

# Pulse of ICRISAT

Celebrating the International  
Year of Pulses

Annual Report  
2016



INTERNATIONAL CROPS RESEARCH  
INSTITUTE FOR THE SEMI-ARID TROPICS



ICRISAT is an International Research  
Institute of the CGIAR





## Message from the Board Chair

ICRISAT has tied its work to the SDGs and we have been able to use our research to help achieve the pathways towards lifting people out of poverty, aiming towards zero hunger, dealing with climate change and improving resilience in the dryland communities.

Chandra Madramootoo

> Watch the video: [annualreport2016.icrisat.org](http://annualreport2016.icrisat.org)



## Message from the Director General

The report connects you to stories of lives that have been changed through innovation; partnerships that have enabled us to scale impact; and how we have been engaging with policy makers to bring about equitable and sustainable solutions for smallholder farmers across sub-Saharan Africa and India.

David Bergvinson

> Watch the video: [annualreport2016.icrisat.org](http://annualreport2016.icrisat.org)

# Research Highlights

## Impacts in Mission Areas

### ► Overcoming poverty and hunger



**USD2679 net returns per ha** from dry season groundnut production in Nigeria

Yields in Tanzania

Sorghum: Increased from **380** to **1200 kg/ha**

Pearl millet: Increased from **500** to **1350 kg/ha**

Pigeonpea: Increased from **500** to **1400 kg/ha**

Groundnut: Increased from **650** to **1750 kg/ha**

> **USD150 million** annual social benefits due to pearl millet hybrids in India

**10-50%** increase in crop yields and incomes on **6 million ha** in two Indian states through integrated farm practices

**Cereal-legume intercropping** systems introduced in Vietnam, Laos, Myanmar, Nepal and India result in increased incomes

### ► Reducing malnutrition



**Nutritious complementary food package** tested on children in Malawi and Tanzania with positive results

### Smart Food campaign - Kenya

**1700** trained

>**8000** households reached

**5400** children under 5 years reached

### Nutritionally dense cultivars

**2 high-Fe pearl millet cultivars** identified for West and Central Africa (WCA)

**15 high-Fe and -Zn sorghum varieties** identified for adaptation in Nigeria

**100 promising finger millet varieties** profiled for nutrient content

**Nutritionally dense groundnut genotypes** identified in WCA

## Impacts in Crosscutting Areas

### ► Empowerment of women



**10,770 women** gained access to land and increased their income when 241 ha of degraded land was converted into productive land in Niger

### ► Digital Agriculture



- **30% more income** for farmers who followed sowing app advisories
- App for pest and disease recognition
- ICT-based agri-startups incubated by ICRISAT have initiated software development to support FPOs nationwide with their operations and management

## Our work contributes towards the following SDGs



Read the full report: [annualreport2016.icrisat.org](http://annualreport2016.icrisat.org)



## ► Preventing environmental degradation



### Watersheds

**70,000 ha** and **50,000 families** covered in 15 pilot watersheds in India

**Impact:** **50-100%** increase in groundwater recharge | **30-60%** increase in cropping intensity | **2x** increase in crop yield

**8000 ha** of land at Yewol watershed became a learning site visited by Government and community leaders from 23 districts

**Impact:** Increase in irrigable area: From **240** to **970 ha**  
Increase in crop yield: From **1.2** to **1.9 t/ha**  
New crops introduced: **5**  
Increase in area under chickpea cultivation: **100%**

**35 ha** of abandoned land was rehabilitated benefitting 360 members of 52 households in Chifra, Ethiopia

### Wastewater treatment

**27 locations** piloted in 5 Indian states | **30-92% reduction** in pollutants

## ► Coping with climate change



**Climate mapping** of Telangana state completed

**Modeling tools:** New improved modeling tools for dryland crops leading to robust **global foresight predictions**

► **Upgraded CRAFT** (CCAFS Regional Agricultural Forecasting Toolbox)

## Research outputs contributing to ICRISAT's mission



### Genetic gains

**Ancestor genome of groundnut cracked:** Co-led sequencing and analysis

**Draft genomes** of pearl millet and finger millet assembled

### Genebank

**17,377** seed samples distributed in 24 countries

**2551** unique germplasm accessions assembled from regional genebanks



### Crop improvement

#### 50 varieties released

Groundnut **6** | Chickpea **6** | Finger millet **3**  
Sorghum **28** | Pigeonpea **5** | Pearl millet **2**



### Seed production

**23,509 tons** of seed of ICRISAT mandate crops shared with farmer groups, NARS and NGOs

Breeder: **292 tons** | Foundation: **1323 tons**  
Certified: **11,807 tons** | Quality declared: **10,087 tons**



### Agribusiness and innovations

**40** institutions mentored to support establishment of 75 farmer producer organizations (FPOs)

**16 FPOs** promoted in India | **27** agribusiness incubators mentored in national agricultural research system (NARS) institutions  
Cost-effective groundnut sheller developed

**9** INDUSTRY, INNOVATION AND INFRASTRUCTURE



**11** SUSTAINABLE CITIES AND COMMUNITIES



**13** CLIMATE ACTION



**15** LIFE ON LAND



**17** PARTNERSHIPS FOR THE GOALS



Our work is accomplished with the support of our funders and the collaboration of smallholder farmers, national governments, international bodies, the national agricultural research system, advanced research institutes and universities and private sector.



**2016**

**INTERNATIONAL  
YEAR OF PULSES**

## Glimpses of ICRISAT's research work on pulses over 45 years in Asia and Africa

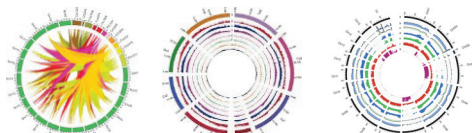
### Machine-harvestable variety

**NBeG 47** is the first machine-harvestable chickpea variety released in Andhra Pradesh, India, suitable for the state's variable climate

### Genomic resources

#### Genome sequences

Published in Nature Biotechnology



[Pigeonpea 2011](#) [Chickpea 2012](#) [Fusarium oxysporum 2016](#)

Resequencing of **3000** chickpea lines

### Accessions shared (as of 2016)

**16,996** chickpea accessions and **12,596** pigeonpea accessions were deposited at the Svalbard Global Seed Vault over the last 8 years

### Variety/hybrid releases (as of 2016)

(from breeding material supplied by ICRISAT)

#### India

**160** chickpea varieties in 26 countries

**91** pigeonpea varieties/hybrids in 19 countries

#### Africa

**41** chickpea varieties in 4 countries

**32** pigeonpea varieties/hybrids in 8 countries

Machine harvestable chickpea

**2016**

Pigeonpea and chickpea draft genome sequences

**2012**

Accessions deposited at Svalbard Global Seed Vault

**2009**

World's first commercial pigeonpea hybrid

**2008**

Towards  
SDGs

**Pu**  
of IC

## Expansion of varieties based on ICRISAT-origin material

### Impacts

#### Africa

|                  |                 |                  |
|------------------|-----------------|------------------|
| Increase in...   | <b>Chickpea</b> | <b>Pigeonpea</b> |
| Cultivated area: | <b>24%</b>      | <b>96%</b>       |
| Production:      | <b>130%</b>     | <b>175%</b>      |
| Productivity:    | <b>39%</b>      | <b>50%</b>       |

#### India

- Chickpea:** Accounts for **48%** of the demand for breeder seed
- Pigeonpea:** Accounts for **37%** of the pigeonpea area

#### Myanmar

- ICRISAT-origin varieties cover **96%** of **chickpea** area



1972: Our journey begins

Genebank established at ICRISAT-India

## Genetic resources

### Germplasm collection (as of 2016)

#### India

**20,602** chickpea accessions from 59 countries

**13,778** pigeonpea accessions from 74 countries

#### Africa

**1200** chickpea accessions from 6 countries

**1500** pigeonpea accessions from 14 countries

### Seed samples distributed (as of 2016)

#### Chickpea

**153,193** samples to 88 countries

#### Pigeonpea

**75,335** samples to 113 countries

## Crop improvement (as of 2016)

#### Chickpea

**Yield potential:** 2.5-3.0 t/ha (120 varieties)

**Short-duration:** <100 days to maturity

#### Varieties developed

**40:** Drought tolerance  
**10:** Heat tolerance  
**100:** Fusarium wilt  
**60:** Ascochyta blight

#### Pigeonpea

**2-2.5 t/ha** (varieties)  
**3-3.5 t/ha** (hybrids)

**<100** days to maturity

#### Disease resistant:

**>20** varieties/hybrids developed for **Fusarium wilt** and **Sterility mosaic** disease

### Subsets collection (as of 2016)

#### Chickpea

**3000** Composite

**1956** Core

**211** Mini core

**300** Reference sets

#### Pigeonpea

**1000** Composite

**1290** Core

**146** Mini core

**300** Reference sets

## Seed Systems

### Africa

|                             | Chickpea               | Pigeonpea                  |
|-----------------------------|------------------------|----------------------------|
| Certified seed production : | <b>125,640 t</b>       | <b>4250 t</b>              |
| Coverage :                  | <b>1.25</b> million ha | <b>&gt; 0.5</b> million ha |
| Additional benefits :       | <b>USD300</b> million  | <b>USD130</b> million      |

## Linking farmers to markets

### Africa

|                 | Chickpea               | Pigeonpea             |
|-----------------|------------------------|-----------------------|
| Producer price: | <b>30-50%</b>          | <b>25-40%</b>         |
| Annual exports: | <b>USD46.6</b> million | <b>USD203</b> million |



GOOD FOR YOU - THE PLANET - THE FARMER

# PULSES

Some of the **biggest global issues** are:

**Poor diets**

malnutrition to obesity

**Environmental issues**

climate change, water scarcity and environmental degradation

**Poverty**

Smart Food is one of the **solutions** that contributes to addressing all these issues in **unison**.

Smart Food is food that **fulfills all the criteria** of being:

GOOD FOR YOU

GOOD FOR THE PLANET

GOOD FOR THE FARMER

Know more about Smart Food  
[www.smartfood.org](http://www.smartfood.org)

*for you*



## NUTRI-DENSE

- High protein
- High fiber
- Zero cholesterol
- Rich in vitamins and minerals



## HEALTHY CHOICE

Helps manage

- Obesity
- Diabetes
- Celiac disease
- Gluten sensitivity



## BALANCED DIET

The UN World Food Programme includes 60gm of pulses in its typical food basket







# ARE GOOD...



for the *planet*



## LOW CARBON FOOTPRINT

Reduces nonrenewable energy in the entire crop rotation by 22-24%



## LOW WATER FOOTPRINT

- 4055 liters for 1kg pulses
- 15,415 liters for 1kg beef

## IMPROVES SOIL HEALTH

- Aids microbial diversity
- Breaks pest cycles
- Reduces nitrogen fertilizer use

for the *farmer*



## MULTIPLE USES

- Food
- Fodder
- Fuel
- Green manure
- Fences/baskets
- On-farm diversity



## YIELD POTENTIAL

New varieties and hybrids have 3 times more yield potential

Added traits:

- Early maturity
- Tolerance to biotic and abiotic stresses
- Climate smart



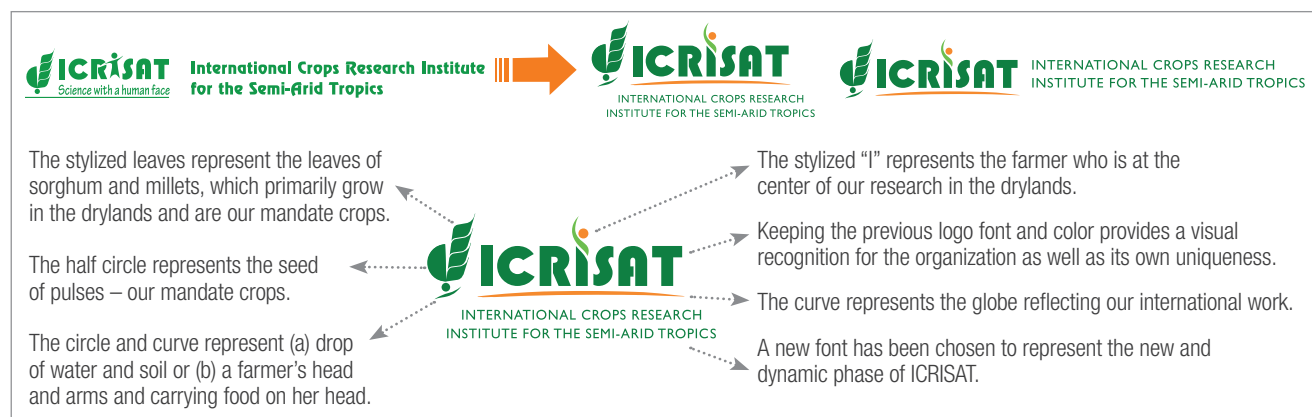
## MARKET POTENTIAL

Developing value chain creates marketing options for farmers leading to higher incomes

# Communication initiatives

## Modernized ICRISAT logo

Our journey of change: The logo was modernized in 2016 to reflect the new and dynamic phase of ICRISAT



## Other notable initiatives

### ► Celebrating the International Year of Pulses (IYP)

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

### ► Launched Agri-buzz blog

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

### ► Positioning ICRISAT in key research areas

#### ► Climate-Smart Villages

<http://annualreport2015.icrisat.org/>

#### ► Digital Agriculture

<http://www.icrisat.org/digital-agriculture/>

#### ► Empowering Women

<http://www.icrisat.org/empowering-women/>

### ► New timelines

#### ► Combating Aflatoxin

<http://www.icrisat.org/aflatoxin-timeline/>

#### ► Fertilizer Microdosing

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

## New 100 Voices series

Three new series with a total of 33 videos were launched as part of the 100 Voices series.

- Youth in Agriculture
- Women in Agriculture
- Public-Private Partnerships

## Media coverage

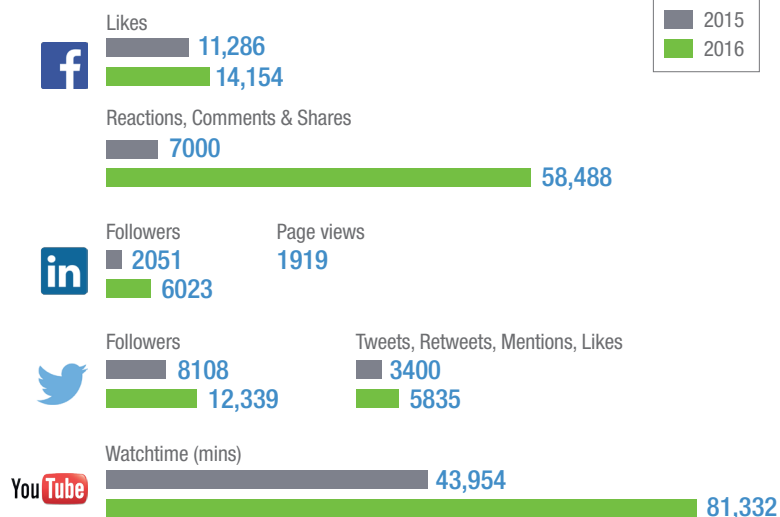
**851**

national/regional  
news posts

**15**

global news  
placements

## Social media



Read the full report: [annualreport2016.icrisat.org](http://annualreport2016.icrisat.org)





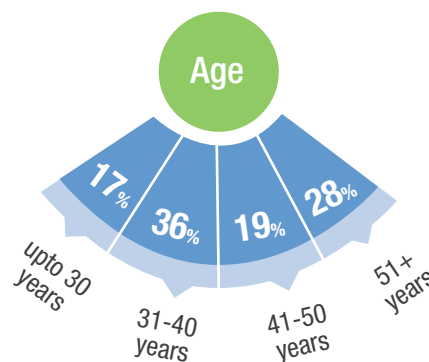
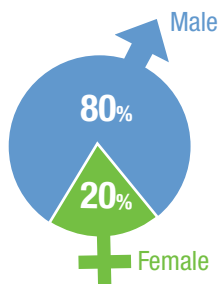
# Our people

## Diversity

**29**

Nationalities

|                                    |                                      |
|------------------------------------|--------------------------------------|
| <b>7</b> USA, Europe and Australia | <b>4</b> Asia and Southeast Asia     |
| <b>11</b> West and Central Africa  | <b>7</b> Eastern and Southern Africa |



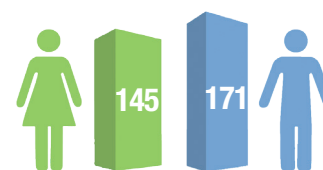
## Knowledge sharing

**316**

Training courses and scientific visits conducted



No. of trainees



**568**

Research publications

**237**  
Papers in ISI/Thomson Reuters listed journals

**39**  
Books and journal volumes

**30**  
Monographs

**12**  
Policy briefs

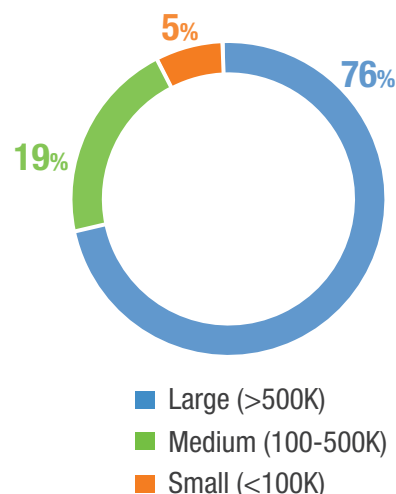
**53**  
Papers in other peer reviewed journals

**9**  
Articles in international newsletters

**64**  
Book chapters

**124**  
Conference proceedings

## Contribution to grant revenue by project size



# ICRISAT Governing Board



**Chandra A Madramootoo**, Canada  
Chair, ICRISAT GB



**S Ayyappan**, India  
Vice Chair, ICRISAT GB  
(till Feb 2016)



**Trilochan Mohapatra**, India  
Vice Chair, ICRISAT GB  
(from Feb 2016)



**Oluwande Muoyo**  
Nigeria



**Rachel K Chikwamba**  
South Africa



**Sissel Rogne**  
Norway



**Wendy Umberger**  
Australia



**David Bergvinson**, Canada  
Director General, ICRISAT



**Nigel Wells Kerby**  
Britain



**Paco Sereme**  
Burkina Faso



**Paul C Anderson**  
USA



**Pradeep Chandra**  
India (from Dec 2016)



**Rajiv Sharma**  
India (till Nov 2016)



**Shobhana Pattanayak**  
India (from Feb 2016)



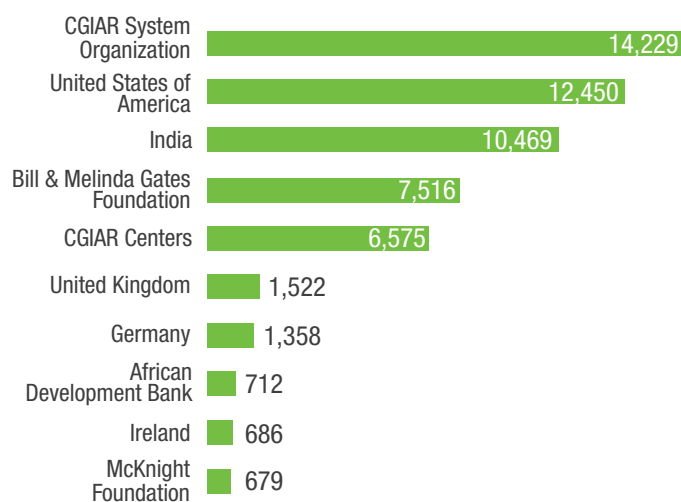
**Siraj Hussain**  
India (till Feb 2016)

## Financial summary

(in US\$ thousands)

### Top Ten Donors for 2016

(in US\$ thousands)



| Balance Sheet                             |               |               |
|---|---------------|---------------|
|   | 2016          | 2015          |
| <b>Assets</b>                             |               |               |
| Cash and Cash equivalents                 | 22,882        | 13,742        |
| Investments                               | 44,961        | 42,499        |
| Accounts receivable                       | 15,811        | 10,732        |
| Inventories                               | 702           | 783           |
| Prepaid Expenses                          | 295           | 277           |
| Property and Equipment - net              | 7,654         | 8,145         |
| Other assets                              | 2,884         | 3,836         |
| <b>Total Assets</b>                       | <b>95,189</b> | <b>80,014</b> |
| <b>Liabilities</b>                        |               |               |
| Accounts payable                          | 11,882        | 11,295        |
| Accruals and provisions                   | 2,203         | 2,538         |
| Payments in advance from donors           | 31,629        | 23,396        |
| Long-term liabilities                     | 5,585         | 6,579         |
| <b>Total Liabilities</b>                  | <b>51,299</b> | <b>43,808</b> |
| <b>Net Assets</b>                         |               |               |
| Unrestricted                              |               |               |
| Undesignated                              | 18,716        | 10,934        |
| Designated                                | 21,113        | 21,113        |
| Permanently Restricted                    | 4,061         | 4,159         |
| <b>Total Net Assets</b>                   | <b>43,890</b> | <b>36,206</b> |
| <b>Total Liabilities &amp; Net Assets</b> | <b>95,189</b> | <b>80,014</b> |



## 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)

## Realigned research program structure

In 2016 the ICRISAT Research Program structure was realigned to facilitate greater agility and faster response to national needs and priorities (see below).

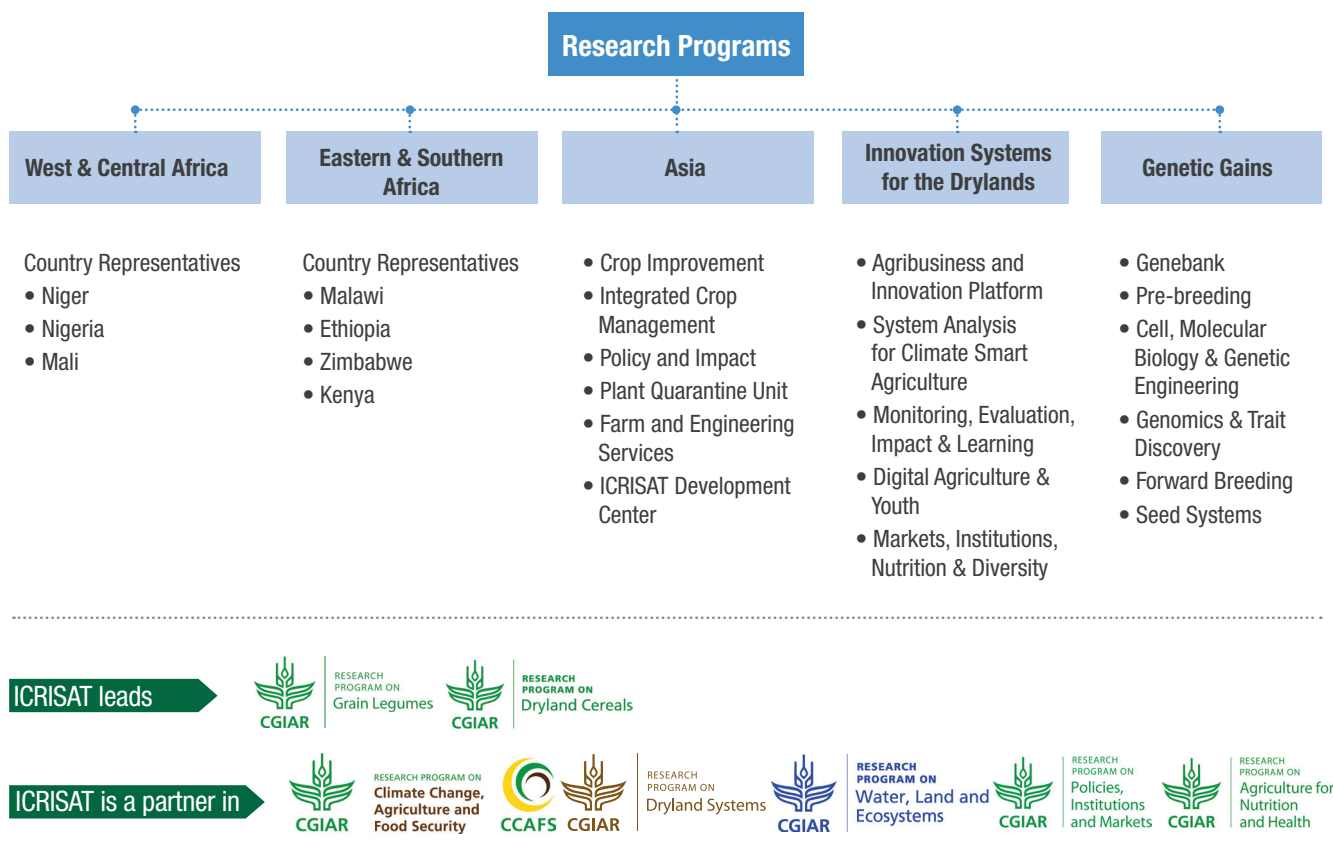


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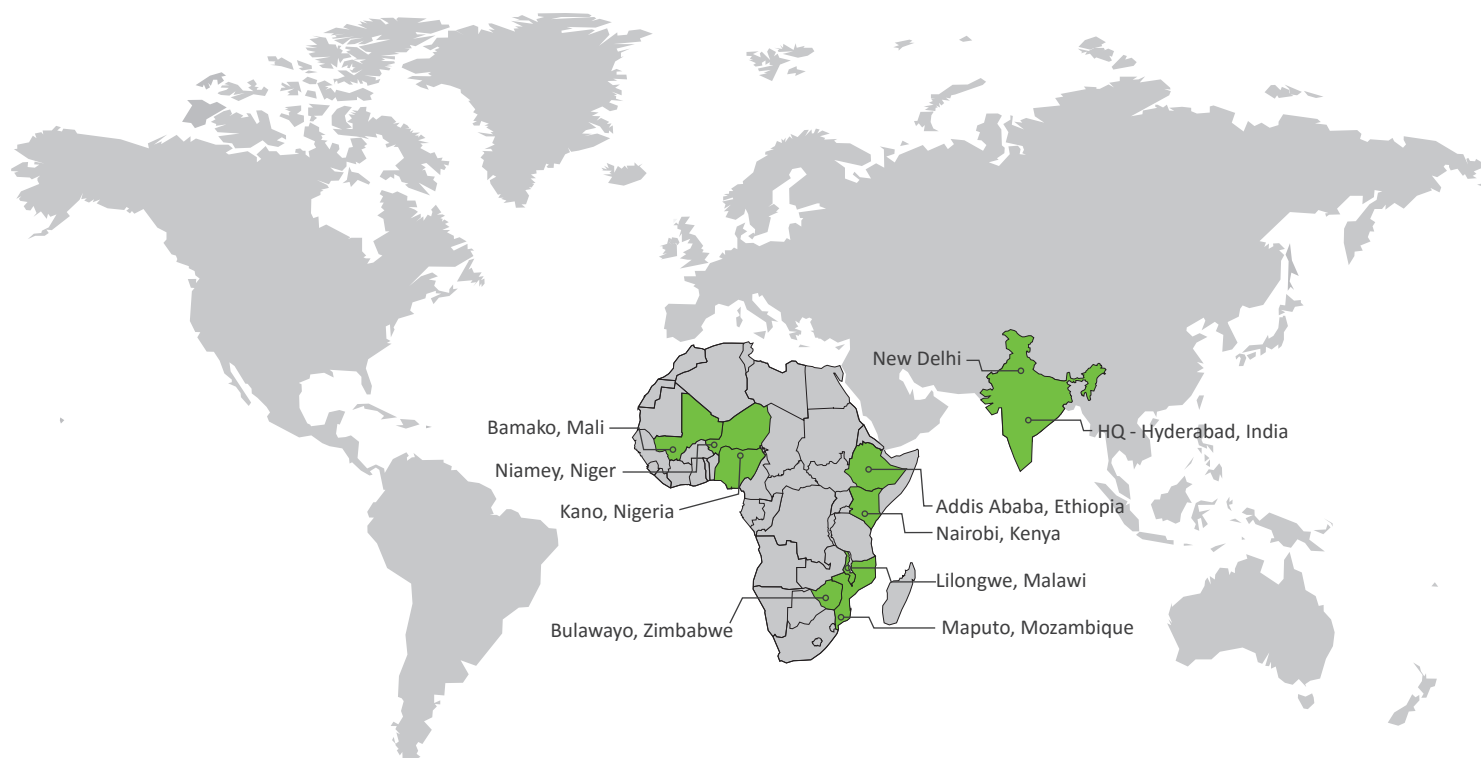
Prasad Rao SV  
Ramesh MNR  
Vinay Kumar R

### Web Edition

Tinku Ray  
Smitha Sitaraman  
Fareeduddin M



## ICRISAT locations



INTERNATIONAL CROPS RESEARCH  
INSTITUTE FOR THE SEMI-ARID TROPICS



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 agribusiness 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.



About ICRISAT: [www.icrisat.org](http://www.icrisat.org)



ICRISAT's scientific information: [EXPLORE.it.icrisat.org](http://EXPLORE.it.icrisat.org)



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