The Andhra Pradesh Government and ICRISAT heralded a new beginning for smallholder farmers, with the signing of a Memorandum of Agreement (MoA) for technical backstopping of the Andhra Pradesh Primary Sector Mission aimed to position the state among the best three performing states by 2022.

Popularly known as the “rice bowl of India”, Andhra Pradesh is currently challenged by rainfall deficit and the effects of global warming. To address these challenges, the state’s Primary Sector Mission seeks to (a) increase productivity; (b) mitigate the impact of drought through water conservation and micro-irrigation; (c) improve postharvest management; and (d) establish processing, value addition capacity and supply chain of identified crops.

Dr David Bergvinson, Director General, ICRISAT, met Mr N Chandrababu Naidu, Chief Minister of Andhra Pradesh on 17 January to discuss the new collaboration. In the course of the meeting, Mr Naidu emphasized the opportunities presented by new technologies to leapfrog to a new level of
ICRISAT to provide technical backstopping...from page 1

growth and benefit small and marginalized farmers. He spoke about launching the smart village campaign to provide wireless connectivity to farmers in the state.

Dr Bergvinson spoke about new ICT-mediated innovations to deliver agricultural innovations to stakeholders and expressed ICRISAT’s full support for the success of the Primary Sector Mission.

Technical backstopping will involve establishing pilot sites of learning in 13 districts of 10,000 ha each; upgrading soil analysis laboratories; technical support for planning; as well as adopting an Inclusive Market-Oriented Development (IMOD) strategy to benefit smallholder farmers through public-private partnerships; and promoting private investments in the state.

The strategy paper “Agricultural Transformation in Andhra Pradesh: Equitable, Scientific, Prosperous and Climate Smart” which was prepared jointly by ICRISAT and the Department of Agriculture, Government of Andhra Pradesh and released in October 2013, stresses the transformation from sectoral to holistic approach, subsistence to marketable surplus and profitability, and from vulnerability to sustainability using science-led development through a consortium approach. It also focuses on the need for upgrading delivery systems and agri-businesses through an effective governance and policy framework. The paper envisages bridging the large crop yield gaps, enhancing agriculture in the state through enabling policies, and promoting institutions for encouraging innovations in the area of crop production, value chain, market linkages and value additions.

Later in the day, Dr Bergvinson met Mr SP Tucker, Agricultural Production Commissioner and Special Chief Secretary (Planning), Government of Andhra Pradesh. Also present on this occasion were officials from the Department of Agriculture and ICRISAT representatives Dr SP Wani, Director, ICRISAT Development Center (IDC); Prof Rajesh Agrawal, Assistant Director General, Finance; and Dr KV Raju, Assistant Director, IDC.

The Primary Sector Mission Strategy paper prepared by the ICRISAT team can be accessed here:

Announcements

ICRISAT is holding its Global Planning meeting 2015, from 27-31 January at headquarters. The exercise is meant to confirm its strategy, re-affirm its culture and values, celebrate its achievements, endorse research plans, and discover new opportunities. The venue is the Academic Court.

On the occasion of ICRISAT’s Global Planning Meeting scheduled next week, all staff based at Patancheru and colleagues from ICRISAT locations are requested to join Director General Dr David Bergvinson at the Anniversary Lawns (near 205 cafeteria) at 08:15 hrs on Tuesday, 27 January. The brief gathering is meant to provide an opportunity to welcome Board Chair Dr Chandra Madramootoo and colleagues from all our locations in sub-Saharan Africa.
Promising results showing for heat-tolerant pearl millet breeding material

Heat Tolerant B-Composite (HTBC), one of the new breeding materials developed by ICRISAT involving recently identified heat-tolerant breeding lines in pearl millet, has shown extremely promising results.

This was revealed by Dr SK Gupta, Senior Scientist, Research Program-Dryland Cereals at a recent meeting of pearl millet breeders from six member companies of the ICRISAT-Pearl Millet Hybrid Parents Research Consortium (PMHPRC).

Very few breeding materials show good seed set under air temperatures above 42°C.

In the 2014 screening, the newly developed HTBC reported high seed set in the range of 57-94% (see table). Earlier too, 17 identified B-lines showed high seed set varying from 64.1-75.9%. It was also observed that the shuttle breeding approach has resulted in the development of new breeding lines with more than 70% seed set.

Pearl millet has recently emerged as a significant irrigated summer season cereal crop in north-western India. Since its flowering coincides with air temperatures of ≥40°C, there is poor seed setting and consequently poor grain yield in most of the available hybrids. Currently, very few hybrids have good seed setting under high temperature, when grown under well irrigated conditions, yielding about 4-5 tons of grain and 8-10 tons of dry fodder per hectare.

Moreover, the limited variability of adapted genetic material lays these hybrids susceptible to downy mildew disease.

<table>
<thead>
<tr>
<th>Breeding material</th>
<th>No of lines</th>
<th>Seed Set (SS) (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>B-lines</td>
<td>59</td>
<td>14 lines &gt; 70 SS</td>
</tr>
<tr>
<td>R-lines</td>
<td>20</td>
<td>7 lines &gt; 70 SS</td>
</tr>
<tr>
<td>S&lt;sub&gt;3&lt;/sub&gt; progenies derived through shuttle breeding</td>
<td>30</td>
<td>21 &gt; 70 SS</td>
</tr>
<tr>
<td>HTB-Composite</td>
<td>20 rows</td>
<td>57-94 SS</td>
</tr>
</tbody>
</table>

To address this problem, ICRISAT annually constitutes a nursery comprising of 100-200 pearl millet genotypes (hybrid parents, advanced lines, germplasm accessions and populations). The nursery is screened by seed company members of the Hybrid Parents Research Consortium, having test locations in the target ecology. For the summer of 2015, 150-180 lines will be sent for testing to six locations in Rajasthan, Gujarat and Uttar Pradesh.

The meeting held at ICRISAT headquarters on 16 January to review the 2014 trials, also saw ICRISAT scientists Drs DK Murthy and Piara Singh discuss crop simulation modeling-related research opportunities, while Rakesh Srivastava spoke on molecular approaches which can be integrated in this research.

For the journal article on this research, see [http://oar.icrisat.org/8447/](http://oar.icrisat.org/8447/)

For more information on pearl millet, EXPLOREit @ ICRISAT: [http://exploreit.icrisat.org/page/pearl_millet/680](http://exploreit.icrisat.org/page/pearl_millet/680)


**Investor:** Pearl Millet Hybrid Parents Research Consortium

This project is supported by the CGIAR Research Program on Dryland Cereals.
Value chain interventions benefit smallholder farmers in Ningi, Nigeria

ICRISAT is providing science-based support to the sorghum and groundnut value chains of the Federal Government of Nigeria’s Agricultural Transformation Agenda to address the country’s challenges of improving food security, alleviating poverty and safeguarding the environment. The interventions have been in the form of on-farm trials and demonstration of sorghum, groundnut and millet varieties and crop production practices as well as seed production with a large number of farmers in Ningi Local Government Area (LGA). This has led to the successful introduction, cultivation and adoption of dry-season groundnut for seed, grain and fodder.

These measures to improve the livelihoods of smallholder farmers in Ningi, Nigeria were recently commended when Honourable Abbas Saleh Balma, Chair, Ningi LGA, presented a letter of appreciation during his visit to the Institute’s Kano facility. He was accompanied by Alhaji Mohammed Kilishi Musa, district head of Ningi.

Groundnut farmers in Ningi showed a mean pod yield of 1.8 t/ha compared to the national average of 1.3 t/ha. Partial budgeting by one of the extension agents, Mr Muhammed Sadissu, showed that the farmers in Ningi obtained an average profit of N243,125/ha (US $1,500/ha) from sales of groundnut and haulms in May 2014. The farmers appreciated this impact on their livelihood and gave feedback to the leaders. Arrangements were then made for 150 farmers to produce foundation seed of groundnut under ICRISAT’s supervision for the forthcoming USAID-funded groundnut upscaling project.

The leaders who were received by Dr Hakeem A Ajeigbe, ICRISAT-Nigeria Country Representative; Dr Babu Motagi, groundnut breeder; and Dr Ignatius Angarawai, sorghum breeder, toured the center and drought screening facilities.

The activities of the Sorghum Value Chain and Groundnut Value Chain projects are supported by the CGIAR Research Program on Dryland Cereals and CGIAR Research Program on Grain Legumes.

For more information on Nigeria, EXPLOREit @ ICRISAT: http://exploreit.icrisat.org/page/nigeria/703

Reader’s comment

Glad to know that 40 varieties of chickpea have been released in India from ICRISAT breeding material. It is a great contribution to Indian agriculture, particularly in pulse breeding. There is plenty of scope to utilize ICRISAT’s collection of germplasm of its five mandate crops – sorghum, pearl millet, chickpea, pigeonpea and groundnut; and six small millets – finger millet, foxtail millet, little millet, kodo millet, proso millet and barnyard millet – for varietal improvement in Indian agricultural research stations. I suggest that more finger millet varieties be developed as it is one of the most important millet crops in the semi-arid tropics of India.

Dr P Gurumurthy, coordinator, District Agricultural Advisory & Transfer of Technology Centre, Vizianagaram, Andhra Pradesh
Demand-driven innovations emphasized to enhance oilseed crop productivity

P

roviding user-friendly technologies that farmers can easily adopt to maximize the production and productivity of oilseed crops was identified as a key area for future focus by Dr S Ayyappan, Director General, Indian Council of Agricultural Research (ICAR) and Secretary DARE, Government of India. Dr Ayyappan identified this priority in light of the need for demand-driven innovations to fight poverty, eradicate hunger and malnutrition, and provide environmentally sustainable solutions.

Dr Ayyappan was speaking at the inauguration of a two-day national seminar on technologies for enhancing oilseed production through the National Mission on Oilseeds and Oil Palm (NMOOP), which served as an effective platform for researchers and development officials to come together to share knowledge and experiences to enhance the production and productivity of oilseeds in India.

Mr K Madhusudhana Rao, Commissioner and Director of Agriculture, Government of Andhra Pradesh, emphasized the need to identify and be guided by commercial opportunities in the oilseeds sector.

Dr Ayyappan highlighted India’s role as a key player in the global oilseed scenario with about 12% of oilseeds area, 6% of vegetable oil production, 9% of total edible oils consumption and 14% of vegetable oil imports. He also underlined the importance of fostering collaboration with industry and health institutes to ensure beneficial effects of oilseed products on human and animal health.

Dr Ayyappan at the exhibition holding a packet of ICRISAT-bred groundnut variety ICGV 91114. Also seen is Dr S Ayyappan (2nd from right).

Dr David Bergvinson, Director General, ICRISAT, mentioned that of the nine oilseed crops (castor, groundnut, linseed, mustard, rapeseed, safflower, sesame, soybean, and sunflower) grown globally, groundnut production is the third largest worldwide. “ICRISAT and our national partners in Asia and sub-Saharan Africa will focus on inclusive market-oriented development of appropriate genetic and integrated crop management technologies to make groundnut more competitive and profitable to smallholder farmers. We will build a strong collaboration with ICAR institutions, presently working on six joint ICAR-ICRISAT collaborative partnership projects,” he said.

A crop cafeteria of annual oilseeds was inaugurated on the occasion, showcasing the latest improved varieties/hybrids of oilseed crops. This included ICRISAT-bred groundnut varieties such as ICGV 91114, released in three states of India – Andhra Pradesh,
Benefits of integrated watershed management highlighted on Farmers’ Day

Over 350 women and men farmers, officers of Karnataka State Department of Agriculture (KSDA), local leaders, NGO staff and partners participated in a Farmers’ Day held in Ukkali village in Vijayapura district of Karnataka, as part of an awareness building exercise on the benefits of watershed-based sustainable intensification in rainfed areas through integrated watershed management.

Interactive sessions and field visits were conducted to evaluate the benefits of technologies implemented so far, which include water conservation through groundwater recharging; farm ponds for harvesting runoff water; productivity enhancement through improved varieties; soil test-based balanced nutrition; and biomass generation for improving soil fertility. The watershed project initiated in March 2014 has adopted the consortium and convergence approach which involves partners, including the departments of agriculture, horticulture, forestry, other line departments, NGOs, farmer committees and farmers.

Mr M Thanveer and Mr Sanju Kishan, senior officials of the Power Grid Corporation of India Ltd (PGCI) pledged their commitment and support to taking the initiative forward to enhance system-level productivity and livelihoods while protecting the environment. Mr Raghavendarao Sudi of ICRISAT explained about the low-cost technologies for soil-crop-water management and their benefits.

The event was organized as part of a collaborative project between PGCI, KSDA and ICRISAT, under the CGIAR Research Program on Water, Land and Ecosystems.

For more information on watershed management EXPLOREit @ ICRISAT http://exploreit.icrisat.org/page/natural_resource_management/899/367

Demand-driven innovations emphasized...from page 5

Karnataka, Odisha; drought-tolerant variety ICGV 00350 released in Andhra Pradesh and Tamil Nadu; and another drought-tolerant variety ICGV 00351 released in Tamil Nadu, India. An exhibition of machinery and technologies to enhance production and productivity of oilseeds was also organized. ICRISAT exhibited pod and seed samples of improved groundnut varieties.

Dr Hari Upadhyaya, Director - Genebank, ICRISAT made a presentation on the global perspective of groundnut production, trade and utilization, wherein he informed that over the last three decades groundnut production had increased globally, coupled with increase in productivity in Asia and Africa. “Over the last two decades, there has been a decrease in area (30%) and production (10.4%) in India, but productivity has increased considerably (29%) due to adoption of improved cultivars and crop husbandry.

Emphasis is now being given to developing resources- and input-use efficient groundnut varieties with matching cropping duration and with appropriate seed quality traits,” Dr Upadhyaya said.

ICRISAT is using new approaches like marker-assisted selection, farmer participatory varietal selection, and strengthening of the seed sector to enhance the impact of improved varieties. Management strategies are being devised to maximize groundnut productivity and enhance the profitability of smallholder farmers even under resource-poor conditions of the semi-arid tropics.

The event was organized by the Department of Agriculture and Cooperation, Ministry of Agriculture, Government of India and the Directorate of Oilseeds Research, Hyderabad.

For more information on groundnut, EXPLOREit @ ICRISAT: http://exploreit.icrisat.org/page/groundnut/686
Call to enhance pigeonpea productivity to combat protein malnutrition in India

The urgent need to explore novel ways to enhance pigeonpea productivity through crop improvement was underlined at the Second International Conference on Bio-resource and Stress Management held in Hyderabad recently. Pigeonpea productivity has remained stagnant over the last few decades, thereby depriving the predominantly vegetarian population in India of a main source of protein.

Presenting a paper on “Advances in pigeonpea research”, ICRISAT’s pigeonpea breeder Dr CV Sameer Kumar highlighted the research being done in collaboration with the Indian Institute of Pulses Research, towards tackling this challenge. The joint areas of research include:

- Application of genome sequencing and genomic resources in crop improvement
- Development of Cytoplasmic Genic Male Sterile hybrids with 30-40% yield advantage over traditional varieties
- Development of photo-insensitive super-early maturing lines
- Introgression of cleistogamous flower structure to maintain genetic purity of elite lines
- Use of obcordate leaf shape as Naked-Eye Polymorphic marker to assess the genetic purity of hybrid parental lines
- Development of disease-resistant hybrids and elite breeding lines.

The conference organized by Ratikant Maiti Foundation (West Bengal), Professor Jayashankar Telangana State Agricultural University and Acharya NG Ranga Agricultural University, was attended by 700 delegates from around the world, with 300 oral presentations and 155 poster sessions on agriculture and allied fields.

Pigeonpea: India fact sheet

- Pigeonpea or red gram \([Cajanus cajan (L.) Millspaugh]\) is the second most important pulse crop next to chickpea, covering an area of around 4.42 m ha (occupying about 14.5% of area under pulses) and production of 2.86 MT (contributing to 16% of total pulse production) and productivity of about 707 kg/ha.
- It is an integral component in the country’s various agroecologies, and is mainly intercropped with cereals, pulses, oilseeds and millets.
- It is mainly consumed as dry split \(dal\).

For more information on pigeonpea, EXPLOREit @ ICRISAT:  [http://exploreit.icrisat.org/page/pigeonpea/687](http://exploreit.icrisat.org/page/pigeonpea/687)
Visitors’ log

On 13 January, a team from Sevita International, a Canadian company and Ruchi Soy Industries, Indore, India, visited ICRISAT. The team led by former ICRISAT chickpea breeder Dr Jagdish Kumar and currently Principal Soybean Breeder and Leader, Soyfood Program, India-Canada Joint Venture, Sevita International, Inkerman, Canada; Dr Akhilesh Sarraf, Director, Ruchi Hi Rich Seeds; and Dr David Hendrick, CEO and Chair, Sevita International, interacted with ICRISAT Director General Dr David Bergvinson and Deputy Director General- Research Dr Peter Carberry and scientists of ICRISAT. The team visited the various facilities and evinced special interest in the area of farm implements, chickpea and groundnut improvement, germplasm conservation and evaluation, insect pests and genomics.

Congratulations!

The Indian Society of Plant Genetic Resource has chosen Dr Hari Upadhyaya for the prestigious Dr Harbhajan Singh Award for the biennium 2013-14. The award recognizes his scientific excellence, leadership and outstanding contributions in the field of plant genetic resources.

New projects

Project title: Attributed Funding from Germany as a Contribution to the Genetic Resources Collections of ICRISAT for 2014

Principal Investigator: HD Upadhyaya

Investor: BMZ/GIZ

Aims:
Conservation, regeneration, characterization/evaluation of germplasm collections of sorghum, pearl millet, chickpea, pigeonpea, groundnut and small millets at ICRISAT-Patancheru, India and at the regional genebanks in Niamey-Niger; Nairobi-Kenya; and Bulawayo-Zimbabwe.

Project title: Sujala III – Providing Technical Assistance for Implementation of Component-2 of the KWDP-II in respect of capacity building for productivity enhancement in watersheds

Principal Investigator: SP Wani

Investor: Watershed Development Department, Government of Karnataka

Aims:
The project aims to strengthen science-based watershed management in the Integrated Watershed Management Programme (IWMP) by introducing innovations in the planning process through:

- Soil mapping and site-specific nutrient use for productivity enhancement
- Capacity strengthening of farmers and stakeholders through a formal training program on IWMP
- Facilitate exposure visits to site of learning watersheds in India and abroad (China, Thailand, Philippines, Ethiopia, Kenya, etc.).