

ICRISAT  
Annual Report  
**2015**

## Building climate-smart farming communities



INTERNATIONAL CROPS RESEARCH  
INSTITUTE FOR THE SEMI-ARID TROPICS

We **believe** all **people** have a **right** to  
**nutritious food** and a **better livelihood.**





ICRISAT  
Annual Report 2015



# Building climate-smart farming communities





**Photo credits:**

Front Cover: At the launch of the Joint Agro-Meteorological Services Incubator (JAMSI) in Mali participants are introduced to an automatic weather station.

Photo: Oumar Diop, AMAP

Contents page: Community training for contour boundaries design in Koro village.

Photo: M Petri, ICRISAT

Back Cover: AgMIP scientists share climate scenarios and impact on farms with farmer organizations, government and other stakeholders.

Photo: Sabine Homann-Kee Tui, ICRISAT

All dollars are in US\$.

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# Message from the Director General

Climate change is now an issue that demands urgent attention. The UN Global Goals for Sustainable Development and COP 21 Paris Agreement emphasize its importance. The agricultural sector will be hardest hit by climate change and the impact will be felt most by the smallholder farmers we serve in Africa and Asia.

Unseasonal rains, increasing frequency of droughts and extreme weather events, crop failures and low crop yields often exacerbated by degraded ecosystems have resulted in household food shortages, malnutrition, high poverty levels and forced migration. These are issues we have had to address in our work of building climate-smart farming communities. The farming community in the dryland tropics is the most impacted by climate change and ICRISAT and its partners have responded to the clarion call of COP 21 by developing climate-smart approaches for the dryland tropics that we proudly highlight in our annual report for 2015.

Research in dryland crops continues to be our primary focus. In keeping with the motto of 'demand-driven innovation,' our scientists have bred new varieties based on local requirements for enhanced nutrition, drought and heat tolerance, pest resistance and machine-harvestability. The more we work with governments, the importance of a holistic approach becomes more evident. While crops research is our core strength we are also working with partners, adopting an agro-ecosystems approach that integrates livestock, agroforestry and income-generation activities. In fact, the success of the watershed management approach has prompted companies to adopt it for their Corporate Social Responsibility activity.

To paraphrase Nobel laureate, Dr Norman Borlaug, "The world has the technology to sustainably feed 10 billion people." The challenge is - how do we leverage existing technologies to better serve the needs of smallholder farmers?

As part of its strategy ICRISAT is focusing on digital agriculture. This includes cloud computing, analytics, breeding informatics, systems and weather modeling to generate computer simulated future scenarios of the impact of climate change, geospatial analysis for building water harvesting structures, and the use of drones and mobile phones to provide cropping advisories to help smallholder farmers take the best decisions under climate variability.

While new technologies, both agricultural and digital, can be the game changer, the importance of global and local policies cannot be underestimated. Foremost on our agenda are the national priorities of countries we are working in. The country strategies that we are developing with national partners will guide agricultural investment decisions and innovations while being inclusive of women and youth to address the challenges faced by smallholder farmers. We are also in the process of realigning our organization structures to be more agile and responsive to national needs and priorities.

As I look back on the vast body of work we have done so far in partnership with governments, international bodies and NGOs I am proud to say that our work significantly contributes towards the UN Sustainable Development Goals.

For ICRISAT, 2015 has been a momentous year. I thank the staff for rising to meet challenges, donors and partners for sharing our vision and the Board for its guidance. Most of all, I salute dryland farmers for their ingenuity and determination to overcome adversity to see a better life for their families by being bold and adopting new climate smart agriculture practices. I end with a slogan for 2015 – onward with urgency to achieve the UN Sustainable Development Goals before 2030!

David J Bergvinson



## Message from the Board Chair

I have had the opportunity over the past year to visit ICRISAT's work in parts of the semi-arid tropics notably, India, Zimbabwe and Ethiopia. The impact of the Institute's research in these countries is clearly visible, as evidenced by the expanding acreages of new varieties of our mandate crops – sorghum, millets, groundnut, pigeonpea and chickpea. I am extremely heartened to witness such growth in production, especially with regard to grain legumes, given that 2016 is being celebrated as the International Year of Pulses.

All this was possible through collective effort. We are working in synergy with governments, the private sector, other CGIAR centers and various foundations. Notable among them are our multi-country projects with the Bill & Melinda Gates Foundation – Tropical Legumes III (TL III) and Harnessing Opportunities for Productivity Enhancement (HOPE) that cover grain legumes and dryland cereals respectively and benefit millions of smallholder farmers. ICRISAT scientists, working in conjunction with national partners are introducing germplasm with resistance to diseases and pests, tolerance to climatic and other environmental stresses, and improved quality and yield traits.

These ICRISAT-led successes are very timely as the world will probably have to switch to cultivating more climate-hardy crops, to ensure food security by 2050. Our crop breeding programs would not be possible without our highly valued genebanks at headquarters and at our research stations in East and West Africa. Our scientists are able draw upon more than 120,000 germplasm accessions from 144 countries. Our research streams are

focusing on trait dissection, phenotyping, simulation modelling, molecular physiology, QTL and genetics and nutrition.

New crop varieties are only one component of the work being undertaken by ICRISAT. Over the years we have developed a slew of climate smart agriculture technologies and trained farmers to use them. For reducing chemical fertilizer usage, a major contributor of GHGs, technologies like microdosing, and intercropping with legumes are being actively adopted by farmers in the drylands. Alternatives to fossil fuels are also being researched. This includes ethanol from sweet sorghum. Working in some of the poorest and harshest semi-arid regions in sub-Saharan Africa and Asia, the valuable experience we have garnered has shaped our holistic approach in addressing climate change using both adaptation and mitigation strategies. In this context, ICRISAT's crops score an advantage over the Big 3 – rice, wheat and maize. They have a low carbon footprint and are inherently climate smart – high on nutrition and use less water – a point reinforced by our Smart Food campaign.

As we continue with renewed vigor to work towards executing the organization's vision and mission in making a difference in the lives of smallholder farmers in the semi-arid tropics, I thank our investors, the various governments, partners and Team ICRISAT for joining hands.

Chandra Madramootoo



## Vision

A prosperous, food-secure and resilient dryland tropics

## Mission

To reduce poverty, hunger, malnutrition and environmental degradation in the dryland tropics

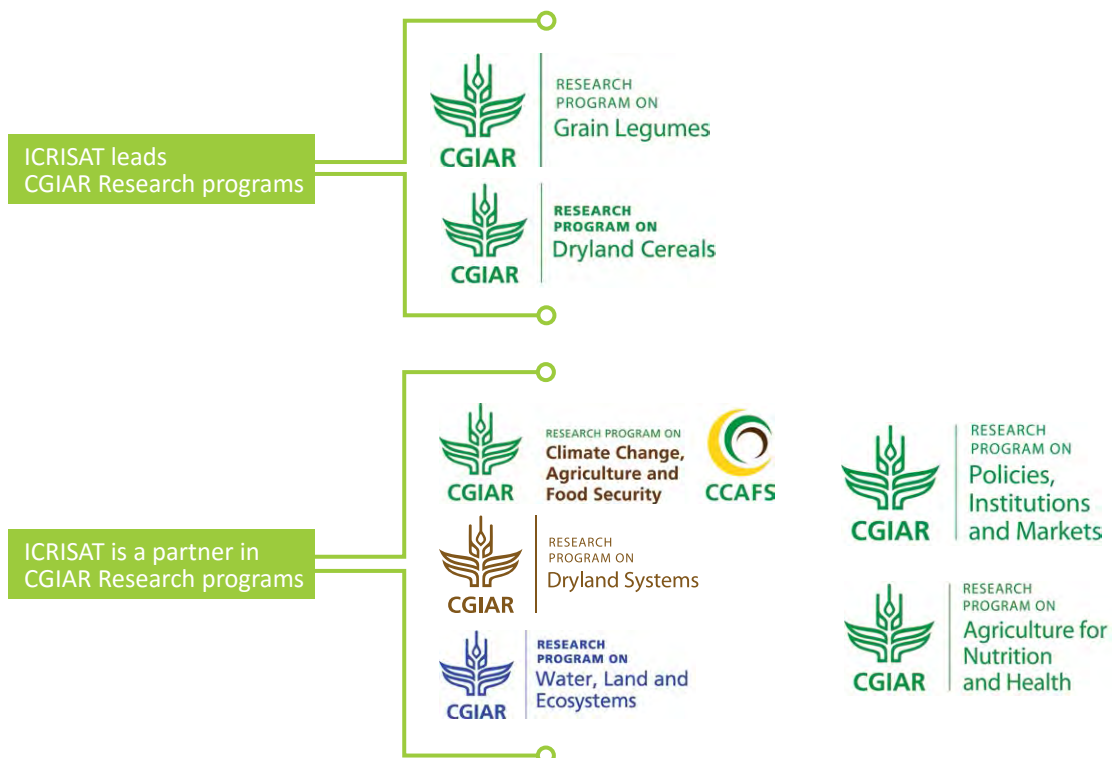
## Approach

Inclusive Market-Oriented Development (IMOD)

## Research Programs

The work at ICRISAT is accomplished by four major research programs

- Resilient Dryland Systems;
  - Markets, Institutions and Policies;
  - Grain Legumes; and
  - Dryland Cereals, **along with the**
  - Agribusiness and Innovation Platform (AIP);
  - Knowledge Sharing and Innovation (KSI); and
  - Platform for Translational Research on Transgenic Crops (PTTC)
- under the overall framework of the Inclusive Market-Oriented Development (IMOD).**





## Research highlights

Overcoming hunger and poverty, reducing malnutrition, preventing environmental degradation, coping with climate change and empowering women were the major thrust areas in 2015 for ICRISAT's various research areas.

Improving the livelihoods of smallholder farmers in the semi-arid tropics lies at the core of all of ICRISAT's endeavors. For crop improvement of our mandate crops, both conventional breeding and genomics were used by our research programs for developing farmer/market-preferred varieties that are high-yielding, more nutritious, and resilient to various climatic conditions and emerging pests and diseases. Farming systems and community approaches were tested and upscaled with the intent of making agriculture a sustainable and viable livelihood and/or business. Work taken up by supporting programs have contributed to enhancing ICRISAT's research.

To further maximize the impact of its research work ICRISAT has adopted country strategies. They serve to refine the organization's strategies in each African country where it is hosted and for the Indian states where it has major initiatives. Their purpose is to provide an understanding of ICRISAT's resources and intended impacts for its priority geographies. These strategies link research goals to national priorities and donor priorities in a cohesive manner to thus facilitate coordination and improved implementation across location-specific value chains for the key crops for which ICRISAT has the global mandate. At present, country strategies have been developed for seven African countries (Mali, Niger, Nigeria, Kenya, Ethiopia, Malawi and Zimbabwe) and three Indian states (Andhra Pradesh, Maharashtra, Odisha). Further to the development of state strategies in India, at the request of the Indian Prime Minister's Office, strategy documents were prepared on: Self-sufficiency in pulse production; Enhancing water use efficiency on farms; Soil health mapping; National agriculture markets; Weather-based crop insurance; and Digital Agriculture in the context of the Prime Minister's call for "Digital India".

In the following pages read about how ICRISAT's work is making a difference.



### Research Program – Dryland Cereals

For the three cereal mandate crops – sorghum, pearl millet and finger millet – new varieties and hybrids, new methodologies, genomic resources, knowledge, dissemination and partnership were developed.

**Finger millet was formalized as a mandate crop in the ICRISAT research portfolio at the Governing Board meeting in September 2015.** At the request of Ethiopia partners, tef was also included into ICRISAT's research portfolio.

#### Representative genome sequence of finger millet

Through a multi-institutional collaboration, a representative whole genome sequence of finger millet was generated; this will enable the application of advanced genomics tools to improve the productivity of finger millet in East Africa with likely spillover benefit to other finger millet growing regions of the world. The collaboration extends to institutions in India, Kenya, USA and China.

#### Testing genetic materials

The LeasyScan platform, fully functional since late 2014, it is being used to test a range of genetic materials from different legume and cereal species, going beyond ICRISAT mandate crops, and this includes germplasm and breeding populations. For example, a diverse set of pearl millet breeding material (hybrids, B- and R-lines) that were bred specifically in India for adaptation to < 400 mm rainfall and > 400 mm rainfall were found to have





been bred for differences in the rate of canopy development. Automatic weighing of potted plants in the facility was used to evaluate hourly plant transpiration in-vivo and pinpointed transpiration response to vapor pressure deficit (VPD) differences between known genotypes. These are major steps towards the systematic and large-scale phenotyping for traits controlling plant water use at high rate and precision and offer opportunities to harness their genetics for the breeding of improved varieties.

### New varieties and hybrids released

#### *Sorghum*

- Two varieties (12KNICSV-188 and 12KNICSV-22) were released in Nigeria;
- Two hybrids IESH 22023, IESH 28002 (ATX 523 x Macia) were identified for on-farm testing in Kenya and Tanzania;
- One hybrid (SDSA 1 X ICSR 43) and two varieties (IESV 91018 LT and IESV 93042 SH) were recommended for release in Kenya.
- One variety in Kenya (IESV 24029 SH) and two varieties (Gadam Hamam, IESV 23010 DL) and two hybrids (ICSA 90001 x ICSR 172 and IESH 22023) in Tanzania entered National Performance Trials;
- Four hybrids (IESH 22012, IESH 22022, ATX 623 x Macia and ICSA 12 x KARI Mtama 1) were identified as suitable for malting;
- Four varieties (KARI Mtama 1, KAT 487, Tegemeo, Sila) and five hybrids (IESH 22012, ATX 623 x Macia, IESH 22009, IESH 22010 and IESH 22002) were selected for superior feed quality through collaboration with private sector.

#### *Pearl millet*

In India six new pearl millet cultivars – three OPVs (ICMV 05222, ICMV 05555, ICMV 15111) and three hybrids (ICMA 00444 x IP 6202, ICMA 09888 x IP 11431 and ICMA 09888 x IP 13150) with >20 tons/ha of dry biomass were identified.

#### *Finger millet*

Three finger millet accessions (IE 2187, IE 5791 and KNE 741) were selected for drought tolerance and six cultivars (Ikbulule, Acc 32, KNE 628, KNE 814, P224 and U15) with high levels of calcium were advanced to participatory variety trials in Kenya, Tanzania and Uganda.

### Biofortification of pearl millet

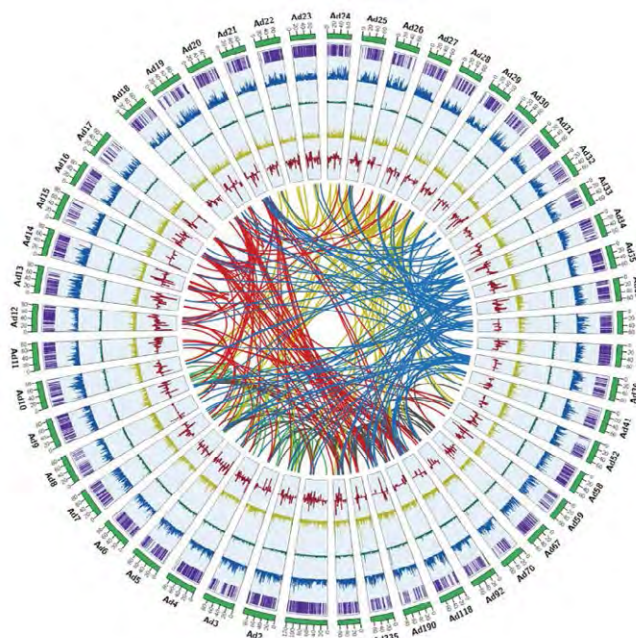
- In West and Central Africa (WCA), three OPVs were identified with high Fe and Zn density for on-farm testing.
- In India, a high Fe version of ICMV221 with 70 ppm Fe (11% higher of the original variety), and two high Fe and high yielding hybrids (ICMH1201 and ICMH1301) were identified. ICMH1201 has 75 ppm Fe and ICMH1301 77 ppm Fe.

### Implementation of the Breeding Management System

Training courses were held in Kenya and Ethiopia for the ESA region and in Mali for the WCA region.

## Research Program – Grain Legumes

The focus of this program has been on modernizing breeding programs. Genome sequence of groundnut was assembled and high-density arrays for three legumes crops were developed. These tools together with earlier existing tools are being used for trait mapping and breeding applications; and transgenic events are also being advanced. A first generation machine-harvestable chickpea variety, 'high oleic acid' groundnut varieties together with hybrids and improved varieties of pigeonpea are expected to have a significant impact on enhancing production.



Groundnut genome sequence. (Source: PNAS paper).



## Development and utilization of genomic, genetic engineering tools and information systems

- **Co-led sequencing** of one genome of groundnut and dissection of geotropism in groundnut.
- **Contributed to sequencing the A and B genomes of peanut** as part of the International Peanut Genome Initiative.
- **High Density single nucleotide polymorphism (SNP) arrays** with more than 50,000 SNP were developed for each of the three legume crops.
- **Herbicide-tolerant transgenic chickpea events** were developed and identified for pre-emergence herbicides under contained glasshouse conditions.
- **Early generation transgenic chickpea events carrying Bt gene stacks identified** with significant pod borer resistance in terms of reduced pod damage and high larval mortality in containment greenhouse.

## Development and evaluation of new breeding material

To meet the needs of farming communities and markets, novel types of breeding material were developed and evaluated to hand over to national breeding programs.

- **Machine harvestable chickpea variety** NBeG 47 was released for Andhra Pradesh, India.
- **Chickpea varieties nominated for release:** Close collaboration with Kenya (KALRO) and Simlaw Seeds resulted in nomination of four chickpea varieties: two desi (ICCV 97110, ICCV 97128) and two kabuli (ICCV 97306, ICCV 97406).
- **Developed 'high oleic' groundnut varieties** which have health benefits to consumers and benefits to industry through enhance shelf-life and identified high oil lines for release in India.
- **Variety trials** were conducted with 81 groundnut entries at Samanko for West and Central Africa region.
- Pigeonpea varieties and hybrids released
  - **India:** Four pigeonpea varieties (ICPL 14003, ICPL 332 WR, GRG 811 and Amravathi) and two hybrids (ICPH 2740 and ICPH 4503) were released.
  - **Africa:** Four varieties (ICEAP 00554, ICEAP 00557, ICEAP 0053, ICEAP 00932) in Tanzania and one variety (ICEAP 01514/15) in Zambia were released.



Genebank at Patancheru, India.

## Genebank

Strengthening the genebank at Patancheru, India, and three regional genebanks at Niamey, Nairobi and Bulawayo in Africa; using mini core to identify multi-trait climate resilient germplasm accessions for use in crop improvement; and release of germplasm, as cultivars were areas of major focus for ICRISAT's genebank.

### Germplasm assembly

- Added unique germplasm to the genebank – 898 accessions of finger millet, pearl millet and sorghum.
- Collected 1,416 new germplasm samples of groundnut, pearl millet, pigeonpea, and sorghum from Kenya, Niger, Nigeria, Senegal, and Uganda through RCDC.

### Climate resilient and multi-trait germplasm for use in crop improvement

- Climate resilient, nutrient-dense seeds, and agronomically superior germplasm identified in chickpea and groundnut.
- Twenty seven sets of mini core supplied to researchers in India during 2015, bringing total to 266 distributed in 36 countries.

### Germplasm released as cultivars

- Identified finger millet accessions (IE 2872, IE 3475, IE 4673, IE 6337 and IE 7079) as best performing in the states of Andhra Pradesh and Karnataka, India; (IE 2872 and IE 4415) in Kenya for further evaluation and release. Also, foxtail millet accessions (ISe 156, and ISe 1575); and proso millet (IPm 2769) were identified for release in India.
- Over 60 germplasm accessions are under national variety testing in Niger.
- Sorghum variety (IS 15401) which was released in 2001, gained popularity in southern Mali in 2015 for its low phosphorus tolerant trait.





## Resilient Dryland Systems

Resilient Dryland Systems is a systems research program that uses R4D approaches, analytical methods and tools from biophysical, social and economic sciences to understand the systems context of targeted domains, in collaboration with partners. The major challenges addressed are sustainable watershed development and managing common property resources; managing climate risk; development of lower risk farm livelihood systems; and overcoming market failure by using innovation systems approaches for connecting value chain actors.

### Climate Smart Villages piloted and policy makers informed on adaptation to climate change

- **Seasonal rainfall forecast and model-based crop management scenarios** were applied in four villages in Anantapuram and three villages in Bijapur, India, to inform smallholder farmers on how to cope best with prevailing drought conditions. During the 2015-16 cropping season, the strong *El Nino* event and associated forecasts of rainfall deficit encouraged farmers to use low input investments with short season legume (mung bean) intercropped with pigeonpea amongst other management adjustments.
- **Agricultural adaptation measures necessary to adjust to future climate change were projected** through a major study called the Agricultural Model Intercomparison and Improvement Project (AgMIP) funded by the Department for International Development (DFID) which engaged and influenced policy makers, farmers and stakeholders across many levels in 8+ countries in sub-Saharan Africa and India.

### Pioneered Innovation Platforms in three countries

(An Innovation Platform brings together stakeholders from across the value chain creating new market opportunities.)

- **India:** Enabled 250 farmers in Rajasthan to enter a medicinal plant value chain that enhanced household annual income by US\$75 to US\$748;
- **Mozambique:** More than 500 farmers in Manica earned greater income by making better decisions regarding production, storage, marketing and selling of common bean produce in local and distant markets;



Photo: ICRISAT

*In a finger millet field during a farmers' field day.*

- **Ethiopia:** About 300 farmers in East Shewa gained greater income by intensifying their systems with legume intercropping, improved management of small ruminants (mainly goats), water harvesting and better management of common lands.

### Technology interventions

- **Participative Varietal Selection** by farmers coupled with **Integrated Soil Fertility Management** technologies were demonstrated in three zones of Niger. About 248 demonstration test kits were prepared and 24 farmer field school kits were distributed.
- **Khadins (traditional water conservation systems), common silvi-pasture systems, agro-horti kitchen gardens, value chains of medicinal crops and small ruminants** created market-led opportunities among the local stakeholders in the driest of areas (<150 mm rainfall) in Rajasthan, India. The work was featured in *Al Jazeera* and the *Third Pole*.

### Capacity building

- Major capacity development for 30 staff and partners on systems analysis (APSIM and Household modelling) for smallholder farmers were held in Niger.
- A BMGF-sponsored workshop was organized in Senegal with partners and system thinkers from across the WCA region to progress the planning of new initiatives on crop-livestock integration.

## Research Program – Markets, Institutions and Policies

This program conducts research aimed at generating policy relevant insights and is involved in the collection of primary data (household and community level) and the compilation and processing of secondary data



Photo: ICRISAT

### *Pilot testing of Computer Assisted Personal Interview tool for village surveys.*

(national and sub-national). The datasets are available for policy research and analysis.

In India, the work was accomplished to a large extent through the Village Dynamics in South Asia (VDSA) project in select villages. Data was collected on a range of topics from rural households' dietary preferences to farmers' access to formal credit and insurance coverage. In West and Central Africa, a three-year panel data of village level studies was collected in two countries (Burkina Faso and Niger) and covered different aspects of agricultural production and household consumption, markets and natural resource management.

### **Identified changes and drivers in sorghum and millet consumption demand in Africa**

Currently available statistics on food commodity consumption are generally based on country aggregate net supply. They provide no information on how consumption may vary by households.

Using nationally representative household survey data of the World Bank, ICRISAT and Virginia Tech University analyzed the consumption and demand for sorghum and millet in Niger and Nigeria. The responsiveness of sorghum and millet demand to changes in the crop's own price (own-price elasticities), other food group prices (cross-price elasticities), and household expenditures (expenditure elasticities) were estimated. The study showed that:

- Rural/urban consumption patterns of millet and sorghum in Nigeria are the same as in Niger. The average consumption expenditure for these grains in rural households is 3.8 times (millet) and 4.7 times (sorghum) compared to urban households.
- Sorghum and millets in West and Central Africa are mostly consumed in rural areas and have low income

elasticity. The link to markets and the need to align to market and consumer demand is a key driver of success. The results for dryland cereal crops have highlighted the benefits of sharpening the focus of research interventions based on differences in demand across target countries.

- While the demand for sorghum across Ethiopia is steadily growing, Tanzania shows stagnant trends and the consumption is mainly satisfying food security targets. These contrasting cases point towards different research targets that must be considered in program development.

### **Spatial and temporal patterns of key parameters of ICRISAT mandate crops**

Work was primarily done on delineation of systems, typologies and agro-ecological zones in which legumes and cereals play an important role and identification of areas to be targeted for appropriate technological interventions. The spatial and temporal patterns of key parameters (specifically area and yield) of ICRISAT mandate cereal and legume crops across India using district-level databases and crop-livestock typology were analyzed.

Results are in the form of GIS maps for focus legume crops during the period between 1980-82 and 2007-10. The major results from the analysis were:

- In India, there is a shift in the pulse producing area from northern to southern regions and from eastern to western regions, and over time central India has emerged as an important center of pulse production.
- The share of area under chickpea in high-yield categories increased from 14.2% in the 1980s to 44.5% by 2010. Similar patterns and trends were observed in dryland cereals as well.

## **ICRISAT Development Center**

The overarching goal of IDC is to create prosperous rural communities by making agriculture a viable business. The activities undertaken are based on a holistic approach from water management to crop selection, farm practices, processing and market development.

### **Pilot projects and activities**

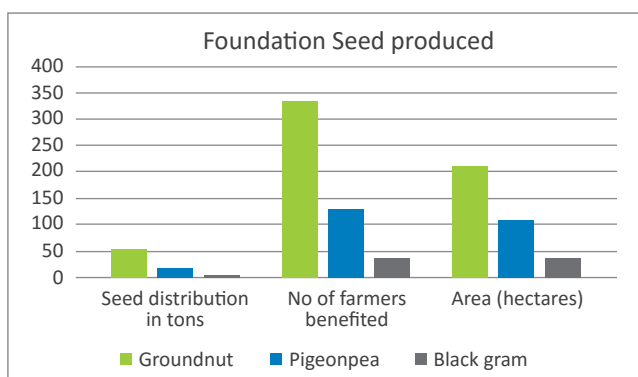
- **Rythu Kosam, Andhra Pradesh, India:** Pilots of 10,000 ha in 13 districts covering 36 blocks/mandals





across 265 villages were established. Baseline survey of 4,891 farmers was done for benchmarking and understanding the issues for required interventions.

- **Soil health mapping:** Analyzed 5,335 samples, in addition to 12,000 samples from the Department of Agriculture. Deficiencies were diagnosed in zinc (52%), boron (33%), sulfur (49%), calcium (30%), phosphorus (24%) and low levels of organic carbon in 59% fields.



- **Demonstrations and crop cutting experiments for balanced fertilization:** Ten demonstrations per block were conducted. Yield improvements over the control are 6-27% for rice and 12-28% for groundnut.
- **Improved varieties:** Fifteen tons of groundnut seed and 15 tons of foxtail millet, maize and pearl millet seed were arranged from ICRISAT and evaluated.

Crop (variety)	Yield increase over local cultivars
Groundnut (ICGV 9114, K-9, Kadiri haritha)	12-64%
Foxtail millet (Suryanandi)	57%
Maize (Bioseed-9200)	42%
Pearl millet (ICTP 8203)	29%

#### Bhoosamrudhi, Karnataka, India:

- **In-situ soil and water conservation and improved land management:** The **Broad Bed and Furrow** system was piloted in 450 ha in Raichur and 125 ha in Vijayapura.
- **Direct Seeded Rice technology** was piloted in Chikmagalur, Dharwad and Tumkur. The rice yields when compared to the previous varieties

used were either on par or showed an increase with significantly reduced water usage as well as saving in time for enabling timely sowing of the second crop.

#### Scaled up project activities:

- **Bhoochetana, Karnataka, India:** In partnership with the Government of Karnataka the project was scaled up to cover 6.68 million ha (4.4 million ha in rainy season and 2.25 million ha in post-rainy season). **Integrated technologies** like improved soil, water, seeds, pest management covering 3.4 million farmers (2.55 million in rainy season and 0.85 million in post-rainy season) were implemented in 30 districts.
- **Crop yields increased by 17% to 33%** with improved technologies when compared to farmers' practice in spite of erratic and scanty rainfall (15 districts received deficit rainfall of 21% - 41%) during June to September
- **Net economic benefit of US\$22 million** was generated through increased crop yield by adopting improved management practices in different crops.

#### Bhoosamrudhi, Karnataka, India:

- **Direct Seeded Rice (DSR)** technology was scaled-out in 8,000 ha by 10,000 farmers in Raichur.
- **Surface and sub-surface drip irrigation** in paddy is being evaluated at Raichur which has resulted in 35% -40% additional water saving compared to DSR.
- **Water impact calculator**, a generic decision support tool for efficient irrigation scheduling was demonstrated at Chikmagalur, Raichur and Vijayapura.

## Agribusiness and Innovation Platform

This program is involved in strengthening public-private partnerships of ICRISAT through start-ups, agro-companies, government agencies and National Agricultural Research Systems (NARS) in India and sub-Saharan Africa. In 2015, the projects ranged from technology commercialization, development of nutritionally-rich food products to entrepreneurship development, capacity building in nutrition and food safety, and facilitating agribusiness opportunities to women and youth entrepreneurs.





Photo: PS Rao, ICRISAT

Sorghum and millet products developed by AIP.

## Nutrition

- **Energy and Nutrient Dense Food (ENDF) developed for addressing malnutrition:** Millet- and- pulse-based ENDF developed by AIP is being considered for efficacy trials by the Ministry of Women and Child Development (WCD) in Rajasthan, India, for addressing malnutrition in children, women and adolescent girls.
- **Diversity in starch digestibility and rancidity profile of pearl millet established:** The knowledge generated will help promote commercialization of pearl millet through development of pearl millet products with enhanced shelf-life and low digestibility (for diabetics) and high digestibility (for children and elderly).

## Food safety

- **Setting up of food testing laboratories in Africa:** Host institutes in Zimbabwe, Rwanda, Gambia, Republic of Congo and Nigeria were assisted in establishing the infrastructure for food testing laboratories with support from the Ministry of External Affairs and Ministry of Food Processing Industries, Government of India.

## Agribusiness

- **Selected as Resource Support Agency:** For setting up 16 **Farmer Producer Organizations (FPOs)** in three states of India, AIP was selected by the National Bank for Agriculture and Rural Development (NABARD) as a Resource Support Agency.
- **Incubation support for 14 startups provided:** The startups are in sectors such as farmer-led **seed production, food processing, and ICT-based farming control systems.**
- **FPOs strengthened:** Produce aggregation resulted in collective bargaining by member farmers resulting in

better prices for their produce. Farmer members of Davur Farmer Producer Company Limited in Medak district were able to obtain US\$1.45 per kg for their pigeonpea produce by selling to the National Agricultural Cooperative Marketing Federation of India Limited (NAFED) while the prevailing market rate was US\$1.40 per kg. Apart from this additional income, the farmers were also able to save US\$0.05 per kg by way of reduced costs incurred on transportation and market fee deductions.

- **Facilitated 3 patents and 2 trademarks:** Established an **Intellectual Property (IP) Facilitation Cell** with funds from the Ministry of Micro, Small and Medium Enterprises, Government of India, for identifying and protecting IP rights of innovations of start-ups and to provide legal assistance.
- **Capacity building of stakeholders:** A training on “Management of Food Testing Laboratory and ISO/IEC 17025:2005” was conducted at the Food Testing Laboratory, Banjul, The Gambia and eight entrepreneurship development programs were conducted during the year.

## Awards

ICRISAT scientists received several awards and were recognized both nationally and internationally. Dr Rajeev Varshney, was awarded the prestigious Indian national award, the Shanti Swarup Bhatnagar Award 2015. Dr Eva and Dr Fred Weltzien-Rattunde received the Justus-von-Liebig Award for World Nutrition 2015. For complete list see <http://www.icrisat.org/awards/>.

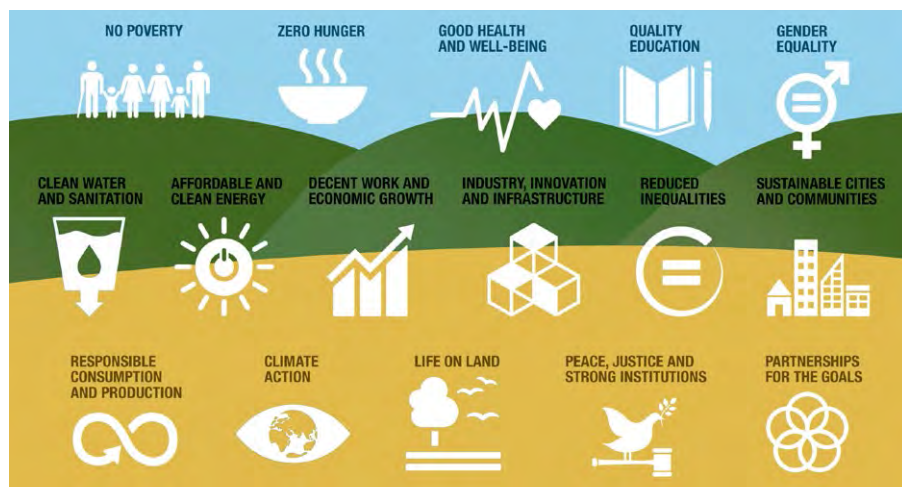
**Dr Peter Carberry**  
Deputy Director General-Research





# Making a difference

## ICRISAT's work to help achieve SDGs



ICRISAT works in the drylands which are some of the driest and harshest regions of the world. Working in these regions has given us unique insights, experience and specialized skills in managing soil, water and other natural resources, restoring degraded soils, coping with adverse climate shocks and helping build the resilience of smallholder farmers.

Dryland crops, pearl and finger millets, sorghum, pigeonpea, chickpea and groundnut, which are ICRISAT mandate crops, are Smart Food as they are highly nutritious, grow under adverse conditions with little inputs and have multiple uses beneficial to the farmer. Millets and legumes are traditional dryland crops which provide sustainable livelihoods and productive employment to 2.5 billion people living in the drylands. Millets are high in folic acid, zinc and iron and have 3 times more calcium than milk. Their low glycemic index helps manage blood glucose levels which is useful for diabetics. Both millets and legumes are high in fibre, protein, vitamin and micronutrients such as zinc, phosphorus, potassium, magnesium, etc.

Our work helps farmers cope with climate change by providing them improved crop varieties which can better withstand drought and high temperatures and also help them diversify cropping systems and livelihoods.

We integrate gender across the whole value chain from analyzing problems and opportunities to developing agri-business and linking them to markets.

ICRISAT's vision of a prosperous and food-secure future for all resonates strongly with almost all of the Sustainable Development Goals (SDGs) since our work is holistic in nature covering multiple aspects of a sustainable future.



**R**educing poverty, hunger and malnutrition in the dryland tropics are core to ICRISAT’s mission. Our work across the entire value chain – from improved seeds and technologies to post-harvest agri-business and facilitating market access – helps raise incomes of smallholder farmers while ensuring food and nutrition security.

**ICRISAT Impacts:**

- Improved varieties of pigeonpea developed by ICRISAT have resulted in **80% rise in farmers’ incomes** in Kenya, Malawi, Mozambique, Tanzania and Uganda.
- The Malawi Seed Industry Development project has resulted in **US\$3.3 million** worth of consumed legumes and grain in households.



**N**utrition is an important aspect of our work. ICRISAT works along the whole value chain to integrate nutritional aspects from improving degraded soils of the drylands to improve crop nutrition, breeding for higher nutrient levels through to working with communities to cook nutritious foods.

**ICRISAT Impacts:**

- To combat anemia in women and children ICRISAT developed the first bio-fortified pearl millet variety – released in India as Dhanashakti – which is **7% higher in iron and zinc**.
- ICRISAT specializes in Smart Food like millets, sorghum and legumes that are ‘good for you’ as they are naturally highly nutritious with high levels of calcium, iron, zinc and other minerals. Finger millet has **3 times more calcium** than milk. Pearl millet has the **highest folic acid content** among cereals and is recommended for pregnant women. Millets have a **low glycemic index** which helps manage blood glucose levels and prevents diabetes.



**P**roviding vocational and technical training to women and youth is crucial to our work of strengthening value chains. Making agriculture profitable enables smallholder farmers to provide quality education for their children.

**ICRISAT Impacts:**

Around **5,000 youth trained** in agri-business, while around 45,000 participants benefited from other trainings and exposure visits.



**I**CRISAT’s research framework is inclusive as it seeks to incorporate the voices of women, youth and the marginalized to inform its research strategy. Acting as a catalyst we help rural communities develop their own solutions while ensuring women, youth and the marginalized are empowered to participate and lead solutions.

**ICRISAT Impacts:**

Having **50% women** on watershed committees in India has ensured that their concerns are addressed in decision making. It has also empowered them to have an equal say in community affairs.

More than **27 farmer seed producers associations**, totaling 870 members (640 women and 230 men) in the Dosso region of Niger have been working with ICRISAT through the Tropical Legumes II project, since 2007 to: access modern varieties; train in seed production technologies; access inputs; and production market for groundnut seed by linking women seed producers to the market.



**A**griculture uses the most water and working in the drylands we work in the most water scarce areas which have the most critical need for solutions to improve water availability. On-farm and off-farm







water harvesting and management coupled with treating wastewater for agriculture and integrated watershed management is helping improve water availability for farmers.

**ICRISAT Impacts:**

- ICRISAT’s initial work in Kothapally watershed in India has been scaled up across the state of Karnataka, India. Improved water availability has **increased crop yields by 20-66%** and resulted in an agricultural growth of more than 5% per annum since 2009.
- The Yewol watershed in Ethiopia has led to a **5-fold increase** in the irrigated area and reduced drudgery for women as water is now available on farm.



**D**ryland crops such as sorghum have the potential to provide a clean and reliable source of energy. Sweet sorghum can be turned into biofuel at a low cost while addressing food security concerns of converting agricultural land to produce bio-fuel.

**ICRISAT Impacts:**

- Sweet sorghum, grows in a range of environmental conditions, with limited water and nutrients. Biofuel from sweet sorghum costs less, while other parts of the plant are useful as animal feed. Use of sweet sorghum ethanol **reduces carbon emission by 80-90%** when compared to use of fossil fuels.



**F**arming and associated non-farm activities are a key driver of livelihoods in rural areas of India and Africa. Additionally engaging women and youth in livelihood opportunities is critical to our work.

Agri-business has the potential to not only benefit farmers through value addition but also attract youth to agriculture.

**ICRISAT Impacts:**

- ICRISAT’s Agribusiness and Innovation Platform has been working to encourage entrepreneurship among youth by supporting agribusiness start-ups in the

domain of food processing, seed business, farming and agri-biotechnology. Impacts so far are: 74 agribusiness start-ups incubated; **Over 800,000 farmers benefited** by products and value-addition services offered by clients; facilitated **US\$13.2 million as investment** to start-ups; facilitated commercialization of 331 agro-technologies for Indian institutions; and 1,218 ventures provided incubation support.



**D**igital Agriculture enables farmer’s to access information, finance and markets to minimize farming risks and move up the value chain. Innovative seed financing models are helping farmers in Malawi reap better dividends from agriculture.

**ICRISAT Impacts:**

- In Mali **using drones for land mapping** has helped strengthen land tenure systems thus benefiting farmers. Coupled with an android-based app this also helps them optimize resource use. Info-entrepreneurs emerged as new professionals to strengthen the existing agricultural extension system.
- The Green SIM innovation pushes relevant information to farmers on their mobiles, while the Green Phablet allows access to a database which can provide customized recommendations to farmers. **40,000 farmers in 171 villages bought the Green SIM** in the first six months of the pilot initiative generating additional income for women and youth working as info-entrepreneurs.



**O**ur work in urban wastewater recycling for use in agriculture reduces the burden on civic infrastructure, is environment friendly and promotes safe and healthy agriculture in peri-urban areas which are fast emerging as high growth centers.

**ICRISAT Impacts:**

- Initial work in treating domestic as well as industrial waste water for use in agriculture is showing encouraging results. Our model comprising decentralized wastewater treatment system and



reuse of treated wastewater in agriculture provides a solution for safe reuse of domestic wastewater at community scale.



The core principle underlying ICRISAT's work is sustainable natural resource management. Reducing the carbon and water footprint and improving soil, water and other natural resources is an integral component of our research.

#### ICRISAT Impacts:

- Millets, sorghum and legumes are 'good for the planet' as they have a low carbon and water footprint. Incorporating pulses in the cropping cycle can **reduce the carbon footprint by 24 to 37%**. Pulses can eliminate the use of nitrogen fertilizer as they fix nitrogen in the soil. Pulses require less water and effectively increase the water use efficiency of the entire crop cycle.



The dryland areas of the world are increasing under the impact of climate change. For e.g. more than 3 million ha area have become semi-arid over the last 40 years in India and 40% of the land in which maize was grown, will not be suitable for the crop by 2030. Focusing on drylands is critical and ICRISAT is providing science-backed climate-smart solutions to millions of smallholder farmers in the drylands to build their resilience to climate change shocks.

#### ICRISAT Impacts:

- Early maturing, resilient varieties of millets and legumes help farmers escape terminal drought and ensure a good harvest. **More than 40 varieties and hybrids** of legumes have been released in Africa and India over the last five years which will help farmers withstand climate change shocks.
- **Climate modeling** work is providing farmers a range of tools – from advisories on what to grow in the next season in case of delayed or poor rains in Andhra Pradesh, India, to adaptive packages for farmers to mitigate climate change effects in Zimbabwe.



Our genebank being maintained over the last four decades is a critical part of our strategy to protect against loss of biodiversity due to desertification and land degradation. Genebanks in India, Niger, Kenya and Zimbabwe hold more than 120,000 germplasm accessions from 144 countries.

#### ICRISAT Impacts:

- More than **1.4 million samples of nearly 100,600 germplasm accessions** shared with collaborators in 145 countries.
- Identified germplasm with new sources of tolerance to drought, salinity, heat and water logging, disease resistance, improved agronomic traits (early-maturity, high yield, seed size) and quality (oil, protein, iron, zinc, calcium).



Overcoming poverty and food insecurity is a key element to ensuring peace and this is the core work we do in the rural areas through making farming sustainable and profitable. Our work also involves building effective, transparent and accountable community-level institutions for building inclusive and just societies. We also work closely with community and government institutions and provide formal capacity building.



Multi-stakeholder partnerships are the cornerstone of our work. We work with governments, donor agencies, national research agencies, civil society organizations, private sector, farmers groups, etc., to realize a sustainable future for all.

Read more on: [ICRISAT's SDG work](#)  
Watch [Dr Bergvinson talk](#) about SDGs









# Building climate-smart farming communities

## ICRISAT's approaches

*Different approaches are being undertaken to assist farmers adapt to Climate Change. Here are some of the main models being developed by ICRISAT specifically for adaptation at village level. The detailed description of each approach is available at <http://annualreport2015.icrisat.org>*



1

### Watershed management approach

A pool of climate-smart agricultural practices equips farmers in the mining belt of Karnataka, India, to **rehabilitate their ecosystem** and earn up to 12% - 27% better crop yields even in uncertain weather.



2

### Futuristic multi-model approach

60% of farm households in Nkayi, Zimbabwe, will be exposed to greater vulnerability by 2050 due to climate change. Computer simulated on-farm **future scenarios and solutions** serve in guiding policy makers.



3

### Agricultural and digital technologies approach

81% of farmers in a remote Ghana village rely on climate based **cropping advisories on mobiles** for on-farm decisions. They also use new agricultural technologies to increase farm productivity.



4

### Meteorological advisory and farm systems approach

In 458 ha in Mopti, Mali, farmers demonstrated that climate change adaptation is achievable by using **eco-friendly methods and climate information** for managing crops, livestock and forest cover.



5

### Climate and crop modelling approach

In Kurnool, India, farmers heeding the **seasonal cropping advisory** derived from climate and crop simulation modeling earned 20% more than others who did not.



# 1. Watershed management approach

Rehabilitating ecosystems and building resilience of farming communities

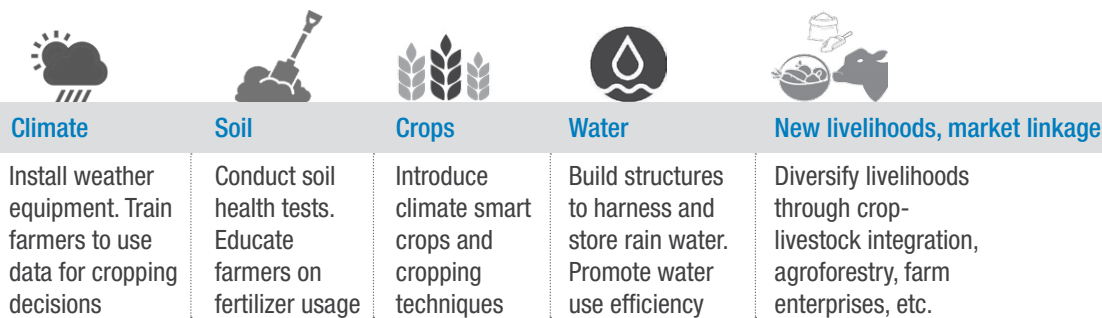
Bellary district in the mining belt of Karnataka, India, is a hotspot of water scarcity, land degradation and poverty. A temperature rise of 2°C or more, dry spells and unseasonal rains are predicted for Bellary district for 2021-2050, escalating future farming risks.

ICRISAT's pool of climate-smart agricultural practices is equipping farming communities to restore their ecosystem and get better yields and incomes even in uncertain weather.

Interventions ranged from monitoring the weather, mapping soil health, and choosing climate resilient varieties to water harvesting and improved livelihoods through the watershed approach depicted below. Recommended fertilizer usage resulted in 19% to 27% increase in yields. Improved cultivars helped increase yield between 12% to 27%.



**Community meetings**  
to identify key interventions and implement capacity building



**Monitoring, learning & evaluation**



For complete details on this approach refer <http://annualreport2015.icrisat.org>

**Project:**  
Improving Rural Livelihoods through Integrated Watershed Management in Bellary District in Karnataka



**Investor:**  
JSW Foundation

**Partners:**  
DoA, Government of Karnataka, WDD, UAS, Raichur, JSW Foundation, Farmers Association and ICRISAT



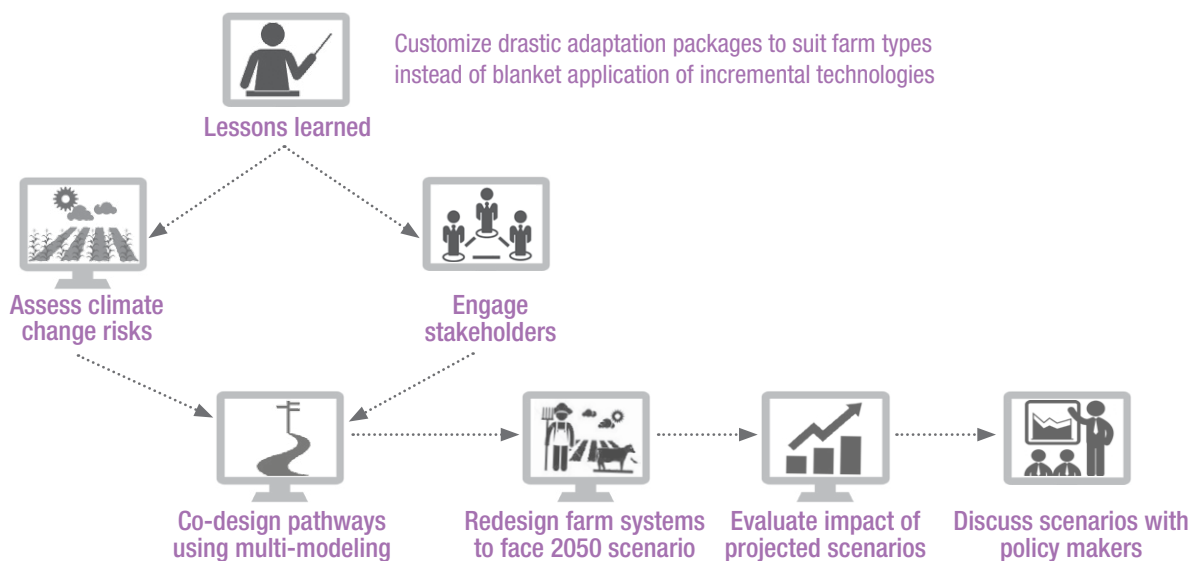
## 2. Futuristic multi-model approach

### Customizing adaptation packages to reduce vulnerability to climate change

Farmers in Zimbabwe are reeling under the impact of unpredictable climate. The situation is much worse in Nkayi district which has the highest poverty prevalence in Zimbabwe. Future scenarios predict that 60% of farming households will be exposed to greater vulnerability due to an estimated 2-3.5°C rise in temperature.

Using a multi-model framework for climate, crop, livestock and socio-economic simulation, customized climate change adaptation packages were developed for farmers in Nkayi to cope with a stark 2050 scenario. A critical element was to devise drastic adaptation packages as opposed to incremental changes in climate smart technologies. The computer-simulated scenarios are helping policy makers make crucial decisions to support farmers.

It is estimated that implementing the adaptation packages will help the very poor double their returns while the poor and better-off will see their returns increase by 50-75%. The entire community will see an 86% increase on net returns as compared to 72% for incremental technologies.



For complete details on this approach refer <http://annualreport2015.icrisat.org>

#### Project:

Re-designing smallholder crop-livestock systems in semi-arid Southern Africa to address poverty and enhance resilience to climate change: stakeholder driven integrated multi-modeling research

This work is being undertaken as part of the



#### Investor:

AgMIP receives major support from UK Aid, USDA, USAID, Bill & Melinda Gates Foundation

#### Partners:

Wageningen University, Germany; ICRIAT





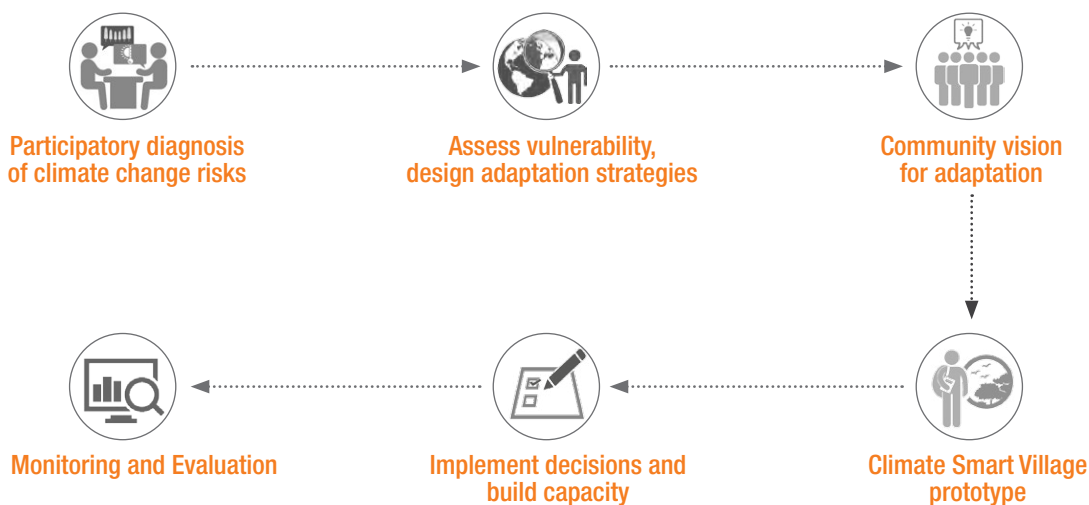


### 3. Agricultural and digital technologies approach

#### Integrating climate information and eco-conservation technologies

Jirapa region in Ghana has extremely challenging conditions for farmers with high temperatures, erratic rainfall and eroded soils resulting in low crop yields. Climate change in Ghana is expected to take the form of more frequent and intense drought, increasing rainfall variability, and higher temperatures – from between 2°C to 4°C by 2100, or about 1.5 times higher than the global average. In Jirapa district, long spells of drought often punctuate the wet season, leading to partial or total crop failures. These changes are expected to affect crop yields and resource availability in a region already characterized by scarcity.

Using a mix of climate information services from crop advisories on mobiles to farmer helplines; climate smart farm technologies; local institutions and knowledge; and a village development plan, the Doggoh community is creating a climate smart village.



For complete details on this approach refer <http://annualreport2015.icrisat.org>

**Project:**

Developing Climate-Smart village models through integrated participatory action research at site in West Africa

This work is being undertaken as part of the



RESEARCH PROGRAM ON Climate Change, Agriculture and Food Security



**Investor:**

CGIAR Research Program on Climate Change Agriculture and Food Security (CCAFS)

**Partners:**

INERA, INRAN, ISRA, IER, CSIR, AEDD, CONEDD, CNEDD, CIFOR, RPL West Africa, ICRISAT

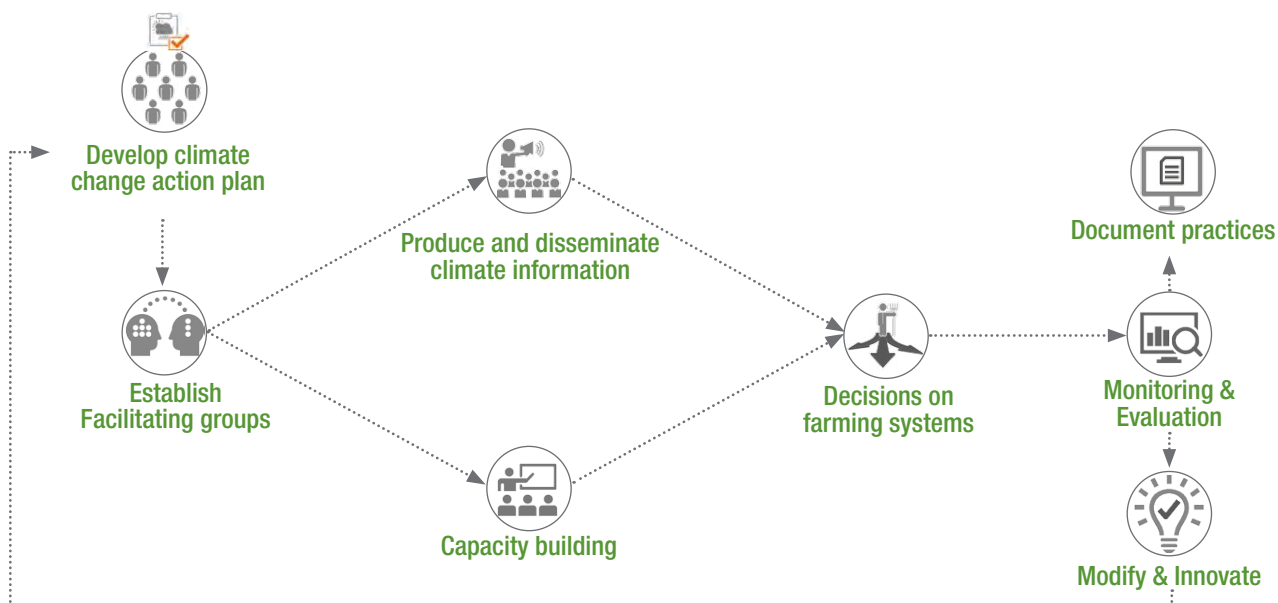


## 4. Met advisory and farm systems approach

Using climate information to build resilient agroecosystems

Frequent recurrence of dry years since 1968 and prolonged drought have been the bane of the Mopti region in Mali. Inter-annual rainfall variability is very high and the region is exposed to both flooding and drought. Nearly 40% of households have a poor or limited food consumption score (2013). The average rates of stunting stand at 46.5%. Levels of wasting are also very high at 14.7%.

Institution building and trainings like Farmers' Field Schools, weather warning committees, technologies parks, innovation platforms, etc., have helped farmers combat climate change by adopting ecosystem conservation methods and using high quality climate information for agroforestry, crop, livestock management decisions. Innovative climate-resilient technologies were implemented in 458 ha to demonstrate that climate change adaptation is achievable.



For complete details on this approach refer <http://annualreport2015.icrisat.org>

### Project:

Disseminating learning agenda on resilient-smart technologies to improve the adaptive capacity of smallholder farmers in Mopti

This work is being undertaken as part of the



RESEARCH PROGRAM ON Climate Change, Agriculture and Food Security



### Investor:

United States Agency for International Development (USAID), Accelerated Economic Growth Program (Add on), Global Climate Change (GCC)

### Partners:

The World Agroforestry Centre (ICRAF), Aga Khan Foundation, World Vision Mali and ICRISAT





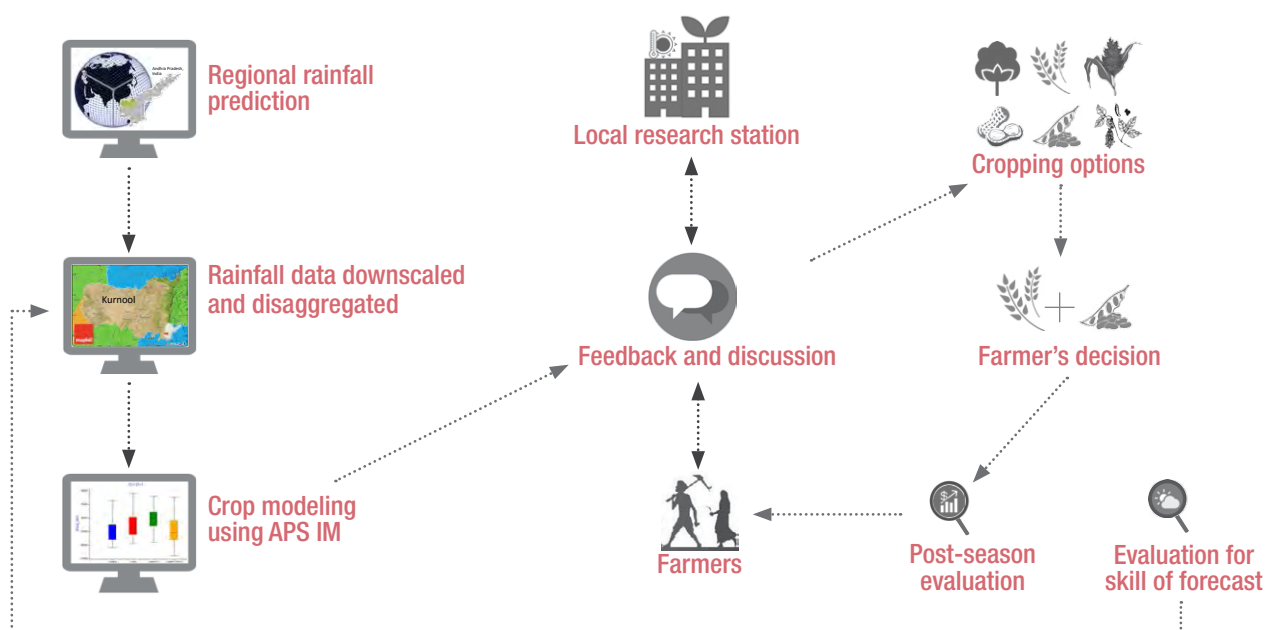
## 5. Climate and crop modelling approach

### Cropping advisories based on seasonal forecasts

A majority of the farming community in Hussainapuram, Kurnool, Andhra Pradesh, India, live below the poverty line. Over 50% of the cultivators hold less than two hectares of dryland. Recurrent droughts force migration to nearby cities for employment. In this region the soils are deficient in major and micro nutrients like nitrogen, phosphorus, sulfur, boron and zinc.

In view of the recurrent droughts (twice every five years), crop advisories using climate and crop simulation modeling were developed using the approach shown below to minimize farmers' risk in years with less rainfall.

Farmers who followed the cropping advisory earned 20% more than others who did not heed the advice.



For complete details on this approach refer <http://annualreport2015.icrisat.org>

#### Project:

Tailoring climate information for farmers' cropping decision-making

This work is being undertaken as part of the



RESEARCH PROGRAM ON Climate Change, Agriculture and Food Security



#### Investor:

CCAFS

#### Partners:

Regional Agricultural Research Station (RARS), Nandyal under Acharya NG Ranga Agricultural University, (ANGRAU) and ICRISAT.



# Corporate section



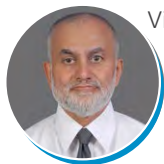
Photos: ICRISAT



**Dr Chandra A Madramootoo, Canada**  
Chair, ICRISAT Governing Board



**S Ayyappan, India**  
Vice Chair, ICRISAT Governing Board



**David Bergvinson, Canada**  
Director General (from Jan 2015)



**Nigel Wells Kerby, Britain**  
Member



**Oluwande Muoyo, Nigeria**  
Member



**Paco Sereme, Burkina Faso**  
Member

**2015** ICRISAT  
**Governing Board**



**Paul C Anderson, USA**  
Member (from Oct 2015)



**Rachel K Chikwamba, South Africa**  
Member



**Rajiv Sharma, India**  
Member



**Ashish Bahuguna, India**  
Member (until Feb 2015)



**Siraj Hussain, India**  
Member (from March 2015)



**Wendy Umberger, Australia, Member**  
(from Apr 2015)



**Sissel Rogne, Norway**  
Member  
(from May 2015)



**Gry Synnevag, Norway**  
Member  
(until Apr 2015)





# Communication initiatives

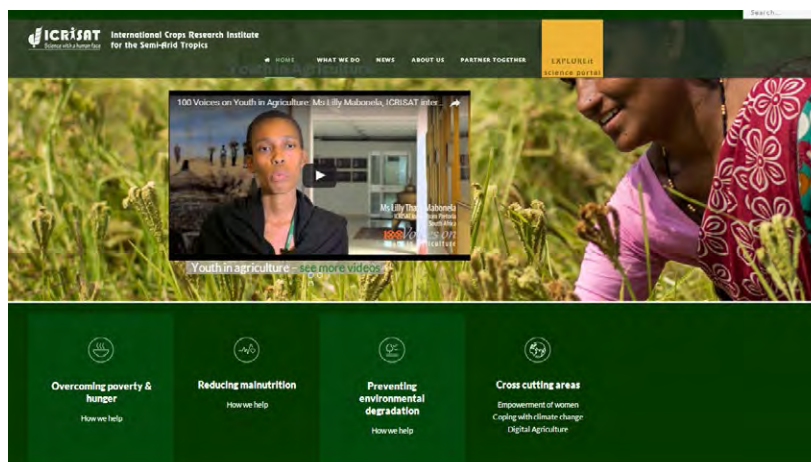
## ► Reconceptualized website

In 2015, ICRISAT reconceptualized the use of its website.

ICRISAT now has two corporate websites – one specifically designed for its scientific information ([EXPLOREit.icrisat.org](http://EXPLOREit.icrisat.org)) and one that focuses on the big global issues we are working with partners ([icrisat.org](http://icrisat.org)).

[ICRISAT.org](http://ICRISAT.org) includes dedicated sections for each of our **mission** areas:

- Poverty and hunger
- Malnutrition
- Environmental degradation
- Gender
- Climate change



### Water4Crops – reuse of treated wastewater delivers higher crop yields

The safe reuse of wastewater for agricultural purposes is showing higher crop yields and reducing the amount of pesticides in rainforests for 20-40%. The reuse of treated wastewater irrigated fields has shown an overall yield of up to 40% in vegetables such as okra, brinjal and dilly as compared to those irrigated by freshwater. These results have been achieved under the European Union and Government of India funded project Water4Crops project. Read more

**New sections** introduced in 2015:

## ► Proven technologies

A collated list and description of science backed technologies that are ready for wider adoption.

<http://www.icrisat.org/proven-technologies/>

## ► Corporate Social Responsibility

Our work with a variety of companies and foundations to help achieve their CSR objectives.

<http://www.icrisat.org/csr/>

## ► DG Blog



<http://dgblog.icrisat.org/>

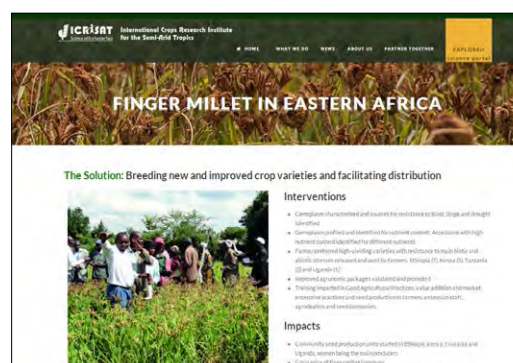
## ► Research facilities and services

Research facilities that can be capitalized on by national systems and other researchers.

<http://www.icrisat.org/research-facilities/>

## ► International Year of Soils

## ► Impacts



<http://www.icrisat.org/icrisat-impacts/>





## ▶ 35 new profiles added

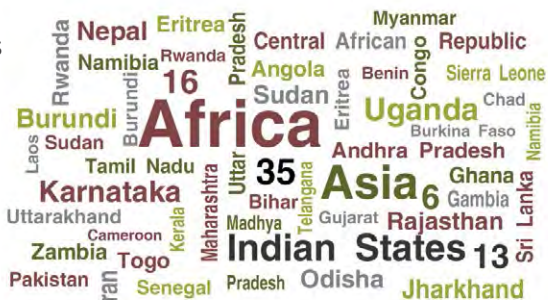


Our scientific site, [EXPLOREit.icrisat.org](http://EXPLOREit.icrisat.org) provides profiles and data on all the major geographic locations, topics, crops and systems we work on. It also provides access to all our resources such as data, publications, stories, videos and photos.

In 2015, 35 new profiles were added, EXPLOREit now features profiles and resources on 50 locations where ICRISAT has undertaken research work.

The new profiles cover **6 countries in Eastern and Southern Africa; 10 countries in West and Central Africa; 6 in Asia; and 13 states in India.**

They provide a rich collection of the challenges and achievements, publications, research projects, stories, videos and data sources of these countries or states.



## ▶ New launches

We have made a major effort to raise the voices of our partners through:



To capture the diversity of views across a single topic, ICRISAT launched the 100 Voices video series on topical issues like The Future of Genomics, Women in Agriculture, Youth in Agriculture, etc.

<http://www.icrisat.org/100-voices/>



Take 2 series showcasing brief video highlights of presentations from ICRISAT's Science Seminars is for busy people interested in agricultural research and development.

<http://www.icrisat.org/take-2-highlights-of-science-seminar/>



## ▶ Youth music videos

Young farmers want change and can show how farming is the future when conditions are right, for example, access to modern tools, quality seeds, training and capital. Young farmers in Mchinji in central Malawi share their views, stories and demands at a workshop. From this animated workshop came their catchy Kondwa (happy) tune.

Malawi young farmers sing out loud: <https://youtu.be/LRd4sOQRWMI>  
For the longer video see : [https://youtu.be/GIT79hz\\_BOI](https://youtu.be/GIT79hz_BOI)

Malawi farmers dubbed with Pharrell Williams:  
<https://youtu.be/XwiPxRWbbnw>



## ▶ Showing research through interactive timelines

The Village Level Studies (VLS), later called Village Dynamics in South Asia (VDSA) that started in 1975 is a learning repository for understanding agricultural and rural transformations. The interactive timeline created in 2015 gives a clear picture of the work undertaken over the years and its impact.



<http://www.icrisat.org/Timelines/vdsa/>



Subscribers increased by **150%** in 2015





## ▶ Award winning 2015 initiatives

### The Communicator Awards

The Communicator Awards is a leading international awards program recognizing big ideas in marketing and communications and receives over 6,000 entries from companies and agencies of all sizes, making it one of the largest awards of its kind in the world. The awards are sanctioned and judged by the Academy of Interactive & Visual Arts, an invitation-only group consisting of top-tier professionals from acclaimed media, communications, advertising, creative and marketing firms.



The ICRISAT- Annual Report 2014 won the **Award of Excellence** for featuring an interactive section on how gender can be integrated at every stage of the value chain, in the Print (Annual Report – Non-profit) category.

<http://annualreport.icrisat.org/>



A **distinction award** was given for the Big Ideas for CSR partnership in sustainable development concept and folder with options for companies to engage ICRISAT to implement their CSR, in the Print (Brochure – Business to Business) category.

<http://www.icrisat.org/csr/>



A **distinction award** was given for Take2 - video highlights of science seminars series in the Online Video (Science) category. Interviews with each presenter capture the key messages and promote the longer seminar.

<http://www.icrisat.org/take-2-highlights-of-science-seminar/>

### CSR Impact Award

ICRISAT and SAB Miller received a **'Special Mention' Certificate** of Good Practice Recognition for the Corporate Social Responsibility case study 'ICRISAT - SABMiller @ Medak'. This initiative is based on the ICRISAT Development Center (IDC) project - Improved Livelihoods through Community Water Resources Management in Community Watersheds. The award was given at the India CSR Summit 2015, held on 7-8 October at Bangalore.







Over **410** news posts  
including **24** global news placements

# ICRISAT in the media

► Our presence in print and electronic media

► Major global/national media stories

**ALJAZEERA**

News Programmes Opinion Investigation

Topics: South Sudan | Brexit consequences | Syria's Civil War | North |

### Women lead the way out of poverty in an Indian

In an arid and inhospitable Thar desert, women have taken the struggle against poverty into their own hands.

18 Nov 2015 07:10 GMT | Poverty & Development, Environment, Asia, India

Shares: 2146

**Rajasthan, India** - Rameshwari Devi wakes up at 4am each morning and walks the 3km to her nearest water source northwest Rajasthan, a vast wilderness spread over 320,000sq km and covering 60 percent of the state.

Droughts are frequent and water is scarce for up to 11 months of the year. Soil quality is poor which makes producing enough to eat a monumental task. Communal grazing pastures are a lifeline providing cattle feed, fuel, wood and medicinal plants. To help support their families, the menfolk have been migrating to the cities, leaving the women to fend as best they can.

The women of Derasar are not easily cowed, however. They are both tough and resourceful. Led by Rameshwari, they have set up a self-help group under the auspices of ICRISAT, the International Crops Research Institute for the Semi-Arid Tropics.

**THOMSON REUTERS FOUNDATION NEWS**

Home Women's Rights Climate Trafficking Property Rights Humanitarian Food

### Could pigeonpea be a life changer for Malawi's drought-stricken farmers?

By Alice Paul-Rossat | ICRISAT

Friday, 9 October 2015 12:38 GMT

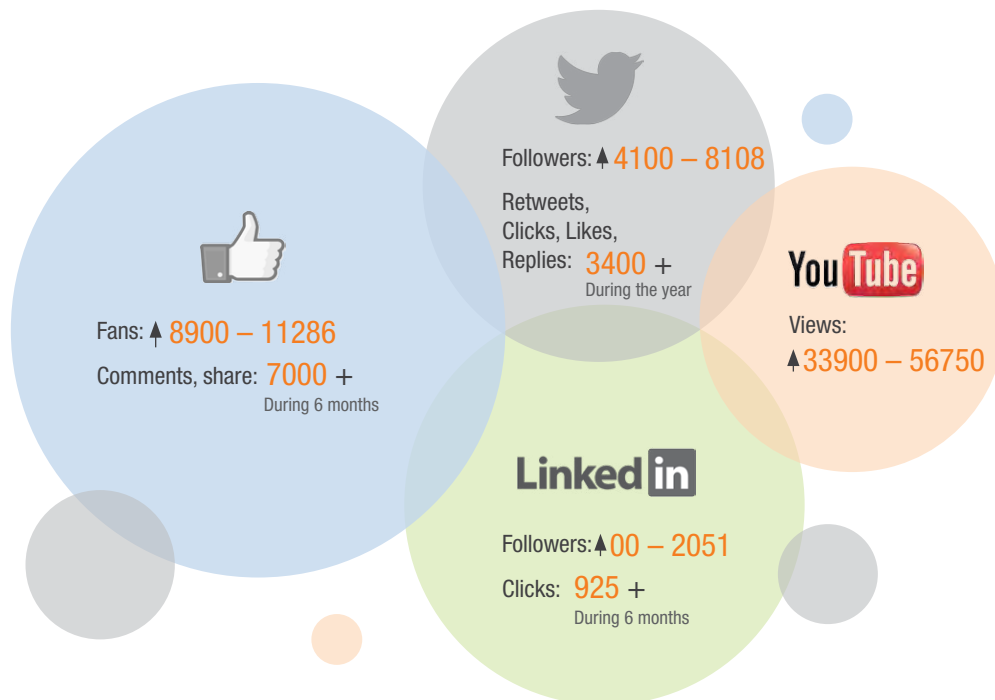
\* Any views expressed in this article are those of the author and not of Thomson Reuters Foundation.

We focus on the human and development impacts of

In Chamboho in Karonga district in North Malawi, 31-year-old John Mwaiku and his family plant pigeonpea has transformed their lives. When John first left school, he rushed to the southern city Blantyre to find a

For more media coverage look up our archives <http://www.icrisat.org/media-coverage/>

► Our presence on social media





# Financial summary

		US\$ thousands	
		2015	2014
<b>Balance Sheet</b>			
<b>Assets</b>	Cash and Cash equivalents	13,742	11,054
	Investments	42,499	54,818
	Accounts receivable	10,732	12,335
	Inventories	783	944
	Prepaid Expenses	277	475
	Property and Equipment - net	8,145	8,891
	Other assets	3,836	4,637
	<b>Total Assets</b>	<b>80,014</b>	<b>93,154</b>
<b>Liabilities</b>	Accounts payable	11,295	16,176
	Accruals and provisions	2,538	2,725
	Payments in advance from donors	23,396	27,820
	Long-term liabilities	6,579	7,642
	<b>Total Liabilities</b>	<b>43,808</b>	<b>54,363</b>
<b>Net Assets</b>	<b>Unrestricted</b>		
	Undesignated	10,934	19,446
	Designated	21,113	15,113
	Permanently Restricted	4,159	4,232
	<b>Total Net Assets</b>	<b>36,206</b>	<b>38,791</b>
<b>Total Liabilities and Net Assets</b>		<b>80,014</b>	<b>93,154</b>

		US\$ thousands	
		2015	2014
<b>Operating results and movements in Net Assets</b>			
<b>Operating results</b>	Revenue	64,246	87,987
	Expenditure	66,353	85,849
	Change in net assets, operational	2,107	2,138
<b>Net Assets - Unrestricted</b>	<b>Undesignated</b>		
	Balance, beginning of the year	19,446	16,431
	Operating (deficit)/surplus for the year	2,107	2,138
	Gratuity/Pension reversal	(405)	877
	Transfer to Appropriated	(6,000)	-
	Balance, end of the year	10,934	19,446
	<b>Designated</b>		
	Balance, beginning of the year	15,113	15,113
	Transfer from unappropriated	6,000	-
	Balance, end of the year	21,113	15,113
<b>Total Unrestricted Net Assets</b>		<b>32,047</b>	<b>34,559</b>
<b>Restricted</b>		<b>4,159</b>	<b>4,232</b>
<b>Total Net Assets</b>		<b>36,206</b>	<b>38,791</b>



## Grant Income from Donors for 2015

Donor	US\$ '000	Donor	US\$ '000
CGIAR Consortium	30,720	Austria	317
Consortium Research Centers	9,364	Catholic Relief Services (CRS)	261
India	8,297	Navajbai Ratan Tata Trust (NRTT)	181
Bill & Melinda Gates Foundation)	2,271	Alliance for a Green Revolution in Africa (AGRA)	176
United States of America (USA)	2,265	AFDB	176
Netherlands	1,002	Office Cherifien des Phosphates Foundation (OCPF)	153
United Kingdom (UK)	997	Food and Agriculture Organization (FAO)	153
Germany	848	Philippines	123
Ireland	698	China	88
McKnight Foundation	650	Canada	44
Seed Companies	588	Italy	35
Global Crop Diversity Trust (GCDT)	457	Thailand	25
Zimbabwe	438	CORAF/WECARD	16
Forum for Agricultural Research in Africa (FARA)	408	Coca-Cola India Foundation	10
Australia	353	Turkey	5
International Fund for Agricultural Development (IFAD)	353	Tanzania	2
Nigeria	331	<b>Grand Total</b>	<b>61,805</b>







# Our people

## ▶ Diversity

**28**  
Nationalities

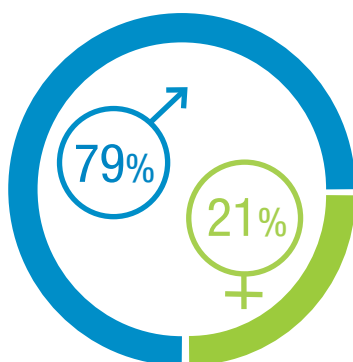
**8** USA, Europe and Australia

**3** Asia and Southeast Asia

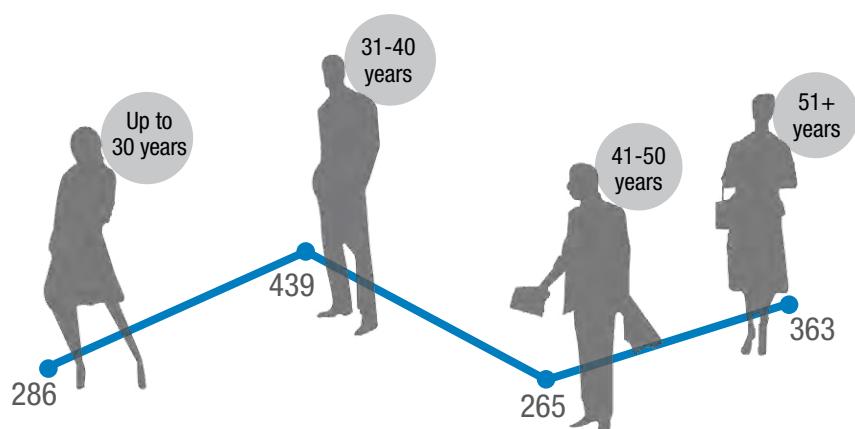
**9** West and Central Africa

**8** Eastern and Southern Africa

## ▶ Gender

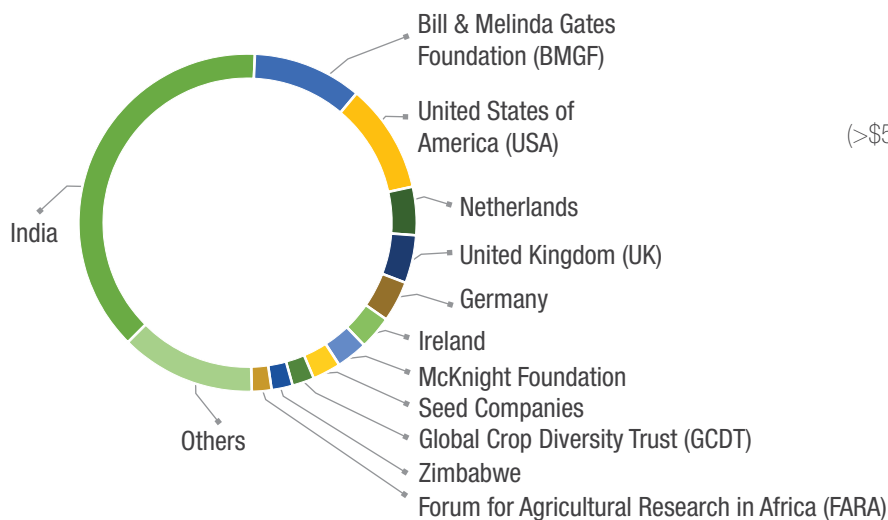


## ▶ Age

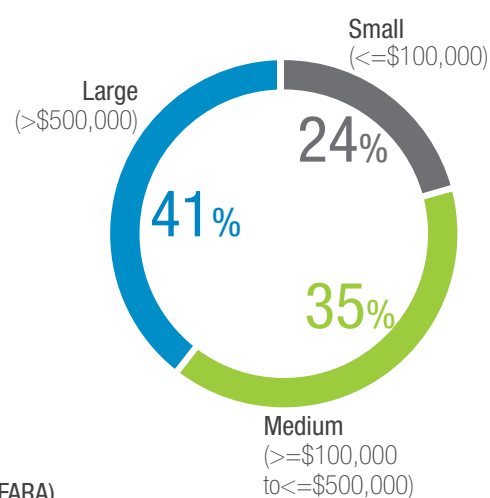


# Projects

## ▶ Projects funded



## ▶ Projects by size of grant



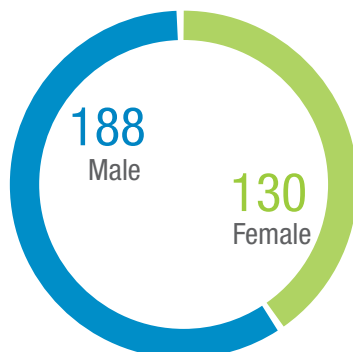


# Knowledge sharing

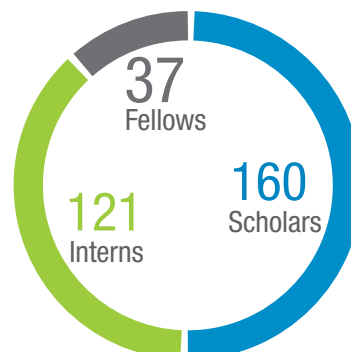
## ▶ Capacity building

**350**

Training courses and scientific visits conducted



Personnel Trained



Trainees by Category

## ▶ Research publications

**216** Papers in journals listed by ISI/Thomson Reuters

**105** Papers in other peer reviewed journals

**15** Books

**70** Book chapters

**33** Monographs

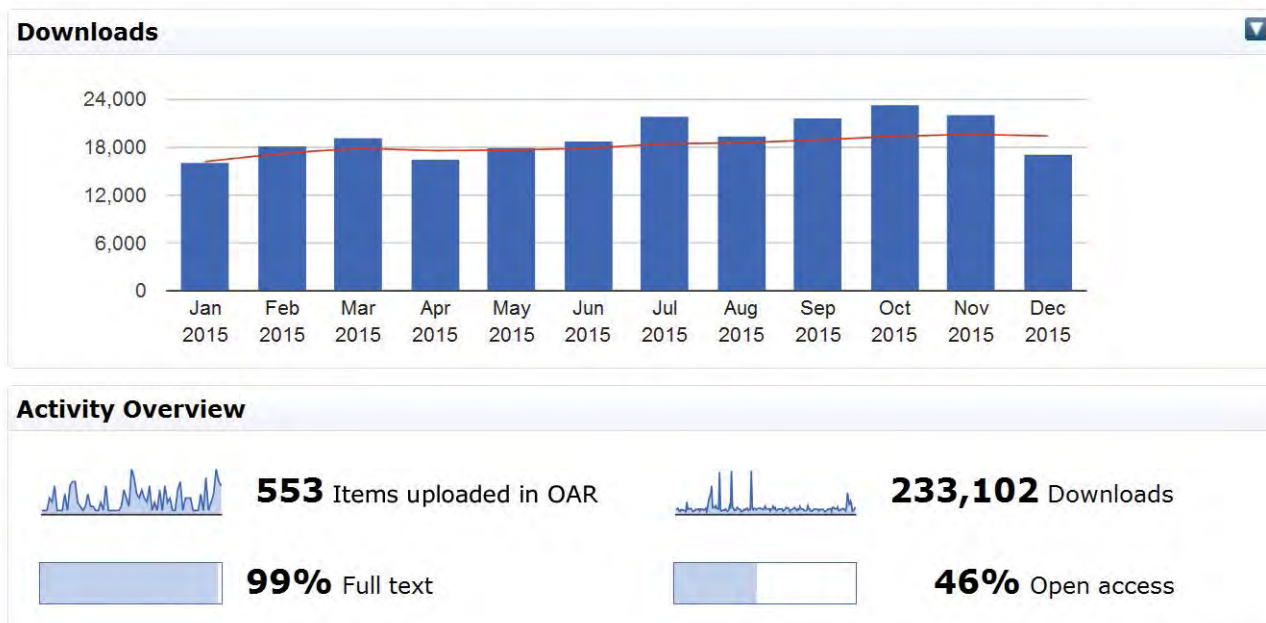
**88** Conference proceedings

**39** Science posters

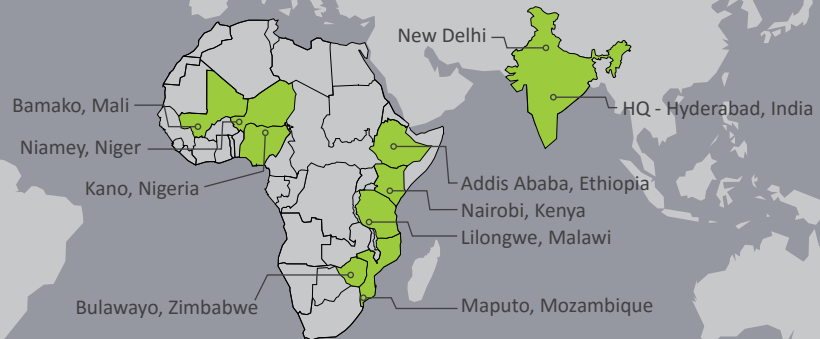
**7** Reports

**10** Policy briefs

## ▶ Downloads from ICRISAT's library (Open Access Repository)



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ICRISAT is a member of the CGIAR System Organization

We believe all **people** have a **right** to **nutritious food** and a **better livelihood**.

ICRISAT works in agricultural research for development across the drylands of Africa and Asia, making farming profitable for smallholder farmers while reducing malnutrition and environmental degradation.

We work across the entire value chain from developing new varieties to agri-business and linking farmers to markets.

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ICRISAT appreciates the support of CGIAR investors to help overcome poverty, malnutrition and environmental degradation in the harshest dryland regions of the world. See <http://www.icrisat.org/icrisat-donors.htm> for full list of donors.



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