Feature Story

Creating more linkages across the sorghum value chain

Unique ways of promoting sorghum through programs to sensitize school children and radio talk shows to link actors along the sorghum value chain were carried out alongside activities to prepare farmers for the 2017 cropping season in Nigeria.

The activities encompassed much of the sorghum value chain from distribution of quality seed to farmers and linkages with seed companies and seed producers to developing entrepreneurship among women and youth.

The target regions were the four Staple Crop Processing Zones (SCPZs) of Adani-Omor, Bida-Badeggi, Kano-Jigawa and Kebbi-Sokoto.

Equipping farmers for the cropping season

Setting up sorghum demonstration plots

- 435 plots for
- 120 communities in
- 126 Local Government Areas in 6 states

State map of Nigeria.

Promoting sorghum

Sensitizing school children

Volunteer students (150 girls and 50 boys) were trained on processing and packaging of sorghum.

Radio talk shows

Ms Halima Ndyako, Gender Specialist and Dr Hakeem Ajeigbe, ICRISAT Country Representative-Nigeria, attend a radio talk.

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Linkage with offtakers

Production of sorghum seed was done in collaboration with:

- Three seed companies: Tecni Seeds Ltd, Inspire Agric Genetics Ltd, and Green Pal Global Ltd.
- Institute of Agricultural Research–Zaria
- Outgrowers including the Youth Agripreneur

Sorghum seed production details

<table>
<thead>
<tr>
<th>Class</th>
<th>Variety</th>
<th>Foundation</th>
<th>Certified</th>
<th>Breeder</th>
<th>Total</th>
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<tr>
<td></td>
<td>SK 5912</td>
<td>2,000 kg</td>
<td>18,420 kg</td>
<td>50 kg</td>
<td>61,298 kg</td>
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<tr>
<td></td>
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<td>1,000 kg</td>
<td>39,700 kg</td>
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<td></td>
<td>Samsorg 44</td>
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<td></td>
<td>Samsorg 43</td>
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<td>EX-DAC</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>61,298 kg</td>
</tr>
</tbody>
</table>

Selected traits: High-yielding, disease-tolerant with market-preferred traits

Seed was distributed along with necessary advisory services.

All demonstration plots will be managed by the lead farmer under the supervision of the Extension Agents (EAs) and field technicians.

Agreement in the pipeline:

Delfarm Projects Ltd, Adani-omor SCPZ, has:

- An offtaker with a capacity for handling 1,000 tons annually
- Will allocate 80 ha for sorghum during the 2017 rainy season

ICRISAT will provide:

- Foundation seed of SK5912 to plant 1 to 2 ha
- Technical support for proper management

Trainings on seed production and seed entrepreneurship

Special focus on women and youth

Shortage of quality seed led to the development of this strategic plan to ensure production and diffusion of improved quality sorghum seed

26 women groups with 577 members from Kano-Jigawa SCPZ were supported with 208 kg of seed of improved variety of Sorghum (CSR-01) to plant on a 26 ha plot and produce about 46.8 t of grain in the 2017 cropping season.

132 youths from Kano-Jigawa, Kebbi-Sokoto and Bida-Badeggi SCPZs were trained and linked to seed companies to make their venture profitable; 8 kg of foundation seed (for 1 ha plot) was provided to each of them

31 youths from Kano-Jigawa SCPZ were trained and supported with 240 kg seed of CSR-01

70 members of the Ajingi Development Association, a self-help youth organization, were trained and provided 60 kg of improved seed.
**Linkages with agro-dealers**

- Two agro-input dealers from each of the 23 participating LGAs were selected
- To establish meaningful business relationships they attended the training of EAs and lead farmers
- They will be regularly updated on Good Agricultural Practices (GAP) as well as linkages to seed and other input companies.
- They are expected to sell basic inputs, like seeds and crop protection chemicals as well as offer advisory services to the farmers in the participating communities.

**Promoting sorghum**

**Sensitizing school children**

Volunteer students (150 girls and 50 boys) were trained on processing and packaging of sorghum. The grain used was the harvest from the plots on their school farms. The trainings exposed students to sorghum products development and its business potential to generate employment/income and to also instil the idea of seeing farming as a business rather than a development activity or for subsistence living.

**Effective project management**

**Workshops and trainings**

Workshops with stakeholders and National Agricultural Research Systems (NARS) partners on improved sorghum husbandry and capacity enhancement/pre-season training of farmers, EAs and field technicians were conducted. Training courses on financial management and effective Monitoring and Evaluation were held for the project staff.

**Radio talk shows**

Clockwise from left: Coal City FM Radio Enugu studio anchorman, Mr Romanus Egba, Dr Hakeem Ajeigbe, and Mr George Opara from FMARD Abuja during the radio talk show.

Four radio talk shows were organized in the month of May with Arewa Radio (Kano), Power FM (Bida), Vison FM (Sokoto) and Coal City FM (Enugu). Several questions on sorghum production and markets were asked by the public via telephone, while others solicited government effort to ensure their areas are reached through the program so that they can also benefit from such a robust package meant for the rural poor.

**Plans for Adani-Omor SCPZ**

**Technical training:** This is for lead farmers and EAs on good agronomic practices (GAP) and post-harvest losses.

**Food processing and product development:** Women/ youth groups will be trained with special emphasis on food fortification and nutritional benefits.

**Mechanization of farms:** Small-scale equipment like hand-planter, multi-thresher, etc., will be introduced for reduction in drudgery, job creation and income generation.
Learnings from the 2016 season:

**Key learning:**

The outstanding performance of market-preferred varieties of sorghum encouraged farmers to invest in its production.

**Challenges:**

- Commercial seed sales and linkages with agro-dealers were low
- Need for enhancing the technical knowledge of agro-dealers

**Other issues:**

- *Striga* infestation was a major concern in some locations
- Early-maturing sorghum varieties in some areas were damaged by birds
- Farmers were keen on linkages that facilitated quick access to fertilizers, tractor hiring services and agro-chemicals at reasonable prices
- Small land holdings in many parts of Kware LGAs of Sokoto State affected the size of demonstration plots
- Stalk sweetness of sorghum variety ICSV 111 presented problems in the form of people cutting the crop indiscriminately for chewing the stalks
- An interesting development is that some farmers grew the ICSV 111 variety in the *fadama* (irrigable) areas during the dry season

**Opportunities:**

- Tremendous opportunity exists for use of Internet Service Providers for mobile application connectivity (GSM) for outreach activities. E.g. Globacom and Etisalat close user group (CUG).
- Banks and other NGOs (MANOBI Corporation) are willing to partner if markets and good infrastructure exist.
- Collaboration with the private sector and using a market-oriented approach will increase the confidence of farmers.
- Northern Nigeria Flour Mills PLC, Kano, commissioned a new sorghum mill on 18 July. This will increase the offtakers capacity.

These issues were discussed at a review and planning meeting that had an impressive attendance of all farmers and LGA officials of the regions.

**Project:** ATASP-1 Sorghum Outreach Program  
**Funder:** Nigeria Government through African Development Bank  
**Partners:** IITA lead implementer (Cassava), Africa Rice (Rice), ICRISAT (Sorghum), Nigeria NARS, women and youth groups and private sector

This project contributes to UN Sustainable Goals
Workshops

Training on feed-based intensification options to improve dairy animal performance

Participants are exposed to silage making process.

A training program on improving the basal diet of livestock, which mainly comprises of crop residues, was held for field veterinarians from the Indian state of Karnataka. This was for the Bhoosamrudhi project – a collaborative project between the Government of Karnataka (GoK) and CGIAR centers, led by ICRISAT.

Crop residues are major feed resources for smallholder livestock production. ICRISAT in collaboration with the International Livestock Research Institute (ILRI) works at improving fodder value of key crops (see box) at source through inclusion of crop residue fodder traits (quantity and quality) in new cultivar breeding, selection and dissemination work. The ICRISAT-ILRI collaboration concentrates on ICRISAT mandate crops – sorghum, pearl millet, groundnut, chickpea and pigeonpea, while ILRI’s collaboration with other institutes focuses on crops such as maize, wheat, rice, sweet potato, mung bean, vegetable soybean, minor millets, etc.

The training focused on improving the quality of the basal diet - i.e. of the crop residues – and laid emphasis on exploring ways for improving livestock rations by fortification and densification. The objective was to make best use of feed resources in a context-specific manner, including supplementation and combination of different diet constituents, and physical feed forms such as feed blocks, feed pellets and feed mash.

Field veterinarians from four districts of Karnataka (Bidar, Chikballapur, Dharward and Udupi) were exposed to feed-based intensification (through cultivar selection of dual-purpose crops, chopping and supplementation), ways to address fodder deficit by linking fodder surplus-deficit areas (through feed-processing entrepreneurial ventures) and fodder preservation in the form of silage and hay. They were also trained in smallholder silage making through a live demonstration on the process.

ILRI scientists explained to the participants the use of near infrared spectroscopy (NIRS) tool for phenotyping of various crop cultivars for fodder quality analysis and invitro digestibility studies. More than 30 field veterinarians and district heads of the Department of Veterinary & Animal Husbandry, Government of Karnataka, attended the training held on 4 July at ICRISAT headquarters.

Examples of ICRISAT’s work on improving fodder value of its mandate crops

**Groundnut**

In 2002, ICRISAT introduced an early maturing, high yielding and drought-tolerant groundnut variety (ICGV91114), which produced 15% higher pod yields, 17% more haulm and better quality fodder than the locally grown variety. Farmers who fed their cows and buffalo the improved fodder saw their milk production immediately increase by 11%. A subsequent impact study estimated that adopters of the new variety earned around USD 970 from the sales of groundnut and milk—four times more than from growing the local variety.

**Sorghum**

In the case of sorghum, it was found that sorghum stover from 1 ha (3.6 ton Dry Matter) with 3% units increase in digestibility can produce 345 liters of additional milk, which generates an additional income of ₹ 8,294/- to the farmer (since digestibility is more, intake will also be more and additional milk production will be 682 liters).
In 2017-18, ILRI will work in 10 villages covering 100 farmers and demonstrate the impact of feed-based intensification, commercial fodder production and smallholder silage making. It is expected that the Department will use the experience in these 10 villages to scale up the program throughout the state. Besides the above work, ILRI will also support the government to pilot small- and medium-scale enterprises to produce and supply complete feed/hay/silage, based on context, in a business mode. Towards all of the above, the participants prepared a work plan at the end of the training.

**Project:** Improving Rural Livelihoods through Innovative Scaling-up of Science-led Participatory Research for Development  
**Funder:** Government of Karnataka  
**Partners:** All CGIAR Centres lead by ICRISAT and line departments of Government of Karnataka

This work contributes to UN Sustainable Goals

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**Millet-based cooked foods win appreciation**

Mr Krishna Byre Gowda, Minister of Agriculture for State, Government of Karnataka, inaugurated the ICRISAT stall exhibiting several millet-based cooked foods at a two-day workshop organized by the Government of Karnataka in Bengaluru. A team led by Ms Vani Anamdas, Manager, Housing and Food Service, ICRISAT, participated in the workshop held from 8-9 July to create awareness among people from all walks of life to incorporate millets in their daily diet. Dignitaries who visited the stall included Mr M Krishnappa, Minister for Housing, Karnataka and Mr Priya Krishna MLA. The stall attracted many visitors. The Millet Melodies app featuring recipes shared by ICRISAT was widely reported in the local media.

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**Congratulations**

Dr Bhogireddy Sailaja, DBT-Research Associate, Genetic Gains Program, ICRISAT, has been awarded the ‘**Jawaharlal Nehru Award** for P.G. Outstanding Doctoral Thesis Research in Agricultural and Allied Sciences 2016’ in the Biotechnology category. The award recognizes her significant contribution towards the improvement of rice productivity despite high temperature stress induced by climate change. The award was presented by Mr Radha Mohan Singh, Union Minister for Agriculture and Farmers Welfare, Government of India, and Dr Trilochan Mohapatra, Secretary, Department of Agricultural Research and Education (DARE), Director General, Indian Council of Agricultural Research (ICAR) and ICRISAT Governing Board Member, at the 89th ICAR Foundation Day, on July 16.
Announcement

New crop sciences research center at NIAB in Cambridge to also focus on legumes and ‘orphan crops’

The inclusion of legumes and the so-called ‘orphan crops’ in the research portfolio of the newly-launched Cambridge Centre for Crop Science (3CS) was hailed as a step in the right direction by the leadership of ICRISAT.

The new center developed by the University of Cambridge in collaboration with the National Institute of Agricultural Botany (NIAB) is funded by The Higher Education Funding Council for England (HEFCE). With £16.9m from the HEFCE-managed UK Research Partnership Investment Fund and additional funding from the National Institute of Agricultural Botany Trust, the 3CS will focus on impact: working with industrial partners to translate the University’s strong fundamental plant research into outputs for the farmer, processor and consumer.

While 3CS will make significant contributions to the main globally-traded crops such as wheat and rice, there will be a focus on advances in the genetics and agronomy of other UK crops, such as potato and legumes, and so-called ‘orphan crops’: those that lag behind in technological advances but are vital for smallholder farmers across the developing world, said the release from NIAB.

I am delighted and excited by the announcement by the UK Higher Education Funding Council of significant funding for a new Cambridge Centre for Crop Science (3CS) developed by the University of Cambridge in collaboration with NIAB. This will be a major new research and development facility located at NIAB in Cambridge. 3CS will facilitate connectivity and partnerships between scientists, producers and the food industry both nationally and internationally to help sustainably address the global challenges of the role of agriculture in economic growth, food security, hunger and malnutrition. I am sure it will rapidly develop into a major international centre of excellence for training as well as the delivery of better products and services. Over the last three years ICRISAT, the University of Cambridge and NIAB have been forging closer links and have several active collaborative research programs. As a Trustee of NIAB and Chair of the Governing Board of ICRISAT, I look forward to our partnerships developing and we wish the 3CS every success.

Dr Nigel Kerby, MBE
Governing Board Chair
ICRISAT

The delivery of both public goods and economic growth is an essential agenda for today’s plant scientists, with the need to produce sufficient healthy nutritious food without harming the environment being at the top of the international agenda.

Dr Tina Barsby
CEO and Director
NIAB ICRISAT

3CS innovations will generate new crops and new ways of growing crops for food, fuels, industrial feedstocks and pharmaceuticals.

Professor Sir David Baulcombe
Head of Cambridge’s Department of Plant Sciences and the Project Lead for the University
New Publications

An assessment of yield gains under climate change due to genetic modification of pearl millet

Authors: Singh P, Boote KJ, Kadiyala MDM, Nedumaran S, Gupta SK, Srinivas K and Bantilan MCS

Published: 2017. Science of the Total Environment, 601-60: 1226-1237. ISSN 0048-9697

Abstract: Developing cultivars with traits that can enhance and sustain productivity under climate change will be an important climate smart adaptation option. The modified CSM-CERES-Pearl millet model was used to assess yield gains by modifying plant traits determining crop maturity duration, potential yield and tolerance to drought and heat in pearl millet cultivars grown at six locations in arid (Hisar, Jodhpur, Bikaner) and semi-arid (Jaipur, Aurangabad and Bijapur) tropical India and two locations in semi-arid tropical West Africa (Sadore in Niamey and Cinzana in Mali). The study shows that drought and heat tolerance in pearl millet increased yields under climate change in both the arid and semi-arid tropical climates with greater benefit in relatively hotter environments. This study will assist plant breeders in evaluating new promising plant traits of pearl millet for adapting to climate change at the selected locations and other similar environments.

http://oar.icrisat.org/10064/

Elicitation of resistance and associated defense responses in Trichoderma hamatum induced protection against pearl millet downy mildew pathogen

Authors: Siddaiah CN, Satyanarayana NR, Mudili V, Kumar Gupta V, Gurunathan S, Rangappa S, Huntrike SS and Srivastava RK

Published: 2017. Scientific Reports, 7 (43991):1-18. ISSN 2045-2322

Abstract: Endophytic Trichoderma hamatum UoM 13 isolated from pearl millet roots was evaluated for its efficiency to suppress downy mildew disease. The results indicated that T. hamatum UoM13 treatment induces resistance corresponding to significant over expression of endogenous SA, important defense enzymes, PR-proteins, and HRGPs, suggesting that SA biosynthetic pathway is involved in pearl millet for mounting systemic immunity against downy mildew pathogen.

http://oar.icrisat.org/10065/

Risk aversion and willingness to pay for water quality: The case of non-farm rural residents

Authors: Larue B, West GE, Singbo A and Tamini LD

Published: 2017. Journal of Environmental Management, 197: 296-304. ISSN 0301-4797

Abstract: Stated choice experiments are used to investigate the economic valuation of rural residents living in the province of Quebec for water quality improvements. In Quebec, rural residents played an important role in the setting of stricter environmental regulations. Unlike most stated choice experiments about the valuation of improvements in water quality, this study explicitly accounts for risk in the design and analysis of choice experiments. Risk in phosphorus and coliform reductions is introduced through a three-point uniform distribution in the choice sets. The results show greater support for constant absolute risk aversion preferences than for constant relative risk aversion. Rural residents value coliform and phosphorus reductions and the more educated ones are particularly willing to see the government tax farmers and taxpayers to secure such reductions. As the science improves and risk in water quality outcomes decrease and as the political weight of non-farm rural residents increase, it should be easier for governments to replace voluntary cost-share programs by polluter-payer programs.

http://oar.icrisat.org/10066/

Payments for ecosystem services and agricultural intensification: Evidence from a choice experiment on deforestation in Zambia

Authors: Vorlaufer T, Falk T, Dufhues T and Kirk M

Published: 2017. Ecological Economics, 141: 95-105. ISSN 09218009

Abstract: Agriculture is considered to be one of the major drivers of deforestation worldwide. In developing countries in particular this process is driven by small-scale agriculture. At the same time, many African governments aim to increase agricultural productivity. Empirical evidence suggests, however, that win-win relationships between agricultural intensification and forest conservation are the exception. Payments for Ecosystem Services (PES) could be linked to agriculture support programs to simultaneously achieve both goals. We report from a discrete choice experiment in Zambia that elicited preferences of smallholder farmers for PES contracts. Our results suggest that potential PES recipients in Zambia value in-kind agricultural inputs more highly than cash payments (even when the monetary value of the inputs is lower than the cash payment), highlighting that PES could potentially succeed in conserving forests and intensifying smallholder agriculture. Respondents who intended to clear forest within the next three years were found to require higher payments, but could be motivated to enroll in appropriately designed PES.

http://oar.icrisat.org/10067/