ICRISAT

Annual Report 2011

Sequencing of the pigeonpea genome promises improved livelihoods for smallholder farmers

ICRISAT
Science with a human face

International Crops Research Institute for the Semi-Arid Tropics

Citation:
ICRISAT (International Crops Research Institute for the Semi-Arid Tropics). 2012. ICRISAT Annual Report 2011. Patancheru, Andhra Pradesh, India: ICRISAT. 52 pp. ISSN 1017-9933.

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International Crops Research Institute for the Semi-Arid Tropics
Patancheru 502 324, Andhra Pradesh
India

Vision

A prosperous, food-secure and resilient dryland tropics.

Mission

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

Goal

Partnership-based international agricultural research-for-development that embodies *science with a human face*.

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Message from the Director General

The year 2011 started on a highly positive note with the conduct of our global research meeting of scientists and senior staff members at the headquarters, capitalizing on our new Strategic Plan to 2020 and aiming to renew and reinvigorate ICRISAT in a major way. During the meeting, we all committed to stronger teamwork primarily towards the development of our three-year Medium-Term Plan.

Change offers new and exciting opportunities for us all. We are making significant progress in internalizing our new Inclusive Market-Oriented Development (IMOD) framework, a powerful unifying concept of our strategic plan, as we continue to strive towards our vision of a prosperous, food-secure and resilient dryland tropics.

We celebrate our 40th anniversary in 2012, and as we look at our achievements so far, it is clear that the year 2011 has witnessed highly significant successes.

ICRISAT has been entrusted leadership of two CGIAR Research Programs (CRPs) – Grain Legumes and Dryland Cereals – and is actively involved in major research-for-development programs across the semi-arid tropics. The ICRISAT-led HOPE project in India and in sub-Saharan countries of Africa has made great strides in helping smallholder farmers increase the yields of two dryland cereal crops – sorghum and millets. Our research under the Tropical Legumes I and II programs have complementary benefits as the learnings and successes of TLI (legume genomics) are passed on to TLII (legume improvement) to be promoted among and extended to the ultimate beneficiaries, the farmers of the semi-arid tropics. Our landmark science achievement for 2011 is of course the cracking of the pigeonpea genome sequence by an ICRISAT-led global research partnership.

The Bhoochetana (revival of the land) project in India, implemented in the state of Karnataka, has gained so much recognition that the state government of Andhra Pradesh has once again sought our partnership in applying the same brush of success in this state, and there are indications that other states will follow. We likewise proudly report our increasingly successful women empowerment initiatives in several countries in sub-Saharan Africa.

We have much to be grateful for. As always, we acknowledge the contributions of all our stakeholders whose faith in our ability enables our efforts, our Governing Board whose guidance and encouragement fuels our enthusiasm, and our highly dedicated team of scientists and support staff without whom our vision would be all for naught. Together with our partners, it is our privilege to serve this great mission of leading the journey of hope and prosperity for the poor in the dryland tropics.

William D Dar
Director General

Message from the Chairman

I write this message for ICRISAT's Annual Report with a sense of pride in the work, skills and dedication of my colleagues. Because of their efforts, ICRISAT continues to grow from strength to strength and from success to success in fulfilling its mission to reduce poverty, hunger, malnutrition and environmental degradation in the dryland tropics. Our work is now being regularly reported in the international media.

ICRISAT's mandate in the semi-arid tropics spans countries in Asia and sub-Saharan Africa. In this past year, ICRISAT has laid the foundation for the implementation of the ICRISAT South-South Initiative (ISSI). This initiative is strengthening and extending our India-Africa partnership, and has elevated ICRISAT's role as a bridge, broker and catalyst. As of December 2011, ICRISAT has shared 829 of its improved varieties and hybrids with 79 countries; saw the release of the ICRISAT-developed groundnut and pigeonpea varieties in Mozambique and Malawi; and the spread of its Agribusiness and Innovation Platform activities developed in India to Ghana, Kenya, Mali, Uganda and Zambia. These are no small achievements in a single year, and they hugely demonstrate ICRISAT's serious attention to its role.

In our constant search for better crop varieties, ICRISAT's leadership in sequencing the pigeonpea genome deserves special mention, as it is a landmark achievement of 2011.

The challenges posed by Climate Change still loom large, and ICRISAT is doing its share to mitigate the consequences. In March 2011, ICRISAT launched a project to test its *Hypothesis of Hope*, which spells out measures to ensure that our farmers overcome the threats associated with this global problem.

ICRISAT was also chosen to lead two important CGIAR Research Programs on Grain legumes and Dryland Cereals. Besides the high quality science being performed at ICRISAT, we have witnessed the sincerity and integrity of ICRISAT's management and staff in carrying out their mission. ICRISAT's Governing Board has lauded its science and institutional health, and has complete faith in ICRISAT's ability to develop relevant, practical and sustainable solutions in the areas of these CRPs.

Along with my fellow Board members, I thank ICRISAT for its service in the semi-arid tropics, and thank all stakeholders for their continued support and trust in this very special, relevant and committed research institution.

Nigel Poole
Chair, ICRISAT Governing Board

Rajeev Varshney setting up a genomics experiment.

The Brilliance of Genome Sequencing

The integration of genomic tools in plant breeding is becoming routine, resulting in the more rapid development of superior crops. However, for most of the ICRISAT mandate crops, genomics-assisted breeding is still at an early stage. This is mostly due to limited genomic information and a poor understanding of the inheritance (genes, alleles, interactions, and regulation of these) underlying agronomic performance, product quality and tolerance/resistance to important abiotic and biotic stresses.

Sequencing generations

In 2000, Arabidopsis (*Arabidopsis thaliana* L.) was the first plant to have its genome sequenced. Since then, genome sequencing has progressed rapidly and several economically important crops have been sequenced – rice (2005), poplar (2006), grape (2007), papaya (2008), sorghum, maize and cucumber (2009), soybean (2010), and pigeonpea and strawberry (2011). However, the time and personnel costs associated with these efforts prohibited the sequencing of larger numbers of plant species, especially those with large complex genomes, such as groundnut. Recent advances in next generation sequencing technologies, with increased throughput and reduced costs, have dramatically increased the opportunities for sequencing plant genomes. Further, sequencing additional genotypes of a given species is substantially less expensive once a complete (or nearly complete) aligned genome sequence has been produced (eg, sequencing another sorghum variety can be done now for under US$1500, whereas the first 95% complete aligned sorghum genome sequence cost over US$2 million).

By the end of 2013, we expect that all five ICRISAT crops will have genome sequences, and that these will be in use by breeders …

Genome sequencing of ICRISAT crops

Among ICRISAT's crops, sorghum was the first to be sequenced as part of a USA-led effort in 2007-08. In 2011, two groups – ICRISAT (together with Beijing Genome Institute, Shenzhen, China and ten other institutes around the world) and a team led by the National Research Centre on Plant Biotechnology, New Delhi – published aligned sequences of the pigeonpea genome using different sequencing approaches. By the end of 2013, we expect that all five ICRISAT crops will have genome sequences, and that these will be in use by breeders – truly remarkable progress in such a short period of time.

Sorghum is a major dryland cereal, particularly in the semi-arid tropics of Africa and Asia. The sorghum genome was sequenced by an international consortium of 21 institutes including ICRISAT. The sorghum genomic sequence and novel molecular markers identified from it are useful not just for the sorghum community but also across research communities addressing the improvement of many other species for which less comprehensive genomic resources are available now (eg, sugarcane and pearl millet).

Pigeonpea is an important legume crop grown in semi-arid regions globally. Like other grain legumes (eg, chickpea, lentil, cowpea and common bean), it is known as the "poor people's meat" because of its high protein content, but crop productivity worldwide has stagnated. Access to an aligned pigeonpea genome sequence will provide breeders with more effective methods to improve yield and quality, tackle pests and diseases, and improve tolerance to harsh environmental conditions. It is the first "orphan crop", the first "non-industrial crop" and the second food legume (after soybean) for which published genome sequence information is available.

Chickpea is grouped into *kabuli* and *desi* types. *Desi* chickpeas have darker seeds and a rough coat and are cultivated mostly in the Indian subcontinent, Ethiopia, Mexico and Iran. *Kabuli* chickpeas are lighter colored, have larger seeds and a smoother coat, and are grown mainly in southern Europe, northern Africa, Afghanistan, Pakistan, Chile, and in the Indian subcontinent. Efforts are underway to sequence the genomes of both types of chickpea in partnership with the Indian Council of Agricultural Research and universities in the USA, Canada, Australia, Spain and Germany.

Groundnuts (peanuts) have a large complex genome, making its genetic analysis challenging. The Peanut Genome Project, coordinated by the USA Peanut Foundation and MARS Inc., and involving scientists from University of Georgia, University of California-Davis, USDA-ARS, BGI-Shenzhen, NCGR, University of Brasilia, EMBRAPA, ICRISAT and several institutes from China have recently started sequencing of diploid progenitors and cultivated peanut genotypes. The outcome will enable molecular breeding approaches for improving groundnut yields, resistance, tolerance and product quality traits.

Millets are a group of a dozen small-seeded grasses harvested as grain crops. As it is closely related to the biofuel crop switchgrass, foxtail millet was given early priority and a team led by the University of Georgia produced an aligned genome sequence. As foxtail millet is pearl millet's closest relative, pearl millet breeders are already using this unpublished foxtail millet sequence, along with the published genomic sequences of rice and sorghum, to accelerate pearl millet improvement. Further, ICRISAT is building a consortium to generate an aligned genome sequence for pearl millet by the end of 2013.

Outlook

The availability of an aligned genome sequence opens new paths for crop research and improvement by providing: a better understanding of plant genome structure and the dynamics of molecular evolution; the identification of genes and genomic regions controlling important traits; and better tools and platforms for gene mapping, gene isolation and better integration of conventional and genomics-assisted breeding approaches. ■

It takes many players, including scientists, technicians and field helpers, to apply the benefits of genome sequence information for crop improvement.

Mrs Temegnush Dhabi proudly displays the chickpea in her grain store.

Leading a Legacy of Legumes

"I would never have thought chickpea could bring me such high returns," says 50-year-old Temegnush Dhabi in her grain store filled with bags of recently harvested chickpeas. "From 1.5 hectares, I harvested 42 bags (about 4 tons) of grain."

Temegnush has been a farmer for 26 years. Since working with researchers from the Ethiopian Institute for Agricultural Research and ICRISAT over the past four years to test improved resistant chickpea varieties, Temegnush has seen dramatic increases in her chickpea yields. She is one of nearly a quarter million smallholder farmers in sub-Saharan Africa (SSA) and South Asia (SA) directly reaping the benefits of new legume varieties through the Tropical Legumes projects I and II.

Perhaps the most important achievement has been creating excitement about tropical legume technologies among researchers and farmers, and improving the livelihoods of smallholder farmers…

Legumes are among the oldest cultivated plants. Fossil records show that prehistoric people domesticated and cultivated legumes for food. Today, this extremely large category of crops is second only to cereals in supplying carbohydrates, protein, and fat necessary for human food needs. Of over 30 species of legumes, the major ones for sub-Saharan Africa and South Asia include chickpea, common bean, cowpea, groundnut (or peanut), pigeonpea, and soybean.

Annual area planted to these crops stands at 27 million ha in SSA and 40 million ha in SA, with an annual production estimated at 19 million metric tons (MT) in SSA and 43 million MT for SA. Average yields are low, at less than 1 MT per ha. An estimated 140 million households (over 101 million in SSA and 39 million in SA) grow one or more of the six major legumes – valued at more than US$ 31 billion – each year.

Partners in Tropical Legumes I (TL I), led by the CGIAR's Generation Challenge Program (GCP), include the NARS of collaborating countries, advanced research institutes in Brazil and the USA, ICRISAT, CIAT, BecA and Egerton University in Kenya. The project is researching the use of advances in genomics to harness important traits found in global stocks of legume genetic resources to develop crops that better meet farmers' needs.

In the companion project (Tropical Legumes II or TL II), ICRISAT and sister CGIAR Centers, the International Center for Tropical Agriculture and International Institute of Tropical Agriculture, together with several national program, private sector, and NGO partners are working closely with smallholder farmers to ensure that they access seed of improved grain legume varieties developed by the Tropical Legumes projects.

Overcoming challenges through Tropical Legumes II

Major constraints to the production of tropical grain legumes fall into two categories – technical and institutional. Drought, extreme heat and soil

degradation, combined with diseases, pests and weeds are the technical constraints that must be addressed. Solutions to these have been researched for the past three decades or more, and ample knowledge has been accumulated. While research continues to tackle these and emerging constraints, adaptation and adoption of available technologies are increasing tropical grain legumes productivity and production.

Institutional constraints include mainly government policies and regulations – such as the lengthy variety release process, lack of grading and standards, lack of incentives for private investment in seed production, decline in investment in agricultural research and development, and many others.

The TL II project has attempted to address many of these and has learned important lessons. Perhaps the most important achievement of TL II so far has been creating excitement about tropical legumes technologies among researchers and farmers, and the possibilities of bringing about change in the lives and livelihoods of smallholder farmers in target countries.

Emerging success

The TL II project has already had valuable impact. More than 60 new varieties of tropical legumes have been released in the target countries, and 93,000 metric tons of improved legume varieties seed has reached 240,000 smallholder farmers in the project countries in sub-Saharan African and Asian regions. Many farmers, together with extension workers, have been trained in improved farming practices, and have strengthened efforts to encourage legume farming.

A good example is Ethiopia, where the project has visibly transformed the landscape in Central Ethiopia. Earlier, farmers grew mainly cereals such as teff (Ethiopian millet) and wheat, but now many more farmers are growing chickpea.

Addressing the roles of women in producing food and making decisions about family nutrition needs is critical to achieve success. “With the increased income I earned last season I bought a second pair of oxen, which I lend to neighboring farmers,” Temegnush says. “I’m no longer seen as a poor widow but a successful farmer.”

It is small achievements such as those enjoyed by Temegnush that add up to considerable success when multiplied by the millions who also benefit. The next phase of the project will focus on gender specific aspects of tropical legume production, marketing and consumption. Particular emphasis will be given to location-specific monitoring and evaluation, impact assessment, data management and increased seed production and delivery. The project will also continue to emphasize capacity strengthening of national agricultural research systems in the two regions.

Obviously, TL II is the perfect complement to TL I. As TL I employs high-end science to improve the crops, TL II delivers the goods to the smallholder farmers who might not otherwise have access to science-led solutions and achievements in agriculture. ■

Farmers and researchers visiting the success of a newly released variety of groundnut in Tamil Nadu, India.

Mr Abdulai Sule Kudai of Kudai village, Jigawa State, Nigeria, showing off his bumper harvest of an improved groundnut variety in November 2011.

Employing the Gems among the Genes

Beatrice Komen smiled again. It had taken her four years to finally reap a harvest so satisfying. Beatrice and fellow farmers of the Baringo district in the Rift Valley of Kenya are of course unaware of the long chain of events that resulted in their bountiful harvests. Prior to this, scientists in Ethiopia, Malawi and Tanzania conducted chickpea trials to test and select the best varieties for these regions. Intense research and testing was also taking place more than 5000 km away in Patancheru, India and in other laboratories across the world. The farmers are just grateful to the final link in the chain of events, the Egerton University, which provided them with the high quality seeds and advice that resulted in livelihood-saving harvests of chickpea during the off-season.

… the use of molecular tools, for example in Marker Assisted Breeding, can take years off the time it takes to develop new varieties using conventional methods

Employing Modern Science through Tropical Legumes I

As a companion project to Tropical Legumes II, TL I is developing and employing modern molecular tools and approaches to increase the effectiveness of improving four legume crops – chickpea (*Cicer arietinum* L.), groundnut (*Arachis hypogaea* L.), cowpea (*Vigna unguiculata* L.) and common bean (*Phaseolus vulgaris* L.). ICRISAT is focused on chickpea and groundnut.

Already, the TL I project has benefited the scientific community through the development of faster breeding techniques and more targeted research to find important plant traits, and the farming community that eventually uses the improved seed to cultivate more productive varieties resistant to drought and disease.

Benefits to science: As a modern breeding approach, the use of molecular tools, for example in Marker Assisted Breeding, can take years off the time it takes to develop a new variety, by providing quicker answers and results in the process of breeding improved varieties of crops.

“Together with the National Fund project of India, we were able to produce the first SSR-based genetic linkage map for cultivated groundnuts” said scientist Vincent Vadez, leader of TL I’s Objective to improve groundnut productivity for marginal environments in sub-Saharan Africa. SSRs, or “simple sequence repeats”, are a type of molecular tool that can identify which gene (eg, for drought tolerance) is present in a plant. “TLI and other associated projects have provided us the molecular markers associated with root-related traits for drought tolerance in chickpea”, says Rajeev Varshney, leader of chickpea activities of TLI.

Crop breeders find this information invaluable. “Together with breeders from Kenya, Ethiopia and India, we have started to use markers related to drought tolerance in breeding programs”, says Pooran Gaur, ICRISAT’s chickpea

breeder who is working on chickpea breeding activities in both TLI and TLII. Additionally, groundnut breeders at ICRISAT are using molecular markers to breed against leaf rust in groundnut.

Molecular marker information springs from tapping the genetic diversity of a given crop. Scientists are now in a position to advise on combinations of plant parents that can give rise to a variety resistant to a disease or tolerant to the drought condition of a particular region, and have identified new drought tolerant sources of groundnut and chickpea germplasm. All the data collected and produced in these investigations has been made freely-available to researchers via internet-based information resources.

Benefits to farmers: In all the field trials held within collaborating countries, farmers have been greatly encouraged to participate in selecting the best varieties. They enthusiastically get involved in the process when given a chance to select drought and pest resistant varieties and also choose varieties with market preferred grain characteristics in terms of color, size and taste.

Farmers are benefitting from the resistant and improved varieties in terms of bigger and more stable harvests that inevitably bring in better, more reliable incomes. In addition, the improved varieties provide nutritional benefits to both farmers and consumers.

Sustainable benefits

The TL I team not only makes the results of research available to scientists and farmers, but also teaches them how to use the tools and approaches developed in the project. Farmers are learning how to select the best varieties and how to reap the maximum benefits from these on their farms. Also, future scientists from many countries are receiving field and laboratory training on the application of modern scientific tools being employed in TL I. Such transfer of knowledge is important to ensure that the successes of TL I continue to be achieved long after the project is over.

Legume genomics that begins with crushing a seed in a laboratory to extract its DNA, has far reaching impacts on the scientific community, capacity building of NARS, and eventually on the farmer who unwittingly validates the scientific findings by achieving better harvests in the field. If only the likes of Beatrice Komen knew the full story, how much astonishment would accompany the simple joys of reaping a good harvest. For scientists, the knowledge that they contribute to food security is enough reward. ■

ICRISAT geneticist RK Varshney (right) discusses the employment of molecular tools with chickpea breeder P Gaur.

Seed farmer Mr Mrema with hybrid sorghum (promoted by the HOPE team) in Miwaleni, Tanzania.

A Ray of HOPE in Sub-Saharan Africa

The team is enthusiastically developing and promoting seed production and dissemination models in the region

News! Field agents from seven unions of the farmer organizations Mooriben and FUMAGaskiya participate in a training program in Dantchiandou, Niger on improving organic fertilizer using a composting technique.

News! In August 2011, the Republic of Southern Sudan released two sorghum varieties – KARI Mtama 1 and Macia.

News! In Tanzania, the Department of Research and Development released for the first time two finger millet varieties, U15 and UFM149, and foundation seed of these are being multiplied in seven hectares (targeting production of 7 tons) at the Miwaleni research site, Tanzania.

News! ICRISAT establishes a greenhouse at Sadoré, Niger for screening pearl millet against the devastating downy mildew fungal disease, and is using the facility to provide hands-on training to national scientists in the region.

These and several more achievements have stemmed from the 'Harnessing Opportunities for Productivity Enhancement (HOPE) for Sorghum and Millets' project, involving ICRISAT and partners in sub-Saharan Africa and India. The project seeks to improve the livelihoods of at least 200,000 smallholder farm households who depend on sorghum and millet for food and income – 60,000 in West and Central Africa (WCA), 50,000 in Eastern and Southern Africa (ESA), and 90,000 in South Asia (SA).

The project is reaching these farm households through methods such as participatory varietal selection and testing, field demonstrations, farmer field schools, sale and distribution of small affordable seed packs, and use of rural radio stations and video shows.

Targeting technology

By involving farmers in the selection of improved varieties, the HOPE team succeeded in identifying 35 new cultivars of sorghum, pearl millet and finger millet that meet farmer, consumer and industrial requirements. Participatory approaches in variety selection and Farmer Field Schools are efficient models for technology verification and dissemination, and are being employed in several of the HOPE target countries. Overall, 14 sorghum hybrids were evaluated in pre-release variety trials in three on-station conditions, and in three villages in each of the three sorghum production zones of Mali.

Following the release of two varieties of sorghum in the Republic of South Sudan, the country imported a total of 3.6 tons of foundation seed (seed that will be used to produce seed for farmers in the country) of the two varieties produced in Tanzania, thus displaying the trust they place in these two products of research promoted by the HOPE team.

Scientists have embraced molecular tools to improve efficiency of variety development, eg, to introgress resistance to the parasitic weed *Striga,* tolerance to drought stress into farmer preferred sorghum varieties, and resistance to the downy mildew disease in pearl millet. Such new approaches shorten the time it takes to develop new and improved varieties.

Enhancing farmers' knowledge

The team is enthusiastically developing and promoting seed production and dissemination models in the region. The models involved the sale of small seed packs of improved adaptable varieties, farmer-to-farmer exchanges, and distribution of relief seed using farmer organizations and NGOs. In WCA, over 11,500 farmers were reached with quality seed of improved pearl millet varieties, and almost 15,400 farmers were reached with quality seed of improved sorghum varieties. In ESA, over 68,600 farmers were reached with quality seed of sorghum varieties and almost 23,000 farmers with improved finger millet varieties.

In ESA, 50–80% yield increases (over the local variety and farmer management practices) were achieved in fields of farmers who participated in the integration of improved *Striga* resistant varieties with fertilizer microdosing; while in WCA, the Integrated *Striga* and Soil Fertility Management technologies promoted by the HOPE team increased yields of pearl millet and cowpea intercrops by 20–40%. Additionally, profits of this technology increased by 50–80% in 80–100% of the on-farm trials.

Training farmers is a challenging yet satisfying experience. Besides engaging in classroom lessons and hands-on training, the team developed and disseminated a number of manuals on Integrated *Striga* management, agri-business development, participatory approaches and seed production in user friendly formats, in English, French and local languages.

The team also identified 15 to 20 farmer organizations with 200 to 1000 members each in the target countries, and organized consultative meetings with up to 20 agro-input dealers operating within their reach to initiate farmer to market linkages. They also helped to build demands from industries and niche markets for sorghum, pearl millet and finger millet, including buyers such as the Purchase for Progress (P4P) program of the World Food Program and the flour milling and beverage industries. The project has also identified farmer-friendly micro-finance institutions and banks, and manufacturers of user-friendly and efficient post-harvest and processing equipment.

To ensure sustainability and further growth, the HOPE team has enhanced the capacity of partners to deliver technologies to farmers. Short-term and in-service training has already been provided to 460 men and 128 women in ESA, and 490 men and 272 women in WCA in subjects such as data analysis, molecular techniques, seed production and product marketing. This is in addition to the thousands of men and women farmers who have been exposed to new innovations through field days.

Through such multi-disciplinary and participatory approaches, the project is well on its way to offering a ray of 'HOPE' to the smallholder sorghum and millet farmers in sub-Saharan Africa. ■

Farmers sampling snacks made from sorghum and millet during a field day in Moshi, Tanzania.

Women farmers of Rajasthan with the tall, luxurious pearl millet that promises a healthy harvest of both grain and fodder.

… and HOPE in Northwestern India

Heera Ram Chaudhry (Heerji) of Aagolai village in western Rajasthan chuckled and said with pride, "No sir, we don't stop for lunch, the Sogra (flat bread of pearl millet) we eat for breakfast is enough to last us till the evening". Heerji and his fellow farmers grow and eat pearl millet as a staple. The cereal is packed with healthy nutrients and can indeed sustain hunger for hours longer than other foods.

In India, pearl millet is grown on over 9 million hectares with a production of 9.5 million tons of grain. Average national yields are around 1.0 ton per hectare. Just four states – Gujarat, Haryana, Maharashtra and Rajasthan – account for more than 90% of the pearl millet area in the country. Pearl millet is not only the staple food for rural households in these states, but is also used as cattle and poultry feed, and provides green/dry fodder for livestock.

The improved technology (promoted by the HOPE team) resulted in a yield increase of 30 to 150% over the local cultivars

The significant increase in grain production from 3.5 million tons in the 1950s to the present day 9.5 million without a significant increase in land area can be attributed to the advent of hybrid technology in the mid-1960s. Since then, the joint efforts of public and private sectors led to the development of about 70 pearl millet hybrids available in the Indian market today.

To date, hybrid deployment has focused mostly on better-endowed environments; regions where rainfall is below 400 mm (such as northwestern India), were left behind. Over 4 million hectares of the pearl millet area in northwestern India receives highly variable and unpredictable rainfall, and experience severe moisture stress and high temperatures during the crop season. Pearl millet is the only cereal crop that can be grown under such extremely harsh ecologies, and feeding the large livestock populations here will rely heavily upon pearl millet stover for fodder during the long dry season. Farmers are either unaware of hybrid technology or suitable hybrids are not available. While the state agricultural universities have bred some hybrids for this region, the weak public sector seed system prevented the seed from reaching farmers.

In India, one component of the Harnessing Opportunities for Productivity Enhancement (HOPE) of Sorghum and Millets in sub-Saharan Africa and South Asia project is focused on this marginal environment and the development of pearl millet hybrid technology. During 2009-11, about 13,000 farmer households were provided with 20 tons of seed of 17 improved pearl millet hybrids along with 280 tons of fertilizer, and were also trained in appropriate crop management practices. Even the private sector joined this endeavor and has contributed hybrids suited for this region for demonstration trials.

The improved technology resulted in a yield increase of 30 to 150% over the local cultivars and local crop management practices. Nine best performing hybrids have been selected for scaling-up. Farmers associations and self-

help groups were formed in Gujarat, Haryana and Rajasthan, and have helped with activities such as seed and fertilizer distribution, field days and exposure visits, collection of soil samples for nutrient analysis and training of farmers. With their newfound knowledge in collecting soil samples, farmers took great interest in sending the samples to soil testing laboratories, such as the District Soil Testing Laboratory in Mahendergarh, Haryana, the Government Soil Testing Laboratory in Jodhpur and the Mobile Soil Testing Vans in other parts of Rajasthan, and the Soil Testing Laboratory in Deesa, Gujarat. Upon receiving the results of the tests, the farmers actively seek advice regarding the types of fertilizers needed in their fields. Where earlier they used only nitrogen fertilizers (eg, urea), they are now using both nitrogen and phosphate fertilizers (eg, urea, di-ammonium phosphate and single super phosphate), and are witnessing the results of these better targeted soil amendments.

The HOPE project was conceptualized on an integrated value-chain approach that harnesses market "pull" linked to increased production potential. So far, several grain/feed markets such as cattle feed manufacturers in Pipad and Nagaur, Rajasthan, poultry feed manufacturing units in Mahendragarh, Haryana and feed manufacturing plants of dairy cooperatives in Gujarat were identified where farmers can sell pearl millet surpluses. Most farmers were not aware of these markets in the proximity of peri-urban areas. Now they are linked to these markets and are kept informed about the fodder price differences in the village and nearby towns. The HOPE team also informed financial institutions about business opportunities in the pearl millet value chain by organizing training programs and interactions with farmers. The farmers are now more knowledgeable about various government schemes, Kisan Credit Cards, Crop Loans and Crop Insurance. In addition, the team also organizes special training programs for women farmers.

The approach being followed by HOPE in India is to develop new hybrids with farmers, provide information and training, and link farmers with market opportunities, which has already started to provide some relief to the stressed farmers. In this deprived pearl millet producing region of the country, hope and confidence are now the order of the day. ■

Farmers of Bikaner, Rajasthan are proud to be involved in the HOPE project, which is making a big difference in their lives.

Farmer Ramaiah (left) with ICRISAT technician Devender Rao in his lush finger millet field improved through Bhoochetana.

Boosting Livelihoods through Bhoochetana

Devikere Nagappa, a farmer in the village of Alur of Davanagere District in Karnataka state, India, has been cultivating groundnut on his quarter hectare of rainfed farmland. His average yield of 1.5 t ha^{-1} was nothing to talk about, but when his farm yielded a bumper crop of 4 t ha^{-1} in the 2011 cropping season that brought in an additional income of Rs 67,500 (US$ 1350), he was featured in the local newspaper.

Venkatesha Gowda, a bajra (pearl millet) farmer from Nagalapura village of Raichur District in Karnataka, got an additional yield of 0.3 t ha^{-1} through the use of improved technologies and earned an additional income of Rs 8400 (US$ 168) in the 2011 season.

Bhoochetana aims at increasing crop productivity by 20% in four years covering 5 million ha and affecting 5 million smallholder farmers

Bhoochetana

Both Devikere Nagappa and Venkatesha Gowda have benefitted from the Bhoochetana project, an initiative of the Government of Karnataka in southern India, to bridge the gap between on-farm current crop yield and achievable yield. 'Bhoochetana' means 'reviving/rejuvenating the soils', and that is exactly what this initiative is doing – reviving soils and thereby reviving and improving the livelihoods of three million smallholder farmers in Karnataka, since its inauguration in May 2009.

The project, prompted by the stagnant agricultural growth rate of 0 to 0.5% in the state during 2000-2008, was based on the success of the Sujala Watershed program technically supported by ICRISAT during 2005-2008. Bhoochetana aims at increasing crop productivity in all 30 rainfed districts by 20% in four years covering 5 million ha and affecting 5 million smallholder farmers. Bhoochetana has adopted a science-led holistic approach for scaling-up through a consortium of State Agricultural Universities and research and extension institutions. It functions through a convergence of various schemes and capacity building of all the stakeholders, and provides for sustainable intensification of rainfed agriculture in the state.

Project implementation

ICRISAT and the Watershed Development Department of Karnataka started the project with soil analysis and mapping. Results from 12,000 farmer fields in six districts revealed a widespread deficiency of multiple nutrients such as nitrogen, phosphorus, sulphur, boron and zinc. Since then, an additional 78,000 soil samples were collected from farmers' fields and analyzed by ICRISAT and the state Department of Agriculture laboratories from the remaining 24 districts.

The results were interpolated using Geographic Information Systems to produce soil fertility maps for each Taluk (sub-district level unit), and will be published in 2012 as a Soil Fertility Atlas of Karnataka. The soil sampling and

mapping informed farmers about the nutrient deficiencies in their fields and made them eager partners in the project. Based on the soil analysis results, project members developed taluk-wise balanced fertilizer recommendations and shared them with the farmers.

Led by ICRISAT, the stakeholders and partners, comprising the Department of Agriculture, Watershed Development Department, Universities of Agricultural Sciences of Bengaluru, Dharwad and Raichur, community-based organizations and watershed associations, tackled the project as a consortium to boost rainfed agriculture in Karnataka.

Towards this, they built the capacity of stakeholders at all levels through team building workshops, training programs, mass media, publications and village meetings. They also organized farmers field days and farmers visits to ICRISAT to get first hand information on productivity enhancement and sustainable management practices. Rainfed farming technologies such as soil moisture conservation techniques; nutrient management recommendations for various crops based on analysis of soil samples; cultivation of high yielding short duration varieties of major dryland crops; training in integrated pest management methods and use of stress-tolerant cultivars and machinery are being implemented to increase productivity. The concept of village seed banks to ensure availability of quality seeds to farmers was also promoted successfully.

The success of the project is evidenced through an annual agricultural growth rate of 6% in the state in 2009-10, and over 13% in 2010-11. Bhoochetana was also primarily responsible for the state receiving the 'Krishi Karman Award' from the Government of India for the highest production of coarse cereals, and the Leadership in Agriculture 2011 Award from *Agriculture Today*.

The Bhoochetana program has enabled farmers to increase yields of various crops like maize, sorghum, pearl millet, finger millet, chickpea, pigeonpea, groundnut, green gram, sunflower, soybean and vegetables by 23 to 66%.

Moving forward

Encouraged by the success of Bhoochetana, the Government of Karnataka embarked in June 2011 on the Suvarna Bhoomi Yojane-Horticulture initiative, again with support from ICRISAT. Under this program, 250,000 smallholder farmers were granted cash incentives by the government to shift from the production of low-value crops to high value vegetables, fruits and spices, with ICRISAT providing technical support such as detailed nutrient recommendations and other management practices.

The Government of Karnataka has recently decided to extend Bhoochetana to cover 5 million hectares of rainfed area in the state and to support irrigated crops such as rice and sugarcane on 0.5 million hectares. Technical support to enhance agricultural and livestock productivity will be provided by the consortium of CGIAR Centers.

Neighboring states such as Andhra Pradesh and Tamil Nadu have also noted the success of Bhoochetana and new initiatives are underway.

The Bhoochetana model, if adopted in key rainfed areas in the country, could be the key to uplifting vulnerable communities from food insecurity to food prosperity. ■

Devikere Nagappa (front right) with his family and government officials, proudly holds up the improved groundnut harvested in the last season.

Mariam Coulibaly, President of the Bankora Women's Cooperative, gazes contentedly over her groundnut field.

Women Farmers in Development

… social networks play a role in the empowerment of rural women across sub-Saharan Africa

The women of Wakoro, Mali used to grow groundnuts without much success until Mariam Coulibaly from a village in the Dioila district and four other women visited the ICRISAT station at Samanko, Mali in 2001. They were impressed by three varieties that were growing there, and were given one kg seed of each variety. In 2002, the women planted the seed in 10x10 meter plots and shared the seeds they harvested with other women in the village. Impressed with the yields and earliness of the varieties, Mariam requested the village chief to allocate a larger piece of land to them to multiply the varieties.

The women ultimately formed an association called Bankora for producing and marketing groundnut seed, whose membership grew to almost 200 in just a few years. The increasing demand for seed enabled the women to increase their income and food security, and improve their status in the community.

Through this community based seed production approach, the women farmers of Wakoro have been able to access seeds locally at cheaper prices and have enhanced their skills in quality seed production and seed marketing. More importantly, they have become self-sufficient in groundnut and sell a significant quantity of seed outside the district, earning a much needed income.

Role of networks

This women's association is just one example of how formal and informal social networks play a role in the empowerment of rural women across sub-Saharan Africa. Their enhanced skills help them to improve the contexts in which they live, and thereby bring about equitable and sustainable change and development.

In Niger, five women's associations in Hankoura, and two women's associations in Faska were empowered in seed production and marketing of small-sized seed packs.

The start of such success stories traces back to the Groundnut Seed Project funded by the Common Fund for Commodity in 2003-2007 followed by the Tropical Legumes II (TL II) project in 2007-2010, where more than 124 farmers' associations and 98 smallholder farmers were trained in seed production technologies and small-scale seed business skills. As part of the two projects, varieties were selected by farmers through Farmer Participatory Variety Selection trials in Nigeria, Niger, Mali and Senegal, and partner institutions, including women's associations, were provided training. NGOs and rural development projects initiated and catalyzed institutions and institutional arrangements that would deliver seed at low transaction costs to smallholder farmers.

The training enriched certified seed production and delivery schemes and strengthened the capacity of the farmers' associations to produce high quality certified seed so that they were able to continue the program on their own initiative when the projects ended.

In order to scale-up these interventions, the second phase of the TL II project is extending community-based schemes to several other villages and districts in Mali and Niger focusing on organized women's groups. In Niger, 16 women's associations with a total of 694 members and 89 women small-scale seed producers were involved in seed production and delivery in the Dosso region. Their successes include identification of three groundnut varieties for production; training of women in seed production technologies and small-scale business management and marketing skills; registration and recognition of individual producers and women's associations as small-scale seed companies; linking with seed producers, traders, agro-dealers, INRAN (National Institute in Niger), and with rural radios to facilitate information dissemination.

In Mali, the scheme was extended to two villages in 2009 and extended to four more villages in 2010 in the Koulikoro region, and involved 150 women through a partnership between ICRISAT and Plan Mali. Five groundnut varieties were made available, and the exposure to the new varieties heightened the enthusiasm of the women's groups who recognized prospects for income generation as well as improved nutrition for their families.

Signs of success

From these interventions, significant outcomes have occurred, such as:

- NGOs (Plan Mali, Aga Khan Foundation and EUCORD) in Mali using the community based schemes to enhance the capacity of women to produce and sell seed;
- small-scale seed companies such as FASOKABA in Mali and ALHERI Seed Company in Niger using the small-pack sale as a marketing strategy, and are using the CBOs formed by ICRISAT's interventions to produce commercial seed; and
- a rural development project in Guinea that bought two tons of seed from the Wakoro women's association to establish a community based groundnut seed production scheme.

A study on uptake of groundnut production technology and the spread of seed technology confirmed that social networks and relationships expand the options available to women. It also identified gender-differentiated social opportunities, constraints and risks for more relevant and responsive social development interventions. Indeed, women farmers in the semi-arid tropics, whose many contributions usually remain unnoticed and unappreciated, are finally being recognized for their essential role in community development. ■

Women's association groundnut seed production plot in the Dosso region of Niger.

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	US$ thousands	
	2011	**2010**
Assets		
Cash and Cash equivalents	9,711	5,490
Investments	55,170	47,828
Accounts receivable	11,261	18,533
Inventories	1,002	949
Prepaid Expenses	496	379
Property and Equipment - net	6,040	5,971
Other assets	3,257	1,076
Total Assets	**86,937**	**80,226**
Liabilities		
Accounts payable	19,840	17,689
Accruals and provisions	2,401	2,514
Payments in advance from donors	23,027	19,023
Long-term liabilities	11,080	12,148
Total Liabilities	**56,348**	**51,374**
Net Assets		
Unrestricted		
Unappropriated	17,345	18,647
Appropriated	11,113	8,113
Permanently Restricted	2,131	2,092
Total Net Assets	**30,589**	**28,852**
Total Liabilities & Net Assets	**86,937**	**80,226**

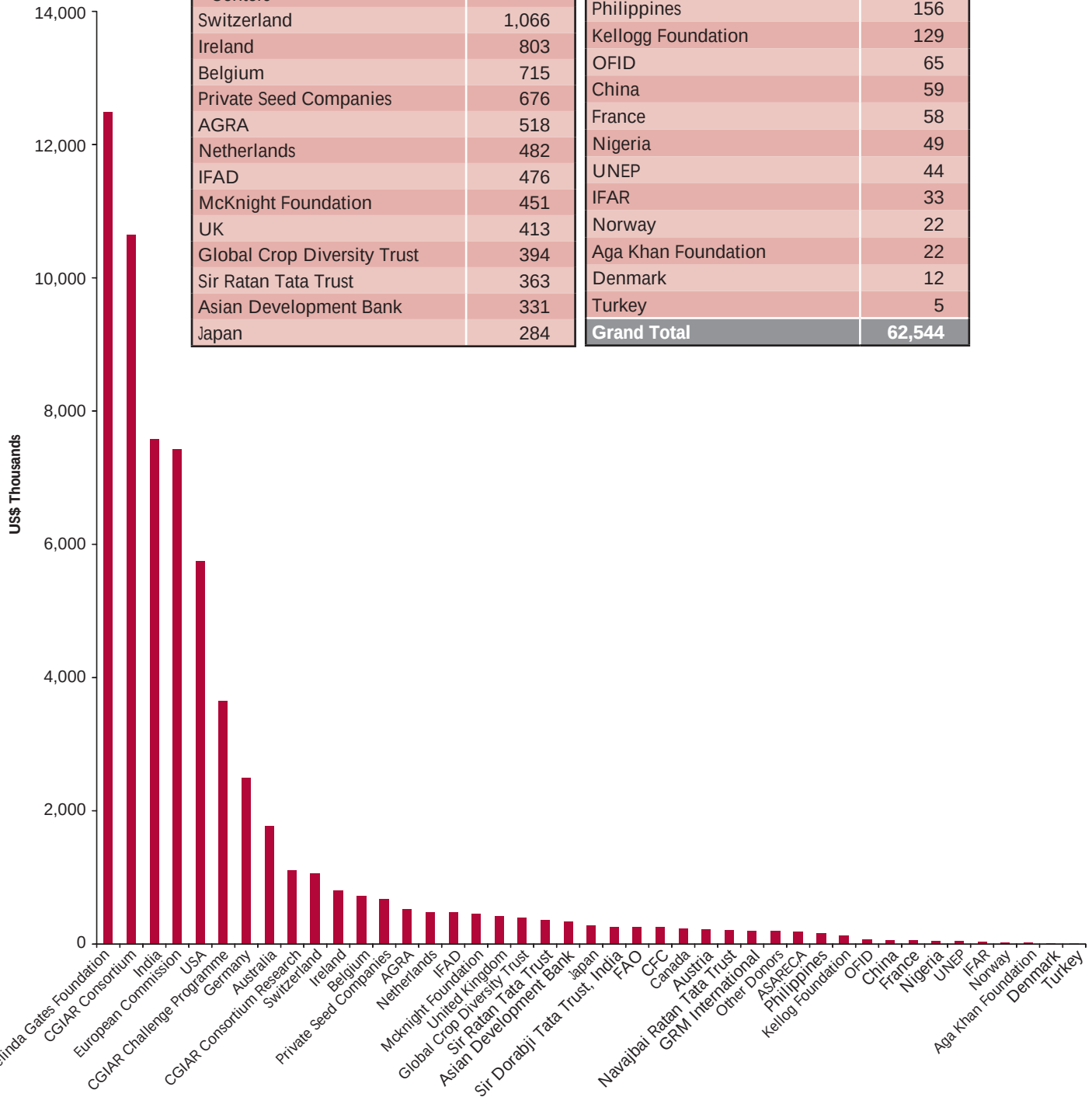
Operating results and movements in Net Assets

	US$ thousands	
	2011	**2010**
Operating results		
Revenue	67,014	64,734
Expenditure	65,316	61,207
Change in net assets, operational	**1,698**	**3,527**
Net Assets - Unrestricted		
Unappropriated		
Balance, beginning of the year	18,647	15,120
Operating (deficit)/surplus for the year	1,698	3,527
Transfer to Appropriated	(3,000)	-
Balance, end of the year	**17,345**	**18,647**
Appropriated		
Balance, beginning of the year	8,113	8,294
Transfer from unappropriated	3,000	-
Acquisition of physical facilities	-	(181)
Total Net Assets - Unrestricted	**11,113**	**8,113**
Net Assets - Permanently restricted	**2,131**	**2,092**
Total Net Assets	**30,589**	**28,852**

Grant income from donors for 2011

Donor	US$'000
Bill & Melinda Gates Foundation	12,488
CGIAR Consortium	10,646
India	7,578
European Commission	7,431
USA	5,742
CGIAR Challenge Programme	3,648
Germany	2,489
Australia	1,772
CGIAR Consortium Research Centers	1,109
Switzerland	1,066
Ireland	803
Belgium	715
Private Seed Companies	676
AGRA	518
Netherlands	482
IFAD	476
McKnight Foundation	451
UK	413
Global Crop Diversity Trust	394
Sir Ratan Tata Trust	363
Asian Development Bank	331
Japan	284

Donor	US$'000
Sir Dorabji Tata Trust, India	259
FAO	259
CFC	256
Canada	231
Austria	225
Navajbai Ratan Tata Trust	210
GRM International	197
Other Donors	194
ASARECA	184
Philippines	156
Kellogg Foundation	129
OFID	65
China	59
France	58
Nigeria	49
UNEP	44
IFAR	33
Norway	22
Aga Khan Foundation	22
Denmark	12
Turkey	5
Grand Total	**62,544**



List of restricted projects that commenced in 2011

Donor	Project Title	Key Partners
ACIAR, Australia	Bioinformatics for Breeding: Data Management and Cross Prediction	The World Vegetable Center (AVRDC), Taiwan; Australian Temperate Field Crops Collection, DPI-Victoria, Australia; GCP-CIMMYT
OFID, Austria	Groundnut Improvement for Poor Smallholders in Asia	
Commonwealth of Learning (COL), Canada	Coordinating and Assessing the Effectiveness of Mobile Phone-based Learning among Rural Communities of India using LIVES	University of Agricutlural Sciences-Raichur, India; Mann Deshi Mahila Sahakari Bank Ltd, India; VIDIYAL, India
IFAR	Development of Bio-fertilizer for Suppression of Fusarium Wilt, Dry Root Rot in Chickpea and Enhancement of Productivity under Ecologically Stressed Environments - Fellowship Grant for Ms Egamberdieva Dilfuza	National University of Uzbekistan, Uzbekistan
IFAR	Induction of Doubled Haploids in Chickpea - Fellowship Grant for Ms Sameera Sastry, India	Jawaharlal Nehru Technological University-Hyderabad, India
IFAR	Are there Common Features in the Tolerance of Reproduction to Drought, Heat and Salinity Tolerance in Chickpea (*Cicer arietinum* L.)? - Fellowship Grant for Ms R Pushpavalli, India	Bharathidasan University, India; University of Western Australia, Australia
IFPRI	Crop Modelling Efforts under Global Futures Project	
ILRI	Delivering New Sorghum Millet Innovations for Food Security and Improving Livelihoods in Eastern Africa	
Africa Rice Center	Measuring and Assessing the Impacts of Crop Genetic Improvement in Africa: The Case of Pearl Millet, Rice and Sorghum.	
CIMMYT/ Generation Challenge Program (GCP)	Development of a SNP Platform for Molecular Breeding in Elite Material of Chickpea	
CIMMYT/GCP	Commissioned Research Project 2011 – Integration of MARS and GWS modules in the ISMU pipeline for facilitating molecular breeding for complex traits	Cornell University, USA; INRA, France; The James Hutton Institute, UK; University of Queensland, Australia

Donor	Project Title	Key Partners
CIMMYT/GCP	Product Delivery Coordinator (PDC) for the Groundnut Project Activities in the Legume Research Initiative for GCP – Dr Emmanuel Monyo	
CIAT/CCAFS	Policy Inventory of Climate Change Mitigation and Adaptation in Mali, Senegal and Burkina Faso under the CGIAR Research Program "Climate Change, Agriculture and Food Security"	Harvard University, USA
CIAT/CCAFS	West Africa Regional Program Leader of the CGIAR Program on Climate Change, Agriculture and Food Security (CCAFS)	The Institut de l'Environnement et de Recherches Agricoles (INERA), Burkina Faso; The International Centre for Research in Agroforestry (ICRAF), Kenya; The Institut d'Economie Rurale (IER), Mali; The Institut des Sciences de l'Environnement (ISE), Faculté des Sciences et Techniques, Université Cheikh Anta Diop-Dakar, Senegal; The International Union for Conservation of Nature, the Central and West Africa Programme (IUCN-PACO), Burkina Faso; The Faculté d'Agronomie FA, Université de Parakou, Benin; The Institut de l'Environment et des Recherches Agricoles (INERA), Burkina Faso; L'Association Malienne d'Eveil au Developpement Durable (AMEDD), Mali; Agence Nationale de la Meteorologie du Senegal (ANAMS), Senegal; AGRHYMET Regional Center, Niger; CSIR-Savanna Agricultural Research Institute (CSIR-SARI), Ghana
CIRAD	Sustainable Management of Agricultural Biodiversity in Mali	CIRAD, France
Department of Agriculture & Cooperation, India	Selection and Utilization of Water-Logging Tolerant Cultivars in Pigeonpea	Indian Institute of Pulses Research (IIPR), India; Banaras Hindu University (BHU), India; Jawaharlal Nehru Krishi Vishwa Vidyalaya, (JNKVV), India; Indian Agricultural Research Institute (IARI), India; Punjab Agricultural University (PAU), India; Haryana Agriculture University (HAU), India.
Department of Agriculture & Cooperation, India	Development and Promotion of Promising Varieties/Lines with High Yield and High Oil Content with Enhanced O/L Ratio for Enhancing Production and Quality of Groundnut Oil in Drought Prone Environment to Boost the Income of Small & Marginal Groundnut Farmers in India	Acharya NG Ranga Agriculture University, Regional Agricultural Research Station-Tirupati, India; Tamil Nadu Agricultural University, India; Junagadh Agricultural University, India; National Research Center for Groundnut, ICAR, India
Department of Agriculture & Cooperation, India	Evaluation and Production of Cytoplasmic Genetic Male Sterility (CGMS) based Hybrids for Enhancement of Productivity and Stability of Yield in Pigeonpea - under NFSM	

Donor	Project Title	Key Partners
Department of Biotechnology, India	Secondary Metabolites of Entomopathogenic Microbes to Control *Helicoverpa armigera*	
Department of Biotechnology, India (through Biotech Consortium India Limited), India	Development of Actinomycetes based Metabolites as Delivery Systems for Soil, Health Management in Groundnut (*Arachis hypogaea* L.)	Sri Biotech Laboratories India Ltd., India
Department of Science and Technology, India	Securing Chickpea Productivity under Contemporary Abiotic Stresses: Improvement of Podding and Seed-filling under Heat, Drought and Salinity - Indo-Australia Joint Project	The University of Western Australia, Australia; Panjab University-Chandigarh, India
Department of Science and Technology, India	DST-ICRISAT Center of Excellence (CoE) on Climate Change Research for Plant Production (CCRPP)	
Department of Science and Technology, India	Introgression of Shoot Fly Resistance QTLs into Elite Postrainy Season Sorghum Varieties using Marker Assisted Backcrossing (MAB)	
Department of Land Resources, India	Capacity Building Training Program under Common Guidelines, 2008 for Watershed Development Projects	
Government of Andhra Pradesh, India	Mission Project on Bridging Crop Yield Gaps through Science-Led Development in Andhra Pradesh under Bhoochetana - RKVY 2011 - 2012	Department of Agriculture, Government of Andhra Pradesh, India; Central Research Institute for Dryland Agriculture (CRIDA), India; Acharya NG Ranga Agricultural University (ANGRAU)-Hyderabad, India; Non-Governmental Organizations (NGOs); Community-Based Organizations (CBOs)
ICAR (under NAIP), India	Engaging Farmers, Enriching Knowledge: Agropedia Phase-II	Indian Institute of Technology-Kanpur (IIT-K), India; University of Agricultural Sciences (UAS)-Raichur, India; Indian Institute of Management-Calcutta (IIM-C), India.
ICAR (under NAIP), India	National Training on Carbon Sequestration and Carbon Trading	
ICAR, NICRA thru CRIDA, India	Enhancing Resilience to Climate Variability and Change in Watersheds with Focus on Groundnut and Pigeonpea in the Indian SAT	

Donor	Project Title	Key Partners
Government of Karnataka, India	Science-led Consortium Approach for Development of Horticulture Inclusive Market Oriented Development through Suvarna Bhoomi Yojane in Karnataka	Department of Horticulture, Government of Karnataka, India; Department of Watershed Development, Government of Karnataka, India; University of Horticulture-Bagalkot, India; University of Agricultural Sciences-Dharwad, India; University of Agricultural Sciences-Bangalore, India; University of Agricultural Sciences-Raichur, India; BASIX, India; BAIF Research Foundation, India; MYRADA, India; Jain Irrigation, India; Non-Governmental Organizations (NGOs); Community-Based Organizations (CBOs)
Government of Orissa, India	Introduction and Expansion of Improved Pigeonpea (Arhar) Production Technology (IPPT) in Rainfed Upland Ecosystems of Orissa	Orissa University of Agriculture and Technology (OUAT), India; Directorate of Agriculture and Horticulture, Ministry of Agriculture, Government of Orissa, India; NGO and Farmer Self-Help Groups (FSHG)
Ministry of Water Resources, India	Farmers Participatory Action Research Programme (FPARPs) - Phase 2	
Indo-German Science and Technology Center (IGSTC), India	Biotechnological Approaches to Improve Chickpea Crop Productivity for Farming Community and Industry under Indo-German Science & Technology Centre (IGSTC)	Goethe Universitat Frankfutam, Germany; GenXPro GmbH, Germany; BenchBio Private Limited, India
Coca Cola India Foundation, India	Watershed Project - Bhujal	
Coca Cola India Foundation, India	Feasibility Study in 13 Villages of Block Vakkaleri, District Kolar, Karnataka	
Navajbai Ratan Tata Trust, India	Enhancing Livelihoods through Livestock Knowledge Systems (ELKS)	
EU (thru IFAD), Italy	Development of a Robust Commercially Sustainable Multiple Uses Sorghum (MUS) Value chain in Kenya and Tanzania	Africa Harvest Biotechnology Foundation International, Kenya; Kenya Agricultural Research Institute (KARI), Kenya; Western Seed Company, Kenya; East Africa Malting (EAML), Kenya; South Eastern University College (SEUCO), Kenya; Ministry of Agriculture (MOA), Kenya; Department of Research and Development (DRD), Tanzania; Namburi Agricultural Seed Company Ltd, Tanzania; Tanzania Breweries Ltd, Tanzania
JIRCAS, Japan	Seed Multiplication of Sorghum Mapping	JIRCAS, Japan
United Nations University, Japan	On the Job Training for Capacity building for Developing Researchers in the Developing Countries	

Donor	Project Title	Key Partners
IER (AusAID funding), Mali	Unlocking the Opportunities to Enhance Sustainable Seed systems of Staple Crops (Sorghum, Pearl Millet, Maize, Cowpea and Groundnut) to Improve Food Security and Agricultural Production in West and Central Africa.	
INRAN- CORAF/ WECARD (AusAID funding), Niger	An Integrated Cereal-livestock-tree system for Sustainable Land Use and Improved Livelihoods of Smallholder Farmers in the Sahel (CerLiveTreeS)	
The Bureau of Agricultural Research, Philippines	Capacity Building of SUCs and DA Scientists and Researchers on Rainfed Agriculture Research and Development	Department of Agriculture, Bureau of Agricultural Research (DA-BAR), Philippines
Mariano Marcos State University (MMSU), Philippines	Sweet Sorghum RDE Capacity Building	Mariano Marcos State University (MMSU), Philippines
Isabela State Universiry, Philippines	Evaluation of Pigeonpea Varieties under Various Cropping Systems for Special Purposes Across Locations	Isabela State Universiry, Philippines
ICBA, UAE	Sorghum and Pearl Millet for Crop Diversification, Improved Crop-Livestock Productivity and Farmer Livelihoods in Central Asia	
ASARECA, Uganda	Integrated Management of Water for Productivity and Livelihood Security under Variable and Changing Climatic Conditions in ECA	Kenya Agricultural Research Institute (KARI), Kenya; National Agricultural Research Institute (NARI), Eritrea; Ethiopian Institute of Agricultural Research (EIAR), Ethiopia; Centre National de Recherche Appliqué au Développement Rural (FOFIFA), Madagascar; Société Malagasy d'Etudes et d'Applications Hydrauliques (SOMEAH), Madagascar; Rwanda Agricultural Research Institute (ISAR), Rwanda
ASARECA, Uganda	Pearl Millet Innovations for Improved Livelihoods in Drought Prone Areas in ECA	Department of Research and Development (DRD), Tanzania
ASARECA, Uganda	Sustainable Intensification of Sorghum-Legume System to Improve Livelihood and Adaptation to Climate Change in Semi-Arid Areas of Eastern and Central Africa (ECA)	

Donor	Project Title	Key Partners
Bill & Melinda Gates Foundation (BMGF), USA	Improving the Livelihoods of Smallholder Farmers in Drought-prone Areas of Sub-Saharan Africa and India through Enhanced Grain Legume production and productivity - Tropical Legumes II, Phase II	Acharya NG Ranga Agricultural University (ANGRAU), India ; University of Agricultural Sciences-Bangalore (UAS-B), India; Tamil Nadu Agricultural University, India; University of Agricultural Sciences-Dharwad (UAS-D), India; University of Agricultural Sciences-Raichur (UAS-R), India; Orissa University of Agriculture & Technology (OUAT), India; Bihar Agricultural University Africa Harvest Biotech Foundation International, Inc (AHBFI); Victoria Seeds, Uganda; Zanobia Seed Company, Tanzania; Namburi Seed Company, Tanzania; Kenya Seed Company, Kenya; (BAU), India; Bangladesh Agricultural Research Institute (BARI), Bangladesh; Institut de l'Environment et de Recherches Agricoles (INERA), Burkina Faso; Institute of Agronomic Research (IAR), Nigeria; Institut d'Economie Rurale (IER), Mali; Institut National de Recherches Agronomiques du Niger (INRAN), Niger; Jigawa State Agricultural & Rural Development Authority (JARDA), Nigeria; Kano State Agricultural & Rural Development Authority (KNARDA), Nigeria; Katsina State Agricultural & Rural Development Authority (KTARDA), Nigeria; Savanna Agricultural Research Institute (SARI), Ghana; Senegal Agricultural Research Institute (ISRA), Senegal; Association des Organisations des Paysannes Professionnelles (AOPP), Mali; International Insitute of Tropical Agriculture (IITA); FASO KABA seed enterprise, Mali; EUCORD, Mali; Association de organisation paysane Professionel, Mali; Wakoro Women's association, Mali; Plan Mali Farmer Organisation, Mali; Sahel 21 Farmer organisation, Mali; WADACE Farmer organisation, Niger; WADAT Farmer organisation, Niger; Tchin Garba abd Doula FO; Ethiopian Institute of Agricultural Research (EIAR), Ethiopia; Kenya Agricultural Research Institute (KARI), Kenya; Agricultural Research Services (ARS), Malawi; Agricultural Research Institute of Mozambique (IIAM), Mozambique; Agricultural Seed Agency (ASA), Tanzania; Research and Development, Ministry of Agriculture and Food Security (MAFS), Tanzania; Centre for Agricultural Research and Devlopment (CARD), Malawi; Centro Internacional de Agricultura Tropical (CIAT); National Semi-Arid Resources Research Institute (NaSARRI) of NARO, Uganda; Ngetta Zonal Agricultural Research and Development Institute (Ngetta ZARDI) of NARO, Uganda; Ethiopian Institute of Agricultural Research (EIAR), Ethiopia (covering also ARARI); National Agricultural Research Institute (NARI), Eritrea; Kenya Agricultural Research Institute (KARI), Kenya; Ministry of Agriculture, Govt. of Southern Sudan (GoSS); Department of Research and Development, Tanzania; Ugandan National Agricultural Research Organization (NARO), Uganda; National Agricultural Advisory Services (NAADS), Uganda; Egerton University, Kenya; Eastern Africa Grain Council (EAGC), Kenya

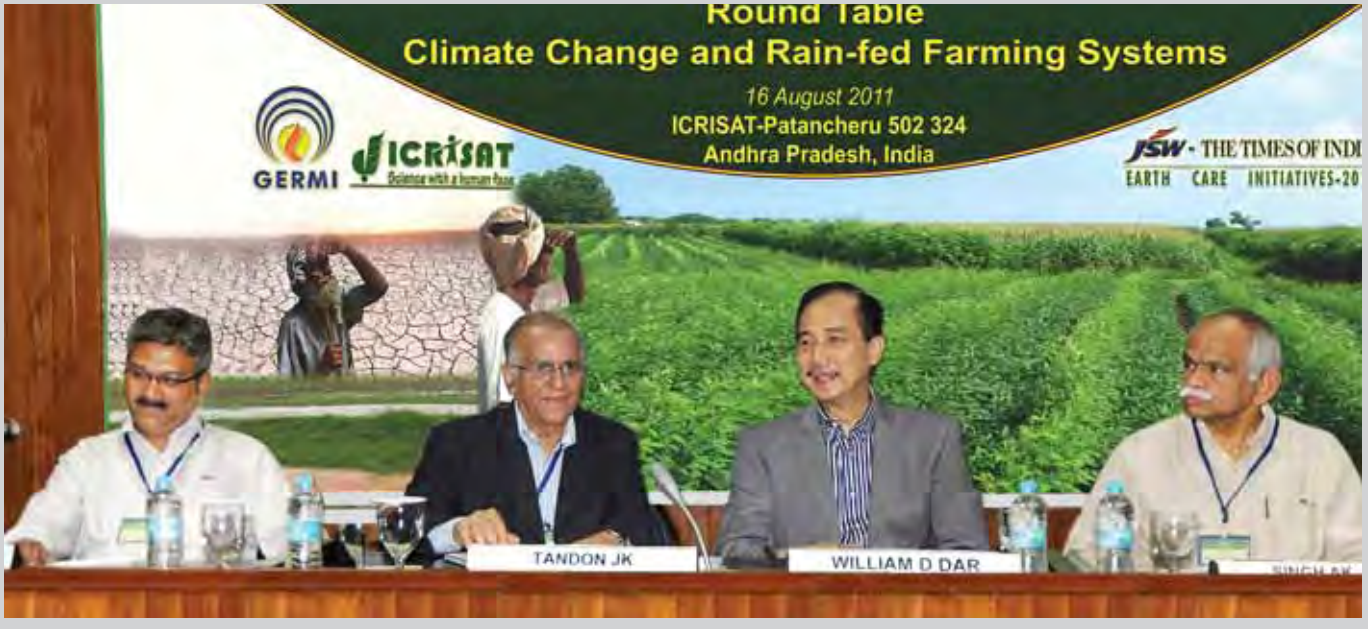
Donor	Project Title	Key Partners
Purdue University, USA	Encouraging Regional Trade with Hermetic Storage for Cowpea in West and Central Africa	
University of Georgia, USA	Peanut Collaborative Support Research Program	
The Pennsylvania State University, USA	Evaluation and Mitigation of Anthracnose Disease Pressure due to the Introduction of Sorghum for Feedstock Production	
USAID (through World Bank), USA	Mobilizing Vegetable Genetic Resources and Technologies to Enhance Household Nutrition, Income and Livelihoods in Indonesia.(Vegetables for Indonesia - AVRDC)	The World Vegetable Center (AVRDC), Taiwan
USAID (through World Bank), USA	Zambia Groundnut Productivity	IITA-Nigeria; Msekera Research Station (ZARI) and Provincial Department of Agriculture, Zambia; University of Zambia, Zambia; Tuskegee University, USA; USDA-ARS-National Peanut Research Laboratory, Georgia, USA.
USAID (through World Bank), USA	Zambia Aflatoxin Research and Mitigation	
USAID (through World Bank), USA	Improving Vegetable Production and Consumption in Mali - Vegetables (AVRDC)	The World Vegetable Center (AVRDC), Taiwan
USAID (through CNFA), USA	Agrodealer Strengthening Program in Zimbabwe	
Solar Electric Light Fund (SELF), USA	Scaling the Solar Market Garden: Solar-Powered Drip Irrigation Enhances Food Security in Benin, West Africa, and could be a Model for the Region	Solar Electric Light Fund (SELF), USA; Association pour le Developpement Economique Social et Culturel de Kalalé (ADESCA), Benin; Naps Systems Oy, Finland; Program on Food Security and the Environment, Stanford University, USA
Action Contre la Faim (ACF), Zimbabwe	Technical Support for the Promotion of Conservation Farming by Action Contre la Faim (ACF) in Chipinge District, Zimbabwe	
FAO, Zimbabwe	Support of the Development of Small Grains Seed Multiplication and Small Grains Production Manuals for use by the Communities in Masvingo, Matabeleland North and Matabeleland South Provinces.	
FAO, Zimbabwe	Improve the Food Security of Smallholder Farmers in the Dry Regions of Zimbabwe through Production of Foundation Seed of Improved Varieties of Pearl Millet, Groundnuts and Cowpeas	
FAO, Zimbabwe	Assessing the Promotion of Conservation Agriculture Adaptation among the Smallholder Farmers in Zimbabwe	

Donor	Project Title	Key Partners
FAO, Zimbabwe	Production of Foundation Seed for Small Grains of Groundnuts and Cowpeas	
GRM International Limited, Zimbabwe	Building Farmers' Resilience through Improved Crop-Livestock Innovations in Semi-Arid Regions of Zimbabwe - PRP Phase II	
GRM International Limited (GRM), Zimbabwe	Impact Assessment of Zimbabwe Agricultural Input Project (ZAIP)	
GRM International Limited (GRM), Zimbabwe	Impact Assessment of Zimbabwe Emergency Agricultural Input Project (ZEAIP)	
GRM International Limited (GRM), Zimbabwe	PRP Evaluation of the 2010/11 Market based Agricultural Input Distribution	

Workshops, Conferences and Meetings in 2011

Event/Topic/Date Workshops/Meetings	Location	Participants	Participating countries/ Institutes	Resources and collaborative support
VLS Writeshop meeting, 3–7 January	ICRISAT-Patancheru	20	ICRISAT MIP staff	ICRISAT MIP
Chickpea Scientists meet, 10–11 January	ICRISAT-Patancheru	60	Canada, Australia, Indian NARS and Private Sector	ICRISAT and ICAR
Global Annual Review meetings (ARM), 24 January–4 February	ICRISAT-Patancheru	158	Senior scientists and managers from all locations	ICRISAT
CGIAR Consortium Board meet, 13–16 February	ICRISAT-Patancheru	30	Board Chairs and DGs of CGIAR institutions	CGIAR and ICRISAT
Project launching meeting on Improving Farmers Livelihood and Food Security through Enhanced Legumes Productivity in India and Myanmar, 21 February	ICRISAT-Patancheru	52	NARS, NGOs from India, Department of Agriculture (DAR) and Myanmar Agricultural services (MAS) from Myanmar	ICRISAT, Myanmar and Indian NARS
Food feed flagship workshop for Eastern and Southern Africa, 24–25 February	ILRI Nairobi	15	Kenya, Zimbabwe, Mozambique, India	Collective Action Program Eastern and Southern Africa, ILRI, ICRISAT, CIMMYT, CIP and SLP
HOPE Project Management Team Meeting, 1–2 March	Naivasha, Kenya	17	ICRISAT	ICRISAT
NIABI 2011: Global Agri–Business Incubation Conference, 8–10 March	ICRISAT-Patancheru	170	India and other countries	ICRISAT
ICRISAT-NAIP-Sweet Sorghum sub project Progress Review and Work Plan Meeting, 11–12 March	ICRISAT-Patancheru	20	NAIP, DSR,SVVU, IICT, CRIDA ILRI, Rusni, ABI, Nutriplus, RDS, ICRISAT-DC and AAI	ICRISAT and NAIP
ICIS Developers Workshop, 28 March–1 April	ICRISAT-Patancheru	60	CGIAR Centers	ICRISAT, AVRDC and the GCP, ACIAR

Event/Topic/Date Workshops/Meetings	Location	Participants	Participating countries/ Institutes	Resources and collaborative support
Hope Annual Review and Planning Meeting for Nigeria, 29–30 March	ICRISAT-Kano, Nigeria	47	IFAD, CBARDP IAR, LCRI, KNARDA,USAID-MARKETS, NGOs and ICRISAT scientists from Mali and Niger	ICRISAT-Kano
A two–day Workshop on Food Feed Crops, 29–30 March	Zimbabwe	12	Malawi, Mozambique and Zimbabwe	ICRISAT-Bulawayo
A two–day Workshop on food feed crops under the CG collective action flagship initiative, 29–30 March	Bulawayo, Zimbabwe	26	Malawi, Mozambique and Zimbabwe	ICRISAT-Bulawayo; ILRI India
Annual Meeting of BMZ project, 4–7 April	Niamey	20	Senegal, Mali, Burkina Faso and Niger	
Stakeholder Consultation and Policy Dialogue, 5 April	The Sovereign, Colombo, Sri Lanka	32	The Ministries of Agriculture, FAO, IWMI, apex research institutions and University of Peradeniya	ICRISAT
HOPE Project Annual Review and Planning Meeting for Francophone WCA, 11–14 April	ICRISAT's Samanko research station in Bamako	34	ICRISAT, national research institutions, NGOs, farmer organizations and seed producers processors	ICRISAT-Bamako
Workshop of the ICRISAT–CIAT–IFAD biofuels project Linking the Poor to Global Markets: Pro–poor Development of Biofuel Supply Chains, 14–15 April	Ho Chi Minh City, Vietnam	34	Key scientists and managers from partner organizations in India, Vietnam, China, Philippines, Colombia and Mali	Vietnam Academy of Agricultural Sciences (VAAS), the Institute of Agricultural Sciences (IAS) and the Nong Lam University
A joint meeting of ICRISAT and ICAR on CRP, 18–19 April	ICRISAT-Patancheru	8	ICRISAT and ICAR	ICRISAT
ISOPOM Project on Development and promotion of promising varieties / lines with high yield and high oil content with enhanced O/L ratio for enhancing production and quality of groundnut oil in drought–prone environments to boost the income of small and marginal groundnut farmers in India, Planning and Budget Allocation meeting, 20 April	ICRISAT-Patancheru	13	India (a) Directorate of Groundnut Research (DGR), Junagadh, Gujarat; (b) Tamil Nadu Agricultural University (TNAU), Coimbatore, Tamil Nadu; (c) Acharya N G Ranga Agricultural University (ANGRAU), RARS, Tirupati, Andhra Pradesh; (d) Junagadh Agricultural University (JAU), Junagadh, Gujarat	ISOPOM Supported Project, ICAR, Govt. of India



Event/Topic/Date Workshops/Meetings	Location	Participants	Participating countries/ Institutes	Resources and collaborative support
Tata–ICRISAT–ICAR Model Watershed and Water Use Efficiency (WUE) Projects' Review and Planning Meeting, 20–22 April	Indore	70	CRIDA, IISS, DOS, CAZRI, NCAF, agricultural universities, NGOs and scientists from ICRISAT	Tata-ICRISAT-ICAR
The Evaluation and Planning Meeting of the Alliance for a Green Revolution in Africa (AGRA) Microdose Project , 26–30 April	Bamako	22	Burkina Faso, Mali and Niger	ICRISAT-Bamako, Mali
Workshop on NARES to Map out Rainfed Agriculture RDE program, 28–29 April	The Philippines	100	senior staff of the Philippine NARES and ICRISAT	The DA Bureau of Agricultural Research (BAR) and ICRISAT
Tropical Legumes II – Obj 2, 6, and 8.5 (Groundnut and Pigeonpea) Progress Review & Planning Meeting, 9–11 May	ICRISAT-Patancheru	26	Indian project collaborators and NARS	BMGF and ICRISAT
RP–MIP Team Writeshop, HR Orientation and Team Building, 9–13 May	ICRISAT-Patancheru	44	Data Entry Operators (DEOs), Scientific Officers and Field Investigators	ICRISAT RP MIP
CFC–FAO–funded project on Enhanced Livelihood Opportunities of Smallholders in Asia: Linking smallholder sweet sorghum farmers with the bioethanol industry, Annual Review and work plan meeting, 24–25 May	Manila, Philippines	15	PCARRD, MAU, FAO, FGBC, SRI and ICRISAT	Philippine Council for Agriculture, Forestry and Natural Resources Research and Development (PCARRD)
Stakeholder Consultation and Policy Dialogue, 31 May–1 June	Bangkok, Thailand	49	ADB, World Bank, FAO and UNCCD	ADB, FCRI and ICRISAT
Training workshop on Enhancing the Commercialization of Finger Millet and Sorghum Productivity, 1–3 June	Tanzania	30	Farmers' groups, agro-dealers, extension, grain processors, seed company and research	Tanzania's Department of Research Development, ICRISAT and HOPE project
A two–day Pre–season Workshop on ICRISAT-WASA Seed Project (SP), 7–8 June	IAR, Ahmadu Bello University (ABU), Zaria, Nigeria	66	NIHORT, Ibadan; NACGRAB, Ibadan; National Rice and Maize Centre, Ibadan; LCRI, Maiduguri; IAR, Samaru-Zaria; Federal Capital Territory, agro-dealers from Kano, Katsina, Zamfara, Kaduna and Benue States; Premier Seed Nigeria Limited, Zaria; Da-allgreen Seed Nig. Ltd., Zaria; Manoma Seed Nig. Ltd., Funtua; Maslaha Seed Nig. Ltd., Gusau; the Seed Project Co. Ltd., Kano and Nagari Seed Nig. Ltd., Zaria	ICRISAT-WASA Seed Project (SP)
The 4th Annual Review Meeting of the Project: Evaluating candidate genes towards enhancement of drought tolerance in chickpea, 8 June	ICRISAT-Patancheru	21	Co-investigators and from ICRISAT	(NFBSFARA)
The Annual Review and Work Plan Meeting of the Project: Enhancing chickpea production in rainfed rice fallow lands (RRFL) 9–10 June	Raipur, Chhattis–garh	37	Representatives from the consortium of institutions and farmers from the eight project districts of Madhya Pradesh and Chhattisgarh	ICRISAT
The Second Annual Review and Workplan Meeting of the HOPE–Dryland cereals project on sorghum, 14–16 June	ICRISAT-Patancheru	33	MAU, MPKV and DSR	BMGF and ICRISAT
International Conference on Agricultural Financing with the theme: Financing agricultural value chain in sub–Saharan Africa (SSA), 16–17 June	Abuja		Researchers, farmers, traders, processors, exporters, consumers, bankers, cooperatives, regulators, industrialists, and research and development specialists from Nigeria and other countries in SSA	Union Bank of Nigeria, ICRISAT

Event/Topic/Date Workshops/Meetings	Location	Participants	Participating countries/ Institutes	Resources and collaborative support
Second annual Review Meeting of the project: Sesame improves livelihoods of farmers in Northern Uganda, 22–24 June	Lira, Uganda	23	NaSARRI, AfrII, Ngetta ZARDI, Uganda Oil Seed Producers and Processors Association (UOSPA), Ministry of Agriculture, and progressive farmers	ICRISAT-Nairobi, the Austrian Institute of Technology (AIT), and the Ugandan NARS
Media colloquium: Demystifying Crop Biotechnology: Issues and Concepts for the Asian Media, 24–27 June	Hyderabad and ICRISAT-Patancheru	130	Media practitioners from India and AMIC delegates from Japan, China, Sri Lanka, New Zealand, Philippines, Singapore, Switzerland, Sweden and other European countries	Jointly organized by ICRISAT, AMIC, DBT-GOI, ISAAA
The Seed Policy Enhancement in African Regions (SPEAR) project meeting, 29 June	Lilongwe, Malawi	22	Breeders from the department of agricultural research services, seed companies, Farmers Union of Malawi, NASFAM, and ICRISAT	ICRISAT Malawi and BMGF
The CRP 3.5 meeting, 29 June–1 July	Dubai	18	ICRISAT, CIAT, ICARDA, IITA, Dry Grain Pulse CRSP, Michigan State University	ICRISAT
"Work Life Issues at ICRISAT", 29 July	ICRISAT-Patancheru	25	Scientists and Managers	ICRISAT
Launch–cum–workshop of the project 'Introduction and Expansion of Improved Pigeonpea (Arhar) Production Technology in Rainfed Upland Ecosystems of Orissa', 9–10 August	ICRISAT-Patancheru	28	Four NGOs (Sahabhagi Vikash Abhiyan, Orissa Professional Development Service Consultants, Loksebak, and Juba Jyoti Jubak Sangha); and three District Coordinators	ICRISAT

Event/Topic/Date Workshops/Meetings	Location	Participants	Participating countries/ Institutes	Resources and collaborative support
Roundtable on Climate Change and Rainfed Farming Systems, 16 August	ICRISAT-Patancheru	65	International and national research institutions, government departments, civil society organizations and private companies	ICRISAT with the JSW-Times of India Earth Care Initiatives 2011
The Nigeria Presidential initiative on sorghum transformation stakeholders forum, 17 August	Abuja, Nigeria	75	Nigerian NARES, seed companies, processors, industrialists, farmer unions, national and international NGOs and international agricultural research and development organizations	Nigeria Presidential initiative
BMGF–funded Tropical Legumes–II (TL–II) project on Economist and Breeders Workshop, 18–19 August	ICRISAT-Patancheru	27	Partners in each of the mandated crops, namely chickpea, pigeonpea and groundnut in the states of Andhra Pradesh, Karnataka, Tamil Nadu and Maharashtra	ICRISAT RPMIP
The 2nd Asian Plant Growth–Promoting Rhizobacteria (PGPR) Conference, 21–24 August	Beijing, China	200	Asia, Canada, Europe, Mexico and USA	The Asian PGPR Society and China Agricultural University
Annual Planning and Review Meeting of two projects – "Translating genomics research for pulse improvement (CEG Phase–II) and "Deployment of molecular markers in chickpea breeding for developing superior cultivars with enhanced disease resistance", 29 August	ICRISAT-Patancheru	18	Co-investigators and project personnel from ICRISAT	Department of Biotechnology, Government of India (GOI)
Strengthening ICRISAT– Philippines partnership. A top–level delegation visited ICRISAT, 30 August–2 September	ICRISAT-Patancheru	13	PHIRARDEP, CHED, Honorable Ana Cristina Go, Member of the House of Representatives, state university and college (SUC) presidents and regional and local government officials	ICRISAT
BREAD project review and planning meeting, 4–6 September	ICRISAT-Patancheru	18	NSF	ICRISAT
The annual review and planning meeting of the Tropical Legumes II (TL–II) project for chickpea R&D in South Asia, 5–6 September	ICRISAT-Patancheru	30	BMGF, ICAR and ICRISAT	ICRISAT and BMGF
Third HOPE project planning meeting, 6–7 September	Arusha, Tanzania	25	Partner participants from both public and private institutions in Tanzania	SARI along with ICRISAT-ESA
The 2nd annual review and steering committee meetings of the VDSA project, 6–9 September	ICRISAT-Patancheru	54	Bangladesh, Philippines, ICAR, NCAP, USA, South Africa, Nepal and ICRISAT Scientists	ICRISAT
Consultation meeting with HPRC partners, 7 September	ICRISAT-Patancheru	33	Partner seed companies, representatives from AICPMIP and DSR	Hybrid Parents Research Consortia, ICRISAT
EU–IFAD Food Facility Program workshop, 7–12 September	Mali		Benin, Ivory Coast, Ghana, Mali and Senegal, IFAD, Economic Community of West African States (ECOWAS) and ICRISAT	EU-IFAD and ICRISAT
The 2nd Annual Review and Work Planning Meeting of the project "Improving Heat Tolerance in Chickpea", 15 September	ICRISAT-Patancheru	14	Scientists from IIPR, Kanpur; Punjab University, JNAU, ANGRAU and ICRISAT	Department of Agriculture and Cooperation, Ministry of Agriculture, Government of India under the NFSM

Event/Topic/Date Workshops/Meetings	Location	Participants	Participating countries/ Institutes	Resources and collaborative support
Generation Challenge Program Phase II Meeting, 21–25 September	Hotel Marriott in Hyderabad	170	Scientists from 40 countries	ICRISAT and GCP
ADB funded project: Vulnerability to Climate Change –Adaptation Strategies and Layers of Resilience a Writeshop, 26–30 September	ICRISAT-Patancheru	14	Bangladesh, Sri Lanka, Vietnam, Thailand and India	ICRISAT- Patancheru
A two–day workshop for developers of the Integrated Breeding Platform (IBP) Configurable Workflow System, 27–28 September	ICRISAT-Patancheru	20	CIMMYT, IRRI, IITA, Generation Challenge Program (GCP), the private sector and ICRISAT	IBP Project and ICRISAT
ICRISAT's first Work–Life Effectiveness/ Integration Workshop, 29–30 September	ICRISAT-Patancheru	22	ICRISAT Scientists	ICRISAT
Workshop on "Food Security and Sustainable Intensification of Agricultural System: Planning the Research Agenda", 6–7 October	ICRISAT-Bamako	22	Participants from Niger, Mali, Kenya, India, Nigeria and the UN attended the workshop, including representatives from IITA, ILRI, AVRDC, ICRAF and ICRISAT (Mali, Niger and India).	ICRISAT-Bamako
LIVES Project Inception Workshop, 10 October	ICRISAT-Patancheru	10	CRIDA, UAS Raichur, Krishi Vigyan Kendra Mahabubnagar, VIDIYAL and Mann Deshi Foundation	ICRISAT-Patancheru

Event/Topic/Date Workshops/Meetings	Location	Participants	Participating countries/ Institutes	Resources and collaborative support
Workshop on remote sensing and GIS skills, 11–13 October	ICRISAT-Niamey	15	Agronomists, geneticists, economists, farm managers, GIS specialists and graduate students	ICRISAT- Niamey
Workshop on AGROVOC Management, Applications and Use of 'VocBench' for AGROVOC managers and editors from South and Southeast Asia, 12–14 October	ICRISAT-Patancheru	13	Italy, Thailand, Lao PDR, Malaysia, Bangladesh and India	FAO and ICRISAT
HOPE Project Planning and Mid–Term Review Meeting, 12–16 October	Addis Ababa, Ethiopia	68	Scientists and managers from 11 HOPE Project countries in Africa and Asia	ICRISAT and Ethiopian Institute of Agricultural Research
Wheat Biofortification Planning Meeting, 15 October	ICRISAT-Patancheru	15	ICRISAT, HarvestPlus, NARS and the private sector	ICRISAT and HarvestPlus
Sensitization Workshop on Emerging Trends in Technology–Enhanced Learning for Agricultural Development, 7 November	IGNOU, New Delhi	20	State agricultural universities (SAUs) under ICAR	ICRISAT, IGNOU and COL under NAIP Project
Tracking of Sorghum Improved Varietal Adoption in India, 11 November	ICRISAT-Patancheru	32	DSR, AICRP on Sorghum, SAUs and HPRC members	ICRISAT-Patancheru
Project Review and Planning Meeting of the ICRISAT–IFAD Project: Harnessing the true potential of legumes: Economic and knowledge empowerment of poor rainfed farmers in Asia, 14–16 November	ICRISAT-Patancheru	23	OTELP, JTDS, Accion Fraterna (AF), Chhattisgarh Tribal Development Programme (CTDP), India, Nepal and Vietnam	ICRISAT-Patancheru
IFAD 954–ICRISAT Project Review and Planning Meeting, 14–16 November	ICRISAT-Patancheru	40	ICRISAT, India, Nepal and Vietnam project collaborators and donor representative from IFAD, Italy	IFAD and ICRISAT

Event/Topic/Date Workshops/Meetings	Location	Participants	Participating countries/ Institutes	Resources and collaborative support
Work–Life Integration Workshop, 17–18 November	ICRISAT-Bamako	24	Scientists and managers WCA	ICRISAT-Bamako
CODE–WA Project Partners' Final Evaluation Workshop, 21–25 November	Mali	26	Researchers, Graduate students and representatives from Niger, Mali, Burkina Faso and Ghana	ICRISAT-Bamako
Three–Day Stakeholder Workshop on Sorghum, Pearl Millet and Groundnut Value Chain Development in Nigeria, 23–25 November	The Tahir Guest Place Hotel, Kano, Nigeria	75		ICRISAT-Kano
Workshop on "Risk and Crisis Management", 30 November	ICRISAT-Patancheru	36	Senior scientists and managers of ICRISAT	HR ICRISAT- Patancheru
Data Management Workshop for ICRISAT–HOPE and TL II Projects, 30 November–2 December	Dubai	16	ICRISAT, BMGF, IITA, CIAT and University of Wageningen	ICRISAT
Tracking Adoption of Improved Pearl millet Cultivars in India, 22 December	ICRISAT-Patancheru	31	AICPMIP, SAUs and HPRC members	ICRISAT
ICRISAT–BMZ/GTZ Project Final Workshop on Sustainable Conservation and Utilization of Genetic Resources of two Underutilized Crops – Finger Millet and Foxtail Millet – To enhance Productivity, Nutrition and Income in Africa and Asia, 15–16 December	ICRISAT-Patancheru	27	ICRISAT; University of Hohenhiem, Germany; KARI, Kenya; NaSARRI, Uganda; UAS, Bangalore; UAS, ZARS, Mandya, Karnataka; ANGRAU, RARS, Nandyal, Andhra Pradesh; ANGRAU, RARS, Vizianagaram, Andhra Pradesh; Rajendra Agricultural University, Dholi, Bihar	ICRISAT-BMZ/GTZ Project

Capacity Strengthening

a. Number and diversity of degree students trained/being trained at ICRISAT

ICRISAT Training Location	Interns		Scholars MSc		Scholars PhD		Fellows		Home Countries of Participants
	F	M	F	M	F	M	F	M	
South Asia	31	19	2	2	24	13	5	8	South Asia (India, Bangladesh)
	-	-	-	-	-	-	1	-	Central Asia (Uzbekistan)
	1	-	-	-	-	-	4	3	South East Asia (Vietnam, Philippines)
	-	-	-	-	-	-	-	1	East Asia (Japan)
	-	-	-	-	-	-	1	-	South America (Uruguay)
	1	7	-	-	-	-	-	-	North America (Puerto Rico, United States)
	1	-	-	-	2	1	1	3	East Africa (Sudan, Kenya, Ethiopia, Tanzania)
	1	-	-	-	-	-	-	-	Central Africa (Cameroon)
	-	-	-	-	-	-	-	5	West Africa (Niger, Senegal, Nigeria)
	2	3	-	-	-	-	-	-	Europe (Germany, France, Italy, Switzerland)
	-	-	1	-	-	-	-	-	Oceania (Australia)
Totals	**37**	**29**	**3**	**2**	**26**	**14**	**12**	**20**	
	66		**45**				**32**		**143**
Joined & completed in 2011	46		1				22		
Joined before 2011 & completed in 2011	9		12				5		
Joined in 2011 & continuing	10		17				5		
Continuing from previous year	1		15				0		
Eastern and Southern Africa	1	3	10	9	3	3	1	2	East Africa
Totals	**4**		**25**				**3**		
West and Central Africa	10	10	5	15	3	2	-	1	West Africa (Niger, Mali, Senegal, Togo, Burkina Faso)
	-	-	1	-	2	-	-	-	Europe (Italy, Belgium, France)
	-	-	-	-	1	-	-	-	East Africa (Kenya)
	-	-	-	2	-	-	-	-	Central Africa (Cameroon)
Totals	**10**	**10**	**6**	**17**	**6**	**2**	**-**	**1**	
	20		**31**				**1**		**52**
Joined & completed in 2011	19		4				-		
Joined before 2011 & completed in 2011	1		10				-		
Joined in 2011 & continuing	-		13				-		
Continuing from previous year	-		4				-		
GRAND TOTAL	**86**		**76**				**33**		**195**

b. Number of formal courses offered with number and diversity of participants

ICRISAT Location	Name of the Course	# of Students			Home Countries of Students
		M	F	Total	
Patancheru, India	Capacity Building for Integrated Watershed Management for State Policymakers: Principles Practices, 10-12 January 2011	23	1	24	India
	Training Course on Research Station Management, 17-22 January 2011	34	-	34	India
	Training Course on Sorghum Hybrid Parents and Hybrids Development and Production, 7-11 February 2011	16	2	18	Ethiopia, Tanzania, Mali, Kenya, Zimbabwe, Philippines, India
	Short course on Goo statistical Analysis of Environmental Data, 21-25 February 2011	9	3	12	India
	NAIP-KM Project Capacity building of consortium partners under NAIP project on Reusable Learning Objects (RLOs), 28 February -1 March 2011	9	3	12	India
	Capacity Building Training of Master Trainers for Bhoochetana at Bengaluru, Karnataka , 18 March 2011	34	1	35	India
	Capacity Building use of New Science Tools for Monitoring and Evaluation of Integrated Watershed Management Program (IWMP), 6-8 April 2011	19	-	19	India
	Second International Training Course on Pearl Millet Improvement and Seed Production, 25 April - 3 May 2011	31	-	31	India, Mali, Niger, Burkina Faso, Nigeria, Egypt, Tunisia and Syria
	Capacity Building Training of Master Trainers for Suvarna Bhoomi Yojane-Horticulture, Bengaluru, Karnataka, 7 June 2011	2	65	67	India
	First International Training Course on Pigeonpea Improvement and Seed Production, 7-12 November 2011	24	6	30	Philippines, Malawi and India
	Training course on Scientists and PHIRARDEP Delegation from Philippines, 19-26 November 2011	5	2	7	Philippines
	Cropping Systems Models: Application in Land Resources Management, 5-9 December 2011	23	7	30	Philippines, Bangladesh and India
Sub Total		**229**	**90**	**319**	

ICRISAT Location	Name of the Course	# of Students			Home Countries of Students
		M	F	Total	
Nairobi, Kenya	Survey design and data collection methods	9	0	9	Ethiopia
	Value chain analysis methods	11	0	11	Ethiopia
	MAB and MET training course	8	6	14	
	Application of markers in crop improvement	11	5	16	
	Modeling Adaptation to Climate Change	8	4	12	
	Participatory Variety Selection	21	23	44	Kenya
	Participatory Variety Selection	28	14	42	Tanzania
	Participatory Variety Selection	18	6	24	South Sudan
	Participatory Variety Selection	20	1	21	Ethiopia
	Sorghum hybrid development and marketing	9	1	10	India
	Testing transgenics, stewardship and risk communication	21	4	25	Kenya
	Seed, Germplasm International policies and treaties	21	4	25	Kenya
	Field workshop breeding and selection	20	5	25	Tanzania
	Integrated Striga management and microdosing; Integrated blast management and microdosing	194	52	246	Uganda, Tanzania, Kenya, Ethiopia, Eritrea and Southern Sudan
	Seed production training course	135	41	176	Uganda, Tanzania, Kenya, Ethiopia, Eritrea and Southern Sudan
	Pearl Millet crop improvement and seed production	25	7	32	Tanzania
	Agrobase training	2	1	3	
	Tools and techniques for monitoring crop water productivity, June 2011	25	7	32	
	Use and application of crop simulation model APSIM	1	2	3	
Mozambique	APSIM Training Workshop, 1-5 August 2011	4	4	8	
Lilongwe, Malawi	First International Training Course on Pigeonpea Seed Production and Crop Management System	2	0	2	
Sub Total		**593**	**187**	**780**	

ICRISAT Location	Name of the Course	# of Students			Home Countries of Students
		M	F	Total	
Niamey, Niger	Training course on ICRISAT Agricultural technologies Practices	5	2	7	Niger
	Training Course on Tree cultivation, 14-16 March, 201	13	2	15	Niger
	Training course on Tree cultivation 21-23 March, 2011	12	3	15	Niger
	BMZ Abiotic stress year-2 project planning meeting, 4-7 April 2011	18	2	20	Niger, Mali, Burkina Faso, Germany, Senegal
	Hope Training on FFS options IGNRM field layout and Minipacks production at Dantchandou, 4-5 April 2011	21	9	30	Niger
	Hope Training on FFS options IGNRM field layout and Minipacks production at Bokki, 14-15 April 2011	23	7	30	Niger
	Training Course on Head mine, 13-15 August 2011, Maradi	10	7	17	Niger
	Hope Training on FFS options IGNRM field layout and Minipacks production at FUMA GASKIYA	21	9	30	Niger
	Hope Training on FFS options IGNRM field layout and Minipacks production at Bokki, 16-17 April 2011	27	3	30	Niger
	Hope Downy mildew greenhouse screening training course, Sadoré, 21-23 September 2011	4	1	5	Niger, Nigeria, Burkina Faso, Mali
	Technical Workshop on Advances remote sensing and GIS skills, 11-13 October 2011	15	1	16	Niger
	GIS 22nd Course, 9-11 November	15	0	15	Niger
	GIS 3rd Course, 5-7 December	13	0	13	Niger
Sub Total		**197**	**46**	**243**	
Bamako, Mali	Groundnut production	-	111	111	Mali
	Aflatoxin control	-	96	96	Mali
	Groundnut production	8	25	33	Mali
	Agrobase generation II	14	1	15	Mali
	Hybrid seed production	16	6	22	Mali
Sub Total		**38**	**239**	**277**	
Grand Total		**1,057**	**562**	**1,619**	

Training Course on AGROBASE GEN II

22-25 August 2011

Publications

List available at http://www.icrisat.org/icrisat-staff-publications-2011.htm

Awards 2011

Rajeev Varshney receiving the NASI-Scopus Young Scientist award from Dr T Ramasami, Secretary, DST and Dr Manju Sharma, former Secretary, DBT and former President of NASI.

Dr Dar receives the Doctor of Humanities honorary degree from PAC President Jun Soriano.

ICRISAT was awarded the Aduyon Award by the Benguet State University (BSU) in Benguet, Philippines in January 2011. Dr Danilo Padua, Professor and Special Assistant to the President, received the award on behalf of the Institute.

HC Sharma (right) *receiving the Gold Medal for Meritorious Services award from NS Gajbhiye, Vice-Chancellor, Gaur Central University, Sagar, MP.*

Dr Sandip Pal, Deputy Director, SAARC Agriculture Centre (left) *honoring Pooran Gaur.*

ICAR Directorate of Groundnut Research, Director JB Misra (right) *with Rajeev Varshney* (center) *and SN Nigam* (left).

Dr Gowda receives a fellowship from the President of the Crop Improvement Society of India.

Sita Mahalakshmi (left) *and Deborah Jacob* (right) *awarded during the SAP-C event.*

P Srinivasa Rao (left) with the winning poster.

G Harini
Best Poster Award.

Rachael Vaicunas
Best Poster Award.

Sandhya
Best Poster Award.

ICRISAT in the NEWS

ICRISAT in the NEWS

ICRISAT to host Africa-India Economic Mission at Hyderabad

Africa-India Mission in Hyderabad

The Christian Science Monitor
Change Agent

e innovations that boost soil fert

rops need air, sun, water, and soil to thrive. When it comes to soil

organic matter.

New Agriculturist

Restored wasteland benefits women in Sahel

Like many women in Niger, Salmou Boureima is not allowed to own agricultural land yet she is responsible for feeding her family and helping her husband farm millet, in addition to grinding grain daily and collecting firewood and water. With frequent droughts and low annual rainfall, Boureima's family often had insufficient food, but in 2007 she joined a women's association to learn how to increase the productivity of degraded village land.

New Agriculturist

Indian women using science to start agribusinesses

Access to science and technology is challenging in rural areas. But in Andhra Pradesh in India, the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) has been teaching women how to use science to shift from subsistence farming to successful agri-businesses - lifting themselves and their communities out of poverty.

In the village of Kothapally, for example, women have increased their income by almost 80 per cent through community income-generating activities, after receiving training from ICRISAT as part of an integrated watershed management programme. Biji Lakshmi used to work as a farm labourer for a few rupees a day,

Worms feed on any organic waste © ICRISAT

produce nutritious fruit which is rich in vitamin C, iron, calcium and phosphorus. Moringa leaves are also highly nutritious, containing seven times the Vitamin C in oranges, four times the Vitamin A in carrots, four times the calcium in milk and three times the potassium in bananas. "In dry West Africa, between 1 15 per cent of children suffer from acute nutritional deficiency," Pasternak explains. "The BDL is an effective means to provide vegetables and fruit with high nutritional value to remote village in the Sahel."

Okra is one of the hardy indigenous vegetables grown © Dov Pasternak

guardian
POVERTYMATTERS BLOG
Small seed packets could play big role in Africa's battle against drought

CGIAR

Kenya: Seed trial pack adopting new crops

The CapSU Monit

BUSINESS

Dar, Gregorio named best agri leaders, workers

livemint.com

AlertNet
Climate Conversations - Small seed packets, big policies tackle Horn of Africa drought

AlertNet
Climate Conversations - Seed vouchers - handouts - could boost drought resilienc

By Jerome Bossuet | Mon., September 5, 10:40 AM | Comments (0)

Rich Pickings

Creating a Global Partnership to Tackle Desertification: An Interview with William Dar

We must make up ground in the fight against desertification

A global partnership is needed to tackle this desertification that degrades more than 12m hectares of arable land every year, affecting some of the poorest and most food-insecure people

guardian
POVERTYMATTERS BLOG
Could thinking small be the next big thing in agricultural development?
Mini-packs of shampoo and soap have been a hit in India. Would a similar approach to fertiliser distribution help small farmers?

Science News
... from universities, journals, and other research organizations

Home of 'Orphan Crop' Pigeonpea Cracked

ScienceDaily (Nov. 6, 2011) — Once referred to as "orphan crop" mainly grown by poor farmers, pigeonpea is now set to join the world's league of major food crops with the completion of its genome sequence.

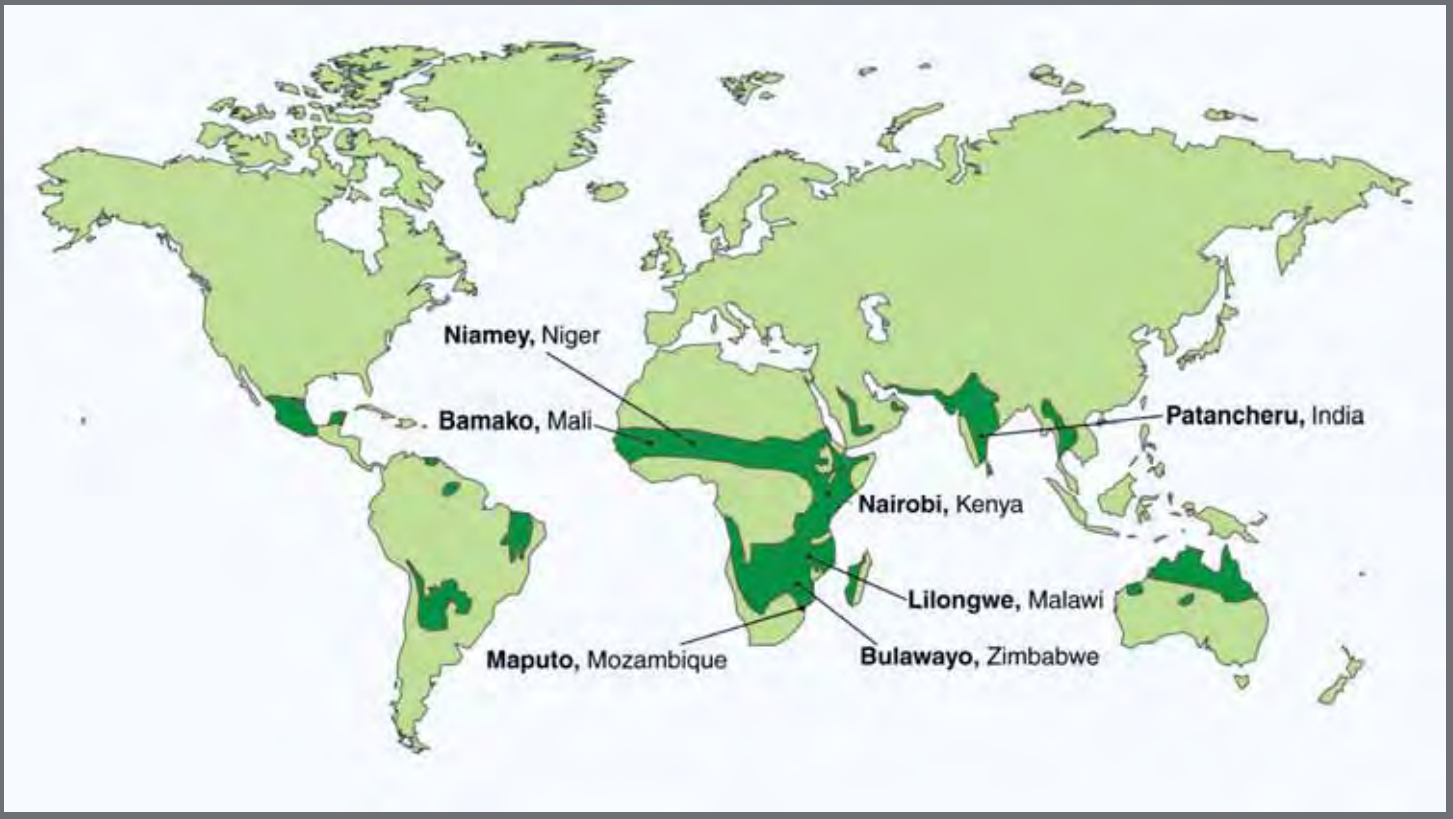
The completed genome sequence of pigeonpea is featured as an advance online publication on Nov. 6, 2011 on the website of the journal *Nature Biotechnology*, the highest ranked

ICRISAT to

The International Crops launch in three-five yea to improve their yield an

Hyderabad-based ICRISA genetic engineering

ICRISAT locations in the semi-arid tropics



ICRISAT
Science with a human face

International Crops Research Institute
for the Semi-Arid Tropics

CGIAR

A member of the CGIAR Consortium

About ICRISAT

The International Crops Research Institute for the Semi-Arid-Tropics (ICRISAT) is a non-profit, non-political organization that conducts agricultural research for development in Asia and sub-Saharan Africa with a wide array of partners throughout the world. Covering 6.5 million square kilometers of land in 55 countries, the semi-arid tropics have over 2 billion people, and 644 million of these are the poorest of the poor. ICRISAT and its partners help empower these poor people to overcome poverty, hunger and a degraded environment through better agriculture.

ICRISAT is headquartered in Hyderabad, Andhra Pradesh, India, with two regional hubs and four country offices in sub-Saharan Africa. It belongs to the Consortium of Centers supported by the Consultative Group on International Agricultural Research (CGIAR).

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ISSN 1017-9933 IRE 021 120-2012