Digital agriculture initiatives to boost smallholder agriculture

The Government of Telangana in India and ICRISAT have joined hands to implement Information and Communication Technology (ICT)-based knowledge sharing platforms and other agricultural innovation initiatives, to improve productivity and profitability of smallholder farmers in Telangana state.

The partnership will explore areas of collaboration in the field of Digital Agriculture along the agriculture value chain and look at the possibilities of ICRISAT playing an active role in the ‘T Hub’ (incubator being launched by the Government of Telangana).

The collaboration will help launch innovative digital platforms that aim to revitalize information dissemination in rural areas, develop expert decision-making systems for providing real-time advisories and enable better access to market information by smallholder farmers.

“Technology can unlock the opportunity to intensify farming in a sustainable way and help diversify farming which is important for a country like India. It can help improve soil health, lower transaction costs, help farmers access resources, and create economic opportunities to attract youth. Agriculture can be a driver of growth. This is an exciting frontier for ICRISAT,” said Dr David Bergvinson, Director General, ICRISAT, during the partnership launch.

“Access to timely information and knowledge can be a great leveller and help millions of farmers in Telangana to improve their yields, incomes and resilience since they can now make informed choices about good farming practices,” said Mr KT Rama Rao, Minister for Information Technology, during the agreement signing.

Mr Pocharam Srinivas Reddy, Minister for Agriculture, felt that it is very appropriate to launch the digital agriculture activities at a time when use of digital gadgets is on the rise in rural areas.

The collaboration will enable the state government to create new economic opportunities for rural populations through digital agriculture and enable consumers create direct linkages to farmers thus leading to cost savings and ensuring quality.

At the event, the GreenPhablet – a customized low-cost combination of phone and tablet – developed by ICRISAT was also launched. GreenPhablet can provide customized...
Overcoming risks in agriculture through Farmer Producer Organizations (FPOs)

To help farmers overcome the risks in agriculture and improve their access to investments, technology and markets, the National Bank for Agriculture and Rural Development (NABARD) and ICRISAT have come together to establish Farmer Producer Organizations (FPOs) in the states of Telangana and Andhra Pradesh in India.

ICRISAT has been chosen as a Producer Organization Promoting Institution (POPI) in Telangana and Andhra Pradesh to incubate and mentor five FPOs in each state. It will also act as a state-level Resource Support Agency to train and strengthen the capacities of NABARD’s other POPIs in Telangana.

ICRISAT’S Agri-Business Incubation (ABI) Program of the Agribusiness and Innovation Platform will be involved in the capacity building and handholding of POPI staff; provide technical expertise; oversee the implementation; and provide inputs in value addition, marketing, storage and other services required by the FPOs.

“This is an important step towards empowerment of smallholder farmers wherein 1,500 farmers collectivized through FPOs, and the POPIs will be trained to promote and nurture the FPOs. This will ultimately benefit over 10,000 farmers in Telangana and Andhra Pradesh,” said Dr David Bergvinson, Director General, ICRISAT.

Organizing small and marginal farmers into FPOs helps create a coping strategy to place them in a better bargaining position in the markets, help acquire better technology resulting in enhanced quality and productivity, provide collective marketing thus eliminating intermediaries, and achieve sustainable livelihoods.

ICRISAT will work in the Medak district of Telangana for sorghum and pigeonpea value chains and agro-processing; and in Anantapur district of Andhra Pradesh for groundnut and millet seed business, value chains and agro-processing.

“This partnership will strengthen the FPOs to enhance their performance in terms of management, technical skills, value addition and create marketing linkages, thereby benefitting over 5,000 smallholder farmers from Telangana,” said Mr VVV Satyanarayana, Chief General Manager, NABARD, Telangana.

The MoUs for Telangana and Andhra Pradesh were signed on 6 July. The NABARD Telangana team comprised Mr Satyanarayana, Mr Hara Gopal, Assistant General Manager and Ms Toolika Pankaj, General Manager.

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Sweet sorghum as biofuel feedstock

To encourage the use of sweet sorghum as a feedstock for biofuel (ethanol) production in India, a consortium of partners from the public, private and research sectors have joined hands.

At the recent project launch Dr David Bergvinson, Director General, ICRISAT, suggested that the project partners should develop a roadmap and not rely on government subsidies for viability of biofuel value chain as this cannot be sustainable in the long run.

Sweet sorghum is more suitable as feedstock for the ethanol industry because of its unique properties such as wide adaptability, drought tolerance, water and nutrient use efficiency along with high annual biomass yields. Sweet sorghum accumulates sugars in the stalks that can be crushed to extract juice, which can then be processed into ethanol. Besides the juice extracted for ethanol and the grain harvested for food, the bagasse, the leftover after extraction of juice from the stalk, can also be used as livestock feed and co-generation of power. While the use of sweet sorghum as a biofuel feedstock is well established in Brazil and China, it is not so in India.

To promote biofuels as an alternative energy source, the Indian government announced a comprehensive National Policy on Biofuels in December 2009 calling for blending at least 20% of diesel (with bio-diesel) and petrol (with bio-ethanol) by 2017. The policies are designed to facilitate and bring about optimal development and utilization of indigenous biomass feedstock for biofuel production.

Over the past several years ICRISAT, under its BioPower strategy, has partnered with national programs, CGIAR centres and the ethanol industry, to develop the sweet sorghum ethanol value chain.

Mr T Sridhar Rao from Madhucon Sugars and Power Industries Limited and Mr Vijay Kumar Babu from Core Green Sugars and Fuel Private Limited shared the perspective of sugar mill owners on sweet sorghum as feedstock. They compared the economics of ethanol production from both sugarcane and sweet sorghum, and deliberated the advantages of sweet sorghum over sugarcane. Expressing an interest in collaborating in this project, they offered land for trials under the project and usage of their distilleries for quantifying ethanol production.

Dr Peter Carberry, Deputy Director General - Research, ICRISAT, stressed on the need for researchers to join hands with the industry and policy makers to build viable value chains, and suggested using modelling tools for enhancing the physiology and genetic traits of sweet sorghum cultivars in the project.

The project was launched on 3 July at a meeting in ICRISAT represented by scientists and managers from the partner institutions.

For more on sweet sorghum [http://exploreit.icrisat.org/page/sweet_sorghum/682](http://exploreit.icrisat.org/page/sweet_sorghum/682)
Role of pulses in improving nutrition

To promote the uptake of pulses which play an important role in improving nutrition and is an important component of the economy of many Asian countries, a Regional Consultation was held recently.

Noted eminent scientist Prof MS Swaminathan in his inaugural address said, “This event is a curtain-raiser for the International Year of Pulses in 2016. Pulses are an important component of the diets of millions of people and play an important role in the economies of many Asian countries.”

Mr Hiroyuki Konuma, Assistant Director General/ Regional Representative, FAO Regional Office for Asia and the Pacific, highlighted the role of the Regional Consultation. “This Regional Consultation will help member countries in sharing knowledge of their respective countries in different fields in order to promote pulses in a sustainable manner.”

The consultation had six thematic presentations and brainstorming in four working groups namely 1) Policy, Strategy and Governance 2) Research, Extension and Outreach program, 3) Value Addition and Marketing and 4) Improved Nutrition through Pulses. Some of the draft recommendations of the working groups are:

- Leverage and strengthen the nutrition focus with inclusion of pulses in existing projects that have nutrition outcomes as their impact indicators.
- Incorporate pulses as an essential ingredient in national food security programs like mid-day meal scheme.
- Provide support for research on bio-fortification, limiting anti-nutrients and increasing bioavailability.
- Focus on post-harvest technology (storage, milling).
- Use ICT to facilitate access to information.
- Develop organized market chain/intelligence to overcome the challenge of thin and fragmented pulse markets.
- Assure realistic/competitive support price linked with government procurement programs, and provide institutional credit to pulse growers at low interest rate.
- Provide government policy support in terms of subsidy on pulse-specific inputs.
- Strengthen linkage between research and out-scaling.
- Encourage quality seed production by farmers/farmers’ association through informal systems in addition to formal system at village level.

Dr Rajeev Varshney, Research Program Director, Grain Legumes, ICRISAT, and co-organizer of the meeting, highlighted the role of partnership with Food and Agriculture Organization of the United Nations (FAO), International Centre for Agricultural Research in the Dry Areas (ICARDA) and national programs of Asia in enhancing productivity and production of pulses in Asia.

“It is time now for pulses breeding programs to embrace modern breeding methods to enhance genetic gains for improving crop productivity and eventually to help smallholder farmers to improve their livelihood,” he said.

The Regional Consultation on Promotion of Pulses for the Multiple Benefits in Asia was held during 29-30 June at Bangkok. The meeting brought senior officials from department of agriculture and research institutes of 15 different countries in addition to representatives of FAO, ICRISAT and ICARDA. The consultation was jointly organized by FAO, ICARDA and ICRISAT.

On the sidelines of the consultation, Dr Varshney also had discussions with Cooperative Legumes Asia Network (CLAN) Country Coordinators. Korea has offered to organize the next CLAN meeting in December. ICRISAT together with ICARDA and The World Vegetable Center (AVRDC) manages CLAN activities for enhancing partnership, research and development for legumes.
Agriculture booms in Madhya Pradesh, but farmers look for off-farm income

Madhya Pradesh saw the highest-ever agricultural growth rate of nearly 25% in 2013-14 as against the growth rates of 20% in the previous two years. The state which is the top producer of soybean, gram, pulses and oilseeds, has seen a 34% increase in the area of wheat, rice and soybean between 2004-05 and 2013-14. Despite this, many farmers are increasingly relying on off-farm income in addition to agriculture for enhancing their livelihoods.

The VDSA studies carried out in the two villages of Papda and Rampura Kalan in Raisen district of central Madhya Pradesh, showed that there is a reduction in fallow land during both kharif (rainy) and rabi (postrainy) seasons by about 25% over the last five years. The area under wheat and soybean has increased by 30% and 20% respectively, between 2009 and 2013, while the area under pigeonpea has reduced by 30% during the same period. Agriculture intensification is at a high pace in these villages, with 80% of the soybean and wheat in Papda village being harvested using machinery, allowing farmers to expand crop acreage.

Prices received by farmers in Papda and Rampura Kalan for their crops was tracked each season through VDSA surveys (Table 1). They show a significant increase in the price of soybean in 2012 and 2013.

Table 1: Peak season average harvest prices* of major crops received by farmers (Source: VDSA).

<table>
<thead>
<tr>
<th>Crop</th>
<th>Season</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
</tr>
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<tbody>
<tr>
<td></td>
<td></td>
<td>INR/ton (US$/ton)</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Wheat</td>
<td>April-May</td>
<td>11,500 (189)</td>
<td>11,600 (190)</td>
<td>13,700 (225)</td>
<td>15,700 (257)</td>
<td>14,300 (234)</td>
</tr>
<tr>
<td>Soybean</td>
<td>Sept-Oct</td>
<td>19,100 (313)</td>
<td>17,870 (293)</td>
<td>31,500 (516)</td>
<td>33,500 (548)</td>
<td></td>
</tr>
<tr>
<td>Paddy</td>
<td>Nov-Dec</td>
<td>24,200 (329)</td>
<td>27,000 (443)</td>
<td>27,800 (455)</td>
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</table>

*Prices are in current prices of the year with US$ prices converted in respective years.

Despite increasing income from agriculture in the last five years, farmers and farm laborers are increasingly getting a greater share of their annual income from non-farm sources. In 2013, households of small and marginal farmers made an average ₹ 5,000 (US$ 80) from crop cultivation and ₹ 21,000 (US$ 331) from non-farm work (Fig 1). Whereas an average household of large-and medium farmers in the two villages made ₹ 55,000 (US$ 900) from agriculture, while earning about ₹ 25,000 (US$ 416) from non-farm sector activities (Fig 2).

References

Agrarian Structural Changes in VDSA Villages in Madhya Pradesh
Madhya Pradesh Agriculture Economic Survey 2014
Empowering NARS partners for large-scale phenotyping data analysis

The experience of ICRISAT in handling and analysis of large-scale phenotyping data, obtained for a large-scale breeding related trials, was shared with the project partners during a one-day workshop organized at ICRISAT.

The project titled “Utilization of chickpea genome sequence for crop improvement” was sponsored by the Department of Agriculture & Cooperation (DAC), Ministry of Agriculture, Government of India, and the project partners are from 6 centers included Indian Institute of Pulses Research (IIPR), Kanpur; Rajasthan Agricultural Research Institute (RARI), Durgapura; Junagadh Agricultural University (JAU), Junagadh; RAK College of Agriculture (RAKCA), Sehore; Bidhan Chandra Krishi Viswavidyalaya (BCKV), Nadia and International Centre for Agricultural Research in the Dry Areas (ICARDA).

ICRISAT along with the partners, had in the crop season 2015, put in the fields across 6 locations for phenotyping, the global composite collection comprising of 3,000 accessions of chickpea including 700 accessions from ICARDA.

Dr David Bergvinson, Director General, ICRISAT, emphasized that “Data management, precision analysis and sharing is the key for the success of any experiment and the interdisciplinary partnership that this project has brought together is remarkable”.

The one-day data analysis workshop was held at ICRISAT India on 6 July.

This workshop is part of the CGIAR Research Program Grain Legumes.

Integrated Breeding Platform (IBP) workshop for NARS partners

A demonstration and awareness workshop on Breeding Management System (BMS) of Integrated Breeding Platform (IBP) for Grain Legumes was organized for National Agriculture Research System (NARS) partners.

BMS is a suite of interconnected software specifically designed to help breeders manage their research activities through all phases of their breeding program. BMS allows to search the germplasm and available studies in the database, visualize their pedigrees graphically, access historical performance and create custom germplasm lists for breeding programs. BMS also supports creation of experimental designs, generation of field maps, barcode labels, nurseries advancement, templates for handheld devices and basic statistical analysis. Steps in the breeding data management process, streamlining pedigree management, its curation and standardization were presented in the workshop.

“Modernization of breeding does not mean only using molecular markers in breeding programs. It also includes use of decision support and data management tools,” said Dr Rajeev Varshney, Research Program Director- Grain Legumes and Co-Coordinator of IBP Regional Hub Asia.

Dr Stefania Grando, Research Program Director- Dryland Cereals, Co-coordinator, IBP Regional Hub Asia, said, “Phenotyping in addition to genotyping is an important activity for modernization of breeding and we need to take care of all these activities in a precise manner.”

NARS partners present at the workshop were from Indian Institute of Pulses Research (IIPR), Kanpur; Indian Agricultural Research Institute (IARI), New Delhi; Directorate of Groundnut Research (DGR), Junagadh; Rajasthan Agricultural Research Institute (RARI), Durgapura; Junagadh Agricultural University (JAU), Junagadh; RAK College of Agriculture (RAKCA), Sehore; and Bidhan Chandra Krishi Viswavidyalaya (BCKV), Nadia, as well as participants from ICARDA.

The one-day program was conducted at ICRISAT India on 7 July and saw the presence of several other scientists from ICRISAT being part of the program.

This workshop is part of the CGIAR Research Programs Grain Legumes and Dryland Cereals.
Launching 100 Voices - The Future of Genomics

To capture the diversity of views across a single topic, ICRISAT launches the 100 Voices video series on topical issues. The first in the series is 'The Future of Genomics'. Views from more than 20 experts across 10 countries working on breeding and genomics in research institutions, private sector, the government, as well as NGOs is documented.

“Remember genomics is this field which is constantly changing. First there was just genomics and there was proteomics, transcriptomics and there is a world of omics coming, catabolomics, microbiomics, all of this is just information. Information we utilized. Constantly it allows you also to check your progress which is important.”

Dr Howard-Yana Shapiro
Mars Incorporated, USA

“I think genomics will be an important component of plant breeding and so I wouldn’t say genomics will lead the future. Genomics brings on board precision and speed. Conventional breeders will be very important even in the new revolution. We can’t just integrate genomics into plant breeding without seeing plant breeding as the key discipline that genomics is coming to facilitate”.

– Dr EY Danquah, University of Ghana, Ghana

“I think genomic tools are already helping now to get things very close to the field. And I would say within the next five years we should really have some varieties that have been developed or accelerated because of the utilization of high-end genomic tools.”

– Dr Appolinaire Dijkeng, ILRI, Kenya

“You need to have a foundation of phenotypic data and maybe over time as you learn more about the genomics you can lower the cost of your phenotyping programs. But you can’t pit these two against each other or the phenotyping may be overshadowed by the excitement of the new technology and I think that’s a risk.”

Dr Cindy Taylor Lawley
Illumina Inc., USA

Future of Genomics at ICRISAT

ICRISAT employs genomics technologies such as structural and functional genomics to identify and isolate genes for traits of interest associated with physiology, entomology and pathology to secure the accuracy of phenotyping and to progress toward trait dissection and gene function.

“ICRISAT is learning along with its partners, especially from the success of private sector which has used genomic tools extensively to accelerate genetic gains and integrate multiple traits of interest,” said Dr David Bergvinson, Director General, ICRISAT.

Re-sequencing its core genebank accession to obtain a much better understanding of diversity within the genebank, ICRISAT is also adopting bioinformatic tools and biometrics systems to provide the necessary links, and databases to support increased use of the genebank’s genetic diversity.

“ICRISAT’s roadmap is to acquire high throughput genotyping capacity that can serve the needs of several CGIAR centers, through a consortium. This will help to build sufficient demand and volume to effectively use such a facility. This would support forward breeding to increase genetic gains and better utilize genetic resources within staple food crops important to smallholder farmers and consumers in the developing world,” said Dr Bergvinson.

Many of ICRISAT’s mandate crops receive little attention in terms of research investment which makes it all the more important to efficiently apply genomic tools to improve genetic gains, nutrition and profitability of pigeonpea, chickpea, groundnut, sorghum, pearl and finger millets.

Dr Bergvinson stated that a major focus will be on building capacities and equipping breeders to apply modern breeding tools to accelerate genetic gains within ICRISAT’s mandate crops.
Welcome

Dr Felix Badolo, a Burkina Faso national, joined as Scientist - Agricultural Economics, on 1 July at ICRISAT-Mali. He holds a PhD in Agricultural Economics from University of Auvergne, France.

Most recently, he worked as Visiting Scientist - Agricultural Economics for the HOPE project at ICRISAT-Mali. Prior to joining ICRISAT, he worked as Research and Teaching Assistant in Economics at the University of Auvergne in Clermont-Ferrand (France), and as Consultant - Economist for the project “Settlement, Market and Food Security in West Africa” at the Organization for Economic and Cooperation Development (OECD) in Paris (France).

We welcome Dr Badolo and his family to Team ICRISAT and wish him all success.

Readers’ comments

It is a very astonishing fact that Bangladesh is moving out of agricultural activity. There are many parameters for this change. Basically the climate which is most unpredictable. No matter how best the forecast of weather is made it is always far from the actual. The farmer who keeps very high hopes often betrayed and driven into despair. The financially well off farmers also face this problem due to not synchronizing their agriculture activities with rains. The poor farmers take loans from either banks or moneylenders and find themselves in a most pathetic condition sometimes leading to suicides if the rains fail.

This is the reason for drifting away from agriculture not only in Bangladesh but in many of the Indian states. Its really great and amazing that many of the national and international organizations (eg; ICRISAT) are doing their best to elevate agriculture and show that this profession is quite reliable to make a living. The small farmers (around 5 acres and less than 10 acres) find life very miserable if they totally depend on agriculture. This is the fact of the matter in moving away from agriculture and have a negative opinion on agricultural activities. But the efforts of all the agencies, government and organisations is commendable. But to reach the needs of a small farmer is a long away.

– V Vijaya Kumar

Wonderful news on "boosting agriculture to achieve double digit growth" wherein ICRISAT is involved in enhancing farm productivity and income of farmers in the coastal agro-ecosystem of AP. The state of AP primarily endowed with rice-based cropping system has confronted unusual weather extremeness such as high rainfall, storms or extreme heat waves in the recent past. In recent times, the groundwater has depleted alarmingly due to the excessive digging of bore wells due to free power policy. There is a need to address the problems of farmers by involving all stakeholders including crop-based institutes of ICAR, SAUs in order to sustain farm productivity, maintain soil health with suitable crops and cropping pattern.

– Dr SS Rao, Principal Scientist (Crop Physiology), Principal Investigator (AICSIP-Physiology & Agronomy I/c) ICAR-Indian Institute of Millets Research