ICRISAT
Happenings
Newsletter

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Photo: F Sichali, ICRISAT

Dr Siambi handing over sorghum seed bag to Mr Kumwembe (R), as Mr Fitzpatrick (L) looks on.

Forging deeper ties with Malawi government

Strengthening its partnership with the Malawi government, ICRISAT contributed 1,400 kg of basic seed of Pilira 1 variety of sorghum for the 2015-16 cropping season. This contribution was made through the Ministry of Agriculture, Irrigation and Food Security, Malawi.

The Pilira 1 is a medium duration variety with a maturity period of 110 to 115 days. It has a yield potential of 2-4 tons per ha.

Mr Bright Kumwembe, Deputy Principal Secretary, Ministry of Agriculture, while accepting the seeds on behalf of the ministry, underscored the appropriate timing of the seed sharing, as the ministry is trying to advocate crop diversification mostly in drought and flood prone areas.

Mr Aidan Fitzpatrick, Head of Development, Irish Aid, said, "Adding sorghum in the Farm Input Subsidy Program (FISP) and extending ICRISAT's seed systems portfolio to sorghum will positively impact livelihoods as the crop has potential to improve food security and income. It is not only an easy crop to produce, but also drought tolerant." He encouraged the Ministry of Agriculture and ICRISAT to continue working in collaboration and provide necessary technical support in order to revamp and out-scale sorghum seed production in Malawi.

Hon Allan Chiyembekeza, Minister of Agriculture and Irrigation in his 2015 meeting with Dr David Bergvinson, Director General, ICRISAT, had expressed the need for ICRISAT's support to meet the challenges associated with low sorghum production in the low-lying areas of Lower Shire in the southern region of Malawi and those along the shores of Lake Malawi where it serves as a staple food. These areas are mostly hit by dry spells and intermittent rainfall.

Presenting the seed bags to the ministry, Dr Moses Siambi, Regional Director, Eastern and Southern Africa, ICRISAT, highlighted that the major challenges to increasing sorghum production in the country were lack of access to seeds of improved varieties, poor production practices and lack of diversification, as farmers cling to traditional crops.

Along with a consortium of partners, ICRISAT is implementing the Malawi Seed Industry Development Project (MSIDP) with the aim of ensuring smallholder farmers have access to seeds of improved varieties of legumes and cereals.

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Technologies developed in Malawi reduce drudgery and labor in groundnut

Woman farmer in Malawi using locally fabricated 'A-frame' groundnut stripper.

The most labor intensive operations in groundnut production – harvesting, stripping and shelling – have now been mechanized to ease the drudgery and labor of smallholder farmers.

Through a consortium which included the Compatible Technology International (CTI), Minnesota; Department of Agriculture Research Services (DARS), Malawi; and ICRISAT, equipment that can lift (harvest), strip (remove pods from plants) and shell groundnuts faster and more efficiently than manual processes, were designed and adapted.

The lifter can harvest four times faster than manual harvesting, while the stripper is three times faster compared to hand stripping, and the sheller can shell 18 times more quantity in one hour than hand shelling. The sheller was further modified to a multi-variety sheller to be able to shell groundnut varieties with different kernel sizes by using different size sieves. The equipment, operated manually, makes them suitable for rural areas where there is no electricity and the poor cannot afford to buy fuel.

It took four years to bring about this positive change in the groundnut production chain in Malawi. In a baseline survey in 2009 about 80% farmers specified lifting, stripping and shelling as the most labor intensive operations. The testing and modifications based on the farmers' preference and feedback led to addressing their concerns.

ICRISAT through DARS has now released the four equipment including groundnut lifter, stripper, single variety sheller and multi-variety sheller.

The Agricultural Technology Clearing Committee (ATCC) of the Ministry of Agriculture, Irrigation and Water Development, approved and released the four equipment during February 2016.■

Project: Enhancing productivity and competitiveness of groundnut-based cropping systems in Malawi by developing and deploying labor saving and drudgery reducing technologies in the groundnut value chain

Partners: Compatible Technology International (CTI), Minnesota, Department of Agriculture Research Services (DARS) and ICRISAT.

Investor: McKnight Foundation

CGIAR Research Program: Grain Legumes

Genomics technologies ensure food and nutritional security

ICRISAT scientists participated in the National Seminar on "Omics Technologies for Better Food and Nutrition".

Dr Mahendar Thudi, Scientist - Applied Genomics and Genotype Service, ICRISAT and Convener of the seminar said, "Omics technologies have become an integral part of crop improvement especially genomics and special emphasis on research that deploy available genome sequence information of crop plants is essential for increased production and better nutritional value of food grains." Dr Manish Pandey narrated the "Journey of genes from genome to field in groundnut" showing the utility of genomics tools for gene discovery and deployment for improving foliar disease resistance and oil quality in groundnut.

More than 150 participants including scientists, research scholars from various institutions from India participated in the seminar organized by Department of Biotechnology, Telangana University, Nizamabad, Telangana, India.■

ICRISAT participants with the seminar organizing committee.

Devi variety popular with groundnut seed farmers in Odisha, India

Ms Julie Das, District Coordinating officer and a seed producing farmer discuss the distinct features of Devi variety.

Mr KC Sahoo, with Devi variety in his left hand and off-type in other hand.

Farmers are taking up seed production of *Devi* (ICGV 91114), the early-maturing and drought tolerant variety of groundnut in a big way. The foundation seed and certified seed production of this variety was taken up in 564 ha during the 2015-16 postrainy season.

The seed production program involved over 1000 farmers across four districts (Nuapada, Bolangir, Kalahandi and Ganjam). The farmers get an additional income of Rs 8000 (US$119) per ha, considering an average yield of 800 kg per ha.

To meet the seed requirement, the project envisages production of 750 tons of certified groundnut seeds every year in 2015-16, 2016-17 and 2017-18 through the seed farmers. The project, designed to be farmer-driven, farmer-implemented, and farmer-owned, has trained farmers to be seed producers and strengthen the system to ensure access of quality seeds to the smallholder farmers. Seed producing farmers were trained to distinguish the pod features of Devi from other groundnut varieties and adopt good management practices.

During the 2015 rainy season, 217 tons of seed of different classes, foundation seed, certified seed and truthfully labelled seeds of *Devi* variety were produced by the farmers of the state. In the process, farmers have learnt to maintain genetic purity of the variety and seed certification procedures. Odisha State Seed Certification Limited (OSSCL) has procured about 54 tons of certified seed from the project's seed producing farmers to distribute to other farmers in the subsequent season.

The remaining seeds went to the next stage of seed production in 2015-16 postrainy season and farmer-to-farmer sharing. Enterprising farmers and small seed traders produce the truthfully labelled seeds and they are released in public domain.

During her visit to the seed production plots, Dr P Janila, Senior Scientist, Groundnut Breeding, ICRISAT, found it interesting that farmers were able to remember the distinct pod shape of *Devi*, and had given it the name '*nakko-beki*', meaning 'nose and neck' in the local language. The pods of this variety are bold with shallow constriction and small beak, while the off-types, in general, have medium constriction with prominent beak and small pods.

The state of Odisha is sixth in India in terms of groundnut production. However, availability of quality seeds is a major problem for the smallholder farmers, forcing them to save their own seeds year after year or to get it from other farmers.

Approximately 80-90% seeds are sourced largely from farmers' saved seeds resulting in poor yields.

Changing the situation required the development and replication of seed production and delivery systems, which will give farmers access to adapted, stress-tolerant, highly productive and market-preferred cultivars.■

Project: Scaling-up of improved groundnut varieties through established seed system in various cropping systems of smallholder farmers in Odisha.
Investor: Department of Agriculture, Government of Odisha
Partners: Department of Agriculture, Government of Odisha; Orissa University of Agriculture and Technology; Orissa State Seeds Corporation Limited and ICRISAT
CGIAR Research Program: Grain Legumes

Forging deeper ties..... from page 1

In 2015, through MSIDP, around 5,500 kg of Pilira 1 variety seeds were produced, enough to cover 1,100 ha. The 1,400 kg seeds given to the ministry would cover about 280 ha put to certified seed production. This certified seed will be channeled to more smallholder farmers through the Malawi Government's Farm Input Subsidy Program. ■

Project: Malawi Seed Industry Development Project
Investor: Irish Aid
Partners: Seed Services Unit of the Ministry of Agriculture and Food Security, National Agriculture Research System, National Smallholder Farmers Association of Malawi (NASFAM), Grain Traders and Producers Association of Malawi, Seed Traders Association of Malawi and ICRISAT
CGIAR Research Program: Grain Legumes and Dryland Cereals

New projects

Providing technical assistance to government of Andhra Pradesh for baseline survey in Rayalaseema zone under *Rythu Kosam* project

Principal investigator: Suhas P Wani

Project period: 2016 - 2017

Abstract: The project will be implimented across 51 villages in 4 districts of Andhra Pradesh.

Feed-the-future - Accelerated Value Chains Development program (FtF-AVCD)

Principal investigator: Moses Siambi

Project period: 2015 - 2018

Abstract: The staple value chain of crops will promote cereals and legumes that are drought tolerant and proven to provide an assured harvest even in low rainfall seasons. The crops that have been selected for this value chain component include pigeonpea, groundnut, sorghum, and millets. These crops provide unique advantage for food and nutrition security, and incomes. The program aims to enhance access to high quality seed, increase productivity, improve post-harvest handling practices, utilize and develop smart foods and increase farmer linkages to markers. With the program period of 3 years the value chain component targets to increase income of 85,000 households by over 25% and improve their nutrition status. Other targets include, increase yield for targeted crops on farmers' field by 30%, reduce post-harvest losses by 30%, establish at least one Market-Producer group in each target county among others.

Addressing the collar rot disease (*Sclerotium rolfsii* Sacc.), an emerging threat to chickpea

Principal investigator: Avijit Tarafdar/M Sharma

Project period: 2016 - 2019

Abstract: The major limitations in chickpea agriculture is susceptibility to many biotic constrains. Among them collar rot (CR) caused by soil borne necrotrophic, omnivorous fungal pathogen, *Sclerotium rolfsii* Sacc is one of the serious emerging threat to chickpea production. The disease is showing increasing incidence in central and southern parts of India, the major chickpea growing region of the country. Cultivation of resistant variety is an economical approach for the management of collar rot of chickpea. However, wide research on resistance in chickpea to collar rot has not been carried out and often resistance identified at one location breaks down at other location, indicating the possibility of variability in the pathogen. Thus an understanding of the genetic diversity of the pathogen is an important prerequisites in developing and deploying varieties with durable resistance to collar rot disease. In present study, molecular and genetic variability within the *S. rolfsii* population will be determined by utilizing appropriate bioinformatics tools. Data generated in molecular work will be correlated with phenotypic data for its effectiveness in studying the variability in pathogenic population of *S. rolfsii*. Understanding of the pathogen variability will help in developing multiple disease resistant varieties and their strategic deployment for the durability of resistance in molecular breeding programs. Therefore, development of a quick and reliable diagnostic method to detect *S. rolfsii* isolates in chickpea is equally important. An easy, accurate and sensitive real-time diagnostic tool will be developed for rapid identification of *S. rolfsii* collected from different geographical locations. A numerous intercellular physio-chemico factors of the host and pathogen itself have an interactive effect on disease development at molecular level and it influences the disease expression. Direct or/and indirect infirmity of these factors or expression of the gene(s) play an important role on disease compatible or incompatible interaction.

Evidence generation for appropriate use of organic and inorganic soil

Principal investigator: T Amede

Project period: 2015 - 2016

Abstract: The research goal is to improve food security and environmental resilience through appropriate application of fertilizers and other soil fertility management options.

Output 1: Review and compile existing soil fertility data and information produced in the Ethiopian highlands, with emphasis on crop response to NPK, lime and organic matter.

Output 2: Facilitate network of Ethiopian soil scientists and agricultural planners to integrate local knowledge in fertilizer recommendations and ensure adequate participation and buy-in from national R&D partners

Output 3: Facilitate policy discussion on fertilizer recommendation and target through formal workshops, policy briefs and evidence generating publications.

Establishment of Agri-Business Incubation (ABI) centers under XIIth plan scheme for National Agriculture Innovation Fund (NAIF)

Principal Investigator: KK Sharma

Project period: 2015 - 2017

Abstract: The main objectives are:

- Handholding in the establishment of new Agri-Business Incubators supported by ABI Fund.
- Synchronize the process and system for effective delivery of agribusiness incubation services to entrepreneurs.
- Enhance revenue and sustainability for operations of the Agri-Business Incubators through handholding and mentoring services.
- Assist the National Academy of Agricultural Research Management (NAARM) in taking-up further the previous networking of ABIs.

100Voices Youth in Agriculture series launched

In this series speakers talk about the need to get more youth into agriculture and the diverse opportunities that exists for them in this sector. Having suitable policies, training, education etc., to empower them is essential. View videos here: http://www.icrisat.org/100-voices/

"It is important to educate the next generation and farmers to sustain the human livelihood. It is also important to train high school teachers, so that they can educate the students about modern agricultural science".

Dr Baozhu Guo – Research Plant Pathologist, United States Department of Agriculture, Agricultural Research Service, Crop Protection & Management Research Unit, Georgia, USA.

https://youtu.be/gXRHN_7ufKQ

"Youth are only interested in popular courses like Information Technology. They should take agriculture seriously and realize how important agriculture is for health and economies, as it helps the poor families to afford food and reduces the unemployment rate in our country".

Ms Pretty Tebatso Aphane, ICRISAT intern from Pretoria , South Africa

https://youtu.be/45F4es38RJ4

"In South Africa we have very less youth in agriculture, most of the people in agriculture are old people. This will lead to low food production and those who produce the food will charge high. This will affect the poor and disadvantaged people".

Mr Obakeng Nonyana, ICRISAT intern from South Africa

https://youtu.be/ZE7PwxXQvyc

Dr Himabindu Kudapa, Scientist- Genomics & Molecular Breeding, Dryland Cereals, International Crops Research Institute for the Semi-Arid Tropics (ICRISAT)

https://youtu.be/fcDaNmHhD5A

Mr Karabo Calvin Sejabaledi Mphaphuli, ICRISAT intern from Pretoria, South Africa

https://youtu.be/YEOg1SyjvZY

"Today's youth are not aware of the potential in agriculture. It is not just limited to farming in fields, but there are a host of opportunities like agribusiness, where youth can engage themselves,"

Ms Lilly Thato Mabonela, ICRISAT intern from Pretoria, South Africa

https://youtu.be/5j0GK6yzwGE

"We have limited resources available in terms of water and fertilizer. Agriculture is also expected to contribute to energy as fossil fuels are becoming less available. So, we need youth to help with these tremendous challenges."

Wilfred Vermerris, Ph.D., Associate Professor, Department of Microbiology and Cell Science, University of Florida Genetics Institute, Gainesville, Florida

https://youtu.be/hU4x48-EmD0

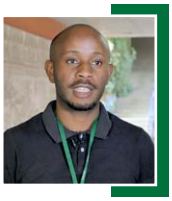
"I think if organisations such as ICRISAT do not rise to the challenge and help countries to develop solutions to the problems of Youth in Agriculture, the future of agriculture in the semi-arid tropics could be very bleak".

Prof. Chandra A. Madramootoo
ICRISAT Board Chair

https://youtu.be/yc57Yo9ZjJk

Mr Page Izwelithini Baloyi, ICRISAT intern from Pretoria, South Africa

https://youtu.be/KmKsKM_IiPs



Tamim Fazily, Associate Professor, Dean of Agriculture, Baghlan University, Afghanistan

https://youtu.be/QeSwMlj96tQ

Ms Kagiso Innocentia Bogoshi, ICRISAT intern from Pretoria, South Africa

https://youtu.be/lFYxugvBLqQ

New publications

Land and water use interactions: emerging trends and impact on land-use changes in the tungabhadra and tagus river basins

Authors: Per Stalnacke, Begueria Santiago, Manasi S, KV Raju, Nagothu Udaya Sekhar, Maria Manuela Portela, António Betaâmio de Almeida, Marta Machado, Lana-Renault, Noemí; Vicente-Serrano, Sergio*

Published: 2016. Working Paper Series 352, ISBN 978-81-7791-208-1

Abstract: The paper provides a comprehensive analysis of the issues, current status and complex inter-linkage in land and water management, emerging trends and its impact in two river basins – the Tungabhadra sub-basin in India and the Tagus basin in Spain and Portugal. The paper covers a wide range of issues including changing water demands affected by erratic hydrological cycles, frequent fires affecting forests, biodiversity and soil thus influencing the livelihoods of marginal communities. The paper also brings to the forefront the need for integrated water management in view of poor integrated across and within sectors. Therefore, an attempt is made to understand the dynamics of rain fed and irrigated farming highlighting the technological and institutional options required for improving water-use efficiency. There is still a long way to go in both the basins before suitable integrated can be achieved leading to an effective Integrated Water Resource Management strategy.

First-generation HapMap in *Cajanus spp.* reveals untapped variations in parental lines of mapping populations

Authors: Kumar V, Khan AW, Saxena RK, Garg V and Varshney RK

Published: 2016. Plant Biotechnology Journal. 01-09. ISSN 1467-7652

Abstract: Whole genome re-sequencing (WGRS) was conducted on a panel of 20 *Cajanus spp.* accessions (crossing parentals of recombinant inbred lines, introgression lines, multiparent advanced generation intercross and nested association mapping population) comprising of two wild species and 18 cultivated species accessions. A total of 791.77 million paired-end reads were generated with an effective mapping depth of ~12X per accession. Analysis of WGRS data provided 5 465 676 genome-wide variations including 4 686 422 SNPs and 779 254 InDels across the accessions. Large structural variations in the form of copy number variations (2598) and presence and absence variations (970) were also identified. Additionally, 2 630 904 accession-specific variations comprising of 2 278 571 SNPs (86.6%), 166 243 deletions (6.3%) and 186 090 insertions (7.1%) were also reported. Identified polymorphic sites in this study provide the first-generation HapMap in *Cajanus spp.* which will be useful in mapping the genomic regions responsible for important traits.

http://oar.icrisat.org/9304/

Pigeonpea breeding in eastern and southern Africa: challenges and opportunities.

Authors: Kaoneka SR, Saxena RK, Silim SN, Odeny DA, Ganga Rao NVPR, Shimelis HA, Siambi M and Varshney RK

Published: 2016. Plant Breeding. 01-07. ISSN 1439-0523

Abstract: Pigeonpea (*Cajanus cajan* [L.] Millspaugh) production in Eastern and Southern Africa (ESA) is faced with many challenges including limited use of high-yielding cultivars, diseases and pests, drought, under-investment in research and lack of scientific expertise. The aim of this review is to highlight the challenges facing pigeonpea breeding research in ESA and the existing opportunities for improving the overall pigeonpea subsector in the region. We discuss the potential of the recently available pigeonpea genomic resources for accelerated molecular breeding, the prospects for conventional breeding and commercial hybrid pigeonpea, and the relevant seed policies, among others, which are viewed as opportunities to enhance pigeonpea productivity.

http://oar.icrisat.org/9308/

Landrace germplasm for improving yield and abiotic stress adaptation

Authors: Dwivedi SL, Ceccarelli S, Blair MW, Upadhyaya HD, Are AK and Ortiz R

Published: 2016. Trends in Plant Science, 21 (01): 31-42. ISSN 1360-1385

Abstract: Plant landraces represent heterogeneous, local adaptations of domesticated species, and thereby provide genetic resources that meet current and new challenges for farming in stressful environments. These local ecotypes can show variable phenology and low-to-moderate edible yield, but are often highly nutritious. The main contributions of landraces to plant breeding have been traits for more efficient nutrient uptake and utilization, as well as useful genes for adaptation to stressful environments such as water stress, salinity, and high temperatures. We propose that a systematic landrace evaluation may define patterns of diversity, which will facilitate identifying alleles for enhancing yield and abiotic stress adaptation, thus raising the productivity and stability of staple crops in vulnerable environments.

http://oar.icrisat.org/9322/