New approaches and priority international investments in four areas have been agreed upon after a series of strategy meetings between the Ethiopian Institute of Agricultural Research (EIAR) and ICRISAT.

The four areas with greatest opportunities identified are:

- **Intensification of legumes for better human and environmental health**
  Research priorities will focus on (i) developing drought-tolerant chickpea varieties that are resistant to fusarium wilt and ascochyta blight; (ii) identifying new varieties of pigeonpea that can be intercropped with sorghum and maize; (iii) identifying new markets; and (iv) addressing aflatoxin contamination of groundnuts.

- **Expanding cereal production by promoting the industrial potential of sorghum and other millets, including teff**
  Research to identify better varieties to cope with drought and *Striga*. The focus will be on teff, a nutritious millet and a traditional food in the Ethiopian diet. The rich germplasm and knowledge ICRISAT has on millets can be capitalized for teff development, especially the problem of lodging – where the stalk grows too long and bends over even dislodging the roots.
Priority investments set for agriculture …from page 1

- **Scaling-up of watershed management for more intensive agriculture**

This has been prompted by the success of the watershed model in Woreillu district of northeastern Ethiopia. The area has become more profitable and resilient through community driven collective action to build water harvesting structures and terraces to hold the soils, establishing community rules on livestock movements and bringing in new crops and agricultural practices.

- **New approaches to help farmers manage climate variability**

The approach goes beyond introducing climate smart agricultural practices like water use efficiency and drought tolerant crops, to having continual weather information available to farmers and continual planning and adapting of farming decisions accordingly.

> “Ethiopia is a priority country for ICRISAT due to the government’s focus on food and nutrition security and recognition of the important role agriculture can play in the country’s development. The government’s approach to partnership to capitalize on the opportunities will be the key to success.”

*Dr Chandra Madramootoo  
ICRISAT Governing Board Chair*

> “The identified opportunities can only be tapped through partnership at all levels of the value chain and making sure each step on this vertical chain has what it needs to act.”

*Dr Fentahun Mengistu  
Director General of EIAR*

“"We need to bring in new innovations and skills to capitalize on these opportunities. For long-term sustainability of these efforts, agribusiness incubators are important for building entrepreneurial skills and capacity in Ethiopia. ICRISAT has experience in setting up agribusiness incubators throughout India and now in other parts of Africa. South-south collaborations between India and Africa can accelerate these initiatives. It will also be important to involve women and youth as entrepreneurs and seeing agriculture as a viable and exciting business opportunity with the adoption of new technologies and leveraging ICT tools to support market integration,” emphasized Dr David Bergvinson, ICRISAT Director General.

These four areas call for demand driven agriculture, and taking the demands of farmers and the market into account in order to prioritize research investments and capitalize on domestic as well as export markets.

These new investments were announced in Ethiopia during the ICRISAT Governing Board meeting held at Addis Ababa on 24 April.

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**Farewell to Governing Board member Gry Synnevag**

The ICRISAT Governing Board recognized their tremendous debt of gratitude to Board Member Dr Gry Synnevag. She leaves behind a legacy with her contribution and focus on issues of gender and inclusivity. She encouraged and advised on taking research results out to smallholder farmers and factoring in their views on adoption of technology. She was a strong supporter for climate-smart agriculture and more.
DG on his first 100 days in office

The highlight of the recent ICRISAT Governing Board meeting was review of the first 100 days in office of the Director General, Dr David Bergvinson. Some of the priority areas presented by Dr Bergvinson included:

1) Developing country strategies based on an inclusive value chain approach
2) Quality of science and impacts which will include a review of every science area
3) Building better working relationships in host countries
4) Change management across all of ICRISAT offices using the McKinsey 7S framework: Structure, Staff, Style (how we engage with each other), Strategy, Systems, Skills and Superordinate goals.
5) Review and updating of all ICRISAT policies and processes
6) Modernization of systems
7) New fundraising approaches and integrating communications into the new strategies
8) Working within the CGIAR - implementation of CGIAR Research Programs and representation of ICRISAT at CGIAR meetings.

Field visits of crop research work in Ethiopia

Coping with Striga and drought in sorghum

Striga and drought are the two major constraints that sorghum farmers are struggling to cope with. While there are several farmer-preferred improved varieties and hybrids, their adoption by farmers is low due to lack of resistance to these constraints. In contrast, there are many landraces and wild sorghum varieties which are resistant to Striga and also moisture stress.
The trials in Ethiopia are an attempt to introduce *Striga* and drought tolerant traits into high-yielding varieties and hybrids through introgression of wild sorghum and landraces with resistance/tolerance genes. The trial involves four varieties and four hybrids with farmer-preferred traits and 40 wild sorghum varieties selected from a collection of 5,100 accessions and 16 landraces from Ethiopia and Sudan. Other trials include selection for dual purpose sweet sorghum and high lysine sorghum with non-shriveling property. Available sweet sorghum varieties are not good for grain and high lysine sorghum varieties suffer from shriveling when dry and hence have low marketability.

**Chickpea – finding varieties resistant to both blight and wilt**

Field trials to select for blight resistant chickpea varieties that are also resistant to wilt are starting to show promise in Ethiopia.

Ascochyta blight and fusarium wilt can cause up to 100% yield losses. Most ICRISAT-derived chickpea varieties are resistant to fusarium wilt and some have combined resistance to both the diseases. More than 90% of chickpea produced in Ethiopia is of *desi* type and varieties with high levels of resistance to ascochyta blight are not available in Eastern and Southern Africa. Therefore, farmers are very vulnerable to blight outbreak, leading to pesticide abuse, increased cost of production and health and environmental hazards.

The chickpea research field at the Debre Zeit Agricultural Research Center (DZARC) showcased several sets of screening trials. One was a set of chickpea lines which were screened and selected for blight resistance during the main season (September 2014 – January 2015) at blight hotspots of Minjar, Dhera and Alem Tena in the Central Rift Valley of Ethiopia. They are currently being screened (off-season trial) for fusarium wilt resistance at the sick plot in DZARC. Another set of chickpea germplasm is being screened for fusarium wilt resistance during this off-season ahead of further screening at hotspot areas for ascochyta blight during the coming main cropping season. One more set of trials are $F_4$ segregation populations sourced from the International Centre for Agricultural Research in the Dry Areas (ICARDA).

**A field visit to chickpea experimental fields.**
Tapping export markets through joint venture and latest technology

The ICRISAT Governing Board also met with a legume processor - Agricultural Commodity Supplies (ACOS) Ethiopia. ACOS is a joint venture, between ACOS Spa (an Italian company) and Ethiopian investors, established in 2005. Technology is key to the success of ACOS. The set-up includes an X-ray machine to detect foreign materials, a high-tech optical selector, conveyor belts for handpicking and six steel silos of 1,000 tons capacity.

In 2013-14, ACOS Ethiopia managed to export close to 27,000 MT of various types of dry pulses, mainly to the European canning market. It employs about 350 people. Navy pea beans, (white pea beans), small red beans, kidney beans, creamy beans, chickpeas and sesame seeds constitute major products.

Hearing first hand from partners and stakeholders

The ICRISAT Governing Board met with stakeholders and partners to hear feedback on their challenges and priorities. Participants included representatives of farmers, extension and developmental agents and private sector that included seed producers, processors and exporters.

In Ethiopia, ICRISAT is working with a range of stakeholders that includes farmers, developmental agents and private enterprises besides researchers to ensure that research responds to real problems and also to make sure that the benefits of research reach the smallholder farmer.

“Introducing chickpea and continued improved varieties have been key to my income. I also have a diverse farm with wheat, cotton, hens for eggs and meat, and cattle for meat and milk as well as chickpea. There are no women’s groups and all my children are at school or work. So I manage the farm on my own and with laborers I employ. My challenges now are environmental challenges like waterlogging, drought and erratic rain, as well as changing market prices.”

Ms Temegnush Dhabi
Farmer, Ethiopia

“Farming is physically hard, so my kids do not want to be farmers. The most important development I would like is to see mechanization. I don’t want my kids to have to work like me.”

Mr Bedelu Mamo
Farmer, Ethiopia

“I started with just seven farmers – selecting the best farmers that already had good agronomic practices. They adopted chickpea and now within six years we have 98% of farmers adopting chickpea. Most important to upscale were demonstrations, capacity building of farming practices and the farmer-to-farmer credit system.”

Ms Abaynesh Shega
Government worker, Ethiopia
Ethiopia emphasizes on development of drylands

Development of dry lowlands for future food security in Ethiopia and the role ICRISAT can play was the focus of discussions between the Honorable State Minister of Agriculture Dr Wondirad Mandefro and Dr Chandra Madramootoo, ICRISAT Governing Board Chair and Dr David Bergvinson, Director General, ICRISAT.

Some of the key issues discussed were:

- Combating moisture stress and land degradation with the aid of innovations/new technologies in water management to achieve stability and sustainable intensification of drylands/lowlands
- Enhancing adoption of improved varieties of sorghum by facilitating Striga management and scaling up of improved varieties
- Improving the productivity of livestock with the use of sorghum as fodder.
- Strengthening market linkages. Markets cannot be created after production but need to be considered early during the interventions.

The Honorable Minister appreciated the value chain approach that ICRISAT is adopting in preparing the country strategy. Value addition, south-south collaboration (business incubators), engaging rural youth, creating business models were also emphasized as the key areas of their progress. He agreed to send a delegation to India to get a firsthand view of the collaboration that ICRISAT has with various state governments and possibly accompany the team.

Elaborating on Ethiopia’s initiatives in agriculture, the Honorable Minister highlighted the achievement in adopting balanced fertilizer application based on soil testing. This was through a nationwide campaign at the woreda (district) level and reduced the dependence on DAP fertilizer. About 25 extension officers per woreda were trained and each of them in turn worked with five progressive farmers and helped in scaling up this technology to cover large areas within one year of operation.

He said that the country has made massive investments in infrastructure which is an important first step in creating sustainable market opportunities to smallholder farmers and the nation has a good extension system and requires further strengthening through capacity building.

The Honorable Minister welcomed the opening of an ICRISAT office in Ethiopia as a first step and said that strengthening it to meet the national needs is the next important step.
Meetings with partners:

**GIZ:** Officials from Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ), Dr Axel Klaphake, Country Director and Dr Johannes Schoeneberger, Sustainable Land Management Program Manager, spoke of the potential of ICRISAT’s various programs to bolster their work in supporting three of the Government of Ethiopia’s flagship areas – Sustainable Land Management, Improving Resilience to Drought and Agricultural Growth Program.

Under sustainable land management program, the focus is on watershed management. This includes rehabilitation of hillsides followed by soil fertility/soil health management through crop rotation and intercropping and use of organics. Teff is an important crop and rotation with chickpea will be an important intervention since chickpea can grow on residual moisture after the harvest of teff. Livestock integration through improved fodder and feed is another key component of this flagship. This is a multi-donor initiative to which GIZ is one of the major contributors.

The drought resilience flagship focuses on transforming pastoralists into agro-pastoralists. Use of legumes and sorghum along with water management are important components of this flagship.

The agricultural growth program flagship aims to create agricultural innovation centers focusing on strengthening wheat and faba bean value chains. Mechanization is a key component of this program. ICRISAT’s incubator program has a good potential to contribute to this flagship.

ICRISAT’s experiences in watershed management, research in millets and legumes and setting up agribusiness incubators are considered important inputs to further strengthen the flagships. It was agreed that the ICRISAT-Ethiopia office will hold further discussions to identify areas for collaborative work.

**USAID Ethiopia:** In a meeting with USAID officials – Mr Dennis Weller, Mission Director and Mr Gary Robbins, Office Chief, Economic Growth and Transformation – Dr Bergvinson was briefed on USAID’s major program in Ethiopia — Feed the Future — whose performance indicators include reduction in poverty and improvement in nutrition. The underperformance of chickpea value chain when compared to other value chains such as maize and wheat, despite the growing demand in domestic and export markets, was one of the issues discussed.

**Canada Cooperation:** Ms Abebech Assefa, Counsellor (Development), Team leader, Food Security and Agricultural Growth and Etenesh Bekele, Agricultural Growth Advisor, spoke of the organization’s support to three of the Government of Ethiopia’s flagship areas – Productive Safety Net Program, Agricultural Growth Program (AGP) and Sustainable Land Management Program. Most of them are multi-donor funded projects to which Canada is contributing.

She suggested that ICRISAT in collaboration with EIAR can make valuable contributions to AGP. She said that the next stage of AGP is laying greater emphasis on nutrition; sustainable intensification through crop rotation and intercropping; and climate-smart agriculture.
Presentations by partners

**Dr Fentahun Mengistu**, Director General, EIAR, made a presentation on meeting current and future challenges through partnership with ICRISAT. Dr Fentahun highlighted the achievements and issues of the four-decade old EIAR-ICRISAT collaboration. Among the achievements highlighted by Dr Fentahun are development of improved sorghum, chickpea and millet varieties as well as hybrids and malt varieties, leading to substantial contribution to Ethiopian agricultural development and strengthening capacity of the national research system. As a way forward, Dr Fentahun suggested greater collaboration to create climate resilient dryland systems by addressing the key problems facing the country in land and water management, water productivity, sustainable farming systems, commercialization and value addition, mechanization and promoting legumes especially pigeonpea, mung bean and groundnut. Considering the importance of teff in the national diet and nutrition, he also sought collaborative work to address the key constraints that teff farmers are facing that include low productivity, lodging, shattering and seed size.

**Dr Olani Wirtu**, Program Director, Agribusiness and Marketing Management, International Development Enterprises, Ethiopia, presented the achievements and impacts of the collaborative work on sustainable intensification of smallholder farming systems. The focus of the work is on addressing important constraints that include frequent crop failure, use of low productive traditional farming practices, high runoff and land degradation and lack of awareness about improved farming practices. These are addressed by implementing *in-situ* water conservation measures through bunding and trenching, rainwater harvesting and production of vegetables and high value crops, drip irrigation and other production technologies for efficient use of water, intensification of the cropping systems through intercropping with pigeonpea and improved haricot beans and establishing community institutions for sustainability. These interventions resulted in changing the attitude of farmers towards agriculture to consider it more as a business than subsistence, livelihood diversification, enhanced food security and greater capacity to adopt and benefit from improved management practices.

**Dr Asmare Dejen**, Vice President, Research and Community Service, Wollo University, Ethiopia, is collaborating with ICRISAT in the area of integrated watershed management aimed at arresting degradation and conserving resources and enhancing productivity and income of smallholder farmers. In addition to natural resource management, the university is actively involved in crop improvement work on sorghum, wheat and chickpea and pest management especially stem borer in sorghum. The collaborative work with ICRISAT has resulted in developing a model watershed by rehabilitating degraded lands and introducing improved crop varieties and livestock breeds; harvesting and utilizing rainwater. Mobilizing communities and involving them in planning and managing the interventions has made a significant contribution to successful transformation of heavily degraded watersheds into productive resources.
Collaborations with Africa in the area of agricultural modernization and mechanization were discussed between HE Sanjay Verma, Indian Ambassador to the Federal Democratic Republic of Ethiopia and HE Tumusiime Rhoda Peace, Commissioner for Rural Economy and Agriculture at the African Union Commission. They also agreed to enhance collaboration between the African Union (AU) Commission and ICRISAT. HE Sanjay Varma is also Permanent Representative to the AU and the United Nations Economic Commission for Africa.

The AU Commissioner lauded the advances that India had made in manufacturing and applying agricultural technology and called for a sharing of that experience, expertise and technology and innovation.

They discussed issues within the context of Africa-India Partnership as part of the South-South Cooperation for Development especially in view of the Africa-India Summit of Heads of State and Government due in October this year in New Delhi. Prior to that, two technical missions from India will visit the African Union Commission to work out details to include in the Joint Declaration and Action Plan for consideration and eventual adoption by the Summit.

They also reviewed the progress in taking forward the agricultural science farms being established in different regions of Africa under the Africa-India Partnership.

Breeding Management System demo for scientists

A demo-workshop of the Breeding Management System (BMS) software was held at ICRISAT-India on 21 April.

BMS is an inter-connected software designed for the daily data management requirements of breeders through all phases of their programs.

The BMS empowers users to search germplasm and studies from the database, visualize their pedigrees in a graphical manner, access historical performance and create custom germplasm lists for breeding programs. BMS also supports creation of experimental designs, generation of field maps, bar code labels, nurseries advancement, templates for handheld devices and basic statistical analysis.

All breeding programs were provided access to the recently-developed BMS cloud. All data is secured by firewalls and regular backups. The workshop ended with a proposal to use the BMS for few selected trials of each breeding program from this season. Breeders agreed to explore on standardization of pedigree management and organize a group meeting for deciding further course of action.

Around 23 scientists, technicians and scholars from ICRISAT Research Program on Dryland Cereals attended the event.

The workshop was conducted by Dr Abhishek Rathore, Mr Praveen Reddy and Ms Sravani Manna.
Turning agricultural waste to renewable energy

Managing agricultural wastes in an environment-friendly way is a critical need now and more so in the future. Spectrum Renewable Energy Limited (SREL), an incubatee of the ICRISAT Agri-Business Incubation Program (ABI), is turning agricultural waste into useful products like Compressed BioGas (CBG), organic manure and automotive fuel.

SREL converts sugarcane waste called ‘press mud’ (filter cake) into renewable CBG and organic manure/soil conditioner. Dr AV Mohan Rao, Founder and CEO, SREL, said, “Biogas plants have huge potential to produce clean fuel from agricultural organic waste. These initiatives hold the key to energy security and have the capacity to reduce the demand for electric power, consumption of chemical fertilizers and also reduce global warming. They can facilitate the replacement of fossil fuels while simultaneously making organic fertilizers available to the local farmers.”

ABI helped SREL commercialize this technology besides providing technical and business consultancy, facilitation of product enrichment, business development, and networking opportunities with agribusiness experts, corporate entities and investors.

“SREL’s aim is to develop self-sustained rural enterprises and decentralized energy systems based on CBG to make poor farmers and rural areas economically developed/competitive in all respects. This initiative has further helped the farmers with access to markets, contract farming and also strongly supports ICRISAT’s mandate of empowering smallholder farmers through sustainable agriculture,” said Mr SM Karuppanchettty, COO, ICRISAT-Agri-Business Incubation Program, which is part of the ICRISAT Agribusiness and Innovation Platform (AIP).

The company runs its large-scale biogas generation and bottling project at Kodoli, near Kolhapur, Maharashtra, India, which can handle 100 tonnes of press-mud, producing about 7,000 kg of compressed biogas with high methane content and 30 tonnes of organic manure daily.

The product awaits necessary approvals from the Ministry of Road Transport and Highways and other relevant agencies for use as transportation fuel.
A large proportion of farmers are relying on combine harvesters for completing farm operations in time, reducing their reliance on labor and the risk of crop damage due to uncertain weather.

An ICRISAT-VDSA study in two villages, Akola district in Maharashtra and Raisen district in Madhya Pradesh, investigated the extent of use of combine harvester for wheat and soybean, and compared the costs and returns of manual versus mechanical harvesting.

Kanzara village in Maharashtra has seen a fluctuating and increasing trend of wheat acreage, and a steep growth in the use of combine harvesters from 20% of the 80 ha grown in 2006 to 90-95% of 325 ha crop grown in 2013-14.

“While the net financial benefits of using the harvesters are low, the farmers want the harvesters for timely harvesting so that they can grow next season’s crop in time,” said Dr Madhusudan Bhattarai, Principal Scientist-Economics, Markets, Institutions and Policies, ICRISAT.

“Peak season labor scarcity intensifies when all farmers in a village grow the same crops, such as soybean or wheat, as they need to harvest and thresh the crops at almost the same time. If the crop harvest is delayed, farmers can face loss, due to shattering of soybean pods, or the risk of crop damage by untimely rainfall,” said Dr Bhattarai.

Mechanical harvesting and threshing an acre of wheat is done in one hour (or 2.5 hours/ha), compared to more than 15 labor days spread over two weeks (or 38 days/ha) if done manually. In return, farmers pay a rental charge for the machinery, lose 2-5% of the grain and the opportunity cost of the straw - which cannot be recovered when using a combine harvester.

In Papda village, Raisen district of Madhya Pradesh, mechanized harvesting provided a net benefit to the farmers of ₹ 236/acre (US$10/ha) for soybean and ₹ 330/acre (US$14/ha) for wheat (see figure). The farmers paid ₹ 1,300-1,400/acre (US$54-56/ha) for renting a harvester.

**Local trend of mechanization**

Mechanization in Kinkhed village, Maharashtra, started in 1982, with a diesel and power thresher used for wheat and sorghum. From 1985 the machine was rented for threshing safflower for ₹ 300/acre (US$30/ha in 1985 exchange rate). In 2007, as plenty of canal water became available, the area under wheat in *rabi* (post-rainy) season and soybean in *kharif* (rainy) began to increase. In 2007, wheat was cultivated in 550 acres (220 ha), and with increasing scarcity of labor, two to three combine harvester-threshers were brought from Punjab to harvest about 400 acres (160 ha). The harvesters were rented at ₹ 700-800/acre (US$18-20/ha in 2007 exchange rate). In 2013, the farmers grew 700 acres (280 ha) of wheat in *rabi*, with 1,000 acres (400 ha) of soybeans in *kharif*, which were harvested mechanically at a cost of ₹ 1,000-1,100/acre (US$42-46/ha).

Presently three combine threshers are operating at the village and district level. Development of the rental market has provided benefits to a large number of smallholder farmers, who could not otherwise access this expensive machinery.
How can precious soils be managed in a sustainable manner? Can we reduce runoff and further land degradation while enhancing yields? Read about these and more in our International Year of Soils page. 

http://www.icrisat.org/icrisat-soil-year.htm

In collaboration with partners and investors, ICRISAT has been working in the drylands of West and Central Africa to alleviate poverty, improve nutrition and link smallholder farmers to markets. To highlight the collaborative efforts in the region and in line with ICRISAT’s increased focus on Africa we present a collection of articles, published in Happenings, pertinent to West and Central Africa. Through this quarterly French edition we hope to reach out and to highlight the work of our partners and donors in the region. Read here http://www.icrisat.org/icrisat-happenings-French.htm

Readers’ comments

I find the causes of extreme poverty of small farmers in the Sahel are deep. The solution for me is this:

- Provide an opportunity to farmer groups organized around the production chains and to support them financially
- Invite the governments of countries to develop road networks in the crop area to facilitate the flow of agricultural products through trade (rural markets) accessible. This will enable farmers to remain in the countryside and live from their production. Currently more and more farmers leave agriculture to come in the cities why? Because they are not able to live from their own farm work. .
- Make or decentralize participatory research and the farmers will be partners in research, not subjects of research.

Dr Kouressy Momoutou, Agrophysioliste breeder

Indeed, development-oriented organizations with ICRISAT as the lead must continue working collectively on a mission for a common purpose: free the small farmers from abject poverty and help create a world where people have better health through safe and nutritious food.

Dr Gilda Victoria B Jacalan, Director, University Public Affairs Office, Benguet State University

Farewell

Dr N Nagaraj, Principal Scientist, Economics, Markets, Institutions and Policies, Patancheru, India, concludes his assignment with ICRISAT on 30 April, after over four years of valuable and dedicated service.

We wish him all success in his future endeavors.