



Impact

Agri-buzz *blog*

Seven villages, 700 women, one story: Plant nurseries in Niger are changing lives



Photo: B Traore, ICRISAT

Women farmers during a grafting demonstration in Niger.

A group of women across four regions of south-western Niger have grown 84,000 trees to earn US\$ 20,400 (CFA 11,200,000) in just three months. Their entrepreneurial quest, an example of besting odds in harsh environs, has seen the women bond over fruit trees while leaving them financially empowered. ICRISAT has interconnected the seven groups to better share business ideas and to promote inter-community exchange.

“Since our group started the nursery business, we have seen many changes in our lives. We are now very busy doing tree growing activities during the dry season,” says Ms Attou Abou, leader of a women’s group in Sarkin Yamma Saboua village, Maradi region.

“On the social front, we meet every day and this has created a kind of empathy and cohesion among women of the village. In addition to this, income generated from selling trees helps us to take care of our children and contributes to family expenses,” she beamingly adds.

The start

It all began in June when a nursery was installed in each of the seven villages - Sirimbana, Djoga, Nazamne, Nadara1, Djinguiniss and Sarkin Yamma Saboua village. Seedlings of fruit trees, Mango (*Mangifera indica* L.), Lemon (*Citrus* spp.), Guava (*Psidium guajava* L.), Pomme du Sahel (Apple of the Sahel) and *Moringa oleifera* were provided to the women to grow, manage and sell.

The initiative was taken up under Government of Niger's World Bank-funded Project, **Supporting Sensitive Agriculture to Climate Risks** (PASEC). Groups of 100 women, farmers engaged in limited income generating activities, were tasked with maintaining and managing each of the nurseries. The women were trained by ICRISAT in fruit plantation and nursery management. Each nursery came to have 12,000 trees.

To address climate change and recurrent food crises that hits villages the hardest, Government of Niger launched in 2011 the National Program dubbed "Nigeriens Nourish Nigeriens", popularly known as the "3N" initiative. The initiative aims to make agriculture spearhead the country's development. Overall, the objective of the initiative is to protect Nigeriens from famine and guarantee them conditions for full participation in national production and improvement of their income. The PASEC project is in line with the 3N initiative.

The way ahead

To consolidate the groups' achievements, ICRISAT has interconnected the seven groups to promote inter-community exchange. ICRISAT has also linked them with a women's group in Sadoré (close to Niamey, Niger's capital city) that has been running a nursery for 12 years.

According to Ms Djénabou Harouna, the more experienced Sadoré women's group is well organized

and each woman has several types of fruit trees. "A part of the sale is donated to the cooperative to support its sustainability. We will use these experiences to better develop our cooperative for the benefit of our communities," she says.

Ms Abou is very optimistic about the future of the groups. "I am convinced that even after this project, the dynamic created within the women's group in our village will continue for our own benefit," she confidently says. ■

Authors

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Project: Projet d'Appui à l'Agriculture Sensible aux Risques Climatique (Climate-Smart Agriculture Support Project)-**PASEC**

Partners: Government of Niger, World Bank

CGIAR Research Programs: Grain Legumes and Dryland Cereals and CGIAR Research Program on Climate Change Agriculture and Food Security (CCAFS)

Auctions in markets herald higher incomes for Malawi's crop-livestock farmers

Farmers in three districts of Malawi are able to earn more than they did from selling goats, thanks to a simple intervention that brought transparency, demand and competition for high quality meat.

It was the competition among buyers that increased the price for heavier goats of good quality, while the goats of poor quality fetched low prices," observed Mr Bictor Chimtondo, a goat rearing farmer, during an auction at Kachala market in Malawi.

With vibrant goat markets and growing goat populations, the demand for goat meat is increasing in urban and rural areas in Malawi. Despite their growing importance as source of nutritious meat and income, goat value chains remain poorly commercialized.

Goats are of high value for farmers in the southern Malawi. One-in-three farmers own goats; a flock size of up to 10 goats provides regular supplementary income. Women and men seem equally successful in raising profits from goats. The money from goat sales is used to buy inputs for crop production or food during periods of shortage and to pay for the education of children. However, farmers benefit very little from their sales especially due to low prices that they fetch through farm-gate sales, the predominant market channel. For instance, at the beginning of planting season, goat prices usually plummet due to increased supply. The demand for goat meat peaks only two months after, during the festive season towards the end of the year.

To push for higher quality in goat markets and better reward farmers for investing in enhancing quality of their goats, the [CLIM²project](#) piloted goat auction sales between October 2019 and February 2020 in the three project districts – Balaka, Chiradzulu and Thyolo.

Direct impacts of goat auction sales

Sales records illustrate that goats sold through auctions where they are weighed and the weight announced fetched on average 6% higher prices than those through conventional sales.

"The use of weighing scale worked to our advantage as we knew the weight of the live goat before selling. Knowing the weight of the goat helped determine the price," says Mrs. Chisinga, who sold her goat of 24 kg at a price of K 17, 000 (US\$ 23) on the market day.

The prospect of securing higher prices at goat auction sales motivate farmers to give supplementary feed to their livestock. Even though supplementary feeding leads to substantial weight gains, conventional market sales do not pay off the cost of feed. Feed technology improvement alone is thus not sufficient. It has to go hand in hand with market improvement, for farmers to improve their goat business at a profit.



Photo: Temwa Mvula

Farmers entering their goats for bidding at Phalula goat sale.

Market site	Type of market	Number of goats traded	Average selling price per kg live weight (Mk)
Chikwakwata Chiradzulu	Auction	18	850
Kachala Balaka	Auction	12	883
	Non-auction	3	796
Kamala Chiradzulu	Auction	12	498
Thekerani Thyolo	Auction	16	749
	Non-auction	15	726
Total	Auction	58	787
	Non-auction	18	737

How auction sales work?

The success of auctions hinges on collaboration between all stakeholders in Malawi's goat value chain. The CLIM² project initiated pilot auction sales that brought together farmers wanting to sell their goats, vendors, butchers and government extension.

1. Farmers and buyers described attributes of a good quality goat from their perspectives.
 2. They identified a goat that represented good quality.
 3. Both farmers and buyers discovered that they shared the same understanding. A good quality goat has attributes of sleek skin, high weight and visible fat on the bone.
- **The auctioning process:** A portable digital scale was used to determine the weight of goats. The animal owners then indicated an expected price, which the auctioneer, represented by the local agricultural extension officer, announced to the buyers. The bidding continued until the final price was reached. The farmer had a final say to sell their goat or not in case buyers bid prices lower than the expected price. A record of the number of farmers and buyers was kept.
 - **Benefits from auction sales:** Buyers competed for good-quality goats and those goats sold faster, indicating to farmers what type of goat the market wants and the prices they can expect. Farmers appreciated transparent price setting at the auction and understood that it can help keep theft under control. Buyers found quality products easily and at reduced transport costs, when normally they would spend time and resources searching for goats at farm gates. Government's extension staff witnessed how this simple model conveyed higher returns to farmer and buyers.

Recommendations

While goats are high value for farmers in the southern region of Malawi, they fall lowest on the priority list in terms of government support relative to other commodities in the agricultural sector. Absence of adequate goat market facilities significantly hinders efforts to alleviate poverty, improve nutrition and food

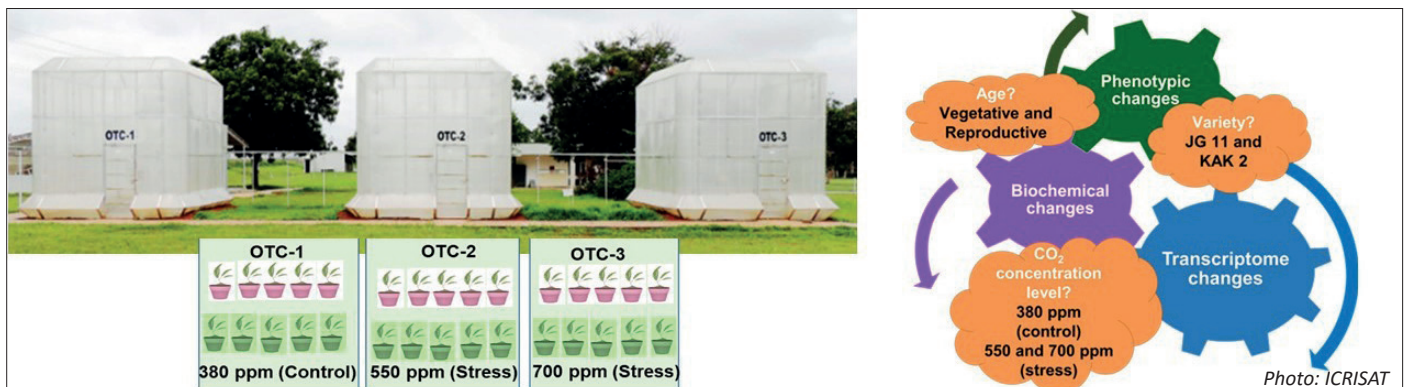
security. Agricultural interventions must therefore go beyond increasing productivity; active support of goat markets is required with conditions conducive for investing in goat markets and for farmers to be rewarded for their efforts.

- With conventional goat markets not distinguishing goat meat quality, consumers fail to get the meat quality that they would be willing to pay for; the high demand for goat meat is also reflected in higher prices of goat meat than beef. Furthermore, transparent weighing mechanisms, e.g. through mobile scales, bring objectivity in the pricing.
- Creating parallel channels through the auction model is a way to make available quality meat to consumers with benefits to the entire value chain. Gross margin analyses illustrated that auction sales conveyed higher returns to farmers, vendors and butchers.
- By bidding for better quality goats, everyone quickly learned what the market wants. The auction model can also be used to instill an understanding of market criteria, the use of mobile scales and facilities for interactions between farmers and buyers.
- Goat auctions present business opportunities for farmers and individual entrepreneurs. Agricultural extension services could use the model as strategic tool for stimulating productivity and profitability at a large scale in the smallholder sector.
- Incentives can be introduced for farmers to organize themselves around goat markets, e.g. the auction model to stipulate quality production and pricing. For local empowerment, district level farmer groups and authorities must regularly conduct auction sales. ■

Authors

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What rising CO₂ does to one of world's most important protein sources



A combined physiological and transcriptomic approach provides insights into the molecular dynamics and gene regulation of the responses to CO₂ stress.

In their effort to ensure food and nutrition security in the face of rising carbon dioxide levels and climate change, researchers at ICRISAT, in a first of its kind study, have demonstrated what elevated CO₂ does to chickpea and have uncovered the molecular basis for these effects. Several important plant metabolic pathways related to sugar/starch metabolism, chlorophyll and secondary metabolites biosynthesis were found to be affected.

Their study, '[Molecular and Physiological Alterations in Chickpea under Elevated CO₂ Concentrations](#)' published in the journal *Plant & Cell Physiology*, shows that elevated CO₂ levels cause the roots and shoots of the plants to grow taller with significantly altered nodulation, total chlorophyll content and nitrogen balance index that accelerates plant senescence.

Rising CO₂ levels

Since the industrial revolution, global atmospheric carbon dioxide (CO₂) concentrations have rapidly increased, rising from 280 ppm to currently exceeding 400 ppm. Predictions warn that the global CO₂ concentration will continue to rise and affect major food crops both positively and negatively.

Many of these effects are yet to be fully understood in most crops. For the semi-arid regions, where chickpea is a widely cultivated legume, a rich and an important source of protein, food and nutrition security of the future hinges on identifying climate-change related plant changes and the molecular basis for these.

While there are crop varieties that are resilient to stresses such as drought, elevated temperature and diseases, the researchers note that plants have not evolved specific mechanisms to respond to elevated CO₂ levels.

The study

The study's authors, a team of researchers from ICRISAT's Center of Excellence in Genomics and Systems Biology (CEGSB) and the Centre of Excellence in Climate Change Research for Plant Protection (CoE-CCRPP), subjected two chickpea varieties widely grown in India, JG 11 (desi) and KAK 2 (Kabuli), to elevated CO₂ in open top chambers at CoE-CCRPP.

One chamber was maintained at current ambient CO₂ level of 380 ppm (control), the other chambers were maintained at elevated levels of 550 ppm and 700 ppm. The plants were sown under stress conditions and harvested during vegetative stage and reproductive stage, 15 days and 30 days respectively, post germination.

The researchers observed common physiological changes and cultivar-specific changes during both growth stages at elevated levels of CO₂.

To investigate the molecular basis for these changes, CGESB collected RNA-Seq based transcriptome (gene expression through RNA) data from 12 physiologically evaluated plant samples at different stages under control and elevated CO₂ concentrations. Transcriptome analysis identified 18,644 differentially expressed genes (DEGs). Among these are genes responsible for root and shoot development, sugar metabolism, porphyrin and chlorophyll metabolism and other second metabolites synthesis pathways, which play a key role in the plant's defense mechanism. The study also identified higher number of DEGs altered at reproductive stage and at 700 ppm CO₂ due to prolonged exposure at higher stress point when compared to vegetative stage and 500 ppm elevated CO₂.

The differential expression profiles of key candidate genes were further validated by quantitative Real Time-PCR, a highly effective tool for gene expression validation. It was noted that the molecular level changes were more pronounced in *Kabuli* type (KAK 2) at reproductive stage.

“The present study will act as a model system for studying the effect of greenhouse gases in plants. Moreover, exploring the cultivar-specific, stage-specific and stress response-specific response of plant upon elevated CO₂ concentrations and identification of key major metabolic and stress signaling pathways could help to identify the candidate gene pools and be useful

in developing climate-resilient crops,” the researchers concluded.

The study was partially supported by Government of India’s Department of Biotechnology, Department of Science and Technology (Climate Change Program) and Bill & Melinda Gates Foundation. It was undertaken as part of CRP-GLDC. ■

This work contributes to UN Sustainable Development Goals



How long do seeds live? A 100-year experiment in the Arctic to reveal the secret

Genebanks of six global research institutions including ICRISAT have begun a 100-year experiment at the [Svalbard Global Seed Vault](#) in a quest to know how long seeds live. Data from seeds of 13 crops, four of which will be provided by ICRISAT's genebank in India, will be collected during the experiment.

"ICRISAT will bring seeds of chickpea, groundnut, pearl millet and pigeonpea to the experiment during 2022-23. The seeds will be tested initially before being put in the vault for storage at -18 degree Celsius. They will be taken out for testing once every decade during the course of the next 100 years to determine longevity," said Dr Vania Azevedo, Head of ICRISAT's [RS Paroda Genebank](#).

The first test sets deposited in the vault for the experiment on Thursday were barley, pea, wheat and lettuce produced by the German genebank IPK in Gatersleben. Over the next three years, six institutions will be placing seeds of other crops into the vault for the experiment. The crops and the participating institutions include—

Rice – The National Rice Seed Storage Laboratory for Genetic Resources (NRSSL) in Thailand

Groundnut, chickpea, pearl millet and pigeonpea – ICRISAT in India

Maize – Instituto Nacional de Investigação Agrária, (INIAV) in Portugal

Soybean – Empresa Brasileira de Pesquisa Agropecuária (Embrapa) in Brazil

Barley, pea, wheat, lettuce and Brassica oleracea (of the cabbage family) – The Leibniz Institute of Plant Genetics and Crop Plant Research (IPK) in Germany

Timothy – Nordic Genetic Resource Centre (NordGen) in Sweden.

"This experiment will provide future generations with valuable information about seed viability and more precise knowledge of how often seeds need to be regenerated," said Dr Asmund Asdal, Seed Vault Coordinator at [NordGen](#), the genebank responsible for managing the project.

The main principle for conserving seeds is that well-dried and frozen seeds from many important food crops can stay alive for a very long time in a genebank. Exactly for how long seeds can maintain germination after storage under optimal conditions is not fully explored. But, it is assumed that seeds of many species can stay alive for centuries; some species may even survive for more than thousand years.



Photo: NordGen

The Global Seed Vault in Svalbard.

Genebanks test seeds in their collections regularly to be able to regenerate them in time and keep the genetic resources viable and available for research and plant breeding. Increased knowledge about how long seeds can stay alive will be extremely useful for the world's genebanks and also for the management of the Svalbard Global Seed Vault, which is a facility where genebanks store duplicates of their primary seed collections as a security in case seeds are lost at home.

Many genebanks, including the ones participating in the experiment, are about five decades old and have accumulated some knowledge about seed longevity during the course of their work. However, that knowledge is far from complete as most of it was gathered during routine work without the specific purpose of measurement of long-term viability.

"In this experiment, all the variables that cannot be measured or recorded during the normal course of genebank operations will be measured using advanced techniques when learning about seed longevity. Seeds from multiple harvest years of different crops and differing varieties produced under varying conditions in diverse geographies are subject to extensive testing for germination and gene expression once a decade over a very long time. This kind of testing hasn't been attempted before," added Dr Azevedo. ■

Increased funding support to further accelerate crop improvement and improve seed delivery systems

One year after it began, Accelerated Varietal Improvement and Seed Delivery of Legumes and Cereals in Africa (AVISA) project is being strengthened to magnify its impact potential with a two-year supplementary grant from [USAID](#). The funding aims to enhance the project's investments and support for modernizing breeding activities and seed systems.

The USAID investment for 2020 and 2021 is aligned with the Bill & Melinda Gates Foundation funded AVISA Project, supporting modernization of crop improvement at ICRISAT; [Alliance of Bioversity International and CIAT](#); [International Institute of Tropical Agriculture](#) (IITA). For ICRISAT, the new investment provides an opportunity to include additional crops (chickpea and pigeonpea) and geography (a small part of Asia) that were not originally a part of the project's mandate.

The USAID-AVISA investment will support strengthening of multi-location yield trial networks and environment profiling to cluster target environments; characterizing markets and socio-economic environment to help define and refine product profiles; integration of advanced breeding tools and technologies while advancing breeding material; and strengthening strategic public and private partnerships in enhancing supply and access to high quality seed of improved varieties.

The investment will also accelerate ongoing establishment of a robust public-private partnership through consolidation of Hybrid Parents Research Consortia (HPRC) for sorghum in East and Southern Africa (ESA) and West and Central Africa (WCA), and for millet in WCA.

Dr Harish Gandhi, the acting Global Breeding Lead at ICRISAT and Co-PI for Modernization of Breeding in AVISA Project, said, "Additional investment from USAID in all three regions shows commitment of our donors towards modernization of breeding. This also helps filling in key resource gaps for executing modernization agenda, helping boost overall efforts."

According to Dr Chris Ojiewo, AVISA Project Coordinator, public-private partnerships are crucial as they involve government entities, seed companies, value chain investors such as grain aggregators, farmer groups and farmer cooperatives, NGOs and agro-dealers

complementing one another to deliver high quality seed of improved varieties of grain legumes and dryland cereals and allied technologies to farmers in focus countries. The USAID-AVISA investment is an opportunity to document the market potential of new improved varieties and to build technical capacity of seed producers such that their investments become more profitable through better yields in seed production plots.

AVISA is strategically structured for all partners to implement modern best practices for breeding program management, organization and technologies by adopting best practices. The project's pipeline has the potential to generate a continuous stream of improved varieties of the most important dryland cereals and grain legumes for the target production environments to achieve greater yields for food and/or feed, added value traits and the prospect of higher incomes and improved livelihoods. In addition, the increase in varietal turnover will mitigate threats from evolving climate patterns, insect pest, parasitic weeds and disease complexes.

The project is not only committed to strategic partnerships with similar initiatives and additional investments by development partners but also to capacity development through training of next generation scientists and seed producers/enterprises on seed production techniques, data management and modernizing breeding programs of partner programs. ■

Project: Accelerated Varietal Improvement and Seed Delivery of Legumes and Cereals in Africa (AVISA)

Funder: Bill & Melinda Gates Foundation, USAID

Partners: ICRISAT (lead), International Center for Tropical Agriculture (CIAT), International Institute of Tropical Agriculture (IITA) and National Agricultural Research Systems partners (NARS) from seven African countries

CGIAR Research Program: CRP-Grain Legumes and Dryland Cereals

This work contributes to UN Sustainable Development Goals



Seed consortium to bring improved sorghum to Indian farmers post rains

To make quality seeds of improved sorghum easily accessible, a consortium of institutions is taking up 3000 tons of seed production this year to supply more than 10% of India's farmers, who are often deterred from cultivating improved sorghum owing to non-availability of seed.

Post-rainy sorghum is grown on 3.5 million ha in India. Although prized for its grain and fodder, in the past few decades, terminal drought stress, low temperatures at flowering and farmers' preference for the bold, lustrous white grains in adapted landrace cultivars limited genetic variability in sorghum. This, coupled with limited efforts for hybrid development, had resulted in a low acceptance (20%) of improved sorghum cultivars in India.

"Non-availability of improved post-rainy sorghum seeds is a major constraint in adoption. It persists though there is credible evidence that farmers in Maharashtra adopting seeds of improved varieties and recommended management technologies achieved 40% improvement in grain yield and 30% increase in stover yields in over 40,000 farmers' fields," Dr Ashok Kumar Are, Product Placement Lead-Asia, ICRISAT, said while adding that the consortium was created to scale-up the gains and interventions of HOPE Sorghum and Millets project that was funded by Bill & Melinda Gates Foundation during 2009-14.

The production of seeds by the Post-rainy Sorghum Seed Consortium will be led this year by the agricultural university, Mahatma Phule Krishi Vidyapeeth (MPKV), Rahuri, in the Indian state of Maharashtra. The consortium will produce seeds of improved varieties - Phule Suchitra, Phule Anuradha, Phule Revati and Phule Vasudha - in 2000 ha spread across Ahmednagar, Pune, Solapur and Jalgaon districts of the state. This was revealed during a pre-planning online meeting held on 15 September where Dr Are was the Chief Guest.

The consortium's operations involves Maharashtra state's agricultural universities - MPKV, Rahuri, and Vasantrao Naik Marathwada Krishi Vidyapeeth (VNMKV), Parbhani, supplying breeder seeds of improved varieties to seed farmers, the Maharashtra State Seeds Corporation (Mahabeej) giving a "buy-back guarantee" to seed producers and procuring seeds at 25% higher than market price and the Maharashtra State Seed Certification Agency (MSSCA) certifying the procured seeds.



Photo: Punna S, ICRISAT

Sorghum in a farmer's field in India.

ICRISAT, ICAR-Indian Institute of Millets Research (IIMR), MPKV and VNMKV train seed farmers, organize field days and share knowledge on quality seed production and ways to achieve higher yields in seed production plots.

With partial funding support from CRP-Dryland Cereals and later CRP-Grain Legumes and Dryland Cereals as well as ICRISAT, the consortium has been able to increase production of seeds from 300 tons in 2013 to 3000 tons in 2016. Last year, 300,000 farmers were supplied with improved seeds.

The improved varieties are now widely used in Western Maharashtra and Marathwada regions of Maharashtra. The traditionally popular post-rainy sorghum cultivar, M 35-1 (Maldandi), is being replaced with improved varieties, resulting in enhanced crop productivity. Economic analysis of seed production has shown that seed growers get a return-cost ratio of 2.21 compared to 1.44 for grain producers. Being open-pollinated cultivars, the seeds are reused and exchanged with fellow farmers. ■

Project: Harnessing Opportunities for Productivity Enhancement of Sorghum and Millets (HOPE)

Partners: Indian NARS, IIMR, Mahabeej, MSSCA, agricultural universities (MPKV, VNMKV)

Funder: Bill & Melinda Gates Foundation

CRP: DC and GLDC

This work contributes to UN Sustainable Development Goals



WE Hub Foundation and ICRISAT pledge to support women entrepreneurs in agribusiness by signing MoU

WE Hub Foundation, a platform to promote women entrepreneurs that was launched by the Government of Telangana State in India, and ICRISAT recently signed a Memorandum of Understanding to collaborate to nurture grassroots innovations in agriculture and ag-tech start-ups.

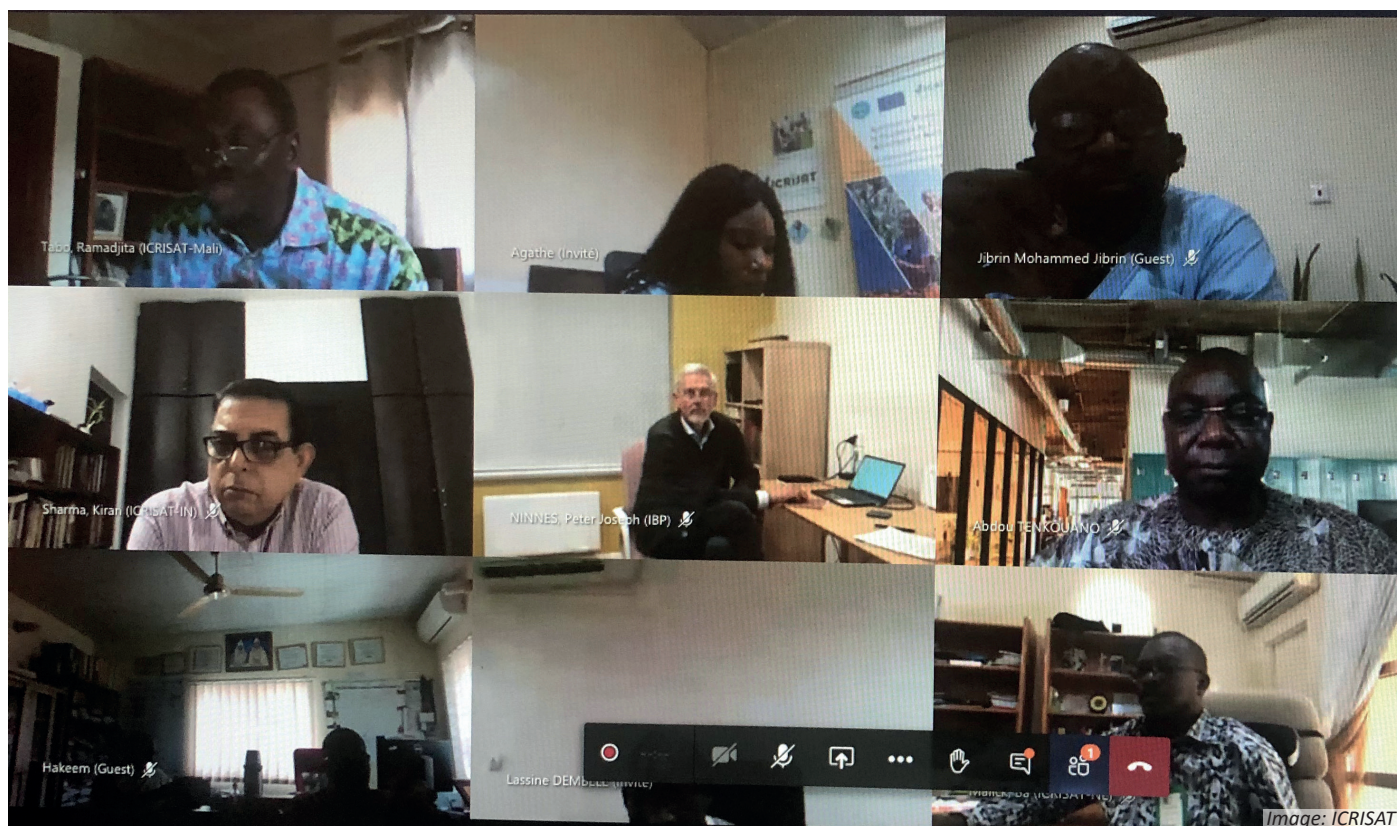
The collaboration will see the two institutions encourage women to pursue entrepreneurship as career and jointly implement activities for capacity building in ag-tech/agribusiness. The institutions have also said they would support each other through their scientists and mentor networks.

To improve sustainability of women-led agricultural enterprises, WE Hub and ICRISAT are expected to jointly work on proposals for entrepreneurship promotion.

As both ICRISAT and WE Hub incubate start-ups, the institutes said they will jointly facilitate generation of leads and scout potential incubatees. The MoU was signed by Ms Deepthi Ravula, CEO of WE Hub and Dr Jacqueline Hughes, Director General, ICRISAT on 8 September. ■

To hear what a few women entrepreneurs associated with ICRISAT have to say, [click here](#).

Developing a five-year Strategic Plan for ICRISAT WCA Research Program



A screenshot of the ICRISAT-WCA regional strategy consultation meet.

Leveraging stakeholder partnerships, improving risk management efforts, enhancing farm production systems while sustaining natural resources and building of stronger research systems were stressed during a recently held consultation meeting to strengthen livelihoods and improve food security in West and Central Africa (WCA). The meeting was organized on 1 September to gather insights for developing a five-year strategy (2021-2025) for ICRISAT's WCA Research Program.

ICRISAT's current strategic plan ends in 2020. Driven by the principle of Inclusive Market-Oriented Development (IMOD) for smallholder farmers in the tropical drylands, the current plan guides country strategic plans. In Niger, the institute's country strategy aimed at boosting smallholder agricultural production and increasing their resilience, while in Nigeria there was a focus on building an agribusiness economy capable of delivering sustainable prosperity by meeting domestic food security goals, generating exports, supporting sustainable income and job growth. In Mali, the plan aimed at enhancing the capacity of key actors in the dryland cereal-based cropping systems to increase the productivity and profitability of family farms while enhancing their resilience to climate change in order to improve food, nutrition security and livelihoods.

Dr Ramadjita Tabo, Regional and Research Program Director, ICRISAT-WCA, outlined the meeting's objectives while suggesting review of achievements and identifying gaps in the implementation of the ongoing strategy.

Dr Farid Waliyar, an Independent Expert invited by ICRISAT and partners, looked at reasons for shorter than expected reach of some technologies. "Changes should be made to the actual regional mandate to take into account the findings, reflecting the new regional mandate in the Strategy of ICRISAT and get the donor support by providing them with appropriate data," Dr Waliyar noted as he talked about climate change as the most important issue for the program to target.

According to Dr Peter Ninnes, another Independent Expert, understanding the donor/ investor landscape, partnerships and intelligence sharing is essential. Such an effort will involve a model that explains how future interventions lead to impacts, articulated in a clear operational matrix (Impact, Intermediate outcomes and Outputs). The pathways to impact would include: enhancing production systems, sustaining natural resources, building resilient communities, building value chains, enhancing opportunities for agribusiness, job creation, creating opportunities for women and youth, linking end-users and consumers to producers (and vice-versa), Dr Ninnes said.

Dr Abdou Tenkouano, Executive Director of [CORAF/WECARD](#), proposed a model in which ICRISAT can collaborate using a risk-centric strategy with a balance of immediacy and resilience (responding to immediate needs without compromising preparedness for future shocks).

“Putting risk management at the center of agricultural research, production and market development programs means that data and programming priorities should better reflect major risks and innovative approaches for managing them at farm, community, landscape, and economy levels,” he said. Also, “Diversity of crop and livestock systems should be emphasized along with increasing productivity and efficiency of individual commodities and value chains.” He also called for a focus on innovations that expand access to savings and credit facilities that are critical to the ability to recover from shocks and sustain production systems. Dr Tenkouano emphasized the crucial role of enhanced partnerships for technologies delivery and impacts.

“The vehicle for delivery in this mission will be partnership-based international agricultural research-for-development. As an association of NARS and the technical arm of the economic communities, CORAF will occupy a central position in coordinating, animating and managing the knowledge products generated by regional research programs to ensure delivery,” he explained.

Dr Bourema Dembele, Country Representative of the Alliance for a Green Revolution in Africa (AGRA) in Mali, invited ICRISAT’s Regional Research Program to use past experience to:

- Resolve urgent issues of intellectual property, biosafety and public acceptance of transgenics
- Develop research programs and priorities aligned with countries’ strategic research needs through a highly participatory process to consolidate its regional role
- Strengthen ICRISAT’s role as a center of excellence for plant genetic resources, and the valuation (PGRE) of priority value chains in close partnership with the national system
- Constitute a hub in West Africa for strategic research on genomics and to strengthen the capacities of NARS on research tools
- Contribute to the definition of rules governing ownership of participatory varieties
- Consolidate its integrated pest management (IPM) and integrated disease management (IDM) activities with innovative approaches
- Strengthen its support and research around ecological intensification and
- Continue its research program in socio-economics and politics at ICRISAT.

Prof Jibrin Mohamed Jibrin, Director of the Center for Dryland Agriculture (CDA), highlighted the key strengths of ICRISAT’s Strategic Plan for targeting a systems approach and the need for expanding strategic partnerships between ICRISAT and CDA. According to Prof Jibrin, emerging possibilities for partnerships include knowledge generation. Also, the new normal post COVID-19 presents a greater need for strong and effective partnerships, he said. “While the ‘One CGIAR’ policy could unlock additional resources, ICRISAT can achieve a lot more at lower cost by leveraging more of its existing and new partnerships with National Agricultural Research Systems (NARS) through: identifying and engaging partners with similar vision and some resources to share. More focus should be placed on working with partners in development of technologies and not just testing and dissemination,” he commented.

The private sector was represented by Ms Halatou Dem, Managing Director, Les Céréales de Tatam, and Ms Coulibaly Maimouna Sidibe, Founder and CEO, Faso Kaba Seed Company. “Currently, we are working on developing infant flour enriched with micronutrients. We have been collecting our raw materials from farmers’ cooperatives based in the Ségou region in Mali. However, it has been very challenging to control the quality of varieties used. Training of producers should be continued to improve quality of products and supply chain with agro-food processing industry actors. This can only be achieved with increased cooperation between ICRISAT and the private sector, including cereals processing companies like ours,” Ms Dem said.

Ms Sidibe termed the quality of seeds and the rate of technology adoption by end users a major constraint. “A major challenge for Malian seed companies remains access to quality seeds for customers. I suggest changing the way of investing and sharing resources between research and private companies. We believe Faso Kaba can play a key role in disseminating ICRISAT’s technologies at scale.”

Following the panel, a guided discussion chaired by Dr Hakeem Ajeigbe, Country Representative, ICRISAT-Nigeria, was held on demonstration of impacts and science policy interface; emerging challenges in gender, nutrition, climate change, new pests, increased dependence of ruminants on crops due to reduced grazing areas; and resource mobilization (including contribution from non-traditional donors).

During the discussions, the importance of quality data, science and communication was mentioned especially with regards to demonstrating impact. “We also need to have high level engagement with donors, increase participation in solutions finding in the conflict zones and for climate change scenarios based on appropriate modelling,” summarized Dr Ajeigbe.

Dr Lassine Dembele, Permanent Secretary of the Malian Ministry of Agriculture, in his concluding remarks, invited ICRISAT and partners to pay more attention to mechanization, post-harvest management, migration, and natural resources management.

“The targeted crops are of interest to our countries, particularly in the context of climate change and marked by the degradation of production systems. We need technologies to meet these challenges. The issue of migration can be addressed by developing agro-processing with the private sector particularly through involvement of women and youth. A strong link must absolutely be developed between research and these companies. The management of natural resources must also be taken into account because our smallholders are using degraded land which needs to be improved with best technologies that are affordable. We also have to think about mechanization because people need to modernize their production systems. Post-harvest technologies that will help reducing losses as well as better market linkages for farmers must be addressed,” said Dr Dembele.

In his concluding remarks, Dr Sharma echoed the importance of assessment of why some technologies have not been reaching out to large number of end users. “We also need to leverage CORAF as the power house of delivery, with AGRA, the national partners and keys constituents,” he said. During his remarks, both opening and closing, Dr Sharma emphasized the ongoing changes in the context of ‘One CGIAR’ towards increased impacts.

According to Ms Joanna Kane-Potaka, Assistant Director General, External relations, the meeting focused on partnerships as the way forward. “Comparative advantages are not just about looking internally but also are oriented to how we complement with external partners. It came out so strongly that we need to work out the whole partnership model,” said Ms. Kane-Potaka.

Dr Tabo thanked the organization committee, all panelists and participants for their contributions to the strategic action plan. “We can do more if we work together keeping in mind issues of intellectual property, training and capacity building of partners while jointly developing projects will also help raise more funding for greater impact”. He also thanked Mr Anjani Kumar, Indian Ambassador to Mali, for his participation in the event.

The panel discussions were chaired by Dr Malick Ba, Country Representative, ICRISAT-Niger. The guided discussions were chaired by Dr Hakeem Ajeigbe, Country Representative, ICRISAT-Nigeria, while opening and closing session were chaired by Ms Agathe Diamo, Head Regional Information.

The webinar was attended by about 70 participants including government officials, private, NGOs, farmers organizations and partners. ■

To view the event, click here <https://www.youtube.com/watch?v=HbN8qZcPkn4>

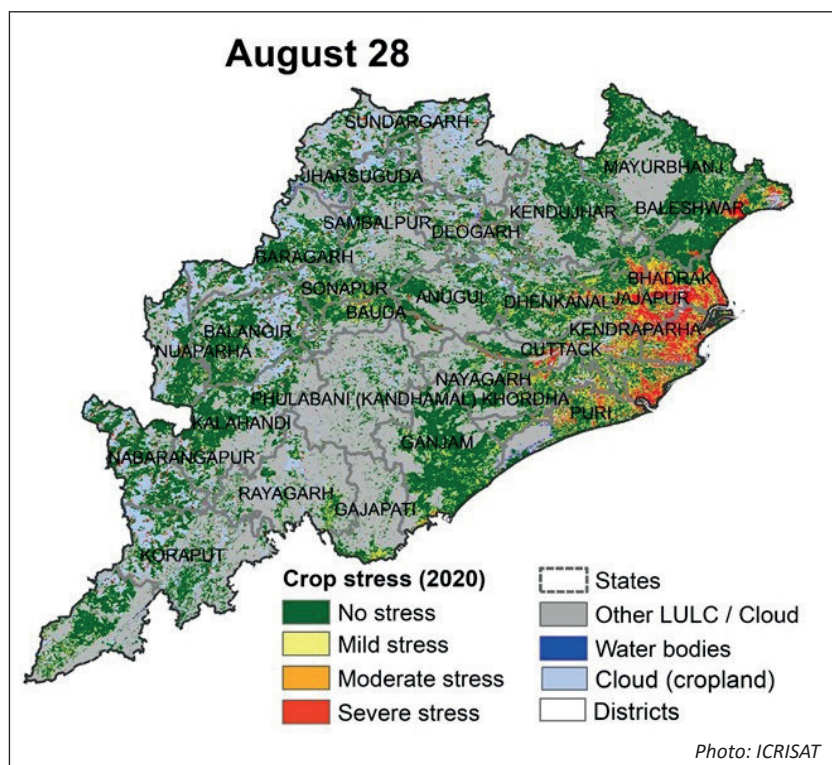
Demonstrating the use of remote sensing and machine-learning for agriculture

Real time information from a remote sensing satellite miles above earth helped identify crop stress due to rains in Bhadrak, Jajapur, Kendraparha and Puri along the eastern coast of India in Odisha state on 28 August. Remote sensing capabilities for such agricultural applications have increased manifold over the years and publicly available resources can be used for efficient farming and land management. This was demonstrated through ICRISAT's work in combining remote sensing and machine learning for agriculture related applications during a recently held webinar for senior executives of the Asian Development Bank.

Using spatial and temporal maps resulting from ICRISAT and the work of its partners, Dr Murali Krishna Gumma, Head, Remote Sensing and GIS, ICRISAT, showed how remote sensing has helped identify irrigated and rainfed cropland in India. He also demonstrated [crop type mapping](#) in Jhansi district, replete with information on crop dominance. To demonstrate use of remote sensing for determining crop intensity, Dr Gumma used maps of Krishna Basin in south India.

He further said Google's Earth Engine (GEE) provides satellite imagery from multiple open-source resources. Machine learning algorithms can then process images and classify information faster than traditional methods of processing and analysis.

Using specific datasets like Sentinel-1 imagery, Dr Gumma demonstrated how district-wise flood analysis was done in Ethiopia's Afar region over a time. He also informed the webinar's audience that his team is [mapping rice-fallow lands in Asia](#) using GEE for the year 2019-2020. Thus far in this exercise, the team has produced pan-Asia maps that reveal areas where rice was cultivated in one season and land left fallow next



Map produced by remote sensing shows real-time crops stress in Odisha.

season and where a single season of rice was followed by rice/wheat or sugarcane in the next season.

For a few applications like crop type mapping, Dr Gumma demonstrated methods of using both satellite and ground data with the help of machine learning algorithms. These techniques were also used to estimate spatio-temporal distribution of drought in Myanmar between 2010 and 2017 and to witness changes in cropping patterns across India over the last two decades.

Remote sensing data can also help in yield estimation, Dr Gumma said. He showed how ICRISAT's soil data, climate data from Indian states, remote sensing products and crop models help estimate yield. The use of remote sensing data for insurance purposes was also demonstrated with cases. ■

Access to, and benefit sharing of plant genetic resources critical to global food and agriculture scenario, say experts



Screenshot of some of the participants of the national webinar, 'Implementation of Access to Plant Genetic Resources and Benefit Sharing'.

Genetic resources are universal and meant to be shared equitably; national biodiversity policy should be framed around this key idea. Experts in plant genetic resources, biodiversity and policy met virtually to discuss how to develop supporting evidence for such policies. CGIAR's genebanks and their contribution in this area was also highlighted at this webinar, 'Implementation of Access to Plant Genetic Resources and Benefit Sharing (ABS)' last week in India.

Flagging off the webinar, Dr Kuldeep Singh, Director, [ICAR-National Bureau of Plant Genetic Resources \(NBPGR\)](#), set the context of the event saying that although access to genetic resources had been largely streamlined, globally as well as in India, there was still much to be done in terms of true sharing of genetic resources and benefits.

Dr VB Mathur, Chairperson, [National Biodiversity Authority](#), discussed the scope and goals of impending amendments to the Access and Benefit Sharing (ABS) guidelines that would better address concerns of all relevant stakeholders. Digitalization and increased transparency of the process is a critical step in this direction, he said.

Dr Juan Lucas Restrepo, Director General, [Alliance of Bioversity International and the International Center for](#)

[Tropical Agriculture \(CIAT\)](#), named India as one of the frontrunners in putting in guidelines for ABS of germplasm; however, he highlighted the need for a wider availability and accessibility of genetic resources across geographies.

Dr Trilochan Mohapatra, Secretary, DARE and Director General, [ICAR](#), hailed the discussion as a much-needed one for developing evidence-based recommendations for the Indian government to implement.

Dr RS Paroda, President, Indian Society of Plant Genetic Resources; and Chairperson, [TAAS](#), reiterated the two basic premises for genetic resources. 1. Genetic resources are the heritage of all humankind, and 2. They are freely available for sharing among all. He affirmed that regulations for access to genetic resources should be for the purpose of creating a system of facilitation, rather than a hindrance.

Dr Vania Azevedo, Head, ICRISAT Genebank, presented the experiences of being part of a [CGIAR](#) genebank system with respect to ABS related to plant genetic resources related to food and agriculture. Enumerating the huge number of accessions (700,000) stored in CGIAR genebanks across 11 institutes, including ICRISAT, she clarified that CGIAR genebanks:

- Hold the accessions in trust; do not own them.

- Conserve the genetic resources for users around the world
- Meet and even exceed international quality standards
- Are subject to policy guidance of the international community
- Provide access to the material for free (or minimal operational cost) for use in food and agriculture
- Are under contract approved by international community.

The ICRISAT Genebank conserves 128,155 accessions of 6 mandate crops and 5 small millets, originated from 148 countries.

Over 113,000 accessions safely duplicated at Svalbard Global Seed Vault, Norway.

From the CGIAR's viewpoint Dr Vania highlighted the treaties and 'in-trust' agreements with FAO, which defined the rules of benefit sharing of the material. "CGIAR is very active in implementing and guaranteeing benefit sharing in several ways," she said. "For example, in the last decade over a million samples have been distributed from various CGIAR Genebanks."

Dr Vania reiterated that redistributing genetic material to users around the world was critical, as "plant genetic resources are of no use if they stay only in freezers or breeding stations."

"CGIAR fulfills the obligation to share benefits not only by making genebank accessions available, but also the materials developed by breeding programs, and the relevant data generated. It also enables capacity building via frequent short- and medium-term training programs and courses at different levels," said Dr Vania.

Several other eminent speakers gave their viewpoints on top priorities of plant genetic diversity for authorities to focus on. The overall recommendation was for greater convergence between various regulatory bodies and enhanced consultation with all stakeholders for a more balanced approach.

The webinar was conducted on 27 August 2020 and was chaired by Dr RS Paroda. Dr Mohapatra was the Chief Guest, while Dr Juan Lucas Restrepo was the Guest of Honor. ■

Click here to watch the video of the event: <https://www.youtube.com/watch?v=oTzCINr4wYk>

Odisha: Scientific management of coconut plantations emphasized on World Coconut Day

World Coconut Day was observed on 2 September in Odisha to highlight the importance of coconut cultivation for livelihoods in coastal communities. With its partners in the Odisha Livelihood Mission (OLM), ICRISAT marked the occasion with demonstrations of planting, intercropping and multi-cropping coconut. A booklet, 'Scientific management of coconut' in Odia language, was also released during the occasion.

As a key partner in the OLM supported by the Government of Odisha, ICRISAT Development Center is undertaking mass scientific planting of coconut saplings by adopting a farmer participatory approach and also enhancing the socio-economic conditions of the rural poor through promotion of sustainable livelihoods. The project is focusing on primary sector livelihoods of rural poor and working intensively in agriculture, non-farm and livestock sectors.



Chairman, Panchayat Samiti, Satyabadi block, Puri (left) planting coconut on the occasion of World Coconut Day.

application for enhancing agricultural productivity across the state's four districts - Raygarh, Gajapati, Koraput and Nabarangpur. The MSoil application, which generates QR code based sample ID with coordinates by capturing details of farmer and the farm including cropping patterns and source of irrigation, has been used to sample 15,000 samples till date.

In 2019, Odisha state was battered by cyclone Fani. It has also been affected by the COVID-19 pandemic this year. The state has witnessed significant crops loss and coconut cultivation has been among the most affected.

The recent event emphasized the need to revive coconut and coconut based livelihoods that have been severely affected by the cyclone last year. The event was organized in Biraramachandrapur village, Satyabadi Block of Puri District and Jhintisan village in Khordha district.

Farmers, members of Self-Help Groups, the village sarpanch, district project managers of OLM, block development officers, staff of Krishi Vigyan Kendra (KVK) and ICRISAT participated. Crown cleaning was also demonstrated in addition to cropping techniques.

Apart from focusing on the restoration of coconut plantations in Odisha, ICRISAT Development Centre has been extensively performing soil test-based nutrient

"This year's theme has been 'Invest in Coconut to Save the World'. Coconut plays an important role in Indian festivities, culinary preparations, as a thirst quencher and in the handicraft industry. The livelihoods in Puri and Khordha districts are predominantly supported by coconut plants. These districts have seen extensive damage to coconut plants due to Fani cyclone. OLM helps farmers to replace the dead plants with new saplings planted while following scientific methods and encourages coconut based cropping systems in the pilots," said Dr Sreenath Dixit, Head, ICRISAT Development Centre. ■

This work contributes to UN Sustainable Development Goals



Nutrition proofing the drylands: Seed to Diet approach



Photo: ICRISAT

At a time when the world is focusing on three global challenges – food security, nutrition and climate resilience – ICRISAT’s learnings and research over four decades on hardy dryland crops in semi-arid ecologies have never been more relevant. Encapsulating the organization’s approach to nutrition as succinctly as possible, we are proud to make a positioning statement [“Why it is critical to nutrition-proof drylands”](#) and present to you an interesting [slideshow](#) that will walk you through the gamut of work from seed to diet.

The work spans breeding improved and biofortified varieties, nutrition ecology, nutrigenomics and diet

studies, influencing policy, creating a market pull through development of nutripreneurs and driving awareness through advocacy and the **Smart Food initiative**.

Partnerships nurtured with governments, National Agricultural Research Systems, State Agricultural Universities, CGIAR centers and public and private enterprises is reaping dividends, powering ICRISAT on its onward journey to fulfil its mission and give wing to its belief that all people have a right to nutritious food and a better livelihood. ■

Striding towards streamlined crop improvement programs

To better accomplish its mission by providing improved crop varieties to smallholder farmers, ICRISAT is overhauling its breeding program with regional crop improvement hubs, improved inventory processes, new facilities and capacity building to make them more rapid, efficient and productive.

Crop breeding remains a key means of providing improved crop varieties to farmers across the world for better food and nutrition security. Especially, smallholder farmers in the drylands face unprecedented challenges today – increasing temperatures, decreasing yields, pest and disease outbreaks, unpredictable weather and so on. In this scenario, crop improvement programs serving smallholders in vulnerable regions need to improve the rate of genetic gain for staple crops in those regions.

At ICRISAT, crop scientists have always strived towards delivering higher genetic gains from the institute's mandate crops – sorghum, pearl millet, finger millet, groundnut, chickpea and pigeonpea – through traditional breeding methods as well as by using modern technologies to achieve faster genetic gains.

Today, as global development partners and donors are looking towards organizations such as ICRISAT to help improve food security, it is even more critical to modernize breeding programs with improvements in product profiling, technology, capacity building and more.

With new infrastructure, experienced and dedicated personnel, data-driven digital platforms, molecular tools, changes are already in place in ICRISAT's Asia and Africa breeding programs.



Photo: ICRISAT

- Regional Crop Improvement Hubs in India, Zimbabwe and Mali – each with its own integrated Crop Improvement Operations Team
- A new facility for Rapid Generation Advancement in crops
- Process improvements in seed inventory systems, multi-location trials and in other steps in the breeding pipeline
- Capacity building of staff in tools/techniques, product profile development, data management, etc.
- Optimized breeding schemes.

There is much more to be done, though, and the possibilities are exciting. Continued support from donors and partners can help deliver great benefits in the form of demand-driven crop varieties that are high-yielding, climate-smart and nutritious.

[Click here](#) for a glance at the key milestones on ICRISAT's journey towards upgrading of the breeding programs. ■

[Watch this short video for a glimpse of the goals of modernizing breeding programs and the efforts made towards them](#)

Resource Mobilization dashboards launched for better tracking and decision making

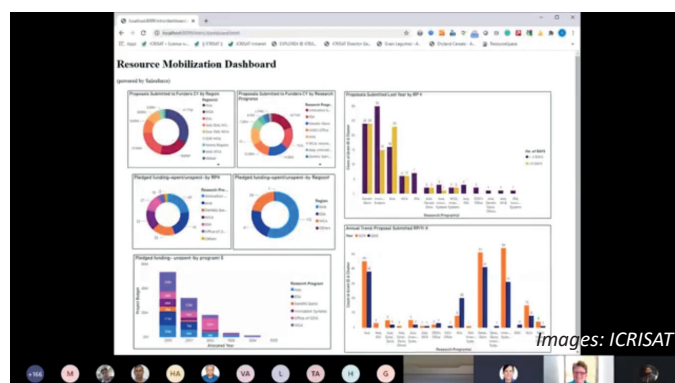
ICRISAT's projects, proposals, donor and pipeline funding information is now available to all staff to assist with their Program resource mobilization. The information is provided in real-time, is interactive and is broken down by research programs and regions where the work is undertaken.

"This dashboard is the first step towards collating our resource mobilization data in a more accessible manner so that we can all have access to it and is also an effort to make the outputs and outcomes more transparent," said Dr Jacqueline Hughes, Director General, ICRISAT, when undertaking the launch. She further stressed that the dashboard is important in tracking ICRISAT's progress within the larger scenario of One CGIAR and will help with identifying, tracking and ultimately improving partnerships.

Ms Lakshmi Pillai, Manager, Grants Management, provided an overview of the five dashboards that have been made available on the intranet: Projects, Proposals, Private sector and CSR, Pipeline and Funders.

All dashboards break down data by region where the work is being carried out and by research programs, and categorize projects and proposals by project grant size of small, medium and large. The **Projects dashboard** provides total funds pledged and trends, current year funding and future pipeline funding information. The **Proposals dashboard** provides trends and lists donors that proposals are being submitted to.

The **Pipeline dashboard** provides predicted funding for the next five years based on a formula of approved or approved in principal funding, submitted proposals with a 40% success rate applied and concepts being worked on with a 20% success rate applied. A five-year seasonal



A screenshot of the Resource Mobilization dashboard launch.

average is also calculated to provide a benchmark. The predicted pipeline is also presented by program and region as well as being presented with only the confirmed funding.

The **Funder dashboard** mentions ICRISAT's top funders and can be viewed by each research program and region. Funds pledged by the **Private Sector and through CSR** (Corporate Social Responsibility) are extracted and tracked in its own dashboard.

The system is built on the Salesforce platform and uses PowerBI to transfer the data to dashboards on ICRISAT's Intranet. The Salesforce system also has been used to set up many other major advancements including online clearances of all grant related items (e.g. proposals, donor reports, MOUs, No cost extension, agreements etc). This is accessible on the web and as a mobile application to make clearances faster and convenient.

The Salesforce system has also been used to automate a lot of requirements, from the generation of reports and reminders of donor due dates to semi-automation of fundraising newsletters. It also automatically updates project information on the website and is used as the main contacts database. ICRISAT's grant management data for the last seven years has been uploaded onto the system.

Speaking about the development of the system, Mr Pradyut Modi, Head, ISU, informed that the platform is based on Salesforce platform which is world's leading customer relationship management (CRM) software. It is highly customizable, user-friendly, secure and provides useful analytics for decision-making.

"The storage with CGIAR Office 365 account has been integrated with Salesforce. Also, using Microsoft's Power-BI platform, the data has been made available



The RM dashboard on ICRISAT's intranet.

through dashboards to all users,” he further said and added that the Salesforce platform has been integrated offline with HR information to keep workflow information update. Salesforce integration with the platforms provides an opportunity to replicate the model disseminating data/reports/dashboard for data from other areas also.

“We went through a very rigorous and methodical process to set up this system and had three big lessons learnt from the process,” said Ms Joanna Kane-Potaka, Assistant Director General - External Relations, ICRISAT. “These include 1) the data collection, cleaning and

migration was a much bigger job than expected and took about a year to get this in really good condition and going back 7 years; 2) This can be achieved without it being a large expense, having costed US\$ 26,000 to date; and the success was also based on strong cooperation and coownership between Strategic Marketing and Communications (SMC) and Information Systems Unit (ISU).” ■

The Resource Mobilization dashboards can be accessed on the intranet at: <http://intranet.icrisat.org/IcrisatLocal/co/salesforce.htm>

Five Resource Mobilization Dashboards on:

1. Projects
 2. Proposals
 3. Private sector and CSR
 4. Pipeline
 5. Funders
- In real time
 - Seven-year data from 2013 included
 - Data disaggregated by:
 6. Research Program
 7. Region where the work is being undertaken
 8. Size of projects (small, medium, large)
 - Available to all staff
 - Using a robust Salesforce platform and PowerBI to transfer data to the intranet
- Salesforce integrated with CGIAR Office 365 and OneDrive used for storage
 - Other features implemented include:
 9. Online clearances of all grant related items (e.g. proposals, donor reports, MOUs, No cost extension, agreements, etc.)
 - 10 Accessible (for those clearing documents) not only on the web but as a mobile application (compatible for all type of mobile devices)
 - 11 Automatic generation of reports, reminders of donor due dates to scientists and semi-automation of fundraising newsletters
 - 12 Automatically updates project information on the website
 - 13 Used as the main contacts database.