Ms Aissata Diakite, an incubatee of Mali Agri-business Incubation Hub (MAIH), won an entrepreneurship contest for her project Zabbaan Holding that produces juices (smoothies and cocktails). The juices have a shelf life of one year and can be stored at room temperature without losing flavor or taste. The production, transformation, standardization, marketing and distribution processes of the products is all done locally in Mali.

Ms Diakite represents a group of 10 Malian young entrepreneurs living in France. She has won the contest of the Mali Diaspora Entrepreneurship Program during an event organized by Fanaday Entertainment on 10 September at Bamako. Ms Diakite has returned back to France for the acquisition of processing equipment for her new enterprise.

MAIH has assisted in the preparation and the feasibility studies of the winning project. The food technologies laboratory of the Mali Institut d’Economie Rurale (IER) has provided her assistance for the production of juice samples. Hotels like the Azalai Salam Hotel group and other customers have already shown interest in the products.

About MAIH
MAIH, a pioneering public-private partnership, addresses the needs of entrepreneurs and smallholder farmers through incubation services including access to technology know-how, skills development, training, and business development, access to office space, equipment facilities and financial resources. One important target of MAIH is entrepreneurship and job creation especially amongst the youth through entrepreneurship development programs. The headquarters are located at ICRISAT, Samanko. The operations for Youth Business Incubation; and Incubation units of Seed Business and Agro Processing Business are carried out from ‘Institut Polytechnique Rural (IPR), Katibougou and IER, Sotuba, respectively.

MAIH is promoted by IER, ICRISAT, ‘Institut Polytechnique Rural (IPR), CORAF/WECARD (West and Central African Council for Agricultural Research and Development), Agri Business Incubation Network (AAIN), UniBRAIN Forum for Agricultural Research in Africa (FARA).

This work contributes to UN Sustainable Development Goal
Strategies for building resilient farming systems for the semi-arid regions of West and Central Africa

Stakeholders reviewed, consolidated and charted pathways for sustaining the resilience of farming systems in different agro-ecologies of the semi-arid regions of West and Central Africa, at a workshop in Nigeria.

The presentations addressed the functioning and the integration of the drivers of resilience and components of effective technology packaging and delivery with the overall aim of increasing production and productivity of the farming systems.

The discussions provided an avenue for prioritizing research extension, policy and options for funding to attain large-scale impact across the region. From the deliberations the following trends and research gaps were noted:

- Growing demand for crop-livestock products in WCA
- Changes in the structure of the demand for food which are driven by increased per capita income and rapid urbanization resulting in change in diets and preferences
- Price volatility of major agricultural produce and natural resources associated with marketing of agricultural produce
- Challenges of managing pastoralism and dealing with issues of conflicts between pastoralism and farmers
- Climate change is a major issue impacting agricultural production and attainment of food security
- Inadequate synergy between research and policy and low participation of women and youth in agricultural extension, thereby limiting service delivery to women in key value chains.

The workshop recommendations for addressing the above issues included:

- Policy dialogue platforms based on evidence-based research findings
- Increased funding for research and development among all partners
- Higher synergy through multi-disciplinary research for crop-livestock integration, adoption of better management practices including climate-smart farming systems
- Strengthening of feedback mechanisms for monitoring agricultural technology
- Increased investment for sustainable intensification of smallholder mixed-crop-livestock systems through effective land use planning and efficient management of soils, water, pasture, and other essential resources
- Development of market-driven innovation platforms linking all actors along the value chain
- Gender mainstreaming
- Dissemination of improved technologies and use of ICT
- Need for appropriate legislations to provide legal framework for sustainable implementation.

The workshop inaugural was attended by Dr Abdullahi Umar Ganduje, Executive Governor of Kano Sate; Prof. Hafiz Abubakar, Deputy Governor of Kano State; Chief Audu Ogbeh, Minister of Agriculture, high level officials of Federal and State Governments, members of Federal and State Legislative Assemblies, academia from the CGIAR centers, universities, colleges and polytechnics, civil society organizations, captains of industries, farmers, the media and students from several institutions.

Papers at the sessions covered diverse issues of crop-livestock systems in WCA. Presentations were made by Dr Bukar Tijani, Africa Representative, FAO, Accra, Ghana, Dr Timothy Olalekan Williams, Director Africa, International Water Management Institute, and ICRISAT staff - Dr Ramadjita Tabo, Research Program Director, West and Central Africa and Country Representative Mali, and Dr Anthony Whitbread, Research Program Director, Innovation Systems for the Drylands. Dr Hakeem Ajeigbe, Country Representative in Nigeria, contributed to the discussions as facilitator and speaker.

Other sessions focused on options for scaling out/up of crop-livestock technologies in WCA and decision support tools for agricultural technology development and delivery.

The workshop titled Future Resilient Farming Systems for Semi-arid Region of West and Central Africa was held at the Centre for Dryland Agriculture, Bayero University of Kano, Nigeria, from 27-29 September.

Partners: Centre for Dryland Agriculture (CDA), Bayero University, Kano and International Institute of Tropical Agriculture (IITA) and ICRISAT

This work contributes to UN Sustainable Development Goals
Need for developing blast-resistant pearl millet in India emphasized

The need for breeding blast-resistant pearl millet varieties was strongly voiced by breeders from seed companies, who attended a field day held at ICRISAT headquarters recently.

Pearl millet blast, caused by *Pyricularia grisea*, has emerged as a serious disease of pearl millet hybrids in India in the past 7-8 years. Host plant resistance is the most economical and viable disease management strategy to control the disease. However, resistance in the commercial hybrids being grown in India is not available as no efforts were made in the past to breed for blast resistance.

The need for machine-harvestable pearl millet cultivars was also raised by the visiting scientists from both the public and private sector, whose primary objective was to select breeding materials and parental lines of potential hybrids for their programs. They reviewed a diverse range of materials dealing with –

- Seed parent breeding
- Forage lines/populations
- Restorer parent breeding
- Downy mildew/blast/heat tolerance nurseries
- Biofortification nurseries
- Screening for drought and genetic resources.

The participating scientists selected 5,786 breeding plots of which 1,194 were unique seed parents and 1,513 unique restorer parents. The most sought-after traits in pearl millet were – thicker and longer panicle with compactness and heat tolerance.

The forage-type breeding material developed by ICRISAT was appreciated and special mention was made by Dr PK Ghosh, Director, Indian Grassland and Fodder Research Institute (IGFRI), Jhansi, India. The newly-developed open pollinated varieties (OPVs) and hybrids have a high green biomass potential of 50-60 tons per hectare compared to the normal output of 15-20 tons per hectare in India.

Participants also felt that there is need to strengthen the restorer development for the more stable A4 and A5 Cytoplasmic Male Sterility (CMS) systems.

The participants gave their feedback on the potential usefulness of the materials they saw and provided critical inputs to further strengthen ICRISAT’s pearl millet crop improvement program.

Participants were also oriented on new tools and technologies that were developed or refined at ICRISAT, this included –

- Using LeasyScan facility to screen for drought adaptation
- New germplasm (mini core set) representing global diversity
- Field-based screening protocols for downy mildew and blast.

Speakers at the plenary session included Dr Om Vir Singh, Project Coordinator, All India Coordinated Research Project on Pearl Millet (AICRPM); Dr Suresh Kumar Gupta, Hybrid Parents Research Consortium (HPRC) Chair; and Dr Kedar N Rai, Former pearl millet breeder at ICRISAT. Dr Rai stressed on the need for participants to share information on the combining ability of lines selected by breeders during previously held field days as this is a vital input for further research.

The field day was attended by 29 participants from the public sector and 46 from the private sector, who are members of the Pearl Millet Hybrid Parents Research Consortium (PMHPRC), including two scientists from a Brazilian seed company. ICRISAT scientists from Eastern and Southern Africa; and West and Central Africa regions participated in the event and selected hybrid parents of their choice to strengthen hybrid pearl millet program in their regions.

The field day held on 27 and 28 September was organized by the Asia Program - Crop Improvement (Pearl Millet Breeding).

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**Project:** Improved Pearl Millet Hybrid Parents for Increased and Stable Production  
**Investor:** ICRISAT-Pearl Millet Hybrid Parents Research Consortium (PMHPRC)  
**Partners:** AICRPM, Jodhpur and its 15 centers from India, 27 private seed companies, IIMR- Hyderabad, CAZRI-Jodhpur, IARI-N. Delhi, IGFRI- Jhansi  
**CGIAR Research Program:** Dryland Cereals

This work contributes to UN Sustainable Development Goals.
Fostering innovative entrepreneurship in the Asia-Pacific region through science and technology parks

The potential of science and technology parks (STPs) to foster diverse innovative technologies and transform them into successful business enterprises that can benefit society was deliberated upon at the 20th annual conference of Asian Science Park Association (ASPA). This is the first time the conference was held in India.

The conference sought to facilitate strong linkages between India and Asia-Pacific countries and their stakeholders in science and technology for cross border exchange of ideas and technologies. Dr Hiroshi Uchida, President, ASPA, urged partners to leverage on the newly acquired Special Consultative Status of ASPA with the United Nations. “I believe this will help us in taking our science park to the global platform,” he said.

Close to 150 industry experts from 11 countries congregated to hear from 30 top management industry experts. Plenary discussions, panel debates and case studies delivered practical insights on where the STP ecosystem is heading to, how STPs should look beyond the conventional government-supported R&D model which is limited in scope and budgets. Some of the case studies illustrated how science parks are playing an important role in the economic development of Taiwan and how unique public private partnerships in South Korea have helped local companies with high growth potential.

The conference had technical sessions on cutting-edge issues in this space and leaders in the industry explored in-depth issues pertaining to science and technology parks for start-ups, translational research platforms and challenges and opportunities in public-private collaborations in Asia.

Dr H Purushotham, CMD, National Research Development Corporation (NRDC), said that the Government of India realizes the importance of Technology Business Incubators (TBIs) and STPs for creating wealth and employment. “All departments have been instructed to create such platforms. NRDC identifies potential R&D outcomes, evaluates it for market potential and helps in its licensing,” he said.

Dr David Bergvinson, Director General, ICRISAT, urged all stakeholders to leverage on their synergistic expertise to promote demand-driven innovations to address the needs of the society. “I urge such partnerships to keep in mind the need for addressing global challenges which include poverty, malnutrition, hunger and the looming challenge of climate change as part of their strategic interventions,” he said.

Technical tours to ICRISAT, IKP, T-Hub and Gubba Cold Storage offered avenues to understanding the operations and success of Indian STPs and Business Incubators. The conference titled – Innovation sharing and collaborative opportunities in Science & Technology for advancement in Asia & Asia Pacific – was organized jointly by ICRISAT and the Hyderabad Visitors Convention Bureau (HCVB) in India from 19-22 October. The ICRISAT team was led by Dr Kiran K Sharma, Theme Leader - Agribusiness and Innovation Platform, Innovation Systems for the Drylands Program; and Chairman of the ASPA-2016 Organizing Committee.

The next ASPA annual conference will be held in Vietnam.

This work contributes to the UN Sustainable Development Goals
New pearl millet varieties and hybrids capture farmers and seed producers’ interest in Niger

The newly developed open pollinated varieties and hybrids of pearl millet were showcased during a field day in farmers’ fields near Yuri in Niger and also at the ICRISAT research center at Sadore.

As part of the program, a farmer participatory varietal selection was conducted during the field day. Farmers, seed companies and NGOs were asked to select the new varieties and hybrids based on their interest. This exercise helped to better understand the requirements of the farmers in different regions of Niger. The selected varieties and hybrids will be produced in the next season to showcase these varieties and hybrids in the farmers’ fields in coming days.

The newly developed ICRISAT-bred pearl millet varieties with high grain Fe content were planted in farmers’ field and also in Sadore for demonstrations. The new varieties are ICTP 8203, GB 8735, ICMV 221 Wbr, ICRI- Tabi and Jira Ni along with hybrids ICMH IS 14002, ICMH IS 14003, ICMH IS 14009, ICMH IS 14011, ICMH IS 15012, ICMH IS 16265 and ICMH IS 16266.

Varieties selected by participants based on their regions’ need included ICTP 8203 and ICMV 221 Wbr and hybrids such as ICMH IS 14002, ICMH IS 14003, ICMH IS 14009, ICMH IS 14011, ICMH IS 16012 and ICMH IS 16265.

During the field visit, the seed kits of 250 g of ICTP 8203 seeds were distributed to each farmer for sowing in their fields next year. After the visit the AINOMA seed company expressed interest for training in hybrid seeds production. An AINOMA technician will come to ICRISAT as an intern for field training during the off-season trials. This work was carried out in partnership with HarvestPlus.

The Indian Ambassador, His Excellency Mr RS Malhotra inaugurated the field day and visited the pearl millet demonstrations in Sadore research station and in farmers’ field at Yuri. He also visited ICRISAT research facilities such as abiotic stress studies platform, genebank and micronutrient soil analytical laboratory. He appreciated the research being conducted at Sadore and the ICRISAT facilities at Niger.

Around one hundred participants representing national partners, Institut National de la Recherche Agronomique du Niger (INRAN), farm unions, various NGOs, Ministry of Agriculture and seed companies (AINOMA seed company) across Niger witnessed the field day and appreciated the newly developed varieties and hybrids.

Partners: INRAN, AINOMA seed company, farm unions (Made bane, Fuma Gaskiya and Hareyben), Ministry of Agriculture, National Seeds Certification Agency and NGOs

CGIAR Research Program: A4NH

This work contributes to UN Sustainable Development Goals

L to R: Dr Malick Ba, ICRISAT Country Representative, Niger, His Excellency Mr RS Malhotra, Indian ambassador in Niger, his wife and Dr Prakash Gangashetty, Scientist - Pearl millet breeding.
Breeding tool plays a key role in program planning

Region-wide Program Improvement Plans for target crops – groundnut, chickpea, cowpea and common bean – were presented at a recent Tropical Legumes (TL) III Genetic Gains workshop. The workshop used the results of the Breeding Program Assessment Tool (BPAT) as a resource to help guide breeding programs in improving their targeting, speed, scale, efficiency, quality (control, precision, and accuracy) according to each partner’s unique characteristics and resources.

The workshop was attended by key breeding programs of CGIAR centers and select National Agricultural Research System (NARS) partners from eight participating countries. The discussions resulted in partners agreeing on the following:

▪ Extensive use of Breeding Management System (BMS)
▪ Adoption of more mechanized practices
▪ Leveraging capacities of partners
▪ Exploring capacities to harness forward breeding
▪ Building modern foundation seed stores.

Key traits identified for development included early maturity, foliar fungal disease resistance, drought tolerance, groundnut rosette disease resistance, P-efficiency, tolerance to aflatoxin contamination and nutrient-use efficiency to meet the needs of poor soil fertility in Ghana, Burkina Faso, Tanzania and Uganda.

Partners realized the most immediate improvement they can make in their breeding program is increasing the cropping cycle by at least one cycle per year to translate the enhanced breeding efficiency. Materials received from ICRISAT for foliar fungal disease resistance were useful and a few adapted lines were selected and promoted to advanced trials. It was also noted that an internal mechanism in CGIAR centers is required to incentivize breeders for sharing of breeding lines with NARS partners. NARS partners were encouraged to engage and invite objective leaders of TL III to their annual work-planning meetings which may provide guidance on collaborative activities to be carried out.

The common objective presented across the countries was to develop market preferred varieties with drought tolerance, pest and disease resistance and improved nutrition. To achieve this it was recommended to increase number of nurseries, number of crosses, breeding trials and sites. Partners were of the view that to improve quality, higher precision phenotyping is required. There is a need for measurement of genetic gain, better data capture and seed storage facilities. NARS partners presented the program improvement plan for each legume in a crop by country combination – chickpea in Ethiopia and India; common bean in Ethiopia, Tanzania and Uganda; groundnut and common beans in Tanzania and Uganda; groundnut and cowpea in Burkina Faso, Ghana, Mali and Nigeria.

Program Improvement Plans at African Hubs

Groundnut

Traits of focus are drought resistance, leaf diseases, aflatoxin and rosette. The objective of the Program Improvement Plan is to improve genetic gains, increase genetic effects and minimize environmental error. Prior to BPAT the West and Central Africa (WCA) program relied mostly on Malawi and India programs for crossing and segregating populations. The actual crossing program started in 2009 with only nine crosses per year. The proposed area of improvement following BPAT for both Eastern and Southern Africa (ESA) and WCA hubs are as follows:

▪ Increase the crossing capability of the program (up to 250 crosses per year per site) and widening the genetic pool through introductions from the genebank in India
▪ Optimization of the selection strategies through Single Seed Descent (SSD), pedigree modification and early generation selection from F2 and F3 generations
▪ Testing strategies to optimize target and testing environments including number of test sites in each environment
▪ Number of replications and number of years for on-station and on-farm testing
▪ Make use of advanced statistical tools (mixed models, spatial analysis) to optimize selection precision
▪ Use of marker technologies (currently focus on traits for late leaf spot and rust)
▪ Strategic partnerships for winter nurseries at government stations in Malawi (early leaf spot and groundnut rosette disease), Naliendele Agricultural Research Institute (NARI) Tanzania for rust or shuttle breeding between WCA and ESA to speed up generation advance.

Cowpea

The program has been in existence for more than 50 years and Program Improvement Plans for immediate follow-up include:

▪ Recruitment of an additional breeder and postdoctoral researchers for molecular breeding and host plant resistance entomologist, etc.
ICRISAT Happenings | October 2016 | 1734 | 7

- Upgradation of facilities for aphid infestation and drought. Improve irrigation systems and screen houses
- Optimization of breeding workflow to reduce cycle time and increased use of molecular tools in collaboration with University of California Riverside (UCR)
- Ensure genetic purity and integrity at all stages of the pipeline
- Farm/plot mechanization.

Common Bean
The common bean program intends to address three pipelines:
- Drought, low phosphorus (P) and low nitrogen (N) tolerance
- High mineral iron (Fe) and zinc (Zn) lines
- Insect pests bean stem maggot and bruchids, and disease resistance (angular leaf spot, common bacterial blight and bean common mosaic virus)

The other key traits include cooking time and yield.

Program Improvement Plans for immediate follow-up includes
- Speed – aiming at four generations per year in Uganda – SSD for fast generation advance, plot mechanization including planters and harvesters
- Increase number of crosses to 100 per year; handle up to 5,000 – 10,000 lines per year; use BMS and molecular tools
- Quality phenotyping
  - Uniformity of fields
- DNA marker technology
  - Use the CGIAR common genotyping facility at ICRISAT or Intertek genotyping platform
  - Better use of data in decision making
  - Improve irrigation facility (solar powered)
  - Already using electronic data capture tools; increase use of automated data collection.

Chickpea
For chickpea, key challenges include Fusarium wilt, ascochyta and pod borers. The program in Ethiopia has a target to increase production by 50% by 2020. Researchers will focus on working with partners to identify quantitative trait loci (QTL) for the meeting the challenges mentioned above. Program Improvement Plans to address these constraints include the following:
- Increase the crossing capability of the program (up to 50 crosses per year) and widening the genetic pool by requesting new germplasm from the genebank in India
- Use SSD for fast generation advance, aim at 2-3 generations per year
- Use BMS and molecular tools
- Quality phenotyping
  - Uniformity of fields
- Use electronic data capture tools; increase use of automated data collection.

Way forward
All partners expressed satisfaction that the BPAT exercise added value to their programs. Dr Jeff Ehlers, Senior Program Officer, Bill & Melinda Gates Foundation, commented that BPAT can be used in an advocacy role: pushing national programs and CGIAR centers to deliver more efficiently.

Dr David Bergvinson, Director General, ICRISAT, said that BPAT assessment should be extended to other locations as well. Dr Moses Siambi, Regional Director- ESA, emphasized on the need to increase production and productivity of the four key legumes under TL III in order to meet the high demand in project focus geographies. “With our integrated efforts we not only need to enable smallholders to move from subsistence farming to marketable surplus production but also ensure better nutrition and health,” he said.

Dr Ehlers commended the partners’ effort for bringing in a real change in mindset and thinking of NARS and other partners and he also appreciated the visible efforts of incorporating the outcomes of the BPAT for improving the breeding programs. He also suggested the need to have the benchmark studies and document the reports on the genetic gains in key breeding programs.

Dr Rajeev Varshney, Research Program Director - Genetic Gains, ICRISAT, encouraged the partners to utilize the ICRISAT genotyping platform/high throughput phenotyping and genotyping facility. He urged the Crop Improvement Breeding and Genetic Gains units of ICRISAT to work closely for better integration of the breeding activities and genomics.

The workshop on ‘Increasing the Genetic Gains of Project Partner Breeding Programs’ was held from 1-2 September at Nairobi, Kenya.

Project: Tropical Legumes III
Investor: Bill & Melinda Gates Foundation
Partners: CIAT, IITA, and NARS partners from sub-Saharan Africa and South Asia.
CGIAR Research Program: Grain Legumes

This work contributes to UN Sustainable Development Goals
MLES work plan to document roadmap to achieving TL III project objective

A Monitoring, Learning and Evaluation (MLE) work plan to document the roadmap to achieving the Tropical Legumes (TL) III project aim was prepared by participants attending a workshop in Kenya. The TL III project aims at releasing 50 high-yielding, stress resistant, market preferred varieties with superior cooking and nutritional qualities of groundnut, cowpea, common bean and chickpea by 2019.

Urging participants to embrace and adopt the approved MLE work plan, Dr Emmanuel Monyo, Project coordinator TL III, said, “Quoting release of varieties per se is not enough but emphasis needs to be put on the genetic gains of those varieties and the available seed systems for their dissemination.” He said there needs to be a better way of documenting project achievements. A properly designed MLE plan will help the team to achieve this.

Dr Jeff Ehlers, Senior Program Officer, Bill & Melinda Gates Foundation applauded the efforts of all the TL III partners and stressed that at the donor level, the Foundation sees the National Agricultural Research System (NARS) as key implementers for the third phase of the project. He also reminded the need for return on investments (ROI) for funds, but above all, synchronizing the work being done with national strategies in order to have bigger impact. He was happy to point out the investments in national institutions like the Ethiopian Institute of Agriculture (EIAR) were bearing fruit. “We need to continue documenting adoption of improved varieties and technologies developed as part of this project. We need to avail indicators of successful return on investments: what has been achieved and how confident we are on what has been reported. The Foundation is interested in knowing what NARS is doing, their capabilities and how we can measure these successes better while adopting the MLE plan,” he said.

Addressing the participants Dr David Bergvinson, Director General, ICRISAT, highlighted the need to develop market-driven varieties and define the research agenda to answer the concerns along the production chains like: what are the market requirements? Who are the partners needed for its delivery? Who are the actors involved throughout the chain? He emphasized on role of engaging with policy makers and urged the CGIAR leaders to be ambassadors to strive for policy reforms. He urged the project partners to synchronize the plans to the country strategies; look for avenues to unlock markets, and document the constraints, enabling policies and partnership environments needed to unlock markets.

During the two-day deliberations MLE consultant Dr Yvonne Pinto, Director of Agricultural Learning and Impacts Network (ALiNe), Firetail, sensitized project partners on TL III MLE principles, highlighted the detailed functioning of MLE, reiterated the objectives, theory of change, elaborated MLE framework and the significance of MLE to TL III project. Mr Amos Kioko, Project Officer – MLE, facilitated and educated the participants on filling of MLE data collection tools and forms. Objective-wise groups were formed to have better integration and synergy while filling the MLE forms and reporting on the project development.

Project indicator reference sheet was discussed to provide guidance on definition of terms, calculations, type of indicator, level of aggregation, data disaggregation, method of data collection, data sources, frequency of data collection, persons responsible, etc. Percentage of women using improved technologies, percentage change in gender yield gap along with number of improved legumes varieties developed and released, number of improved legumes varieties available for national testing, number of farmer-preferred varieties released in the national system, number of participants reached/ awareness created were some of the important indicators discussed as part of the MLE indicators.

The Breeding Management System was also discussed as a tool for data management and reporting. It was suggested to track the average age of variety in a particular country to understand the genetic gains in farmers’ fields.

Dr Stanley Nkalubo, Scientist from National Crop Resources Research Institute (NaCRRI), Uganda, urged NARS to look at the country strategies and what works are being done to improve the nutrition and food security in the country. He cited the example of how iron-rich beans released under this project are helping in the fight against anemia in Uganda.
MLE is a way of learning for all and we need to learn and define the impact using the available facilities and resources, said Dr Clare Mukankusi, who represented International Center for Tropical Agriculture (CIAT). Dr Christian Fatokun, International Institute of Tropical Agriculture (IITA), emphasized on the need to work with industries in the private sector and mentioned about their work with Monsanto for developing improved cowpea technologies. He reminded the team that Tropical Legumes project is a ten-year vision currently in its eighth year and there is need for ex-post assessment of the success achieved and project the future of legumes when the project ends in 2019. There is a need to plan on how to attract youth to replace the ageing generation of farmers. The way farming should be practiced must reflect the changing environment to encourage more youth to join agriculture, he said.

Underlining the importance of efficient data management and use of Breeding Management System (BMS) discussions were facilitated by Dr Rajeev Varshney, Research Program Director - Genetic Gains, ICRISAT and Principal Investigator, TL III, with NARS partners to finalize the target locations per country and identify the country focal points. It was decided that assessment of existing capacities on data management and BMS of NARS partners will be done and accordingly plans for trainings and implementation of BMS and data management strategy will be developed as follow-up activity.

The workshop was held on 30-31 August and was attended by more than 60 participants from CIAT, IITA, the Bill & Melinda Gates Foundation, ICRISAT and NARS partners from sub-Saharan Africa and South Asia.

This work contributes to UN Sustainable Development Goals.
Genomics project on groundnut aflatoxin research launched

To identify the genomic regions and genes associated with aflatoxin resistance in groundnut using a combination of genomics approaches, a new research project was launched. Aflatoxins are among the most potent mycotoxins, carcinogenic and teratogenic compounds. Groundnut and maize are the most susceptible to aflatoxin contamination.

One of the main objectives of the new project is to validate the identified genes and develop diagnostic markers so that they can be deployed in molecular breeding for developing superior lines with enhanced aflatoxin resistance in addition to other desired agronomic and productivity traits.

The project ‘Identification of markers and genomic regions associated with aflatoxin resistance in groundnut’ is funded by the Mars Inc., USA, for a period of three years. A five-member delegation led by Dr Victor Nwosu, Technical Director, Mars Inc., attended the project launch meeting.

“Consumption of contaminated groundnuts is silently deteriorating the immune system of the consumers which has profound adverse impact on human health, even more than estimated. The outcome of this project will help in developing aflatoxin-free groundnut varieties, to provide high quality raw material to develop export quality products,” said Dr Nwosu.

Dr David Bergvinson, Director General, ICRISAT, highlighted the importance of the proposed research for finding genetic solutions to aflatoxin contamination thus providing a sustainable solution to this menace and helping in developing aflatoxin-free groundnut varieties so that the poorest people can afford to have safe and healthy groundnuts for consumption.

Dr Rajeev Varshney, Research Program Director-Genetic Gains and Principal Investigator of the project, and Dr Manish Pandey, Scientist-Groundnut Genomics, Research Program-Genetic Gains, spoke of ongoing work with Mars Inc. in another project which targets developing short duration, drought tolerant, foliar disease resistant and good oil quality groundnut varieties using genomics tools with high level of success and are confident on developing the required improved varieties very soon.

ICRISAT has successfully deployed marker-assisted backcrossing (MABC) for developing marker-assisted backcrossing (MABC) for developing improved lines for foliar disease resistance and oil quality in groundnut. Several of these lines are under multi-location trials in India for potential release as superior varieties.

**Project**  
Identification of markers and genomic regions associated with aflatoxin resistance in groundnut  
**Investor:** Mars Inc., USA  
**Partner:** ICRISAT  
**CGIAR Research Program:** Grain Legumes

This work contributes to UN Sustainable Development Goals.
New Climate Smart Agriculture project launched in the poorest regions of Niger

To improve the resilience of poor households to climate risk in the resource-constrained farming systems of the semi-arid ecology of Niger a project funded by the European Union was launched.

The project will use a participatory approach to co-develop and scale out Climate Smart Agriculture (CSA) innovations which will include:

- Short duration crop varieties well adapted to the climate
- The development of seed value chain to improve access to seeds
- Improved technologies of soil fertility, water harvesting and agroforestry systems.

A crosscutting objective of the project is focused on sustainable increase of agricultural productivity and nutritional values of agricultural products, reduction of poverty by the strengthening local value chains of high value crops and trees for income generation, especially for women and youth.

The project titled “Enhancing resilience to climate change through the dissemination of integrated management technologies: Soil-water-Agro-pastoralism” is designed using an integrated systems approach targeting the development and scaling of CSA innovations to improve the resilience in two of the poorest regions of Niger, Dosso and Zinder. This systems approach will be used in designing resilient farming systems to improve livelihoods and incomes.

“This is an opportunity to link different initiatives and actors to CSA in Niger, for example our work on the restoration of degraded lands for food security and poverty reduction in collaboration with ICRAF (World Agroforestry Centre) and funded by International Fund for Agricultural Developmen (IFAD) and European Union (EU),” said Dr Anthony Whitbread, Research Program Director, Innovation Systems for the Drylands, who was present at the launch and involved in several initiatives in the region.

The Governor of the region, His Excellence Moussa Ousmane, Representative of the Government of Niger commended ICRISAT for its dedication to the cause of poor smallholder farmers, particularly in the Sahelian region in Niger. Mr Saibou Tamoudari, Prefect of Dosso, appreciated that the project addressed the issue of climate change.

The project was launched at Dosso on 24 September and Zinder on 1 October.

Investor: European Union
Partners: NGO Contribution au Développement Rural (CDR); NGO Action pour un Sahel Vert (ASV); Ministry of Environment; Ministry of Agriculture
CGIAR Research Program: Dryland Systems

This work contributes to UN Sustainable Development Goal

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Photo: Mahamane Badamssi, ICRISAT

His Excellence Moussa Ousmane distributes plants to women at the project launch.
Impacts in Nigeria acknowledged and recounted at new office building inauguration

The opening of a new office complex in Kano, Nigeria, was acknowledged by local leaders as a demonstration of ICRISAT’s commitment towards agricultural research and development in semi-arid West and Central Africa. The new building was inaugurated by Dr Abdullahi Umar Ganduje, Executive Governor Kano State.

“‘This new office complex will strengthen the existing collaboration between the national agricultural research institutes and their international counterparts, and ensure that the current challenges to sustainable agricultural production are overcome,’ said Chief Audu Ogbeh, Minister of Agriculture.

ICRISAT activities in Nigeria date back to the 1970s. The following are the impacts of collaborations in the region –

Development and adoption of several sorghum and pearl millet varieties
Through the Semi-Arid Food Grain Research and Development/United States Agency for International Development (SAFGRAD/USAID) project in 1976, several sorghum and pearl millet varieties were developed which were adopted by farmers.

New sorghum varieties and hybrids released
In 1988 ICRISAT set up a Research Station at Bagauda near Kano to pursue a research program focused on the improvement of sorghum-based cropping systems. Two sorghum varieties – ICSV 400 and ICSV 111, and two sorghum hybrids – ICSH 89002 NG and ICSH 89009 NG were released in collaboration with the Institute of Agricultural Research (IAR), Zaria.

Rosette-resistant groundnut varieties released
In 1992 ICRISAT and IAR embarked on a large hybridization program to develop early maturing groundnut varieties resistant to the rosette disease. The outcome of this work was the release of several rosette-resistant groundnut varieties.

Exchange of germplasm, breeding materials and technologies
In 2008, ICRISAT and the Agricultural Research Council of Nigeria (ARCN) commenced another collaboration on development and implementation of joint research programs in Nigeria. ICRISAT in collaboration with ARCN, IAR and the Lake Chad Research Institute (LCRI) has since been working in Nigeria on sorghum, millet and groundnut. Mutual cooperation and collaboration has been established in areas such as exchange of germplasm, breeding materials, scientific information and techniques, and capacity development.

Other collaborative research projects with various National Agricultural Research Systems (NARS) include –

- Rebuilding the groundnut pyramids
- Boosting farmers’ incomes through improved groundnut varieties
- Crop management and processing technologies
- Boosting sorghum production
- Commercialization and industrial utilization through public-private partnerships.

For the past many years, ICRISAT has been operating from a temporary building provided by IAR. The new office is located on the same premises.

At the inaugural ceremony, Dr Ramadjita Tabo, Research Program Director, West and Central Africa and Country Representative Mali, ICRISAT, thanked the Government of the Federal Republic of Nigeria for its support. The inauguration held on 27 September was attended by national partners and representatives of donor agencies, ICRISAT staff Dr Anthony Whitbread, Research Program Director, Innovation Systems for the Drylands; Dr Hakeem Ajeigbe, Country Representative Nigeria and Principal Scientist, Agronomy; Dr Michael Boboh Vabi, Country Project Manager and head of Office Construction Committee; staff of ICRISAT-Nigeria and International Institute of Tropical Agriculture (IITA).
Trainings

Training on Research Farm Management

Farm managers from Indian state universities, private seed companies and ICRISAT staff in Africa underwent training on themes such as Sustainable management of natural resources, Factors affecting research results and coping with errors, Effects of climate change on pests and diseases, and Weed management. The interactive program included lectures and presentations by ICRISAT scientists and staff of Farm and Engineering Services, farm visits showing various field operations, and demonstration of machinery operations. Eleven participants attended the training program organized by the Farm and Engineering Services, Research Program – Asia from 17-22 October at ICRISAT headquarters.

This work contributes to UN Sustainable Development Goal 15: Life on Land.
Listening to people and getting a response is like physics

Mrs Salamatu Garba, Executive Director of Women Farmers Advancement Network (WOFAN)

“You can’t win a race running on one leg! Both legs must go together. Similarly, we must enhance agricultural technologies with simple hand operated machines, planters, and harvesters for women. You can’t let women continue with hard labor for three days and pay them half a dollar for that! Let them own their businesses, let them be engaged in uptake, let them link to markets.”

(Excerpt from a freewheeling conversation with Agathe Diama, Regional Information Officer - West & Central Africa Program)

Biofortified pearl millet varieties to fight iron and zinc deficiencies in India

Dr Kedar N Rai, Consultant with HarvestPlus, International Center for Tropical Agriculture (CIAT); and Former Principal Scientist and Director, HarvestPlus-India Biofortification Program, ICRISAT

Micronutrient malnutrition because of iron and zinc deficiencies is a serious public health problem in low-and middle-economy countries worldwide. In India alone, about 80% of the pregnant women, 52% of non-pregnant women, and 74% of children in the 6-35 months age group suffer from iron deficiency. About 52% of children below 5 year are zinc deficient.

Crop biofortification, which refers to the breeding of cultivars with higher levels of micronutrients, is increasingly being recognized as a cost-effective and sustainable approach to overcome these deficiencies in the food chain.

Open source phenoapps pave the way to efficient data collection in plant breeding

Dr Eng Hwa NG, Theme Leader - Forward Breeding, Genetic Gains Program, ICRISAT

In an effort to introduce new technology into plant breeding programs, members of the Poland Lab at Kansas State University have developed several free PhenoApps for collecting data with Android smartphones and tablets. By fundamentally designing these tools for plant breeders and geneticists, the group hopes to improve specific areas in the plant breeding process where data management remains difficult.

New blog

Crop simulation models: predicting the future of pulses

Dr Vincent Vadez, Theme Leader, System Analysis for Climate Smart Agriculture, ICRISAT

Pulse crops have many benefits for farming systems, both from the angle of human and animal nutrition and of soil health and farming system sustainability. They face production challenges and these will get worse in future climate scenarios. Yet, the biological basis for increasing tolerance to production constraints is being much better understood and germplasm collections offer a treasure trove of solutions for breeding improved cultivars. There are also software tools such as crop simulation models that allow scientists to decipher the complexity of pulse production and simplify the choice of targeted interventions to maximize productivity and sustainability.
Welcome

Dr Issa Ouedraogo, a Burkina Faso national, joined ICRISAT on 17 October as CCAFS/CINSERE Project Coordinator, based in Dakar, Senegal. He holds a PhD in Forest Resource Management with specialization in GIS and Remote Sensing from the Swedish University of Agricultural Sciences, Alnarp, Sweden. Dr Ouedraogo previously worked for the World Agroforestry Centre, the Stockholm Resilience Centre, as guest scientist at the University of Frankfurt and as a consultant at the International Water Management Institute (IWMI) under the joint IWMI-FAO project “Water for Food” (W4F). He also worked as senior researcher at the Institut de l’Environnement et de Recherches Agricoles (INERA) in Ouagadougou, Burkina Faso. We welcome Dr Ouedraogo to Team ICRISAT and wish him all success.

Dr Folorunso Mathew Akinseye, a Nigerian National, joined on 21 September as Post-Doctoral Fellow at ICRISAT –Kano. Dr Akinseye has a PhD in Meteorology and Climate Service (2015) from the Federal University of Technology Akure (FUTA), Nigeria. Prior to joining ICRISAT he was associated with FUTA as a lecturer. We welcome Dr Akinseye to Team ICRISAT and wish him all success.

Readers’ Comments

The approaches you highlighted for building climate-smart farming communities (Happenings, October issue) can also be adopted in the Philippines. With a US$10 million funding our approach is an integrated farming approach using your approaches and renewable energy which we call GET SMART Farms (Green Energy Technologies for a Systematic, Modernized Appropriate Rural Technologies for Farmers Sustainability). This will now provide irrigation to 1,000 hectares benefiting 1,000 or more farmers in a cluster of communities.

Mr Vicente L Sonny Domingo, Office of the President Professional Regulation Commission Board of Agriculture, Manila

ICRISAT’s approaches to building climate-smart farming communities is very interesting. Please add that the increasing number of nurseries in rural areas for medicinal and aromatic plants that grow in the arid and desert regions is also a tool to climate change adaptation, mainly for women, who generally feed the family.

Dr Zakia Bouzoubaâ, Researcher in Plant Physiology, INRA, Rabat, Morocco