Welfare Department, Government of Telangana; Integrated Tribal Development Agencies –ITDAs (Utnoor, Bhadrachalam, Eturnagaram), Department of Women and Child Health Development, Government of Telangana,

**CRP:** Grain Legumes and Dryland Cereals

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**“GIRI POSHANA”** **– A CONVERGENCE MODEL**

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ICRISAT Happenings | October 2019 | 13
Investing in education, research and innovation for climate-smart crops in India

To strengthen the competencies of Indian scientists in climate change-related topics and to foster a generation of high-level teachers in India, 30 scientists/assistant professors and 16 students were selected for undergoing training in European partner institutes at a recent AdaptNET management committee meeting. The group also took stock of e-learning laboratory establishment at Indian partner universities, brainstormed on the possibility to update the curricula of graduate programs in Indian institutes, and arrived at an action plan for upcoming years of the project.

The AdaptNET project (2018-2021) is a bridge between higher education institutions in India and Europe, sharing the common aim of reducing climate change impact on agriculture and developing climate-smart crops. It will support financially the mobility of Indian scientists. During the course of the project, the selected Indian scientists will be trained through four specially designed workshops and the students will receive scholarships to undergo training programs at AdaptNET partner institutes in Europe, said Prof Andreas Voloudakis from the Agricultural University of Athens, and Coordinator of AdaptNET project, reiterating the main objective of the project.

Capacity building and entrepreneurship development are clearly one of the most important activities to nurture our future scientists. AdaptNET is a very relevant project in this context, said Dr Peter Carberry, Director General, ICRISAT. With ICRISAT as one of the partners, this project should serve as an innovation program that provides more opportunities for two-way learning and exchange of knowledge, he added.

The project’s Principal Investigators shared their views in the meeting. Dr Rajeev K Varshney, Research Program Director-Gene Gain, ICRISAT said, “Partnerships like this bring together multidisciplinary teams for better exchange of knowledge by bringing in experts from different parts of the world”. Prof Bidyut Sarmah from Assam Agricultural University, said that Indian universities in addition to following the Indian Council of Agricultural Research norms should explore the possibility of having a complimentary program on climate-smart crops through the AdaptNET project to build capacities and skills of teachers and students. Prof Debendra Chandra Baruah from Tezpur University, Assam, apprised the committee on quality assurance and highlighted different aspects of the process, templates, outcome, feedback, etc. As part of discussions during this session, it was agreed by the committee members to have two additional members (one from Asia and one from USA) as external members of the quality assurance committee.

Prof Carlo Pozzi, University of Milano; Ms Giovanna Lanzavecchia, Università Politecnica delle Marche; Ms Anu Chitikineni, ICRISAT and Dr John Kapsomenakis, Academy of Athens, made presentations on the proposed workshops. The committee discussed and finalized the structure and content of the proposed workshops to be conducted in the coming years.

The second management committee meeting of AdaptNET was held at ICRISAT, Hyderabad, during 14-16 October. For more information visit: https://adaptnet.aua.gr/

Project: AdaptNET “Strengthening education, research and innovation for climate-smart crops in India” an ERASMUS+ CAPACITY BUILDING project
Funder: ERASMUS+ program of the European Union
Partners: The Agricultural University of Athens, Greece coordinates this project with seven other executing partners (Assam Agriculture University, Tezpur University, University of Agricultural Sciences, Dharwad, ICRISAT, Academy of Athens, University of Milano and Polytechnic University of Marche) and two associated partners (SPREADNE and Ecosystems).
CRP: Grain Legumes and Dryland Cereals
Indian soil laboratory network in the making

A soil laboratory network at the national level will be established in partnership with the Indian Council of Agricultural Research under the aegis of the Asian Soil Laboratory Network (SEALNET) said Dr Pushpajeet Choudhari, Manager, Charles Renard Analytical Laboratory, ICRISAT, in a recent presentation. He said that the laboratory is also engaged in training soil laboratory staff working in government agencies.

SEALNET is a forum for soil laboratory managers from Asian countries and is part of FAO’s Global Soil Partnership which aims towards harmonization of methods, measurements and indicators for sustainable management and protection of soil resources. Dr Pushpajeet will be assisting the core team in drafting the FAO-best practice manual for soil analysis.

The 3rd SEALNET meeting was held on 23-27 September in the Philippines. Representatives from 16 Asian countries participated.
Event

Building trust is key for Big Data to deliver benefits to farmers

More than 650 policymakers, agriculture researchers and data experts met to discuss how building trust is key to securing the benefits of big data for smallholder farmers and consumers, during the 2019 Annual Convention of CGIAR Platform for Big Data in Agriculture.

“We are familiar with the cliché that data is the new oil. It is believed that data will bring prosperity just as oil did,” said Mr Jayesh Ranjan, IT Secretary to the Government of Telangana, during his keynote address. “But we need to keep in mind that the term ‘oily’ also has a strong negative connotation as referring to something that is fake and lacking credibility. There are similar ethical implications with big data use,” he said underscoring the convention’s theme of trust.

While urging responsible use of data, Mr Ranjan said organizations and businesses are constantly looking at newer ways to analyze large amounts of data which often is unstructured. The State Governments in India too, have begun deploying administration and governance-related solutions that rely on large datasets including in farming, he added.

“Thanks to the momentum in data-driven farming, significant progress has been made in custom-designing sensors and gadgets like soil sensors, drones, weather forecasting and image processing to collect data from agriculture processes and gain insights and inform decisions,” he said.

Discussing what big data means for rainfed countries like India, Dr Peter Carberry, Director General, ICRISAT, referred to the initial widespread concerns about the rainfall forecast during this year’s *kharif* season in Telangana.

“Big data is about providing decision support to rainfed farmers, their villages and communities. It is about providing knowledge systems that can help make decisions under such uncertainties like rainfall,” said Dr Carberry.

Senior Research Fellow and Module Lead at the CGIAR Platform for Big Data, Ms Medha Devare, highlighted the need to integrate big data efforts across institutions and platforms.

“The challenge with having diverse kinds of data, such as pest and agronomic data, is that it is being collected by different people in different ways, which makes it difficult to find and reuse. We are trying to harmonize that through the Big Data Platform and search tools like Global Agricultural Research Data Innovation & Acceleration Network (GARDIAN).”

Ms Devare, who is the architect of GARDIAN, a newly launched data aggregator and search tool, described the...
‘ontology’ standardization efforts that the Platform is developing. Ontologies, she explained can lead to more complete conclusions sourced from different datasets.

Ms Yvonne Pinto, Director at ALINE Impact Limited, added that “it is not just agriculture” that needs standardization. “It is access to finance, credit and other enablers. If these platforms exist in the agriculture ecosystem, then other services like logistics, marketers, financial service providers get integrated,” said Ms Pinto.

Day one of the three-day convention saw discussions around Aadhar Data in India, empowering food systems through Blockchain technologies, and provided delegates a snapshot of digital agriculture technologies from across the world.

Dr Brian King, Coordinator for the Big Data Platform, said the convention will also reveal the effectiveness of digital communication channels in reaching out to farmers.

“We are looking at how research, existing learning efforts and extension services can integrate with non-conventional communication channels. One of our Inspire Challenge winners has reached a million farmers through their social media-based advisory channels,” he said.

Technical sessions on building trust in the digital agriculture ecosystem were held during the 3-day conference from 16-18 October.

For ICRISAT’s Digital Agriculture initiatives click here

The Most Popular Tweets on #BDPHYDERABAD2019

Andy Jarvis @ajarviscali

#TheIrrelevantScientist returns with a take on the happenings in the #BDPHYDERABAD2019

No audience
Get your nerd on
Fail forwards
Youth Ask, You Do
It’s agriculture

The event was hosted by ICRISAT, Dr Peter Carberry, Director General, welcoming the participants.

Finalists of the Inspire challenge.
Over US$ 1 million worth of grants were awarded to eight winners of the Inspire Challenge during CGIAR’s 2019 BIG DATA convention that was organized at ICRISAT last week.

Four finalists of this year’s challenge were awarded US$ 100,000 each for piloting their project. Hungry cities: Inclusive food markets in Africa; Real-time East Africa live groundwater use database; Gamifying weather forecasting: “Let it rain” campaign; and Rapid genomic detection of aquaculture pathogens were declared winners among 10 finalists of the 2019 challenge. The finalists were selected from over 150 applicants from across the world.

Four grants totaling US$ 625,000 were also awarded to past years’ winners. Pest and disease monitoring by using artificial intelligence, a project partnered by CRP Roots, Tubers and Bananas, CIP, Bioversity International, IITA, PennState and Google, was awarded the winning grant of US$ 250,000. Revealing informal food flows through free WiFi; An integrated data pipeline for small-scale fisheries; and Using Commercial Microwave Links (CML) to estimate rainfalls were the other past winners who were awarded scale-up grants of US$ 125,000 each.

Mr S Niranjan Reddy, Agriculture Minister of the Indian state of Telangana, gave the awards on the final day of the convention.

“Data has been available and research has been using it but it is time to bring it all together to propel agriculture further as the demand for food grows. I am certain the convention will help pave the way for institutions to come together for this purpose,” he said.

The Inspire Challenge seeks to recognize groundbreaking innovations that use big data approaches to advance agricultural research with real potential for developmental impact. These innovations have to demonstrate meaningful partnerships with CGIAR and other sector members. Pitch presentations of this year’s finalists took place at ICRISAT, where the three-day convention was organized by CGIAR’s Platform for Big Data in Agriculture. The convention saw participation of over 650 delegates representing scientific institutions, academia, private organizations and governmental organizations.

Mr Jayesh Ranjan, IT Secretary to Telangana Government, had underscored the importance of trust in Big Data during his keynote address. Delegates discussed open data systems and platforms that can facilitate trust, blockchain technologies to transform food systems, advances in digital agriculture across the world, filling gaps in datasets and a unified information architecture for the CGIAR.
Individual crop improvement operations merge into a single entity for greater efficiency

Under the new model of aligning all crop improvement operations, all the field operations across disciplines such as breeding, genomics and trait discovery, integrated crop management and physiology have come under one umbrella – the Crop Improvement Operations Team (CIOT). To mark this milestone, a portal where online requests can be made was launched and the logo unveiled.

Dr Jan Debaene, Global Head-Breeding, ICRISAT, gave an account of the genesis of CIOT. He emphasized that better skillsets can be developed by centralizing operations and building specialization teams. “The quality and precision of tasks can be increased, making it a successful example for other CGIAR institutes, as ICRISAT is the first to implement this initiative,” he said.

In the past, technical staff from each of the crop improvement teams had significantly contributed to the release of several new varieties and hybrids. Now, CIOT which is a ‘one-stop shop’ for all crop improvement operations, gives them an opportunity to learn new things about all the mandate crops and working in a team comes with many benefits in terms of knowledge sharing and meeting contingencies.

Prior to the launch, to prep up for the big change, a team building activity was held. The technical staff along with scientific officers attended a 2-day workshop on change management, team building and behavioral change.

Congratulating the team, Dr Peter Carberry, Director General, ICRISAT, stressed that the success of the program depends on the quality of the services CIOT offers. He said the new framework will provide diverse career opportunities to the team and chances of replicating the program in Mali and Zimbabwe. “We can show we can be the best in the CGIAR,” he said.

CIOT has nine teams and the major operations include Controlled Environment Research Facility operations, field operations, seed processing, seed inventory & storage, and sampling. Each team will have a lead facilitator and contributing members (2-10 per team, total of 34). The technical staff will move between teams, depending on the seasonal demand and each team will have a scientific advisor/consultant to advise and guide them.

The launch event on 19 September had the ICRISAT management group, research committee, scientists from various programs and the Farm and Engineering Services team in attendance. Dr KK Sharma, Deputy Director General-Research, Dr Pooran Gaur, Director, Research Program, Asia, Dr Harish Gandhi, Regional Breeding Lead – Asia and Dr Sobhan Sajja, CIOT Lead, spoke at the event.