Dairying unproductive in harsh landscapes? Not anymore

A consortium led by ICRISAT implemented a slew of measures over two years to improve dairying in a drought-prone north Indian region, which has resulted in a 95% birthrate of female calves, high efficiency early pregnancy detection, improved green fodder production and a 1-3 liters increase in milk production.

Dairying in Bundelkhand region of India’s Uttar Pradesh has not progressed to the extent it has in other regions of the state and across other states of India. It remains constrained due to presence of low yielding non-descript cattle, low milk yield, less breedable population, scarcity of water, lack of green fodder, dominance of middle men in marketing and poor scientific knowledge. Another reason is Anna Pratha, a worrying socio-economic practice of cattle abandonment.

Anna Pratha
After rabi harvests in April, thousands of animals, especially unproductive and pregnant cows and male cattle, are left to freely graze till September or October, before sowing for next rabi crop. The roaming cattle destroy almost 25-35% of the agricultural produce during kharif or monsoon. Additionally, large farm holding sizes leaves farmers satisfied with the rabi crop. All of this leads to mono-cropping in Bundelkhand.

The free grazing animals remain underfed and often move too far away from their homes and sometimes die. To avoid seeing the suffering of their livestock in dry season, the farmers let them loose. On several occasions, these animals are beaten or kept fenced without feed and water.

Free grazing adversely affects state’s breed improvement programs as local bulls impregnate free grazing cows. Rathod and Dixit (2020) have estimated the region’s annual loss owing to these issues at US$ 212 million (₹ 1,619 crore) annually. Ultimately, this issue leads to several other losses in the form of livelihood security and nutrition security for the farming communities. The damage caused by stray cattle including draught animals on rampage is yet to be estimated as no data is available on the extent of damage.

Although various development based research and extension activities are delivered by multifarious agencies viz., ICAR institutions, National Dairy Development Board, Krishi Vigyan Kendra (Farm Science Centre), State Agricultural and Veterinary Universities, State Department of Animal Husbandry, private agencies, Dairy Cooperatives and NGOs, the farmers continue with traditional livestock rearing practices leading to low productivity in the region.

Further, due to lack of convergence among different agencies involved in dairy development, scientific technologies and practices developed in research institutes do not reach end-users. Without converging efforts of public, private and other agencies it is difficult to reach a large number of dairy farmers with new and
improved knowledge of dairying. In this context, the Doubling Farmers’ Income project in Bundelkhand focused on consortium approach for improving dairy productivity and resource use efficiency.

With financial support of the Uttar Pradesh government, ICRISAT created a consortium to undertake interventions in 20 pilot villages of Bundelkhand’s seven districts. The experience shared here is from villages where the project is being implemented by ICRISAT Development Centre from May 2017.

**Program Design/ Methodology:**
With the help of district administration and officers of the state’s agriculture, pilot sites covering about 5,000 hectares area (hydrological boundary) in the seven districts were identified in May 2017. A cluster of two to three villages were selected for developing a pilot site in each district.

A baseline survey of about 200 farmers from each district totaling 1,400 farmers from 20 selected project villages was carried out. The study included documenting status and issues in agriculture and animal husbandry practices faced by the farming community. Based on the baseline survey results, few issues like Anna Pratha, presence of low yielding dairy animals, poor access to veterinary and breeding services, lack of green fodder production, etc. were identified as critical gaps in dairy sector of the region.

To address these, competent institutions were identified and assigned the role of consortium partner. Between May 2017 and June 2018, ICRISAT worked towards building rapport directly with the community with the help of local NGOs.

As experts in the animal husbandry sector, ICAR-IGFRI and BISLD conducted a preliminary study dealing with dairy animal population, breedable population, types of animals reared, scope for SSS and EPD and fodder production status in the project locations.

Depending on the critical issues identified, multiple dairy development interventions like SSS, EPD, animal health and infertility camps, capacity building programs and green fodder production were initiated by project partners.

A before-after research design was followed with participatory research to know the impact of these programs in the project villages.

**Technology Related Practices**

**Sex sorted semen (SSS) insemination at farmers’ doorstep:** The farmers in these project locations do not get timely veterinary and breeding services and often have to travel far for these. SSS technology comes with a 90% chance of birth of a female calf. Hence, it is revolutionizing India’s dairy sector by producing breeds of choice for the farming community. Once the dairy animal was in estrus (heat), farmers would call the BISLD center in-charge to perform SSS insemination. Most preferred cattle breeds in the project’s locations are Sahiwal, Tharparkar and Jersey while Murrah is the prefer buffalo breed. With high yielding animals, farmers can reduce herd size and with it, the pressure on food and fodder supply.

This intervention was first initiated in Mahoba and Chitrakoot districts of Bundelkhand from January, 2019. Although SSS is considered expensive in India, the farmers only make a small payment while most of the cost is borne by the project team. When farmers of the two districts responded positively, ICRISAT and BISLD replicated the intervention in all the seven districts of the region from October 2019, which also led to strengthening partnerships in the region. In this phase, farmers were only asked to pay a minimal amount since a new scaling-up project by BISLD was already initiated during this period with funding from Uttar Pradesh government.

**Early pregnancy diagnosis (EPD) at farmers’ doorstep:** The project is providing rapid animal pregnancy detection 19 days after SSS. With normal testing practices, it takes as long as three months after insemination to detect pregnancy. Detection involves testing milk’s hormonal content. An early pregnancy detection gives farmers reason to continue rearing the animal, start improving care or get it inseminated immediately in the next estrous cycle. The cost of the intervention was borne by the project team to motivate farmers to adopt the technology. [click here to read more]

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**Project:** Doubling Farmers’ Income in Bundelkhand  
**Funder:** Government of Uttar Pradesh  
**Partners:** BISLD, ICAR-IGFRI, KVKs and NGOs

This work contributes to UN Sustainable Development Goals.
Watershed project in south India marches ahead despite COVID-19

Ensuring smallholder farmers can plant

Eight water harvesting structures were completed during May while following social distancing. The timing was critical to capture monsoon rains and benefit 2,000 smallholder farmers. The structures are part of a recently initiated watershed project in Telangana by Trident Sugars, a wholly owned subsidiary of Natem Sugar, and ICRISAT. The work on the structures is being complemented by farm interventions and farmer training, soil analysis, intercropping and remote sensing analysis. All of this will be monitored and evaluated using Natem’s technologies, which is supporting ICRISAT with data management, reporting and remote sensing. The international development NGO, Solidaridad, is also supporting the project.

In its first phase, the watershed project is targeting 1,820 hectares of land in Kothur and Thumukunta villages of Telangana state. Before work began, a pre-intervention land use survey helped map the land use of the target area. As the project progresses, follow up surveys will be conducted to analyze increase in agricultural land and to identify impact. An intercropping pilot with 30 farmers was also completed. The chickpeas provide farmers with an additional source of income after three months and reduce fertilizer costs by adding valuable nutrients to the soil. A scale-up of the effort is being planned with other crops, including vegetables.

Next steps: Baseline survey and installation of monitoring devices

A baseline study will be conducted in the coming months. The study will provide an in-depth understanding of the project areas, giving greater clarity on the socio-economic status of the communities, agricultural practices and surrounding eco-systems and environment.

Loggers and measuring devices will be installed at each of the structures to monitor the amount of water captured. This data will be automated and will be available remotely through Neta’s dashboard.

The five-year project, for which the MoU was signed in Dec 2019, aims to promote sustainable agricultural practices, improved sustainability for sugarcane cultivation and raising the livelihoods of smallholder communities. This will be achieved by enhancing smallholding farmers’ resilience to climate change events such as reduced water availability, and improving income through reducing input costs, increasing yield and diversifying sources of income.

Project: Improving Natural Resources through Integrated Water Resources Management Approach at Zaheerabad Mandal, Sangareddy District, Telangana

Funder: Trident Sugars Limited (subsidiary of Natem Sugar)

Partner: Rural Education and Agriculture Development (READ)

This work contributes to UN Sustainable Development Goals
Revival of old water resources for better farm livelihoods

A village in North India sets an example

A water tank renovation in one of India’s most drought-prone regions benefited as many as 200 farm families last year and opened up aquaculture opportunities for the village. This helped create a storage capacity of about 25,000 cubic meters. The tank filled multiple times during last year’s monsoon and provided more than 100,000 cubic meter of surface water. This facilitated groundwater recharge in the village, renewing defunct tubewells that supplied water for domestic and farm use.

“Before the tank was renovated, our tubewells could supply water only two hours a day. This year, even in the summer, we had continuous supply. We did not take water from the tank as the tubewells located close to our fields provided plenty of it,” said Mr Ramlakhan Nishad, a farmer of Devara village in Bundelkhand region, which is located in the Indian state of Uttar Pradesh.

The Devara tank benefited all villagers equally irrespective of the location of their farm with respect to the tank, Mr Nishad added. Farmers in Devara mainly cultivate wheat in winter.

Working with its partners in the Doubling Farmers’ Income project, ICRISAT restored the village tank by desilting and construction of a masonry outlet in May-June 2019.

Additionally, large scale field-bunding around the village tank helped enhance soil moisture in the fields and reduce sedimentation load in the village tank, which is essential for long term sustainability. Rejuvenating the village tank also led to starting of aquaculture. The water body has also become a place for worship during community gatherings and a recreational site for children. With monsoon arriving on time this year, Mr Nishad said his village has more reasons to cheer. Several such tanks are being restored across the region under the project.

Project: Doubling Farmers’ Income in Bundelkhand
Funder: Government of Uttar Pradesh
Partners: BSLID, ICAR-IGFRI, KVKs and NGOs

This work contributes to UN Sustainable Development Goals

The Devara Tank in Banda district of Uttar Pradesh. Photo: ICRISAT
New research

Measuring farm households’ vulnerability and resilience to climate shocks now possible, new research shows

Measurement can improve interventions and help smallholder farmers adapt better

A household’s vulnerability to climate shocks and its resilience to recover can now be measured, suggests a recently published study. The study’s authors have turned their measurement approach into an easy-to-use framework using data from smallholder households facing droughts in India.

Vulnerability and resilience are two interrelated factors in climate change research. The authors say vulnerability is determined by exposure, sensitivity and a pre-existing capacity to adapt to the climate shock (in this case, drought), resilience is the ability of households to recover.

For their study, the researchers analyzed data from 2006 to 2014 from the ICRISAT Village-Level Studies in three semi-arid tropical regions of India. Results, from 256 households, revealed that smallholders with smaller landholdings were more vulnerable to drought. Also, a higher cropping intensity (more crops per year) and crop risk (greater reduction in yield/income due to drought) increased their vulnerability, whereas larger farms were less vulnerable.

However, small farms were able to recover more quickly from drought compared to larger farms. Diversification of farm activities – livestock rearing, diverse cropping systems – for extra income generation played an additional factor in increasing their recovery. Other factors which affected resilience included the choice of cash/risky crops, borrowing capacity, liquid investments and the ability to regain yields.

The study’s results will enable policymakers to design policies that help farmers adopt risk management strategies and access credit. Resilience-building plans can target risks at specific time scales, e.g. before, during and after drought.

However, in this study, authors are of the opinion that ultimately it is the farmer household that is the main actor in coping with adverse climate conditions. Therefore, their study on the household-level adaptation will help direct attention where it is needed i.e. at the financial and physical capabilities of the households themselves.

This paper, published by Drs Shalander Kumar, Soumitra Pramanik, Sravya Mamidanna, Anthony Whitbread of ICRISAT, and Dr Ashok K Mishra of Arizona State University, USA, can be accessed here: http://oar.icrisat.org/11512/

For more on our work on similar topics, click here. To see more of ICRISAT’s work on climate change, click here.

Partners: Indian Council of Agricultural Research (ICAR); Arizona State University; and ICRISAT

Funder: Bill and Melinda Gates Foundation

CGIAR Research Program: Grain Legumes and Dryland Cereals (GLDC); and Climate Change Agriculture and Food Security (CCAFS).
Secret to on-off fertility discovered in pigeonpea

New study reveals how in some lines male sterility can be reversed to produce hybrids faster and cheaper

Researchers have identified how temperature controls male fertility in some lines of pigeonpea and have unraveled the phenomenon’s molecular mechanism in a recently published study in *The Plant Genome*. They have also shown that sterility can be reversed with auxin treatment. The new findings are expected to pave way for techniques that can reduce the cost and effort in hybridizing the crop, and lead to increased yields.

Pigeonpea is extensively grown and consumed in South Asia and Eastern Africa, being one of the oldest food crops and a staple source of protein.

**Sterility transition in pigeonpea**

Through their research, the authors demonstrated that pigeonpea lines turning fertile in response to the environment, called Environment Sensitive Genic Sterile (EGMS) lines, can go from being male sterile to male fertile if the temperature of the growing environment is reduced to 24 degree Celsius.

“Male sterile condition can be reversed by reducing the day temperature below the critical threshold temperature of 24 degree Celsius during the tetrad and microspore stage of pollen development,” said Lekha Pazhamala, the study’s first author and Systems Biology scientist at ICRISAT.

After determining the threshold temperature, the team set out to work backwards from protein expression to the metabolic pathway and then onto the gene expression to understand the molecular basis of sterility transition. They zeroed in on a key protein - a transcription factor. Transcription factors are known to play an important role in DNA transcription in the larger process of protein synthesis.

“The transcription factor called **REVEILLE 1** regulates auxin levels, which explains fertility transition in response to day temperature, especially morning hours,” Dr Rajeev Varshney, the study’s lead, said while adding that the research is a result of what scientists today call Systems Biology – a combinatorial approach of transcriptomics, proteomics, metabolomics and computational genomics. Dr Varshney is Director for the Genetic Gains Research Program at ICRISAT.

Auxins are hormones plants produce for growth. By determining the temperature-auxin-transcription factor-pollen stage link, researchers were able to show that external auxin treatment can satisfactorily reverse sterility even when the day temperature is higher than the threshold.
Dr Rachit Saxena, a co-lead of the study and Senior Scientist in Applied Genomics at ICRISAT, explains, “Reversal of male sterility through external application of a common naturally occurring auxin, Indole-3-acetic acid, confirmed what the study found – that disturbed auxin levels causes thickening of pollen wall and inhibit nutrient uptake by developing pollen, leading to their starvation and sterility.”

**Study background and significance**

More than a decade ago, ICRISAT’s pigeonpea breeders observed sterility transition in some pigeonpea lines. But, until the present study, it was not clear how the transition happened and more importantly, how it can be regulated. In the intervening years, ICRISAT and partnering institutions developed the world’s first pigeonpea hybridization technique that uses three lines to produce a hybrid. The hybrids from the three-line system posted 40% more yields than pure varieties.

However, producing a hybrid using the three-line system can be cumbersome. If a two-line system can be developed for pigeonpea with EGMS lines, as was done for rice, it can significantly reduce the cost and effort of hybrid production. Thus, began an effort to study the EGMS pigeonpea lines at ICRISAT, culminating in the present study.

“With an EGMS line, precise temperature control can be used for both production of hybrid seeds for farmers and to multiply the hybrid itself,” said the study’s co-lead, Prof Wolfram Weckwerth, Director, Vienna Metabolomics Center at University of Vienna. “And in environments where day temperatures do not favorably fluctuate, auxins can be used to achieve sterility to fertility transition. We look forward to see the study’s results reach farmers’ fields.”

The findings of the study ‘Multiomics approach unravels fertility transition in a pigeonpea line for a two-line hybrid system’ can be found here.
During the last Kharif season, a smallholder farmer from rural Warangal purchased Maize seeds from a local inputs shop. The dealers' terms were that, with a receipt the seed would cost Rs.1500, but without a receipt the cost would fall to Rs.1400/-. Thinking that the receipt would be of no use to him, the farmer chose to pay Rs.1400. To his utter dismay, only around 20% of the seeds germinated. Upon reading the cover of the seed pocket, to his shock, he noticed that the seeds were for demonstration purposes and had expired three months ago. He took the empty pack back to the input shop and demanded compensation for loss of crop for that season. But without a receipt as proof of purchase, the farmer was powerless to obtain compensation. He was furious.

There are several such anecdotal pieces of evidences of substandard or fake agricultural inputs, but there is hardly any empirical proof of the magnitude of the issue. Through focused group discussions (FGDs) in three villages in Warangal, a rural district of Telangana state, we sought to obtain such evidence.

“Every year new kind of pest and diseases are attacking our crops, at the same time soil health is also gradually declining. To manage pests and diseases, we have to spray frequently and apply more fertilizers leading to high cost. But, [the] insecticides and fertilizers we get are very expensive and many times are substandard or fake. Whom should we blame for this?” asks a female farmer from Neerukulla village.

Farmers told us that every cropping season there is a dilemma in the village over whether they should buy inputs from a local shop or the nearby town or city. Most farmers, particularly small and marginal farmers, buy the inputs they need – seeds, fertilizers or pesticides – using credit. The majority of the farmers we spoke with, emphasized that close to fifty percent of their total crop production cost goes for inputs. So, the quality of these inputs is very important.

To ensure quality inputs, farmers can opt to buy from a retailer in the nearby town. However, they may not be able to obtain inputs on credit without a reference from the market intermediary. Those retailers who do provide inputs on credit to farmers then charge 2-3 percent interest rate per month till the harvest. There is also a requirement to sell the produce through the same trader (though there is no formal agreement). These restrictions and higher costs on purchases in the city, coupled with a one-day wage loss and transport costs for travel to the city (and delivery in the case of fertilizers), force most of the farmers to buy inputs from local (un) authorized village shops.
In the absence of insurance, if the crops fail, perhaps due to poor quality inputs, or for any other reason, farmers then get into a vicious circle of debt. One farmer told us:

“If inputs are substandard or fake, we have to go through a minimum of two years of suffering due to debt. Therefore, in addition to the good monsoon, the quality of inputs we buy decides our farm income season after season.”

Farmers also indicated that they trust inputs, particularly seeds and fertilizers, supplied through the notified state government agencies in subsidized rates. The distribution is made every year through an online Subsidy Seed Distribution System (OSSDM) in Telangana State. However, the supply is very limited, with only a few field crops and chemical fertilizers supplied.

“The government should take action on substandard inputs distributors and traders. By using such substandard inputs, we are incurring losses in agriculture. We expect that the Government should supply good quality of inputs at a reasonable price within our vicinity.”

For remunerative agriculture, quality, availability, accessibility and affordability of inputs is crucial. Quality inputs are essential for improving productivity and, in turn, incomes. This would make a positive impact through inclusive agricultural and rural development in developing countries like India where the majority of the farmers are small and marginal.

Potential interventions to improve the current situation

Capacity building of smallholder farmers

Information asymmetry is evident among the small and marginal farmers. There is a gap in the skills and knowledge needed to check the quality of inputs, which may result in low productivity. Therefore, strengthening the capacity of farmers about inputs use and quality standards (package and expiry dates, per cent germination and other quality parameters), is critical.

Strengthening public-private partnership

Currently, there are fewer public extension officers advising farmers than required, yet there are around 2.82 lakhs (282,000) active private agri-input dealers across the country. There is therefore huge potential for a public-private partnership where private agri-input dealers could become extension service providers and provide defined services in association with public agriculture extension officers. Each agri-input dealer, under the supervision of a public extension officer, would then serve a prescribed minimum number of farmers, thereby increasing the support available to farmers in their service area.

Strengthening farmer collectives

Smallholder farmer’s collective action can create economies of scale to facilitate quality input procurement, extension services, and better bargaining power through setting up collective marketing such as Farmer Producer Organizations or Farmer Producer Companies.

Better vigilance over the input value chain

Insights from the farmers we spoke with suggest a critical need for better regulatory mechanisms which focus on identifying and rooting out sub-standard agricultural inputs supplied by local retailers. Standards must be enforced whilst making sure affordable quality inputs are available to smallholder farmers at their farm gate.

Traceability of products

Every packet of inputs that farmers purchase should be traceable, providing details about where it is tested and its efficacy, as well as reviews by other farmers. Essential information about good practices for how to use the product, contact details of local extension officers and GPS details would also be beneficial and provide traceability along the value chain.

Reforms to the agricultural market system in response to COVID-19

Major reforms to the Essential Commodities Act (ECA) and Agricultural Produce Marketing Committee (APMC) Act implemented in response to the current COVID-19 pandemic can go a long way in building efficient value chains and ensuring better returns to farmers. These reforms provide great opportunities for market prices to prevail, which would allow farmers to sell their produce across India and stimulate competition among private companies. At this juncture, the government could make a real difference to farmers by ensuring appropriate models that bring convergence among all value chain actors and in so doing provide quality inputs at affordable prices to make farming more sustainable and competitive.

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Partnerships

New partnership inked with AGRA to boost improved technology uptake in Africa’s agriculture

ICRISAT-led AVISA project is partnering with the Alliance for a Green Revolution in Africa (AGRA) to enhance uptake of modern technologies, including improved crop varieties. The new partnership will utilize AGRA’s extensive networks to bridge gaps in market access to early maturing and high nutrition varieties, and is also expected to alleviate the effect of COVID-19 on agriculture.

Dr George Bigirwa, AGRA’s Head of Seed Systems, noted that the partnership would focus on popularizing available improved varieties through demos, working with seed companies and Village Based Advisors (VBAs).

“This will be through existing and new linkages to expedite smallholder farmers’ access to new and unique agricultural solutions,” he said during an e-workshop held on 22 April.

Improved agricultural technologies, including improved variety seeds, are key to addressing most causes of low productivity such as pests and diseases, poor soil infertility and climate variability. The adoption of these technologies in sub-Saharan Africa remains very low: Limited access to markets and new technologies forces farmers to persist with outdated varieties and old technologies.

At the workshop, participants from ICRISAT, IITA and CIAT proposed varieties that AVISA targets for dissemination, and highlighted areas they would like the partnership to focus on. The varieties were proposed after consultations with value chain actors in AVISA target countries. Areas such as adoption rates, awareness creation, link to markets and seed availability, especially early generation seed (EGS), were tabled by the participants.

“The partnership would seal existing gaps due to barriers of accessibility and market in areas where AGRA and CGIAR institutions are working separately,” said Dr Chris Ojiewo, AVISA coordinator. He added that leveraging comparative advantages across institutions and pooling resources will lead to bigger impact rather than going alone.

“The partnership will also focus on high nutrition and early maturing varieties to overcome drought and can help agriculture in quickly recovering from the effects of COVID-19,” Dr Ojiewo pointed out.

Dr Rebbie Harawa, ICRISAT’s Eastern and Southern Africa (ESA) Regional Program Director, applauded the initiative while underscoring existing research capacity within CGIAR institutions, and the links between AGRA and off-takers and processors on the ground.

“There is no better time than now to deliver improved agricultural technologies to the value chain stakeholders than now when sub-Saharan Africa is going through a shockwave due to COVID-19 pandemic, locust infestation and drought,” Dr Harawa further said while talking about the partnership’s significance.
The AVISA project works for farmers cultivating major dryland cereals (sorghum and pearl millet) and legume crops (groundnut, common bean and cowpea) in seven African countries. It consolidates the gains made by TL-III, HOPE-II and HarvestPlus projects.

With farmers at the center of all interventions, AGRA invests in building systems closer to the farm in order to drive productivity, access to markets, boost resilience and strengthen country and local private sector capability to scale seed systems and technologies. In the past decade, AGRA has been a strong voice for rural development, fostering a prosperous agricultural economy, supporting thousands of farm-based businesses and over 30 million African smallholder farming families in ways that ensure food security and improved livelihoods.

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

**Funder:** Bill & Melinda Gates Foundation (BMGF)

**Partners:** ICRISAT (lead), International Center for Tropical Agriculture (CIAT), International Institute of Tropical Agriculture (IITA) and National Agricultural Research Systems partners (NARS) from Ethiopia; Tanzania; Uganda; Burkina Faso; Ghana; Mali and Nigeria

**CRP:** Grain Legumes and Dryland Cereals (GLDC)
Scientists, policymakers, farmers and consumers all need to collaborate to mainstream nutritious and resilient crops that can be grown locally and help reduce desertification and land degradation. The need of the hour is to diversify farming systems and diets, and encourage production of locally adapted climate-resilient nutritious crops. Food system experts discussed ways to mitigate the impact of desertification on food systems at the UN Desertification and Drought Day virtual event.

Alternative foods can make the difference
Ms Joanna Kane-Potaka, Assistant Director General – External Relations, ICRISAT, described ICRISAT’s evolution into an organization looking at entire value chains – from soils to improved seeds to processing/agri-business and consumers – for its mandate crops. The Smart Food initiative, she said, is raising awareness and driving the demand from the consumer end for climate-smart and nutritious dryland crops.

Dr Ismahane Elouafi, Director General, International Center for Biosaline Agriculture (ICBA), talked about ICBA’s focus on ‘alternate’ crops because they were resilient and more suited to growing in unfavorable conditions such as poor soils, low water availability etc., than the staple crops. Ms Danielle Nierenberg, President, Food Tank, moderated the panel discussion.

Highlighting Smart Food’s ‘triple bottom line’: Good for you, good for the planet, good for the farmer, Ms Kane-Potaka explained that crops such as millets, sorghum and legumes were high in nutritive value, helped the environment by growing with less water and having a smaller carbon footprint, and were helpful to farmers as they could grow with minimal inputs under unfavorable conditions. She also mentioned agricultural food processors and agri-entrepreneurs as a critical part of changing consumer behavior through new and exciting foods.

Integrating agriculture, nutrition and consumer
Stating that under the existing food system, farmers were often the least benefited, Dr Elouafi recommended an approach that took all players – farmers, processors, retailers and consumers – under consideration so that the returns on investment from agriculture were well distributed among them.

Ms Kane-Potaka said that although different groups were working on solutions for malnutrition, environmental concerns, farmer welfare, they needed to work together in finding solutions that cut across all these areas of the food system. Smart Food, she said, connected all three groups by being nutritionally rich, environmentally beneficial and helpful to the farmer. However, all of these would not have an impact unless there was a demand from the consumer; hence, the need to work from the consumer end.

Role of technology
Dr Elouafi emphasized the urgency to use the various available technology today – IoT, Big Data, 5G, Omics – etc to achieve the UN SDGs by the 2030 deadline.

How to influence policy
‘Storytelling’ is an effective way to influence policymakers towards decisions that promote crops that are nutritious and environmentally beneficial. By creating an exciting narrative highlighting the impact of helpful policies, policymakers can be encouraged to directly visualize their influence. Ms Kane-Potaka gave the example of ICRISAT proposing the idea of a National Millet Festival in Niger and how the festival helped in breaking down barriers between policymakers, farmers, processors, chefs and consumers. On the other hand, Dr Elouafi felt that putting a numerical value to the benefits of a certain policy would also be key.

On the whole, as, it is clear that food systems had to undergo a major change if we are to meet the 2030 deadline of the United Nations Sustainable Development Goals. The panelists concluded that this was the right time to get innovative, involve the women and young population and optimize the use of technology to make a long-lasting change in the way the world produces and consumes food. This is key to a sustainable world.
Farmers in 13 states of Nigeria will receive improved seeds of sorghum, pearl millet, cowpea and rice as a part of an initiative to cushion the pandemic’s impact on food systems. A host of agricultural research institutes, led by ICRISAT, and the Nigerian government recently launched the seed support initiative.

Flagging-off the initiative on 29 May in Kano, Alhadji Sabo Nanono, Minister of Agriculture and Rural Development, Nigeria, said, “The pandemic may very likely precipitate a food crises by disrupting our food production systems, thereby posing a great threat to farmers’ livelihoods as well as national food and nutritional security.”

The Economic Community of West African States (ECOWAS) estimates that COVID-19 pandemic risks food insecurity and nutrition of 50 million people between June and August 2020. The pandemic adds to other threats including climate change and recurrent drought, Fall armyworm (FAW) and locust infestations in West Africa.

“In Nigeria, it becomes more important to provide support to production systems across value chains towards mitigating the impact of this pandemic,” the minister added.

The states were selected based on the importance of sorghum and millet as food crops and access of partners to needy smallholder farmers.

Nigeria had initiated an early coordinated response to minimize impact, Minister Nanono said. He explained that Joint Technical Task Teams (JTTT) at national and state levels developed strategies to facilitate free movement of food and agricultural inputs exempted from lockdown.

“The government is also planning ahead with research institutions to produce breeder and foundation seeds for production of high yielding seeds for 2020 wet and dry season as well as 2021 rainy season,” the minister said.

Dr Hakeem Ajiegbe, ICRISAT’s Country Representative for Nigeria, said, “The seeds are being provided as a palliative to reduce the impact of COVID-19 pandemic on smallholder farming households and agricultural activities in Nigeria.”

To mitigate the impact of COVID-19 and contribute to building sustainable food systems and food security, ICRISAT developed a three-phase response plan with Recovery and Coping Phases, Adaptive Phase and Transformative Phase in West and Central Africa.

Seed support initiatives are a part of the coping and recovery phase of ICRISAT’s interventions, which prioritizes increasing agricultural production through adequate supply of targeted breeder seed to ensure continued support in production of quality certified seed in partnership with governments and other partners in the region.

Nigeria’s Federal Ministry of Agriculture and Rural Development (FMARD) and Centre for Dryland Agriculture at the Bayero University Kano (CDA-BUK) joined hands with ICRISAT and Syngenta Foundation for the initiative, which will also draw support from the Technology for Africa Agricultural Transformation (TAAT) of the African Development Bank, Harnessing Opportunities for Productivity Enhancement for Sorghum and Millets (HOPE II), Accelerated Varietal Improvement and Seed Delivery of Legumes and Cereals in Africa (AVISA) and Agricultural Transformation Agenda Support Program (ATASP-1) projects.
Niger: WhatsApp comes to the rescue of agriculture extension and farmers in lockdown

A WhatsApp group, ‘Climate information’, helped ICRISAT train 139 agriculture extension staff in interpreting seasonal forecast through slide-by-slide posting of presentations accompanied by explanatory audio messages. Nearly all the staff opened the slides and audio messages. The trained extensionists later held a radio broadcast program with 127 groups of farmers across Niger. This exercise demonstrated that WhatsApp and other similar applications can be effectively used for free online trainings.

To control the spread of COVID-19, Niger is restricting movement of people via lockdowns, border closures, confinement, curfews or quarantine. These restrictions have resulted in cancellations of trainings and travel plans. To avoid disruptions of important information getting to farmers during lockdown and to continue supporting vulnerable communities, ICRISAT initiated online training of trainers (TOT) using WhatsApp to coordinate some activities with field agents and farmers.

One of the early objectives in a crop season is to inform and train field technicians (as trainers of farmers) on west and central seasonal projection of rain for 2020, keeping Covid-19 related challenges in view this year.

We have used seasonal forecasts provided in April 2020 by Agrhymet in collaboration with CILSS, African Centre of Meteorological Applications for Development (ACMAD), OMM and national weather services of West Africa and Chad. Forecasts indicate that mean rainfall for 2020 will be higher or similar to the cumulative mean for the period 1981 and 2010. The start of the rainy season will be earlier and the end will be extended, indicating a longer season. Forecasts also indicated fewer long dry-spell periods in the beginning of the rainy season while those towards the end of the season will be relatively longer. In short, the agricultural season for 2020 will be good!

A WhatsApp group called ‘Climate Information’ was created to connect the agents to the training team in Niamey. Internet connectivity support for 139 agents was provided for a training session in May through the Development Food Security Assistance project (DFSA/GIRMA) of Catholic Relief Services (CRS), a USAID funded project.

The training begins with the sharing of a PowerPoint presentation, slide by slide, with the technicians. Each slide contains not more than three simple messages. After a slide is posted and while participants read the content, the trainer records explanation as a voice message. Two to three minutes is given to participants between slides to listen to the voice message and then pose a series of questions regarding the slide. Technicians ask questions in text messages in the group, allowing other participants to read the message and also give trainer time to respond.
Some of the advice given in the group, for example, in case of early start of the rainy season includes prioritizing long-duration crop varieties while short-duration varieties could be used for late sowing in early July. Regarding above normal amount of rainfall, it is advised to avoid varieties that are sensitive to excess water. Additionally, the community should take appropriate measures to deal with flooding as well as provisions against malaria given possible proliferation of mosquitoes. Short dry events can also favor proliferation of insects and parasites and as well as weeds.

Most questions from participants were about understanding of seasonal forecasts and using rain gauge data to make agricultural decisions. Totally, a third of the questions were related to the methods of forecasting and disaggregation to local community, while about a fourth of the questions pertained to forecasts of the start/end of rainy season with respect to crop and appropriate variety. Another quarter of the questions related to the use of rain gauges and decision-making based on collected volume of rain.

A week after the online training, the trained field technicians participated in a local radio broadcasting program to share their learnings with small groups of 5 to 10 farmers from each of the 127 network villages of the GIRMA-CRS.

It was found that that 98% of technicians viewed all the slides and listened to the voice messages shared on WhatsApp during the training, indicating high level of interest. It also indicated that free applications like WhatsApp can be used for low-cost online trainings.

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How dryland crops are helping Telangana’s tribal households meet nutritional requirements during lockdown

An Anganwadi teacher providing Giri Poshana food to beneficiaries at their homes in Sarvai Village, Eturunagaram, Telangana.

To ensure nutrition sufficiency in children, pregnant women and lactating mothers of tribal communities in Telangana, India, during times of lockdown, ready-to-eat foods containing millets, sorghum and pulses produced by ICRISAT are being provided at their doorstep.

“The food products are scientifically formulated to promote dietary diversity and are produced using locally available nutritious millets and protein rich pulses. These foods are also rich sources of dietary fiber, minerals, vitamins, and bioactives beneficial for boosting immunity and keeping the tribal population healthy,” said Dr Saikat Datta Mazumdar, Chief Operating Officer of the NutriPlus Knowledge (NPK) Program at ICRISAT’s Agribusiness Innovation Platform.

The foods are distributed under Giri Poshana, an initiative in which ICRISAT and Tribal Welfare Department of Telangana State have been collaborating to improve dietary diversity and nutritional status of tribal populations. The initiative targets beneficiaries in three Integrated Tribal Development Agencies (ITDAs) of Utnoor (Adilabad district), Etunagaram (Jayshankar Bhupalpally district) and Bhadrachalam (Bhadradri Kothagudem district) of Telangana.

The local farmers are also benefited as they now have demand for their crops, he added.

The initiative, which began in 2019, was being implemented through select Anganwadi centers (community centers for education, health and other purposes) in the ITDAs. The beneficiaries were being provided three ready-to-cook and three ready-to-eat products as supplementary food, served as breakfast and evening snack, in addition to the governments ICDS mid-day meals. However, after COVID hit and lockdown was imposed, the Anganwadi centers closed and nutrition of the beneficiaries became a matter of concern until the program team worked to change the model of implementation.

“The team has explored different ready-to-eat products from dryland crops, which can replace the ready-to-cook products so that the beneficiaries can easily consume at their households without the need for much cooking. While identifying the products, it was ensured that nutritional values of the new food products are similar to the ready-to-cook products, which have been temporarily discontinued during lockdown,” Dr Mazumdar explained.

Accordingly, millet flakes mixture, peanut – fried gram chikki (energy bar) and ragi (finger millet)-jaggery cookies were added to three other ready-to-eat foods - Energy (Peanut) bar, Nutri-Cookies and Jowar bytes. In April and May, 2020, 7421 beneficiaries received Giri Poshana food, which is being distributed by Anganwadi teachers at the doorsteps of beneficiaries.

Beneficiaries and the teachers are also being sensitized about nutrition and hygiene through instructional videos and brochures. “They are eating on time and are eating...
healthy food. In the lockdown, it was difficult for us to go to the market and buy food. Also, children liked eating this food and as a mother it is assuring,” Ms Sudi Gowthami, a mother of a beneficiary child in Bhadrachalam, said.

Further, eight food processing units in ITDA areas managed by tribal women-led Joint Liability Groups (JLGs), will soon become operational to produce nutritious convenience foods using locally grown crops. This move is also set to boost local employment while ensuring healthy food supply. The construction of these units has been nearly completed in all the three ITDA locations and a few of them have commenced dry runs.

Pointing to capacity building of 75 tribal women to be “Nutrition Entrepreneurs”, Dr Mazumdar argues for urgent evolution of local value chains around local food production, local value addition and local consumption to make vulnerable tribal communities sustainable post-COVID. Post restrictions when the threat from virus is better manageable, tribal women, with their newly acquired skillsets in the areas of food processing, food safety and business development, would be ready to start their enterprises and promote local dryland crops while contributing to building of healthier tribal communities, he added.

Projects:
1. Nutritional interventions to improve dietary diversity in the tribal households of Telangana. Also referred to as Giri Poshana.
2. Setting up of eight processing units in ITDAs of Utnoor, Eturnagaram and Bhadrachalam through Joint Liability Groups (JLGs) of Telangana.

Partners: Integrated Tribal Development Agencies, Tribal Women lead-Joint Liability Groups, Girijan Cooperative Society and Anganwadis (Ministry of Women and Child Development)

Funders: Department of Tribal Welfare, Government of Telangana

CRP: GLDC

This work contributes to Sustainable Developments Goals

- Zero hunger
- Reduced inequality
- Gender equality
- Decent work and economic growth
- Responsible consumption and production
The World Food Programme has warned that the COVID-19 pandemic could cause one of the worst food crises since World War II. It predicts a doubling of the number of people going hungry – more than half of them in sub-Saharan Africa. While wealthier people stay inside and practice physical distancing, the economically marginalized populations risk going out in search of food. They take decisions between livelihoods and life in the most extreme cases. Such food inequities show the need for system-level action.

So far, the global food system has proven to be resilient to the COVID-19 pandemic. Food is still being produced, processed and distributed. Unfortunately, the system’s underlying injustices and inequities continue too. Around 1.58 billion people globally can’t afford healthy diets.

These inequities are especially stark on the African continent. Even before the COVID-19 crisis, the African food system was ailing. Food is perennially in short supply. In 2018, more than 250 million people in sub-Saharan Africa experienced severe food insecurity, incomes for farmers are lower than anywhere globally in real terms, and more than 30% of children are stunted partly due to poverty and poor diets.

Africa’s food system is no stranger to crises. Droughts, El Niño events, pests and diseases, terrorism, migration, and political upheaval have all taken a toll. Crises like these shock the system, causing crop and food losses, pushing people into poverty and putting more people at risk of severe food insecurity and malnutrition.

Each crisis tends to be met with a response to mitigate the harm, but the system always seems to return to its earlier undesirable state.

The shock set off by COVID-19 is likely to be different. That’s because it is causing simultaneous and synchronized system failures that will erode economic opportunities now and potentially for years to come. For example, tourism will be hit by limitations on travel and gatherings.

What we see happening as a result of actions to contain COVID-19 is more like a global natural disaster. It’s also an opportunity for a different kind of recovery. With less inertia resulting in a return to the previous state, alternative scenarios become plausible. In this respect it’s similar to the oil crisis of the 1970s, which changed societies fundamentally.

Going back to “business as usual” investments in agriculture and food systems could reproduce those systems’ inequities. Instead, recovery efforts should be geared towards creating a better future.
Researchers have already done the background work to inform this process.

We believe it is possible to redesign food systems to deliver healthy foods, allow farming families to make a good living, and support thriving societies while generating sustainable ecosystem services. The COVID-19 recovery is a time to put decades of data about this to work.

Here we outline three ways to improve agriculture in line with the sustainable development goals: to make systems resilient, sustainable and fair. The examples have all been developed and tested by researchers at universities and research centers.

Focus on nutrition-sensitive agriculture
The World Health Organization has identified a double burden of malnutrition: poor nutrition along with overweight or obesity. This is a growing problem worldwide.

There are various ways agriculture can help tackle the problem. Among them are better integration of crops and livestock, climate smart agriculture, conservation agriculture, and using woody perennials in fields and landscapes to ecologically increase productivity of more diverse food items.

The underlying ideas are focusing on more integrated farming systems that use species diversity as a source of resilience and diversified diets while reducing the use of harmful chemicals.

Artificially stabilized starch food markets distort prices and consumer incentives. When governments subsidies inputs for certain crops, their production becomes relatively cheaper and so do consumer prices. So, especially poorer consumers are more likely to choose these starchy food items that do not provide sufficiently balanced nutrients.

Nutrition-sensitive agriculture supporting diverse diets needs to be encouraged instead. Smart subsidies could steer food production into a state that supports healthy food choices and increases biodiversity in landscapes.

Reframe development progress
People living in rural regions should not have to depend on agriculture alone. Complementary opportunities should be part of rural development and human wellbeing. The most vulnerable rural people are the least likely to progress through agriculture because their farms are small.

There should be a greater variety of ways to meet everyone’s aspirations and needs. Activities such as processing harvests and adding value to products will also improve the functioning of food systems – so these activities should be supported and encouraged. Young people who are turning away from agriculture could play a pivotal role in developing complementary businesses in rural spaces.

Recognize planetary health
Human modification of the natural environment is linked to health problems ranging from stress to infectious disease. With direct effects on diets, pollution, climate change, and disaster risk reduction, agriculture is central in achieving the majority of the sustainable development goals.

The various linkages between the health of natural resources, agriculture or agroforestry, humans and the environment have to be recognized and purposefully managed to optimize impacts and avoid unintended consequences.

Way forward
These building blocks provide starting points for a new political discourse about agriculture. It should be guided by the overall goal of a resilient, sustainable and fair food system. Resulting strategies must consider the variety of biophysical, social and economic conditions across African countries.

We believe it is now time to focus on the opportunity this crisis has brought and “build back better”. While medics and humanitarian aid agencies prepare for the worst, scientists too must choose their contributions.

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