



Photo: A Diamo, ICRISAT

Participants in a group discussion at the country strategy consultation meet at Mali.

ICRISAT's Mali country strategy to be aligned with country's value chain framework

Aligning the goals and objectives of the Mali country strategy in line with the value chain framework for the country was a major recommendation by stakeholders at the Mali consultation workshop. The strategy should also show the planned research and development interventions, input supplies, value addition and the existing as well as the potential new markets to increase the demand for dryland crops in Mali.

The participants agreed that the country strategy fits well with the national agricultural development policy and covers the main challenges identified as key aspects to reduce food insecurity and enhance productivity of sorghum, millet and groundnut value chains in Mali. However, they felt that the strategy puts too much emphasis on production aspects. The relation between different actors such as, major private agro-dealers and agri-food companies needs to be better described and the role they could play needed to be considered.

Other important recommendations:

- Implement Inclusive Market-Oriented Development (IMOD) strategy on a small scale in Mali as a pilot.

- Work with relevant national partners on enhancing the seed certification process in Mali to help release certified seeds to the market as quickly as possible.
- Involve other key players in the value chain including universities engaged in agricultural research and development.

The intended outcomes of the Mali strategy are to:

1. Facilitate technology dissemination and adaptation,
2. Strengthen sustainable seed system innovations that benefit all the value chain actors including producers, consumers, processors and marketers,
3. Enhance the efficiency and impact of crop breeding programs,
4. Improve resilience to climate change by building sustainable farming systems, and
5. Harness inclusive value chains for improved child nutrition and farm income.

The alignment of current and planned interventions with donor and national priorities were also discussed.

Mali country strategy... from page 1

Dr Ramadjita Tabo, Director, West and Central Africa, ICRISAT, and Dr Bouréma Dembélé, Director General, Institut d'Economie Rurale (IER) in their opening remarks stressed upon the importance of partnerships with all stakeholders to achieve agricultural development in Mali.

Two working groups were formed to deliberate on 'Alignment with national priorities, gaps, digital agriculture and beneficiaries' and 'Implementation, performance of evaluation strategy and resource mobilization'.

The main goal of the consultation was to provide a mechanism for stakeholders to review and make recommendations on the country strategy which would help draw up a list of prioritized intervention areas where ICRISAT can best leverage its expertise and resources to foster integrated market-oriented development of Mali agricultural sector with partner institutions.

The specific objectives of the meeting were to:

- Implement a participatory sharing of ICRISAT country strategy in Mali, especially around alignment to the national agenda and priority areas in three to five years;
- Discuss and design an implementation as well as a resource mobilization strategy;
- Secure commitment of national and international stakeholders to the implementation of the strategy.

"The overall goal of ICRISAT's research for development investments is to increase the productivity and profitability



of smallholder farmers by moving from subsistence farms to market-oriented producers while improving their resilience to climate change," said Dr Alphonse Singbo, Agricultural Economist, ICRISAT, as he presented the Mali country strategy.

The ICRISAT strategy development team will update the strategy document by addressing the concerns raised and incorporating recommendations made at the consultation before finalizing the strategy document. The document will serve as a guide for project and research plan development for priority areas.

About 40 partners in Mali from various organizations like research institutions, national and international NGOs, development agencies, parliament and donors attended the meeting which was held on 10 March. ■

Book on climate change challenges and adaptations launched at ICRISAT

"Climate Change Challenges and Adaptations at Farm-level – Case studies from Asia and Africa" emphasizes the



Dr Peter Carberry, Deputy Director General Research, ICRISAT, with the editors at the book launch.

importance of farm-level adaptation in mitigating the risks of climate change in the semi-arid tropics of Asia and Africa. It highlights the key issues that arise in farm-level impacts, adaptation and vulnerability, and discusses the methodological approaches undertaken in Asia and Africa. Systematically describing the perceptions and aspirations of the farmers themselves, the chapters identify constraints and opportunities. Furthermore, the book discusses livelihood strategies for poor farmers across Asia and Africa. Both quantitative and qualitative approaches are used to understand climate change impacts, adaptation options and vulnerability at crop and household level.

Eds: NP Singh, C Bantilan, K Byjesh and S Nedumaran

Published: 2016. CABI, ISBN 978-1-78064-463-9

<http://www.cabi.org/bookshop/book/9781780644639>

Modern genomic tools for crop improvement help farmers withstand shocks



At the project launch (L-R) Dr Krishnappa, Ms Ambika, Dr David Bergvinson, Director General, ICRISAT, Mr Narasimharaju, Dr Peter Carberry, Deputy Director General Research, and Dr Varshney.

Using modern genomic tools to improve dryland crops – finger millet, sorghum, chickpea, pigeonpea and groundnut – is a top priority for the Government of Karnataka (GoK), India. Through the GoK Genomics Project Consortium, new tools like molecular assisted breeding and genome mapping will be used for improving these crops to withstand drought, insects and diseases.

Mr Krishna Byre Gowda, Minister of Agriculture, GoK, in his address at the project launch said, “We are implementing this through a consortium which includes State Agricultural Universities (SAUs), the National Centre for Biological Sciences (NCBS) and ICRISAT. The existing high yielding cultivars preferred by farmers need to be improved further by using new techniques for incorporating drought tolerance as well as insect and disease tolerance to benefit the farmers.” In his absence the address was read out by Dr K Krishnappa, Resident Project Scientist, ICRISAT.

Work plans for each crop

At the project launch, scientists from the SAUs and ICRISAT came up with work plans for each crop.

Work in finger millet will focus on genome re-sequencing of 1,000 germplasm lines important to Karnataka. This project will work in collaboration with institutions in Kenya, USA and China and focus on developing new breeding lines with improved resistance to blast, drought and heat tolerance. Karnataka is the leading producer of finger millet, accounting for 58% of India’s production.

The focus for chickpea will be on developing improved lines with enhanced drought tolerance, Fusarium wilt resistance and molecular mapping of quantitative trait loci (QTLs) for dry root rot.

For pigeonpea the main concern is the emergence of new strains of wilt and sterility mosaic disease and susceptibility of resistant varieties to these new strains. Candidate genes for these diseases will be identified and improved high yielding varieties and hybrids developed through molecular breeding.

Groundnut is a major oil seed crop in Karnataka. High oleic oil has health benefits to consumers and also benefits industry as it enhances shelf life of products. Therefore, developing high oleic groundnut lines using genomics research is a priority. Three to four popular varieties of Karnataka will be improved for resistance to foliar fungal diseases, rust and late leaf spot.

For postrainy sorghum the emphasis is on developing cultivars with stabilized grain and fodder yield and tolerance to shoot fly and drought while diversifying the genetic base.

“To benefit the farmers of the state through the development and release of superior varieties, it is important to evaluate molecular breeding lines coming from earlier or ongoing projects of chickpea, pigeonpea, groundnut and sorghum in the state,” said Dr Rajeev Varshney, GoK Genomics Project Consortium Coordinator and Research Program Director Genetic Gains, ICRISAT.

The project launch, held on 18 March at ICRISAT-India, was attended by Mr Jaya Narasimharaju, Executive Director, Watershed Development Department, Ms Ambika, Department of Agriculture, and scientists from the SAUs and ICRISAT. ■

For list of project names and partners refer web edition.

The Digital Library project

GoK is developing a digital library that has real-time data on soil, water, weather, crops and the socio-economic conditions for the state of Karnataka. “This is an important project and can be a model for the entire country. For the library data we are mapping land for crop suitability,” said Mr Jaya Narasimharaju.

For the data on hydrology the Indian Institute of Science, Bengaluru, India, is assisting GoK. ICRISAT has helped with soil mapping and is also helping in developing a portal wherein any farmer or stakeholder can get information on any crop along with a cost benefit analysis. The information can also be accessed on a mobile. This will be a major activity undertaken by the consortium.

New projects

Improving Chickpea Adaptation to Environmental Challenges in Australia and India

Principal Investigator: Rajeev Varshney

Period: 2016-2019

Investor: Indo-Australian Biotechnology Fund (IABF), Department of Biotechnology, Government of India

Synopsis: Chickpea is one of the major pulses produced in both countries and contributes significantly as source of needed protein in vegetarian diets. However, there is a huge gap in supply and demand of chickpea due to limited supply. Chickpea production is hampered by several biotic and abiotic stresses. Drought, heat and salinity among abiotic and Ascochyta blight among biotic stresses are major production constraints. Therefore, development of improved cultivars with enhanced yield and resistance to biotic and abiotic stresses is quite essential. As part of several collaborative projects, ICRISAT has generated huge resources including molecular markers associated with drought and salinity tolerance, resistance to fusarium wilt (FW) and ascochyta blight (AB) in chickpea. The proposal plans to use generated genomic resources for undertaking both high-quality research as well as translate existing/to be generated genomics research in developing superior varieties/ lines of chickpea. This project aims to identify and deliver genetic improvements in chickpea that will support breeding for enhanced abiotic and biotic stress.

Integrated genomics-assisted breeding for efficient development of superior finger millet varieties for Karnataka

Principal Investigator: Stefania Grando

Period: 2016-2018

Investor: Govt of Karnataka

Synopsis: Finger millet is an important dryland crop. Major constraints to production include blast disease, shoot fly, stem borers and abiotic stress such as drought and low soil fertility. Moreover, finger millet is often cultivated in semi-arid areas where it is also affected by drought. The project will develop comprehensive genomic tools for finger millet in the form of a high-density finger millet haplotype map and identification of substantial number of loci potentially important for finger millet production and improvement. These loci linked to traits of interest (in form of associated genes/QTLs) will provide insights into the genetics and expression of traits for more accurate marker-assisted breeding.

Harnessing the power of genetics and genomics for enhancing rabi sorghum productivity in Karnataka state

Principal Investigator: Stefania Grando

Period: 2016-2018

Investor: Govt of Karnataka

Synopsis: The project envisages to use advanced sorghum genomic, genetic and crop management resources for enhancing *rabi* sorghum productivity in Karnataka State. Following are the project objectives:

- Accelerated breeding for development of shoot fly resistant and post-flowering drought tolerant *rabi* sorghum cultivars
- Development of genetically diverse locally adapted superior breeding and pre-breeding material for sustainable long term varietal development.
- Capacity building through targeted training programs for trait based genomics applications for varietal development.

Improving popular groundnut varieties for foliar disease resistance and high oleate trait using genomics-assisted breeding approach and multi-location testing of MABC lines for varietal release in Karnataka state of India

Principal Investigator: Manish Pandey

Period: 2016-2018

Investor: Govt of Karnataka

Synopsis: The project aims to develop resistance against late leaf spot and rust and improve oil quality in popular cultivars of Karnataka by developing and deploying user-friendly genetic markers. The development of such improved breeding lines upon release and cultivation will reduce dependence on costly and hazardous fungicides in groundnut and will also ensure availability of good quality oil for human consumption.

Genomics-assisted breeding for high yielding and climate resilient pigeonpea varieties/hybrids and promotion of best suitable cultivars for food and nutritional security in Karnataka state of India

Principal Investigator: Rachit Saxena

Period: 2016-2018

Investor: Govt of Karnataka

Synopsis: The project is aimed at utilizing the new genomics and molecular breeding approaches for developing high yielding and climate resilient pigeonpea cultivars in the region for providing breakthrough in the pigeonpea productivity. Resistance to Fusarium wilt and sterility mosaic disease have been targeted as priority traits that have direct relevance and are likely to have immediate impact on pigeonpea productivity in the state.

Development of climate resilient chickpea varieties using genomics-assisted breeding and promotion of best suitable cultivars for food and nutritional security in Karnataka state of India

Principal Investigator: Mahendar Thudi

Period: 2016-2018

Investor: Govt of Karnataka

Tropical Legumes III annual meet focuses on firming up country work plans

At the first annual meet of the Tropical Legumes III (TL III) the various partners presented revised country work plans along the three broad areas of: gender, breeding and seed systems, and monitoring, learning and evaluation.

Dr Jeff Ehlers, Senior Program Officer, Bill & Melinda Gates Foundation, stressed, "We need to understand the current status, identify gaps and move forward more collectively in order to achieve TL III objectives."

"Focus on farmers, building capacities and honor the urgency should be the three main focus areas," said Dr David Bergvinson, Director General, ICRISAT in his address to the participants. He also highlighted the need to leverage the potential of ICTs to connect farmers with markets and empower them with more informed and profitable farming practices.

Elaborate presentations were made by the country focal points, subject experts, objective leaders from ICRISAT and partner institutes:

International Centre for Tropical Agriculture (CIAT) and International Institute of Tropical Agriculture (IITA), and key representatives from national agricultural research systems partners from South Asia and Africa. The sessions during the two-day meeting were on: country work plans; monitoring, learning and evaluation; data management; integration of ICTs; TL III Global Measurement Framework; and seed production and adoption roadmaps.

TL III, being implemented across seven African countries and one country in Asia, is the third phase of a 10-year vision for enhancing productivity of legumes in the drought-prone areas of sub-Saharan Africa and South Asia through increasing availability and adoption of improved varieties and associated production packages.



On the dais (L-R) Dr Robin Buruchara, Regional Director for Africa, CIAT; Dr Bergvinson; Dr Ehlers; Dr Rajeev Varshney, Research Program Director Genetic Gains, ICRISAT and David Chikoye, Director R4D and Country Representative Zambia, IITA.

The meeting was attended by around 50 participants from partner institutes and Dr Ehlers in his concluding remarks urged the participants to take this project as an opportunity to strengthen their skills and build their capacities so they are self-sufficient and sustainable to address the challenges and issues in legume crops in their region and build a better and food secure future. ■

Project: Tropical Legumes III

Partners: International Centre for Tropical Agriculture (CIAT), International Institute of Tropical Agriculture (IITA), NARS partners and ICRISAT

Investor: Bill & Melinda Gates Foundation

CGIAR Research Program: Grain Legumes

New projects...from page 4

Synopsis: The project envisages to develop improved lines with enhanced resistance to both drought and Fusarium wilt and identify genomic regions for dry root rot resistance. It will utilize the available genomic tools (mainly genome sequence) for identification of molecular markers for mapping the QTL regions for drought tolerance as well as Fusarium wilt resistance and identify candidate genes that can be used for cloning for trait improvement.

In addition it is envisaged that by the end of the project period about 50-60 % chickpea production area will be grown with improved chickpea cultivars.

Malawi Seed Industry Development Project Phase II

Principal Investigator: Patrick Okori

Period: 2016-2020

Investor: Irish Aid

Synopsis: The purpose of this project is to improve legume and cereal seed systems and complementary agricultural innovations to catalyse productivity improvement and associated social benefits of improved food, nutrition and income security to smallholder farmers. The project will scale up production and delivery of improved innovations of common bean, groundnut, pigeonpea, sorghum, millet and rice. The project targets to reach 100,000 households.

New publications

An integrated approach to maintaining cereal productivity under climate change.

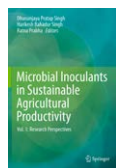
Authors: Reynolds PW, Quilligan E, Aggarwal PK, Bansal KC, Cavalieri AJ, Chapman SC, Chapotin SM, Datta SK, Duveiller E, Gill KS, Jagadish KSV, Joshi AK, Koehler AK, Kosina P, Krishnan S, Lafitte R, Mahala RS, Muthurajan R, Paterson AH, Prasanna BM, Rakshit S, Rosegrant MW, Sharma I, Singh RP, Sivasankar S, Vadez V, Valluru R, Vara Prasad PV and Yadav OP

Published: 2016. *Global Food Security*, 08: 09-18. ISSN 2211-9124

Abstract: Wheat, rice, maize, pearl millet, and sorghum provide over half of the world's food calories. To maintain global food security, with the added challenge of climate change, there is an increasing need to exploit existing genetic variability and develop cultivars with superior genetic yield potential and stress adaptation. The opportunity to share knowledge between crops and identify priority traits for future research can be exploited to increase breeding impacts and assist in identifying the genetic loci that control adaptation. A more internationally coordinated approach to crop phenotyping and modeling, combined with effective sharing of knowledge, facilities, and data, will boost the cost effectiveness and facilitate genetic gains of all staple crops, with likely spill over to more neglected crops.

<http://oar.icrisat.org/9373/>

A Renaissance in Plant Growth-Promoting and Biocontrol Agents by Endophytes.



Authors: Vijayabharathi R, Sathya A and Gopalakrishnan S

Published: 2016. In: *Microbial Inoculants in Sustainable Agricultural Productivity: Research Perspectives*. Springer India, India, pp. 37-60.

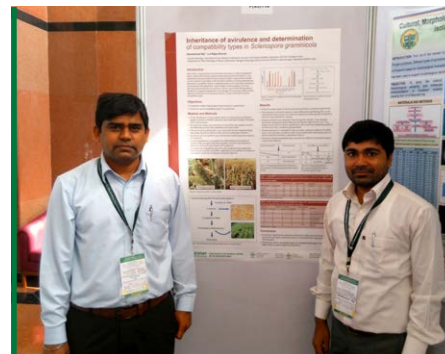
ISBN 978-81-322-2645-1

Abstract: Endophytes are the microorganisms which colonize the internal tissue of host plants without causing any damage to the colonized plant. The beneficial role of endophytic organisms has dramatically documented worldwide in recent years. Endophytes promote plant growth and yield, remove contaminants from soil, and provide soil nutrients via phosphate solubilization/nitrogen fixation. The capacity of endophytes on abundant production of bioactive compounds against array of phytopathogens makes them a suitable platform for biocontrol explorations. Endophytes have unique interaction with their host plants and play an important role in induced systemic resistance or biological control of phytopathogens. This trait also benefits in promoting plant growth either directly or indirectly. Plant growth promotion and biocontrol are the two sturdy areas for sustainable agriculture where endophytes are the key players with their broad range of beneficial activities. The coexistence of endophytes and plants has been exploited recently in both of these arenas which are explored in this chapter.

<http://oar.icrisat.org/9374/>

Award

“Inheritance of avirulence and determination of compatibility types in *Sclerospora graminicola*” research paper, authored by Chandramani Raj and Rajan Sharma, Cereals Pathology, Integrated Crop Management, Research Program Asia, ICRISAT, has been awarded First Prize in poster presentation category. The poster was presented at the 6th International Conference on Plant, Pathogens and People in the Technical Session “Population genetics and pathogen diversity” organized by Indian Phytopathological Society at New Delhi, India during 23-27 Feb, 2016.



Reader's comment

I do agree with Prof Gowda on the issue of youth involvement in Agriculture. Youth make up a huge percentage of the population of Kenya, and for us to tap into their energy, there is need to mechanize agriculture at the production level, where farmers go through a lot of drudgery to produce the little they do. This could attract the youth to get involved. Also agriculture should be economically viable. There is need to go beyond the subsistence level of agriculture in order to benefit from

advancement in science, use of improved crop varieties, better agronomic practices, storage and intra/inter-continental trade arrangements in order to deal with market glut. Unless we relook at some of these things, breaking the yield gap and other objectives will remain a boardroom affair.

Dr Charles Mutinda
Principal Maize Breeder KALRO Embu.