Burkina Faso recently approved the commercial use of its first pearl millet hybrid called Nafagnon. With the approval, the single-cross hybrid also became the first of its kind to be approved in West and Central Africa. Nafagnon yields as much as 45 percent higher than popular variety Misari-1. It is more resistant to downy mildew and has higher fodder yield potential.

ICRISAT’s Pearl Millet Breeding program for West and Central Africa developed Nafagnon in Niger and the Institut de l’Environnement et de Recherches Agricoles (INERA) evaluated it in Burkina Faso. The hybrid’s name means beneficial millet in Bamanankan language. It also goes by ICRISAT Millet Hybrid (ICMH) 147007. Nafagnon matures early in 80-85 days and has a yield potential of about 3 tons per hectare; early maturity helps overcome terminal drought stress. It is a dual-purpose (grain and forage) hybrid resistant to downy mildew, the most harmful pearl millet disease in WCA. The seed size, yield potential, stay-green and earliness of the hybrid are traits highly preferred by farmers and end users in Burkina Faso, where low yield of pearl millet varieties relative to other cereals is forcing farmers away from one of the best suited crops for Sahel’s harsh agro-ecologies.

Nafagnon is a first generation cross of two genetically different inbreds. Such crosses are called single-cross hybrids. It was evaluated in major pearl millet producing countries of the region over the last three years. The National Seed Committee of Burkina Faso announced Nafagnon’s registration in the National Seed Catalog, making it the country’s first pearl millet hybrid to be approved and the first single-cross hybrid to be approved in West and Central Africa.

**Tailored to the region**

“The first hybrid millets that were tested in West and Central Africa were bred in India. Unfortunately, they were too early maturing and susceptible to downy mildew disease. Learning lessons from those
assessments, ICMH 147007 was developed, evaluated and selected in the WCA region,” said Dr Gangashetty, millet breeder for ICRISAT-WCA, Niger.

“It is well adapted to West African environmental conditions,” added Dr Inoussa Drabo, pearl millet breeder at INERA, who led the evaluation of multiple hybrids and selection, and provided the necessary documentation for the release of Nafagnon in Burkina Faso.

“Since the 1990s, researchers at national research institutes and research organizations such as the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) and the Alliance for Green Revolution in Africa (AGRA) have been working to obtain millet hybrids,” said Dr Issoufou Kapran, Seed System Specialist at ICRISAT-Mali.

“The strong research for development partnership between ICRISAT and INERA has been benefiting smallholder farmers in Burkina Faso. Nafagnon, the first hybrid, is another important contribution to improve the livelihood of farmers” said Dr. Ramadjita Tabo, Regional Program Director for ICRISAT-WCA.

All-inclusive approach to new releases

INERA’s approach to millet hybrid development and commercialization in Burkina Faso involves partnerships with farmers and the private sector. Nafagnon was tested by more than 500 farmers and three seed companies - NAFASO, FAGRI and EPAM - were involved. “The evaluation of pearl millet hybrids in Burkina Faso was taken up under the AVISA Project,” said Dr Neya James, national coordinator of the project that is funded by the Bill & Melinda Gates Foundation.

Mr Ladji Sawadogo, a farmer in the village of Balla that is about 40 km from Bobo Dioulasso, planted Nafagnon along with the local variety on the same day on one hectare of land.

“I am impressed by how fast hybrid plants grow. Its leaves remain green at maturity and the grains are well formed and filled on the panicles. Not only will my family have enough to eat, but animals will also have enough to feed,” the farmer said.

Following its approval in Burkina Faso, Nafagnon will soon be included in the next seed catalog of the Economic Community of West African States (ECOWAS).

The hybrid resulted from the activities of HOPE-2 project, funded by the Gates Foundation, HarvestPlus, GIZ, CGIAR Research Program Grain Legumes and Dryland Cereals, INERA, seed companies such as NAFASO, FAGRI and EPAM in Burkina Faso.

Project: Accelerated Varietal Improvement and Seed Delivery of Legumes and Cereals in Africa (AVISA)
Funder: Bill & Melinda Gates Foundation, USAID
Partners: International Center for Tropical Agriculture (CIAT), International Institute of Tropical Agriculture (IITA), NARS partners from Burkina Faso, Ethiopia, Ghana, Mali, Nigeria, Tanzania and Uganda, and ICRISAT
CGIAR Research Program: Grain Legumes and Dryland Cereals (GLDC)
ICRISAT sorghum lines demonstrate high resistance to fungal disease in the USA

Among 158 sorghum lines that were tested in Pennsylvania for resistance to the fungal disease anthracnose leaf blight, ICRISAT lines, specifically ICSB94, showed the highest level of resistance in the field. These lines are expected to be useful in breeding sorghum for north-eastern United States.

With sorghum poised to become an important crop grown by Pennsylvania farmers, Penn State researchers, in a new study, tested more than 150 germplasm lines of the plant for resistance to a fungus likely to hamper its production.

Sorghum, a close relative to corn (maize), is valuable for yielding human food, animal feed and biofuels. Perhaps its most notable attribute is that the grain it produces is gluten free. Drought resistant and needing a smaller amount of nutrients than corn to thrive, sorghum seems to be a crop that would do well in the Keystone State’s (Pennsylvania) climate in a warming world. But its susceptibility to fungal disease is problematic.

“In other locations where sorghum has been grown for a long time, it is attacked by a fungal pathogen that causes a disease called anthracnose leaf blight, which diminishes its yield,” said study co-author Surinder Chopra, professor of maize genetics in the College of Agricultural Sciences.

“We conducted a three-part experiment designed to evaluate the likelihood that anthracnose will be a problem with sorghum production in Pennsylvania, and what plants might resist the disease.”

First, researchers carried out field surveys in 2011, 2012 and 2016 in six Pennsylvania locations to monitor the presence of the Colletotrichum fungus that causes anthracnose in commercial sorghum fields. They collected soil samples, plant samples and samples of the debris left by sorghum or corn, looking for the fungus at sites in Blair, Lancaster, Dauphin, Centre, Bedford and Lebanon counties.

Next, researchers grew 158 sorghum lines at Penn State’s Russell E. Larson Agricultural Research Center at Rock Springs and tested them for vulnerability and resistance to the natural strains of anthracnose fungus. They obtained plant material for many of the sorghum lines from the International Crops Research Institute for the Semi-Arid Tropics, better known as ICRISAT, India.

Other sorghum lines came from varieties Chopra’s research group has been breeding in plots at Rock Springs for years and are being tested for stress tolerance in another study. Still others came from sources such as the US Department of Agriculture’s...
Agricultural Research Service stations in Griffin, Georgia, Lincoln, Nebraska, and Lubbock, Texas; the Grain, Forage and Bioenergy Research Center, Texas A&M Agrilife Sorghum Breeding Program; and the National Plant Germplasm System.

Lastly, researchers conducted experiments in greenhouses on the University Park campus. They chose 35 sorghum lines that demonstrated resistance to the fungus in field trials and tested their responses after inoculating them with the pathogen. The team evaluated and scored those plants for the severity of anthracnose leaf blight that developed.

In findings recently published in Crop Science, Chopra and colleagues reported that the anthracnose leaf blight symptoms were observed on the older and senescent leaves in Pennsylvania. After evaluating, in field and greenhouse tests, the performance of the 158 experimental lines and commercial hybrids, the researchers noted that they discovered sources of resistance to anthracnose leaf blight.

"Many of those sorghum lines we tested had been improved in several states in the US and in other parts of the world," Chopra said. "These should be useful in breeding programs targeted for Pennsylvania and for northeastern US climatic conditions. Several lines received from ICRISAT showed the high level of resistance in the field."

The research was done in preparation for widespread cultivation of sorghum in Pennsylvania, at which time anthracnose leaf blight is expected to become a problem for farmers, Chopra explained.

“Our study is the first to investigate the frequency, diversity and distribution of Colletotrichum fungi species on sorghum in Pennsylvania, and the first to look for disease-tolerant strains that will grow best in the Northeast,” he said. “Our findings will help develop better recommendations for sorghum growers so they can manage and proactively prevent the buildup of inoculum and resulting disease outbreaks.”
Why are aspirations of farming communities important to know in developing economies?

A systematic literature review of studies from 14 low and middle income countries in Asia and Africa has suggested that aspirations of rural poor are strongly associated with agricultural development and can be viable predictors of rural household trajectories.

Agriculture continues to play an important role in developing economies, yet with increasing rural-urban migration, ageing farm population and waning interest of rural youth in agriculture, its sustainability is under threat. Thus, understanding the aspirations of farming communities and rural youth becomes critical. Populations with high aspirations visualize and engage in forward-looking behaviour, whereas low aspirations lead to reduced efforts and fewer investments for a prosperous future. When the poor fail to see a tomorrow better than their today, they do not take action to improve their future, and consequently become more stuck in a poverty trap. Besides, aspirations are not merely expectations of what the future will be like; individuals could aspire to achieve positive outcomes.

What is the relevance of aspiration in agricultural sector?
Aspirations shape economic behaviour as well as political and community engagement. They might therefore significantly affect agricultural productivity, livelihoods and rural welfare. The aspirations of the rural poor play a significant role in shaping their livelihood activities and investments; it is therefore important to know these relationships so that appropriate policies can be designed to nurture their aspirations. The aspirations of farmers may influence short- and medium-term decisions and have a potentially great influence on technology adoption, the agricultural inputs use and investments they select, which could, in turn, lead to increased productivity.

Considering the importance of aspirations, in a recently published article in the European Journal of Development Research, TIGR2ESS Flagship 1 researchers Dr Ravi Nandi and Dr Swamikannu Nedumaran carried out systematic review of literature in developing economies to understand the state of knowledge, identify research gaps and to suggest future research. The researchers screened 419 empirical research publications and identified 22 studies featuring related research in 14 developing countries in Africa and Asia.

Research gap
The FP1 team at ICRISAT found a strong association between aspirations of farming communities and agricultural development. Available studies related to aspirations have mainly emerged from migration and education studies—there is a scarcity of empirical studies on aspirations of the rural poor who are dependent on agriculture as their livelihood source. Therefore, there is a need for empirical studies to understand the life...
trajectories through aspirations of the rural poor in order to develop appropriate strategies and effective policies and programmes that could improve their welfare.

What have we learned?

▪ Higher aspirations are good predictors of technology adoption and input choice for higher agricultural productivity. Aspirations vary widely across different sections of society, with some groups being particularly at risk of aspiration failure.

▪ Higher female aspirations are a crucial indicator of women’s empowerment. Therefore, raising aspirations is one way to empower women.

▪ There is a discrepancy between parental desires and children’s aspirations about farming as a career choice, and their personal plans and investment in agriculture are in absolute contrast.

▪ Agriculture is not a preferred occupation for the new generation, and is seen as a last resort. It appears likely that a significant number of rural farm youths will leave farming in the future.

▪ Natural calamities – for example COVID-19 significantly lower the aspirations of the rural poor.

▪ Compared with other economically viable indicators, the aspirations of the rural poor are better predictors of household trajectories within agricultural and rural development.

What can be done to raise aspirations?

Identifying those sections of society where aspirations are systemically low is crucial. Understanding of what leads to high or low aspirations among the rural poor and how aspirations influence behaviour provides useful information when designing effective pro-poor policies. Such negative impacts could be mitigated through appropriate social protection schemes by the government. Aspirations and future-oriented behaviour can be altered using innovative interventions (such as exposure to success stories, role models, targeted documentaries, street theatre, puppet shows, and aspiration training sessions) and mass media interventions. Policies could help to develop role models, and thereby, open up new opportunities for those sections of society that previously lacked opportunities.

This study is part of the TIGR2ESS-FP1 program in the semi-arid areas of Telangana state in India. It is well placed to understand the aspirations of farming communities. Empirical research is in progress to address a few of the knowledge gaps identified. Through this work, it is hoped that the knowledge gaps identified can be filled by contributing to literature and providing evidence-based policy advice to government and/or development agencies to design appropriate programmes to improve the well-being of farming communities.

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Authors

Ravi Nandi, Associate Scientist - Socio Economist, Innovation systems for the Drylands Program

Swamikannu Nedumaran, Senior Scientist - Economics, Innovation systems for the Drylands Program
Partnerships

Partnering for nutrition sensitive agriculture in Sudan

Promoting improved crop varieties, strengthening seed systems and nutrition sensitive agriculture were identified areas of intervention that can help Sudan transform its food and agro-pastoral systems. Representatives of IFAD, WFP and ICRISAT, during a recent consultative meeting, identified these areas and others where they could work together in Sudan. Other areas identified include sustainable intensification and multi-level capacity building.

Ms Rasha Omar, IFAD Country Director for Sudan, presented IFAD Sudan’s strategic objectives for 2021-2027, which focuses on strengthening resilience of vulnerable rural populations and their production systems, addressing food and nutrition insecurity and climate change in rainfed areas, and improving the performance of key agricultural value chains in the rainfed agro-pastoral states.

Dr Rebbie Harawa, Regional and Research Program Director, ICRISAT-Eastern and Southern Africa (ESA), informed the delegation that ICRISAT’s work to reduce hunger, malnutrition, poverty and degraded environment has poised it well to drive transformation in the region. She highlighted ICRISAT’s abilities to generate and deliver crop and agronomic technologies, pointing to selected regional impacts, such as the 228 varieties of sorghum (94), millets (29), groundnuts (45), chickpea (39) and pigeonpea (21) that were released; tonnage of seeds distributed, farms and landscapes restored and cross-sectoral capacities built in the region during the last decade.

Bolstering sorghum and millet value chains

Sorghum is the most important crop in Sudan, contributing to 75% of food grains with multiple uses - food, fodder and feed, followed by the millets which contribute 19% of the food grains with multiple uses. Nonetheless, Sudan is able to meet only 2,000 tons of its 96,000-ton annual national seed requirement. Sorghum is also one of the primary cereal crops in Africa, with 44 million ha or 62% of global sorghum acreage. In ESA, sorghum is the third most popular cereal crop and is grown in 12% of the cereal cultivation area.

Ms Mio Nozoe, Country Programme Officer, UN-WFP, presented WFP’s focus interventions in the value chain, for example post-harvest, farmer to market approach and market analyses critical for sorghum and millet crops. She also cited the crop intervention in school feeding program as a potential area that WFP Sudan Country Office can benefit by collaborating with ICRISAT.

Dr Harawa referred to the ongoing 4-year project, Strengthening Sorghum and Millets Value chains for Food, Nutritional and Income Security in Arid and Semi-Arid Lands (SOMNI) Kenya & Tanzania project, funded by IFAD, which has had several achievements and offers several
takeaways for Sudan. These include release of high-yielding, nutrient-dense, early-maturing, and stress-resistant 14 sorghum and six finger millet varieties; establishing seed production and delivery mechanisms; distributing over 730 tons of seeds of different classes; introducing mechanization for the smallholder agro-pastoral communities; and capacity building for 90,000 farmers and 166 women’s groups.

**Going ahead**

Ms Omar suggested that the collaboration pick up from where ICRISAT left during its last assignment in North Kordofan, Sudan. Under the leadership of Dr Eric Manyasa, Cereal Breeder at ICRISAT-ESA, ICRISAT had implemented a one-year project in Sudan that was led by the Government of Sudan.

Ms Joanna Kane-Potaka, Assistant Director General-External relations, ICRISAT, strongly recommended the idea of bringing government on board from the onset, and also pointed out the criticality of working in a consortium, building on existing networks and avoiding duplications.

Dr Andre van Rooyen, Principal Scientist and ICRISAT’s interim Country Representative in Ethiopia, briefed the delegation of the centrality and successes ICRISAT has had with public-private sector using a multi-stakeholder approach for integration of crop-livestock systems. Through this approach, ICRISAT has developed key agricultural value chains, unearthed and fixed market gaps, enhanced processing, redistribution of by-products back to the system to generate circularity and reduced the amounts of wastages and inputs required. “In the long-run, ICRISAT has built self-sustaining crop-livestock systems, integrated optimal irrigation systems; and upon exit, left behind sustainable systems,” Dr van Rooyen said.

For more on ICRISAT in Sudan, [click here](#).
In the media

‘Kuroiler chickens’ hold the key to better livelihoods: improves nutrition and income for communities

Project: Crop-Livestock Integration and Marketing in Malawi (CLIM2)
Funder: European Union

The ICRISAT-led CLIM2 project has helped farmers in Malawi improve poultry productivity by introducing to them Kuroiler chicken, which are hardy, produce more eggs and meat. Not only has the project helped improve incomes, it has also helped farm households benefit nutritionally.

Stella James is a smallholder farmer and a hawker in chief Mpunga in Chiradzulu District – and as with most Malawians in rural areas – she keeps some local variety of chicken for food and as a source of income.

At that point, she was facing challenges with rearing of the chickens.

Her ‘birds’ laid few eggs and didn’t grow big enough. Her hope for a better life was shrinking.

Two years ago, she was introduced to the Kuroiler chicken, a hybrid developed in India, which is bigger in size and lays more eggs than local chickens.

Kuroiler is relatively new in Malawi

Stella James’ life changed forever as she was one of the farmers in her area selected to try the breed under the Crop-Livestock Integration and Marketing in Malawi (CLIM2) project, being implemented by a consortium of the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), Small Scale Livestock and Livelihoods Programme (SSLLP) and the International Livestock Research Institute (ILRI).

The project aims to improve value chains and introduce innovations in Malawi’s southern districts of Balaka, Chiradzulu and Thyolo.

And now James and many others are happy farmers due to their new venture.

More Eggs

The Kuroiler is new and not officially released in Malawi yet. The Government of Malawi through Department of Agricultural Research Services (DARS), Lilongwe University of Agriculture and Natural Resources (LUANAR) and the CLIM2 project tested and evaluated the Kuroiler chicken.

“We were given the hens without roosters for trials. We had feeding challenges at first because they could not eat grains. They only ate pounded maize, sorghum and millet,” says James.

She adds that with time the chickens started following what local chickens were doing and the farmers were also trained by the project in feed-making using locally available resources to help them keep chicken feed cost-effective.

Explains James: “After we started making the feed, we saw an improvement. The chickens could lay more eggs and they grew bigger,” she explains, merge “their eggs were bigger and people loved them.

“We had enough eggs to feed our families and sell to other families. We did not struggle to get protein because the eggs were always available.”

Unlike local chickens that die within a few days when attacked by diseases, Kuroilers showed higher resistance as they eventually recovered. Even simple treatment with Aloe Vera would cure Kuroilers.

“We started with crop production as a group to boost agriculture and support our families. CLIM2 came and selected four of us. They gave us each 10 hens. They told us it was for research. They wanted to see if the Kuroilers would adapt to here. With time the birds did well,” says James.
Growth survival

Jenipher Mlenga, from the same village, concurs with Stella James. She says when she started giving eggs to her school-going child, his performance improved after a month.

Mlenga says: “The eggs were as big as duck eggs and were adequate for us.”

Since the chickens were just for a trial, the farmers later sold them and invested the money in a Village Savings and Loans group, where they now get interest on money which they use to support their families.

The chickens also yielded manure, says Mlenga the chickens were also giving her manure. “In the past, I hardly harvested anything. I would not get more than 3 bags of maize in my field. When I used Kuroiler manure, I harvested 20 bags of maize,” reveals a smiling Mlenga.

The Government of Malawi says the breed has a number of benefits for local farmers. Judith Chikoti, a livestock scientist at the Department of Agricultural Research Services, says preliminary research results show that the breed has good growth and survival.

“Kuroiler chickens consistently performed better than Black Australorp and local chickens on station,” she says. “While the local chicken can lay between 30 to 60 eggs in a year, the Kuroiler can lay between 200 to 250 eggs in a year.”

“The only challenge is that as a hybrid, they should not be breed with other chickens and farmers will always have to buy new stock,” says Chikoti while adding, “We have discovered that people love Kuroiler meat when it’s still tender (13 to 18 weeks) and we recommend Kuroilers for the production of meat and eggs.

“Kuroilers require supplementary feed and do well on local feeds, including ingredients like sorghum, pigeon pea, groundnut and cowpea. Households could easily improve their living standards.”

Nutritional status

Patrick Chikhungwa, Director of Animal Health and Livestock Development in the Ministry of Agriculture, says government is in the process of releasing Kuroiler in Malawi after results obtained from the CLIM2 study.

“Evaluation of the Kuroiler the chicken breed under the project has given the needed information for policy and strategic direction which we were lacking,” says Chikhungwa.

He explains that as a country, Malawi has been struggling to come up with a breed which can be easily managed by smallholder farmers.

“We have had other breeds like the Black Australorp (Mikolongwe), but we needed something suitable for local conditions and easier in terms of production for the benefit of smallholder farmers wanting to commercialize. The introduction of Kuroiler chicken will address that gap,” says Chikhungwa.

The CLIM2 project came under the Farm Income Diversification Program (FIDP 2), funded by the EU.

It has been supporting farmer groups and Small and Medium Enterprises (SMEs) in linking them to profitable value chains, with a strong focus on youth and women.

The purpose is to improve livelihoods and nutritional status of rural households through increased and diversified production and better market access.

The project used Innovation Platforms to bring a wide range of stakeholders together to develop a shared understanding of the problems rural communities faced in order to develop shared visions on how future farming systems should function.

During this process, the stakeholders identified chicken and eggs among the most appropriate value chains to improve farmers’ income and deliver nutrition as well.

“The on-farm experiments illustrated that local feeds increased chicken and egg productivity at low cost. The appreciation of the Kuroiler also motivated most of the participating farmers (40 out of 60) to collectively vaccinate entire villages against New Castle disease,” he says.

According to Sabine Homann-Kee Tui, the farmers learned that existing local demand ensures readily available markets for the Kuroiler chicken and eggs.

“The CLIM2 project has shown high potential to increase chicken productivity and production with improved breeds like the Kuroiler, locally sourced feeds and disease control. With more chicken and eggs locally available, more can be sold or consumed,” explains Homann-Kee Tui.

For Stella James and many others, the future looks bright with Kuroiler.
Millets prove tasty solution to climate and food security challenges

A renewed focus on boosting the production of millets and highlighting their benefits, is critical to reducing over-reliance on more commonly grown crops, boosting diverse diets, and food security. That’s especially true during periods of natural disaster when food becomes scarce, according to Dr Nancy Aburto, an agriculture expert at the Food and Agriculture Organization (FAO).

She spoke to UN News earlier this year, saying that following the UN General Assembly’s recent adoption of a resolution proclaiming 2023 as the International Year of Millets in March 2021, efforts are afoot to promote cultivation as a solution to climate and global food security challenges.

Millets – often called “Nutri-Cereals” due to their high nutritional value – are a group of small-seeded grasses grown mainly in dry zones of Asia and Africa. These include sorghum (or great millet), pearl millet, finger millet, fonio, proso millet, foxtail millet, teff and other smaller varietals.

Estimates show that more than 90 million people in Africa and Asia depend on millets in their diets. Africa accounts for more than 55 percent of global production, followed by Asia with nearly 40 percent, while Europe represents around three percent of the world market.

Population challenge
The world needs to produce more food to feed a rapidly growing global population, which is projected to reach 8.5 billion by 2030, and a staggering 9.7 billion by 2050. With a deepening climate crisis and aggravating environmental stresses, there is a heightened need for crop diversification by promoting crops suitable for cultivation in the toughest of environments.

Acknowledging the role of millets in responding to nutritional, agrarian and climate challenges, the UN resolution considers the “urgent need to raise awareness of the climate-resilient and nutritional benefits of millets and to advocate for diversified, balanced and healthy diets through the increased sustainable production and consumption of millets.”

They are rich in vitamins and minerals, including iron and calcium; are high in protein, fiber, resistant starch, and have a low glycemic index, which can help prevent or manage diabetes.

Good to grow
“Compared to the more commonly known cereals such as wheat, rice or corn, millets are capable of growing under drought conditions, under non-irrigated conditions even in very low rainfall regimes, having a low water footprint”, explained Dr. Aburto, deputy director in the nutrition and food systems division of the UN Food and Agriculture Organization.

The International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) based in Hyderabad, India, is a non-profit organization that conducts agricultural research for development. ICRISAT works closely with farmer communities and its partners, including the International Fund for Agriculture Development (IFAD), focusing on millets, among other crops.
ICRISAT Assistant Director General for External Relations, Joanna Kane-Potaka, described millets as a smart food – good for people, the planet, and farmers.

“Millets can help contribute to some of the biggest global challenges in unison - nutrition and health needs, mitigation and adaptation to climate change, poverty of smallholder and marginalized farmers in the dry zones - some of the toughest areas that will take longer to reach the sustainable development goals.”

Boosting sustainability

Through offering a reduced dependence on synthetic fertilizers and pesticides, millets cultivation may also help promote a shift towards sustainable agriculture, diversifying crop rotations and avoiding the promotion of mono-cropping systems.

“The high carbon content of the crop residues makes them particularly important for maintaining and increasing soil carbon levels, important for sustainable cropping systems, and, where applicable, for providing forage, at the same time, for livestock,” noted Dr Aburto.

‘Food system divide’

Millets are believed to be among the earliest domesticated plants, which have long served as traditional staple crops for millions of farmers, particularly in India, China, and Nigeria.

Notwithstanding the wide range of benefits that millets provide, they have largely been missing from the global food security agenda. In fact, in recent years, their production has gradually declined.

Experts point towards market distortions, a lack of appreciation of the benefits of millets and policies that have favored the production of the so-called Big Three cereals - rice, wheat and maize, resulting in a “Food System Divide”.

Joanna Kane-Potaka of ICRISAT, gave the example of India where “during the green revolution, high yielding varieties of rice and wheat were introduced and supported to scale out on a massive scale, to improve food security, while arguably, inadequate attention was paid to nutrition or environmental factors.”

The problem is further compounded by changing dietary habits, high transaction costs and the challenges involved in accessing better markets; especially true for Africa.

“Farmers have therefore shifted to more remunerative crops grown to sell for profit and moved away from subsistence agriculture responding to changing consumer preferences and markets inputs,” said Dr Aburto.

Millet comeback

According to Ms. Potaka, helping millets make a comeback is not just popularization of a neglected and underutilized crop but also an effort to achieve the sustainable development goals (SDGs) – mainly SDG 2 (zero hunger), SDG3 (good health and well-being), SDG 12 (sustainable consumption and production), and SDG 13 (climate action).

“It is essential to work on increasing the production and changing of perceptions about them to drive demand with new and modern products,” she emphasized.

The current trend can be reversed with government-led policies to support production and consumption of millets, coupled with enhanced consumer awareness of their nutritional and health benefits, said Dr Aburto.

In parallel, raising investments for research and development and generating opportunities for farmers to secure better connectivity with efficient value chains and markets, would also be crucial.

Dr Aburto also stressed the vital role of farmers in the conservation and maintenance of genetic diversity of millet through initiatives such as community seedbanks, seed fairs, and farmer networks, with a focus on promoting local millets.

2023: the year of millets

In declaring 2023 the International Year of Millets, the resolution calls on all stakeholders to provide support to “activities aimed at raising awareness of and directing policy attention to the nutritional and health benefits of millet consumption, and their suitability for cultivation under adverse and changing climatic conditions, while also directing policy attention to improving value chain efficiencies.”

Building on the experiences gained from past initiatives such as the 2016 International Year of Pulses and the 2021 International Year of Fruits and Vegetables, the UN agriculture agency is working to develop an action plan in partnership with external stakeholders, including farmers and research institutions.

“Actions taken will be aligned and supported via existing initiatives, such as the UN decade of action on Nutrition, 2016-2025 that provides an umbrella for a wide group of actors to work together to address malnutrition and other pressing nutrition issues,” Dr Aburto added.

In line with FAO’s vision of a sustainable and food secure world for all, producing more and nutritious food for a growing population without overburdening land resources is a massive global challenge.

In the search for climate resilient solutions, millets could be the crucial link in the sustainable food supply chain.
Mighty millets super grains of power

The United Nations General Assembly adopted an India-sponsored resolution to mark 2023 as the international year of millets. We delve into India’s millet production, their nutritional value and how the Indian government is promoting millets and its cultivation.

Super-grain, super-food and wonder-grain are some of the adjectives often used to describe millets, one of the oldest foods known to humans, and probably the first grain used for domestic purposes. The unanimous adoption by the United Nations General Assembly (UNGA) of the resolution to declare 2023 as the International Year of Millets, a proposal sponsored by India and supported by over 70 nations, underlines the international community’s support to recognize the importance and benefits of these grains for the global food system. Speaking on the subject, India’s permanent representative to the UN, Ambassador TS Tirumurti, said, “There is an urgent need to promote the nutritional and ecological benefit of millets to consumers, producers, and decision-makers, to improve production efficiencies, research and development investments, and food sector linkages”. He expressed gratitude to all the co-sponsors, especially Bangladesh, Kenya, Nepal, Nigeria, Russia, Senegal and all member states of the UN for their strong support.

In India, traces of millets have been found in the archaeological sites of Harappa and Mohenjo-daro, and several ancient Indian scriptures make references to millets. For many years, millets were a part of our daily diet. Today, there is a growing realization among Indian farmers that cultivating millets requires fewer inputs and it is also an economically viable option, especially in harsh and dry environments. This is supported by the new-found knowledge on the health benefits of millets. Also, over the last few years, the Indian government has been making extensive efforts to encourage the cultivation of millets. The Union Government of India, headed by Prime Minister Narendra Modi, had declared 2018 as the National Year of Millets to boost production of the nutrient-rich grains.

A smart food

Millets are an important staple cereal crop for millions of smallholder dryland farmers across Asia and sub-Saharan Africa. They are also called nutri-cereals or dryland cereals, and include sorghum (jowar), pearl millet (bajra), finger millet (ragi), foxtail millet (kangni), proso millet (chena), barnyard millet (samvat ke chawal) and kodo millet (kodon), and offer high nutritional benefits. Millets are also referred to as Smart Food, which are good for the consumers, the planet and the farmers. For instance, finger millet has three times the amount of calcium as in milk, and most millets have very high levels of iron and zinc, low glycemic index, good levels of protein and fiber, and are gluten-free. Millets can also contribute to addressing some of the largest global issues in unison: poor diet (malnutrition to obesity); environmental issues (climate change, water scarcity and environmental degradation); and rural poverty. They have a low carbon footprint and have the ability to survive and grow in warm climate with very little water. They are climate-smart and hence constitute a good risk management strategy for farmers as compared to rice and wheat crops, which require higher quantities of water and fertilizer supplements.

Indian millets at the forefront

Efforts to bring Indian millets to the international forefront began in October 2017, during the Committee on Food Security event in Rome. A series of meetings involving the Government of India (GOI), the agricultural research body International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) and other stakeholders was organized at the Food and Agriculture Organization (FAO) of the UN to identify the process of promoting the idea with FAO departments and the Indian Embassy in Rome. Following this initial step, in November 2017, the Government of India’s then Union Agriculture Minister Radha Mohan Singh wrote to Antonio Guterres, UN
Secretary-General, requesting the inclusion of the proposal in the UN General Assembly agenda for an International Year of Millets in 2018. Although this process can typically take five years, the GOI, ICRISAT, CGIAR, the Indian Council of Agricultural Research (ICAR) of the Ministry of Agriculture & Farmers’ Welfare and its millets research institute, ICAR – Indian Institute of Millets Research (IIMR), along with others pursued the cause, which came to fruition in 2021. It is encouraging to note that the world is talking about depleting natural resources like arable land and water, and the pressing need to produce more to meet the food and nutritional requirements of the growing population. Staple crops like rice and wheat are part of our traditional diets but are known to be water guzzlers, challenging our farmers, consumers and policymakers to explore ways to diversify our cropping system. Millets suit this requirement.

Easy to cultivate
Tolerant to drought and high temperature, and other climate change vagaries, millets are mostly cultivated on low-fertile land, mountainous, tribal and rain-fed areas of India like Andhra Pradesh, Chhattisgarh, Gujarat, Haryana, Madhya Pradesh, Odisha, Rajasthan, Maharashtra, Karnataka, Uttar Pradesh, Tamil Nadu and Telangana. As per FAO’s data, the global millet production stands at about 90 million tons, of which India’s share is about 19 million tons. However, as productivity for a majority of millets is very low, several Indian and international organizations have been working towards enhancing crop productivity by using multi-disciplinary approaches. For instance, the Pearl Millet Genome Sequencing Consortium, comprising 30 institutions, decoded the genome of pearl millet and identified genes for drought and heat tolerance that may be useful not only for millets but also for other major cereals. These researches have contributed to developing several high-yielding hybrids and improved varieties of several millets that are grown by farmers in India.

Mission millet
At the national level, the Government of India has been promoting the cultivation of millets on a mission mode to achieve nutritional security, following recommendations by a committee headed by NITI Aayog. Indian Prime Minister Narendra Modi dedicated 17 biofortified varieties of eight crops, which included two varieties of finger millets and one variety of little millet, on October 16, 2020, on the 75th anniversary of the FAO. As a part of the government’s initiative under the National Food Security Act, state governments have been advised to procure millets at minimum support price and distribute them under the public distribution system (PDS). India’s National Nutrition Mission, POSHAN Abhiyaan, has also advised state governments to include millets under large public system delivery channels such as Integrated Child Development Services, Mid-Day Meals etc. While the government and research organizations work towards higher productivity of millets, nutritionists and chefs are contributing towards the promotion of millets by creating unique millet dishes. Promotions are being done on easy ways to cook millets, convenient tasty millet recipes, and word is being spread about their nutritional benefits and environment-friendly qualities among all stakeholders – both at the national and international level. The UN Food Systems Summit 2021 also offers additional opportunity to make the food systems sustainable and resilient. The declaration of 2023 as the ‘International Year of Millets’ will certainly support all these efforts and make millets a popular and healthy food choice for all.

Authored by
Rajeev K Varshney, Research Program Director, Genetic Gains.

With inputs from
Joanna Kane-Potaka, Arabinda Padhee, Nilesh Mishra, Geetika Sareen and Rohit Pillandi.
Can India sustain high growth of pulses production?

India has made remarkable progress in enhancing production of pulses during the past 15 years. During 2005-06, the total production of pulses in India was 13.38 million MT, which increased to 25.58 million MT during 2020-21. This shows an impressive growth of 91% or a compound annual growth rate (CAGR) of 4.42%. During 2020-21, chickpea had a lion’s share of 49.3% in the total pulses production. Among remaining pulses, pigeonpea contributed 16.2%, mungbean 10.3%, urdbean 9.3%, lentil 4.9% and other pulses 9.9%. During the past 15 years, the highest growth in production was observed for mungbean (178%), followed by chickpea (125%), urdbean (90%), pigeonpea (51%) and lentil (34%).

This is a big leap by India towards attaining self-sufficiency in pulses. This has been possible because of the recent mission mode approach adopted by the country in boosting pulses production.

The contributing factors to this success include (1) availability of high yielding cultivars well adapted to different environments and growing conditions, (2) improved crop production technologies, (3) enhanced uptake of improved cultivars and production technologies through knowledge empowerment of farmers and by ensuring supply of quality seed and other inputs (establishing 15 seed hubs, conducting large number of demonstrations on improved cultivars and best production technologies, etc.), (4) expansion of the area of pulses in rice-fallows, spring/summer season and other non-traditional areas, and (5) government policies in favor of pulses.

The dedicated efforts of Indian Council of Agricultural Research (ICAR) through Indian Institute of Pulses Research (IIIPR) and various All India Coordinated Research Projects (AICRPs) on Pulses and a network of partners have made significant achievements in development of high yielding cultivars and their production technologies. Partnership of ICAR with international institutes, particularly ICRISAT in chickpea (desi and kabuli) and pigeonpea; ICARDA in lentil, chickpea (kabuli) and grasspea; and World Vegetable Center in mungbean and urdbean, have been very fruitful. Germplasm and breeding materials supplied by these institutes have contributed to development of several widely grown cultivars.

For example, short-duration chickpea varieties, such as JG 11 and JAKI 9218, developed in collaboration with ICRISAT, contributed significantly to expanding chickpea area in southern India. The National Food Security Mission (NFSM) launched by the Ministry of Agriculture and Farmers Welfare, Government of India, in 2007 boosted efforts on outreach activities on pulses.

One of the greatest success stories for pulses in India is the spectacular increase in area and productivity of chickpea in central and southern India, outperforming rest of the world (all chickpea growing countries excluding India) in chickpea production.

During the past four decades (1979-2019), chickpea production in central and southern India increased by 445% (from 1.27 to 6.95 million MT) due to 177% increase in area (2.42 to 6.71 million ha) and 97% increase in yield (527 to 1036 kg/ha), while in the rest of the world, chickpea production increased 133 % (1.85 to 4.31 million MT) due to 49% increase in area (2.80 to 4.17 million ha) and 57% increase in yield (659 to 1033 kg/ha).

This outstanding achievement by India in chickpea production in central and southern parts of the country largely remained unnoticed, as bulk of this increased production went in compensating for the huge reduction in chickpea production that occurred in northern India, which was due to replacement of chickpea with wheat and other irrigated crops in about 4 million ha (almost equivalent to the total chickpea area of the rest of the world). Expansion of wheat area was crucial for India in ensuring food security and,
India still has vast scope of bringing additional area under pulses cultivations. Concerted efforts need to continue on expanding area of pulses in rice-fallows available in eastern and southern states and promoting spring/summer cultivation of mungbean and urdbean in areas with assured irrigation.

Wide yield gaps still exist between the realized and potential yields of pulses with varying range across crops and geographies. There is a need to map yield gaps for each pulse crop in major growing geographies, identify the major contributing factors to yield gaps, and develop suitable strategies for bridging the yield gaps. This will involve targeted development of improved varieties and production technologies and enhancing their adoption by empowering the farmers with required knowledge and inputs supply.

Crop production technologies which are expected to have high potential impacts on production of pulses need to be given special attention. These include (1) planting methods, such as raised bed and ridge and furrow methods, to avoid water logging in rainy season pulses, (2) integrated water management and efficient irrigation systems to ensure need-based supplemental irrigations to post-rainy season pulses, (3) soil-test based application of fertilizers to meet the requirements of both macro and micronutrients, (4) enhanced mechanization in pulses cultivation, and (5) promoting conservation agriculture.

It is also important to promote efficient and cost-effective seed/grain storage methods to minimize losses during storage. Development of pulses value chain involving farmers among the value chain actors would be important to provide much-needed additional income to farmers.

Pulses would continue to be important in India in the diets of people for nutritional benefits and in sustaining agriculture production systems. The demand for pulses will continue to escalate because of population growth and increasing awareness of consumers about their nutritional benefits.

There are not many countries exporting pulses that are consumed in large quantities in India (desi chickpea, pigeonpea, mungbean, and urdbean). Thus, India should continue concerted efforts towards achieving self-sufficiency in pulses. The rapid strides taken by India in pulses production in recent years and the vast opportunities available for increasing both area and productivity of pulses in the country suggest that India is well-positioned to achieve self-sufficiency in pulses.

Author
Dr Pooran Gaur
Former Research Program Director-Asia, ICRISAT
New initiatives

Work on a ‘forgotten foods’ manifesto begins in Africa

To trigger research and value chain actions as well as advocacy and promotion of indigenous and forgotten foods in Africa, an extensive consultation with all stakeholders in food systems is expected to result in a continent level manifesto. This manifesto on forgotten and underutilized foods will shape a global manifesto set to be presented at the UN Food Systems Summit later this year.

The Forum for Agricultural Research in Africa (FARA) and the Global Forum on Agricultural Research and Innovation (GFAR) led the consultation. Forgotten foods represent an untapped potential for developing our food systems and the manifesto should feature our voice as a continent, said Dr Alioune Fall, Chairperson, FARA’s Board of Directors, in his opening remarks.

In his introductory remarks, Dr Yemi Akinbamijo, Executive Director, FARA, said, “Attention to forgotten food commodities offers a good chance to foster a paradigm change in our food system commodities. Concerted efforts are urgently needed to advance research and development of orphan crops so that security will be achieved and ultimately the livelihood of the population improved.”

The continent has vast potential to feed itself and one of the ways is through forgotten foods. “They are nutrient dense, resilient, indigenous and well-adapted but underutilized, which is an irony,” said Dr Aggrey Agumya, Director of Research and Innovation at FARA.

“Forgotten foods have never received global importance. They have never been the focus of concerted efforts to improve productivity or quality nor have they been the focus of global value chains. These crops are adapted to very challenging environments, which resonates extremely well with our current climate challenges,” said Dr Jacqueline Hughes, Director General, ICRISAT.

According to Dr Hughes, forgotten foods should be an integral part of the continent’s strategy to reduce dependence on food import and to improve food and nutrition security. This could be achieved with policy support from governments in Africa and with financial support by Africa wide organizations such as FARA and African Development Bank, with policies for both supply and demand. “ICRISAT can help revive forgotten foods in Africa via improved varieties of orphan crops like millets and sorghum and with a robust seed system and a strong extension network,” she added.

“Instead of relying heavily on food imports, diversifying crop production to meet both food and nutrition needs is a cost-effective strategy. This can be done by exploiting climate resilient nutritious orphan crop species and mainstreaming them into existing food systems,” said Ms Agathe Diama, Head Regional Information and Smart Food Coordinator for ICRISAT in West and Central Africa.

Exploration of forgotten commodities gained prominence following ICRISAT’s work on sorghum and millet under the Smart Food initiative. ICRISAT works across the whole value chain exploring varietal development, agronomic practices as well as processing to generate new products.
A screenshot of Dr Hughes and Ms Diama speaking during the consultation.

FARA is aligning with this work to develop a Smart Food Africa initiative to expand the work done by ICRISAT on sorghum and millet to other neglected commodities and develop a smart food research and development program for their economic utilization.

On how Smart Food is driving the demand for millets, Ms Diama said, “It is about changing the image of these crops. We engage small and medium enterprises, retailers and have champions. We work with youth, chefs and hotels. In Nigeria, we work in schools and even teach processing. Through the Smart Food campaign, we are promoting and improving indigenous, climate-smart and nutritious drylands crop as diets for better nutrition in rural and urban areas,” she said while calling for better packaging and promotion of these food products. Ms Diama was representing Dr Ramadjita Tabo, Regional and Research Program Director, ICRISAT-WCA.

According to Mr Matthew Montavon, interim Executive Secretary of the Global Forum for Agricultural Research (GFAR), agriculture is facing many risks and the problem of hunger goes beyond productivity. “The COVID-19 crisis has shown the fragility of our food systems, such as the disruption of food transportation and in some cases, significant increases in food prices. We need to rethink our production patterns and, in this context, the promotion of neglected and underutilized species plays an important role,” he said.

All panelists agreed that collective actions are required at global, regional and national levels for the potential of forgotten foods to be utilized. These actions involve creating awareness and communicating the economic, nutritional, environmental and cultural values of these foods. They also involve the provision of an enabling environment for research, empowering farmers in production and supporting the private sector in processing and value addition marketing, the panelists emphasized.

“To move from underutilized products to high value products, a systematic approach is needed,” said Dr Sevgan Subramanian, Principal Scientist and Head of Environmental Health Theme at the International Centre of Insect Physiology and Ecology (ICIPE). “This approach includes how food is produced and how we engage with the communities. A whole body of knowledge has to be created around some of these indigenous foods, including mainstreaming the germplasm, optimizing agronomic practices and developing of suitable post-harvest technologies,” Dr Subramanian added.

The youth is key to taking these crops to the next level and was well represented in the panel. John Agboola, Founder of Agrarian Opportunities, a leading platform connecting Africans to global agricultural opportunities, said the continent is blessed with a young population and that is where it all starts. “We need to look towards the youth to drive the agenda of agri-business and of the manifesto on forgotten foods.”

Ms Nana Adjoa A. Sifa, a Ghanain Agribusiness Entrepreneur, Founder of Guzakuza, explained how important it is to get critical attention to change mindsets regarding the underutilized/forgotten foods. “A collective effort that includes policymakers is required. If we want to change our mindsets, all of us, from the government to people in homes, need to play a role. At high level meetings, start with indigenous foods. Restaurants and hotels need to have indigenous foods on their menus;” she said. Ms Sifa also called for market research to reduce the gap between research and end users of these crops, and advised fellow farmers to become technology-friendly.

“It is imperative to collect and document local knowledge encompassing all aspects of forgotten foods, from traditional beliefs to utilization and agronomics practices. This information would be useful for both product development and creating awareness. We must shape food systems to deliver safe, affordable and nutritious diets,” highlighted Dr Ayoni Ogunbayo, a consultant for the event.

Held on 20 May 2021, the panel discussion was facilitated by Dr Wole Fatunbi, Senior Technical Cluster Leader/Innovation Systems Specialist, FARA.

To view the webinar, [click here](#).
A manifesto on Forgotten Foods for Asia-Pacific with farmers in focus

Farmer collectives, research, policy and advocacy institutions in Central Asia and Asia-Pacific region called for an urgent change to the prevailing yield-for-immediate-profit structure of agriculture. Their proposal of a multi-functional diversified agri-food structure, hinging on Forgotten Foods to reap benefits for the planet, farmers and consumers, will guide a global manifesto set to be presented at the UN Food Systems Summit later this year.

The Regional Consultation on Forgotten Foods in Asia-Pacific held on 28 May 2021 aimed to improve recognition of Forgotten Foods by multiple stakeholders in agriculture. “Together with farmers and other innovation actors in the Asia-Pacific region, we need to define the change needed for research systems and value chain,” said Dr Ravi Khetarpal, Executive Secretary, Asia-Pacific Association of Agricultural Research Institutions (APAARI). With 250 participants from around the world, the consultation resulted in a regional manifesto on Forgotten Foods.

Forgotten Foods or Neglected and Underutilized Crops (NUS), traditionally cultivated among many indigenous communities, are families of crops that have over time suffered the wrath of food consumption trends and eating habits. The industrialization of agriculture pushed them away from the global agricultural and research systems. Popular for being nutrient-dense and requiring low inputs for production, these forgotten foods or crops include pseudocereals, small millets, grain legumes, tuber crops, sea buckthorn and minor fruits.

“The focus now should be combining food and nutrition security with the need for environmentally sustainable diets,” said Joanna Kane-Potaka, Assistant Director General - External Relations, International Crops Research Institute for the Semi-Arid Tropics (ICRISAT). “We should go one step further and incorporate the farmer; ensuring our food is good for you, the planet and the farmer.”

Farmers, development professionals, scientists, and government officials from the regions discussed ways to bring Forgotten Foods back to farms, into research and policy agendas and onto consumers’ tables.

“There is a huge need to address productivity and quality in forgotten grains,” said Dr Birte Komolong, Program Director, Agricultural Systems, National Agricultural Research Centre, Papua New Guinea.

A recent regional survey found that majority of small farmers are in favour of bringing back forgotten foods if financial support and market linkages are in place. “The traditional seeds and the knowledge to grow them are very important. Our focus should be on preserving, growing and, conserving this knowledge around traditional seeds,” emphasized Ms Salome, a farmer representative.

Equally important is investment in sustainable agricultural technologies, innovative processes for capacity development and advocacy for innovation in food diversification that will reward small farmers and consumers in Asia-Pacific and beyond. “Food diversification is required to ensure climate-resilient nutrition,” stressed Prof. Sayed Azam-Ali, Chief Executive Officer, Crops for the Future.

The regional manifesto on Forgotten Foods in Asia-Pacific is expected to create new opportunities for transforming local, regional, and global paradigms to enhance crop diversity and create new pathways for smallholder farmers. It will promote a participatory approach in building a resilient community that will acknowledge indigenous farmers’ knowledge to accelerate change and bring together new practices of research. It also envisages a participatory seeds system that improves access, availability and promotes opportunities for conservation.

A similar consultation was held in May for Africa. Regional manifestos are being developed to inform a global manifesto that will be presented at the UN Food Systems Summit in September. Consequently, a ‘Global Plan of Action on Forgotten Food’ is envisaged.

The Asia-Pacific Regional Consultation was led by the Asia-Pacific Association of Agricultural Research Institutions (APAARI) in partnership with the Global Forum of Agricultural Research and Innovation (GFAR), Alliance Bioversity-CIAT and Crop for Future, as well as the Asian Farmers Association for Sustainable Rural Development (AFA), MS Swaminathan Research Foundation (MSSRF), International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) and Barli Development Institute for Rural Women (BDIRW).
Events

Global Landscapes Forum Africa: Restoring Africa’s drylands needs a localized, integrated approach, say experts at the conference

At the recent GLF Africa: Restoring Africa’s Drylands Conference, thousands of restoration practitioners, scientists, activists, policymakers and others discussed ideas to provide evidence and guidance for restoring the drylands as a precursor to the launch of the UN Decade on Ecosystem Restoration (2021 to 2030).

Africa’s drylands, which form almost 50% of the continent, are home to over 525 million people, most of whom are smallholder farmers relying on rainfed agriculture and livestock rearing for their livelihoods. Climate change is worsening the land degradation in this region and it is imperative to find ways to halt and reverse the degradation through sustainable, integrated approaches. At the conference, experts from ICRISAT presented insights from their work and shared their thoughts during panel discussions.

Presenting international perspectives on the limited investment being made into long-term research to improve restoration protocols, Dr Anthony Whitbread, Research Program Director, Innovation Systems for the Drylands at ICRISAT, said reduced focus and investment in R&D for land restoration is among the numerous challenges in Africa. He suggested the following measures:

▪ Increase funding (and longer funding cycles) for integrative systems sciences, recognizing the multidisciplinary nature of the restoration agenda.
▪ Attract and influence governments and investments by setting up long-term learning sites to demonstrate the impacts of land restoration connected to livelihoods.
▪ Direct funds to support national R&D and find more funding opportunities for post-PhD support.

“Livelihoods are often not connected to the restoration agenda, so the process of restoration needs to be supported by the a) social side – considering issues like the social dilemmas around common property resources, tenure, etc. and b) the livelihood-generation side – by increasing agricultural production, diversification and intensification connected to markets and creation of agricultural entrepreneurship,” said Dr Whitbread.

Dr Birhanu Zemadim, Senior Scientist and Project Leader, ICRISAT, shared his experience on ‘Enhancing community resilience through improved land and water management practices in the degraded landscapes of Mali and Niger’, which has been supported by USAID and the CGIAR Research Program Water, Land and Ecosystems (WLE). He highlighted solutions devised by ICRISAT and its partners to improve crop productivity, erosion control and socioeconomic benefits, and promote participatory watershed management practices to scale up proven technologies in different agro-ecologies. He recounted the benefits of ICRISAT’s mandate crops as smart foods that were nutritionally rich and also climate-resilient and environmentally friendly.

Based on ICRISAT’s work in Niger and Mali, he said that integrated land and water management practices led to better nutrition security and higher productivity gains (35-55%) and economic benefits (20%). It also reduced environmental degradation by 40% by limiting rainwater runoff and soil loss and by regenerating natural vegetation.

Commenting on the knowledge and financial barriers to land restoration in West and Central Africa, Dr Kalifa Traore, Scientific Director, Institut d’Economie Rurale (IER), said, “Researchers and development institutions have to demonstrate to and convince policymakers that investing in landscape restoration will avoid the serious negative social and economic impacts on rural populations.” He made several recommendations for governments, NGOs, private companies and research agencies to work together for better awareness and action to prevent land degradation.

The Global Landscapes Forum Africa Conference was held virtually on 2-3 June 2021 and the session reported here, ‘Restoration of degraded landscapes in Africa: Lessons for the future’, was organized by the CRP Water, Land and Ecosystems (WLE).

For more on ICRISAT’s work in stopping land degradation, click here: https://www.icrisat.org/preventing-environmental-degradation/
Systems thinking can guide Africa’s unique pathway to sustainable food and agriculture systems

<table>
<thead>
<tr>
<th>Innovation systems: Inclusive system analysis and innovation</th>
<th>Interventions and learning: Building adaptive capacity</th>
<th>Inputs and production: Profitable and resilient cropping systems</th>
<th>Market development: Accessible and functional markets</th>
</tr>
</thead>
<tbody>
<tr>
<td>Building analytical capacity to identify and act on strong leverage points</td>
<td>Interventions with farmer friendly technologies</td>
<td>Developing diverse and integrated sustainable production systems</td>
<td>Generating income, stimulating rural economies and the capacity to reinvest.</td>
</tr>
</tbody>
</table>

Building absorptive and adaptive capacity, addressing systemic challenges and creating feedbacks from markets to build human livelihoods, dignity and pride.

Given that most farms in Africa are in the hands of families that integrate livestock with crop production, the continent is well-poised to forge a unique path to sustainable intensification. A shared vision of circular food systems for Africa is what is needed, said Dr Andre F van Rooyen, ICRISAT’s interim Country Representative in Ethiopia. “Knowledge about the value of food and nutrition and the integration of this within education systems to induce consumer demand is paramount to drive this forward,” Dr van Rooyen added.

By adopting systems thinking – wherein the behavior of complex systems is determined by the interaction among the components – we can use the interactions among agriculture, health and water for greater, more holistic and sustainable developmental impact, especially in marginal populations. For practical long-term solutions, policies for all these sectors need to be developed keeping in mind their interrelationships.

Dr van Rooyen was speaking at an independent Food Systems Summit dialog (dialogs organized by individuals or organizations in the run-up to the UN Food Systems Summit) where he mentioned that Africa not transitioning to large-scale, high-input high-output form of industrialized agriculture accords it opportunities to develop very diverse and integrated market-oriented systems that may not mimic the economies of scale seen in nations with industrialized agriculture, but in scope and diversity could be uniquely pertinent to Africa.

The ‘systems thinking’ approach assists in positioning technologies within larger systems, and even reconstitutes the hierarchies of value chain actors – often placing farmers at the same level as the private sector, extension and policy.

The dialog, ‘Building Resilient and Sustainable Food Systems in Africa: Mobilizing African Voices and Building Momentum for the UN Food System Summit’, was organized by the Food, Agriculture and Natural Resources Policy Analysis Network (FANRPAN) on 31 May.

When asked how food systems can be made resilient for sustaining food supply, Dr van Rooyen called for their reconfiguring them around social and institutional innovations without being fixated on associated technologies only.

“The capacity and willingness to change, increase diversity, integrate knowledge, and organize and self-organize are the four cornerstones of resilience,” he said. “Staples satisfy immediate hunger but nourishment requires diverse diets resulting from production systems that carefully consider sustainability. This will in turn require more knowledge about circularity of food systems and changes in the demand of food. It will also require significant re-organization amongst the entire value chain, and within policies.”

Similarly, for positive outcomes in agricultural water use, it is important for policies and research to configure the
interdependencies between agriculture, health, education and environment, Dr van Rooyen said, while presenting the keynote address at the International Water Resources Association (IWRA) Online Conference on managing water in agriculture.

Dr van Rooyen talked about the deep interconnectedness among water, agriculture and health. He introduced the ‘multidimensional poverty index’, saying “To reduce multidimensional poverty, we need to have positive impacts on health and nutrition, education and building assets for the poor.” He also provided data that demonstrated how smallholder farmers preferred food and (their children’s) education as the top priorities for spending. “Without proper food systems – which includes clean water – we cannot build healthy lives and educate children. Health and education are the foundation of national economies,” said Dr van Rooyen.

The IWRA Online Conference 2021 was organized during 7-9 June 2021. Dr van Rooyen spoke during the session, ‘How can managing water in agriculture contribute to food security and public health’, which featured several experts on water management, development and policy from around the world.

Dr Andre van Rooyen’s work is supported by the CGIAR Research Program on Water, Land and Ecosystems, the Australian Centre for International Agricultural Research, CSIRO, Australian National University and the University of South Australia.
**New Video**

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**MILLETS & SORGHUM VIDEO RELEASES IN JUNE**

- **Nutritional insights**
  - Dr. R. Ananthan
  - Dr. Anitha Senthil
  - Dr. Venkatadri Bhat
  - Dr. Ramadjita Tabo

- **Perspectives from:**
  - India
    - Dr. V. Thapa
    - Indian Institute of Millet Research
  - West and Central Africa
    - Dr. Venkatadri Bhat
    - Indian Institute of Millet Research
  - Dr. Ramadjita Tabo
    - Regional Director, West and Central Africa, ICRISAT, Mali

- **Be Inspired by our food and planet**
  - Dr. Chandrasekhar Birla
  - Leader – Geologica and Digital Augmentation, ICRISAT, Egypt

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**Innovating the Crops of the Future**

- Dr. Timothy J. Dalton
  - Director, Feed the Future Innovation Lab for Collaborative Research on Sorghum and Millet, USA

**Sorghum in Consumer Foods**

- Mr. Tim Lust
  - CEO, National Sorghum Producers Association, United Sorghum Checkoff Program (USCP), USA

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**Odisha Millet Mission**

- Dr. Sunakshi Garg
  - Principal Secretary, Department of Agriculture and Farmers’ Empowerment, Government of Odisha, India

**Karnataka Millet Mission**

- Mr. Anuradha Kariappa
  - Deputy Director of Agriculture, Department of Agriculture, Government of Karnataka, India

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View presentations: [www.smartfood.org/foodtec-conference/](http://www.smartfood.org/foodtec-conference/)

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With 2023 adopted as the UN International Year of Millets, Smart Food and ICRISAT bring you a series of expert talks and discussions on food trends, opportunities and driving markets for smart foods including millets and sorghum. See: [www.smartfood.org/foodtec-conference/](http://www.smartfood.org/foodtec-conference/).
New publications

Fall armyworm (*Spodoptera frugiperda*)
Authors: Deshmukh SS, Prasanna BM, Kalleshwaraswamy CM, Jaba J and Choudhary B
http://oar.icrisat.org/11839/

Molecular mapping of dry root rot resistance genes in chickpea (*Cicer arietinum* L.)
Authors: Karadi A, Samineni S, Sajja S, Sharma M, Thudi M, Mallikarjuna BP, Viswanatha KP, Varshney RK and Gaur PM
Published: Euphytica (TSI), 217 (6). pp. 1-13. ISSN 0014-2336
http://oar.icrisat.org/11840/

Impact of COVID-19 on food security: Insights from Telangana, India
Authors: Ravula P, Kasala K and Ray S
Published: Agricultural Economics Research Review, 33 (167). pp. 167-168. ISSN 0974-0279
http://oar.icrisat.org/11841/

MAGIC lines in chickpea: development and exploitation of genetic diversity
Authors: Samineni S, Sajja SB, Mondal B, Chand U, Thudi M, Varshney RK and Gaur PM
Published: Euphytica (TSI), 217 (7). pp. 1-12. ISSN 0014-2336
http://oar.icrisat.org/11842/

Labor force participation of rural women and the household’s nutrition: Panel data evidence from SAT India
Authors: Sangwan N and Shalander K
Published: Food Policy (TSI), 102. pp. 1-13. ISSN 0306-9192
http://oar.icrisat.org/11843/

Seeking sustainable pathways for fostering agricultural transformation in peninsular India
Authors: Anantha KH, Garg KK, Petrie CA and Dixit S
Published: Environmental Research Letters (TSI), 16 (4). pp. 1-13. ISSN 1748-9326
http://oar.icrisat.org/11818/

Can seasonal soil N mineralisation trends be leveraged to enhance pasture growth?
Authors: Bilotto F, Harrison MT, Migliorati MDA, Christie KM, Rowlings DW, Grace PR, Smith AP, Rawnsley RP, Thorburn PJ and Eckard RJ
Published: Science of The Total Environment (TSI), 772. pp. 1-15. ISSN 0048-9697
http://oar.icrisat.org/11819/

Climate change impact and variability on cereal productivity among smallholder farmers under future production systems in West Africa
Authors: MacCarthy DS, Adam M, Freduah BS, Fosu-Mensah BY, Ampim PAY, Ly M, Traore PS and Adiku SGK
Published: Sustainability (TSI), 13 (9). pp. 1-22. ISSN 2071-1050
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Can omics deliver temperature resilient ready-to-grow crops?
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Published: Frontiers in Plant Science (TSI), 12. pp. 1-11. ISSN 1664-462X
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Integrated pest management in major legume crops

Authors: Jaba J, Jatin K, Reddy RS, Kota S and Mishra SP

Published: Taylor & Francis Group, LLC, Boca Raton, Florida, pp. 287-293. ISBN 9781003027690
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The role of natural enemies and biopesticides for sustainable management of major insect pests of legumes

Authors: Kota S, Kukanur V, Reddy RS, Arora N, Jaba J and Rama DK

Published: In: Biopesticides in Organic Farming. CRC Press, Florida, USA, pp. 207-216. ISBN 9781003027690
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