Nurturing the seeds of success in the semi-arid tropics

ICRISAT Annual Report 2006

International Crops Research Institute for the Semi-Arid Tropics


Technology Day
2009


L VELASCO
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in the semi-arid tropics

Contents

Message from the Director General

ICRISAT adopted the themes "Sowing the Seeds of Success in the Semi-Arid Tropics" and "Germinating the Seeds of Success in the Semi-Arid Topics" for its last two Annual Reports. This year, the theme is "Nurturing the Seeds of Success in the Semi-Arid Tropics".

We are using these themes in succession to humbly claim our significant accomplishments among ICRISAT's stakeholders, especially poor farmers of the semi-arid tropics. These accomplishments elevate us higher on the staircase of pursuing our vision towards the improved well-being of the poor of the semi-arid tropics.

ICRISAT today reminds us of what Charles Darwin said, "It is not the strongest of the species that survives, nor the most intelligent, but the most responsive to change."

The need to be responsive led ICRISAT to map a new vision and strategy to 2015, fine-tuning its research themes within a rapidly changing task environment especially the new priorities of the CGIAR. Our overarching research strategy is that of integrated genetic and natural resource management (IGNRM), which empowers communities and smallholder farmers in improving their livelihoods in the context of a globalized market without compromising the natural resource base.

ICRISAT's thrust towards strategic partnerships has begun to pay off. This year, together with ICARDA, we launched 'Oasis' as a new CGIAR Systemwide program with eleven Centers joining. 'Oasis' synchronizes and integrates efforts of participating Centers to combat drought and desertification worldwide. In the host country, our ties with the Indian Council for Agricultural Research (ICAR) has been further strengthened with a 3-year research partnership. In the emerging area of biofuels, ICRISAT is a global trendsetter in technology commercialization by linking its research on sweet sorghum with a private distillery that produces ethanol, ultimately benefiting poor sorghum farmers and consumers.

On crop biotechnology, we are currently working on *Bt* chickpea and pigeonpea varieties resistant to pod-borers, and on genetically-modified groundnut varieties resistant to the Indian peanut clump virus and rosette virus in sub-Saharan Africa. Moreover, we recently gifted our high-yielding, early maturing groundnut variety ICGV 91114 to the farmers of Ananthapur, India. This variety was also released in Andhra Pradesh recently.

I am also happy to state that ICRISAT is in a financially sound position. Our reserves have increased, earned incomes have risen and gross revenues have grown.

The strides reported in this publication have been made possible by our committed staff with the unwavering support of our development investors and partners. With the enlightened guidance and direction by our Governing Board and development investors, we are confident to surge further forward and eventually make our vision a reality.

William D Dar
Director General

Message from the Chairman

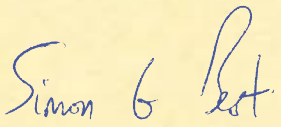
I am proud to report that ICRISAT has met, and in some cases surpassed, its goals for the year. This has been achieved by the hard work and creativity of the Director-General, his management team, our staff and partners with the financial support of our donors. My sincere thanks to you all.

The discovery, development and sharing of the outputs ICRISAT is responsible for requires leading-edge expertise in many areas of science and technology and extraordinary teamwork and collaborative skills. These must be applied internally and externally to build and implement the many partnerships that are our route to impact in a wide range of countries and cultures. As someone who has spent most of his career in high-tech industry, I am constantly impressed with the quality and dedication of ICRISAT's management and staff in an environment of sometimes conflicting demands and always limited resources. Both the work done and the way it is done are truly "world-class" by any measure.

As illustrated in the Director-General's report, ICRISAT is delivering effective and appropriate tools and strategies to counter those endemic challenges of the semi-arid tropics, drought and desertification eg, the OASIS and Desert Margins Program. In addition to these established priorities ICRISAT is making rapid progress in addressing new Science Council priorities of improving nutrition and generating income through crop diversification eg, the African Market Garden program.

ICRISAT also has an important contribution to the world's armory of responses to climate change and increased climatic instability. ICRISAT's knowledge of core stress-tolerance strategies in its mandate crops is helping those working in our sister Institutes to adapt their mandate crops to be better able to cope with their effects. Future insights lie in ICRISAT's germplasm collections, which contain the largest number of accessions in the entire CGIAR system. I'd like to give particular thanks to those donors who have provided continued support for these and our marker-assisted breeding and genomics programs over many years. These have now started to deliver important breakthroughs with much greater impact to come in the next few years.

It is both a great honor and responsibility to Chair such a globally important institution as ICRISAT. Our work is very challenging but vitally important for the poor farmers of the semi-arid tropics and their families. We are determined to continue delivering our contribution to the global effort to help them build a healthier and more secure future.



Simon G Best
Chairman, Governing Board

Integrating MAS and Conventional Breeding for Downy Mildew Resistance

Introduction

Pearl millet (*Pennisetum glaucum*) is grown for grain and stover in the hottest and driest areas of Africa and south Asia. In India, at least 70% of the 9 m ha sown to this crop is genetically uniform single-cross hybrids, which are particularly vulnerable to downy mildew (DM) disease caused by the pseudo-fungus *Sclerospora graminicola*. DM is the most important pearl millet disease, causing national production losses up to 30% during epidemics.

HHB 67, released in 1990 by CCS Haryana Agricultural University (HAU), is one such single-cross pearl millet hybrid. It is highly popular because of its extra-early maturity (65 days from sowing to grain maturity) and is now grown on >500,000 ha in Haryana and Rajasthan states. Recent surveys have indicated that this hybrid is starting to succumb to DM (up to 30% incidence in farmers' fields).

Breeder Seed inspection of female parent.

Development

HHB 67 was rapidly and widely adopted by farmers, so its parental lines were chosen for DM resistance maintenance breeding in an attempt to break the boom-bust cycles that have characterized pearl millet hybrid cultivation in India since the late 1960s. Marker-assisted backcrossing with elite donor parent ICMP 451 was used to add DM resistance to male parent H 77/833-2. Marker-assisted selection (MAS) used restriction fragment length polymorphism, which is considered too slow, too cumbersome, and too expensive to use in applied selection. However, the challenge was taken up by Arun Sharma, a Plant Breeding PhD scholar from HAU working under the guidance of DC Nijhawan and ICRISAT's CT Hash. Additional DM resistance genes were backcrossed into female parent 843A/B from donor ICML 22 using conventional progeny-based greenhouse screening of pot-grown seedlings. Conventional backcross transfer of DM resistance to improve 843A/B took nearly nine years (1991–1999), while marker-assisted backcross transfer to improve H 77/833-2 was completed in just over three (1997–2000).

Testing

Greenhouse disease screening confirmed DM resistance improvement in the new parental lines and their hybrids. Hybrids were tested first at ICRISAT in 2000 and across six sites in collaborative trials during the 2001 rainy season. Two improved versions of HHB 67 were subsequently compared with the original for agronomic performance in three years (2002–2004) of on-station state trials in Haryana, on-station national trials of the All-India Coordinated Pearl Millet Improvement Project, and >100 on-farm trials conducted in several districts of Haryana, where HHB 67 had become the most popular pearl millet cultivar. In these three years of testing, farmers expressed a clear preference for one of the two improved hybrids, which is slightly taller (15–30 cm), later (2–3 days), and has higher grain and stover yields (5–10%) than the

original HHB 67, as well being more resistant to DM and having easily recognizable long, thin panicles with short bristles (like the “designer stubble” of popular Hindi film actors!).

Scientists identifying an off-type plant.

Release

After three years testing in national trials, the Haryana State Varietal Release Committee in January 2005 approved release of this improved version for cultivation in Haryana. Its State Release as ***HHB 67 Improved*** was approved by the Central Plant Variety Release Committee in June 2005, and this was quickly followed in July by approval of its All-India Release (notified in the Gazette of India in November 2005). *HHB 67 Improved* is the first product of marker-assisted breeding to reach cereal producers in India. It is also among the first public-bred marker-assisted breeding products commercialized in developing countries globally, following the 2001 release in Indonesia of rice varieties bred by this technique.

Priming the hybrid seed multiplication pipeline

Large quantities of Breeder Seed of the parental lines of *HHB 67 Improved* were distributed in 2005-06 to public and private seed agencies by ICRISAT and HAU following approval of the hybrid’s release by central government authorities in India. Due to regulatory delays in the release process, much of the Breeder Seed distributed in 2005 was used directly for Certified Seed production of the new hybrid itself rather than multiplication of parental line Foundation Seed. However, this should ensure that Certified Hybrid Seed is available to sow >50,000 ha with *HHB 67 Improved* during the 2006 rainy season. Further parental line seed multiplication during 2006 will ensure that *HHB 67 Improved* can swiftly replace the original, before another downy mildew epidemic.

Picture of HHB 67 Improved *taken 60 days after sowing.*

Economic benefits

By rapidly adopting *HHB 67 Improved,* farmers in Haryana and Rajasthan can avoid grain production losses of Rs 36 crores (US$ 8 million), which would be expected in the first year of a major DM outbreak on the original HHB 67. In years of severe DM attack, up to 30% of the pearl millet grain and straw harvest can be lost. Income losses in a severe DM outbreak on HHB 67 can be estimated conservatively assuming an average grain yield of 800 kg per ha (most of the HHB 67 area is in Haryana, which has recently had state average pearl millet grain yields in excess of 1000 kg per ha), and a minimum selling price of Rs 3 per kg (prices range from Rs 2 to Rs 6 per kg). The value of these potential grain yield losses—in the first year of a major DM epidemic on the original HHB 67—exceeds the total research funding support provided by the UK Department for International Development from 1990 to 2005 towards the development and application of marker-assisted breeding tools for pearl millet. Future applications of these tools (as well as benefits from avoidance of grain and stover yield losses in the second year of an epidemic) will profit society as a whole, representing a well-spent research investment.

Dress Rehearsal for Adapting to Climate Change?

Rainfall variability defines production uncertainty

Rainfed agriculture accounts for 90% of annual food production in sub-Saharan Africa and many of the regions poorest and most vulnerable people depend on it for their livelihoods. However, climate (rainfall) variability largely defines production uncertainty. Farmers coping with such climate variability have adopted strategies that reduce the negative impacts in poor years but fail to exploit the good years for higher productivity. While seasonal rainfall varies from year to year in all climatic zones, such variability is disproportionably higher and has its greatest impacts in the semi-arid tropics of Africa (Figure 1).

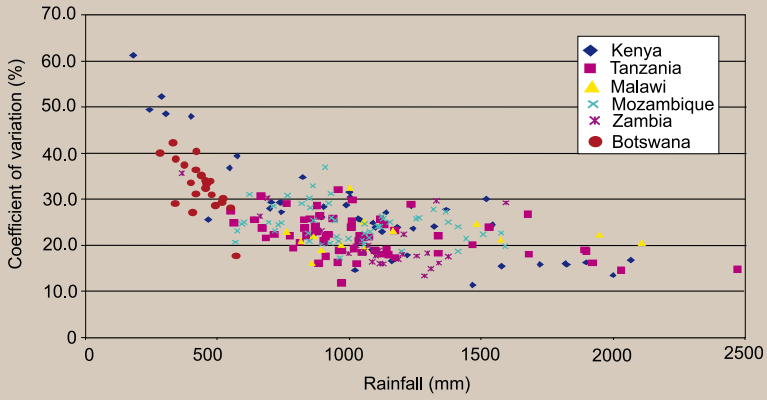


Figure 1. Long-term mean seasonal rainfall totals (mm) and their coefficients of variation for locations in Eastern and Southern Africa.

Because farmers and associated support agents have an imperfect understanding of the nature and long-term impacts of climate variability, they tend to over-estimate its negative effects. As a result (i) agricultural investment by farmers and their support agents remains low, and (ii) researchers and public and private extension and policy systems are unsure of how to target agricultural innovations in the context of long-term climate variability. The outcome is that widespread adoption of sustainable crop, soil and water management innovations and associated market enterprises and financing schemes remain low, and achieving current 'time bound' poverty reduction and food security targets, remains daunting for most nations.

Can climate-induced risk be understood and managed?

Yes. Recently, a range of innovative climate analysis tools have been developed. The new tools provide a good understanding of the agricultural implications of climate variability from two complimentary perspectives.

- Firstly, the use of long-term daily climatic data combined with field-based research results, spatial weather generators, crop growth simulation models, geographic information systems and improved access to and use of climate analysis software allow for the development of robust frameworks that facilitate and guide longer term strategic planning, risk management and decision making by all 'investors' involved.
- Secondly, recent advances in understanding and modeling of the oceanic atmosphere system at the regional and global scale are important developments that are resulting in the practical application of seasonal weather forecasting being evaluated and demonstrated in SSA.

The combined application of these tools allow for the development of climate risk management strategies that integrate the following key aspects:

(1) Decision-support frameworks that provide a longer-term strategic understanding of the temporal and spatial distribution of climatic variability and its impact on the probability of performance and profitability of existing and innovative agricultural practices.

(2) Seasonal climate and agricultural forecasting that enables farmers and support agents to 'fine tune' long-term strategies and thus plan tactically and farm more effectively.

(3) Information on the extent to which climate change is already impacting on the nature of climate variability and the implications for rainfed farming systems.

The demand for such integrated climate risk management strategies is increasingly being voiced by a range of stakeholders who want to identify appropriate short and longer-term investment opportunities in rainfed farming, but who also wish to have a clearer ex-ante assessment of the climate induced risk associated with such investments.

Recognizing this need, in late 2004, ICRISAT, together with ASARECA-SWMNet, facilitated the development of a consortium of 15 national, regional and international organizations to address the challenge. In May 2005, ASARECA and COMESA presented this consortium to NEPAD for official endorsement and inclusion in the NEPAD-G8 CAADP.

Early consortium activities

During 2005 and 2006, consortium members have been engaging with a range of partners and stakeholders in assessing their climate risk management needs and developing appropriate activities and approaches to address those needs. Whilst many of these projects are currently still under review by donor agencies, others have already been funded and are operational (Table 1).

Table 1. Projects developed within the consortium conceptual framework (2005 – 2006)

Project Title	Consortium Members	Stakeholders and Project Partners	Countries involved	Project Status
"Making the best of climate: Adapting agriculture to climate variability"	ICRISAT, IRI	Univ. Nairobi, KMD, ICPAC, EARO, FOFIFA, SOMEAH.	Kenya, Madagascar, Ethiopia	Funded by, ASARECA-CGS
"Developing tools for predicting the occurrence and severity of bean root rots"	CIAT	Pan African Beans Research Alliance (PABRA)	Eastern and Southern Africa	Funded by CIAT and PABRA.
"Statistics in applied climatology: a facilitated e-learning course".	Reading University	National Met. Services in SSA and UK Met. Office.	14 countries in SSA	Funded by DFID and UK Met. Office.
"*An aflatoxin risk early warning system to improve nutrition, health and income in west African smallholder farms."*	ICRISAT, AGRHYMET	IER-Mali, SARI-Ghana, Univ. Of Sherbrooke and Florida.	Mali, Ghana	Funded by CIDA/CCLF
"Options for improved use of climate knowledge and technology in the southern rangelands of Kenya."	ICRISAT, CIAT, IMTR	District Forest and livestock Office and extension staff at Makueni, Kenya. KMD, KARI	Kenya	Funded by DMP
"Providing climate-based decision support for farmers and agricultural concession companies in Mozambique"	ICRISAT, CIAT, ICRAF, Reading University	Mozambique Leaf Tobacco, CIP, DPA, IIAM, EMPRENDA Alliance, USEBA, SNS and Mozambique Met. Service.	Mozambique	Funded by PRO-AGRI-MINAG (World Bank)
"Managing uncertainty: Innovation systems for coping with climate variability and change"	ICRISAT, CIAT, ICRAF, Reading University	ASARECA Networks, ILRI, ARC-Sudan, Univ. of Asmara, NARO-Uganda.	Sudan, Eritrea, Uganda and ECA	Under review by ASARECA-CGS

Conclusion

If a better understanding of the constraints and opportunities of climatically induced risk is not provided to key stakeholders and farmers alike, investment in the rainfed agricultural sector in SSA is likely to remain at its current inadequate level resulting in persistent poverty of rural populations. However, proven tools are available that can facilitate and guide investments that have a high probability of success.

The consortium members are convinced that the successful application of these approaches will, by 2015, have facilitated and guided agricultural investments that will play an important role in moving towards the achievement of the Millennium Development Goals in several countries in sub-Saharan Africa and Secretary Kofi Annan's call for a truly African Green Revolution.

Turning Data into Knowledge – The Impacts of Bioinformatics

Scientists in ICRISAT's Global Theme on Harnessing Biotechnology for the Poor employ a range of modern genomic technologies in their efforts to enhance the efficiency and effectiveness of crop improvement. A critical rate-limiting step in genomics is no longer data generation, but rather the speed at which data is captured, validated, analyzed and turned into useful knowledge. ICRISAT's Bioinformatics Unit is striving to remove this rate-limiting step by providing the software platforms for handling large volumes of data. The Bioinformatics Unit focuses on three key areas: (a) the development of an appropriate platform for storage and retrieval of data; (b) the development of efficient protocols for handling and validating the large volumes of data with special emphasis on data quality; and (c) the development of high-throughput sequence analysis tools and methodologies for purposes such as the identification of molecular markers, and as aids to annotation or comparative genomics.

Figure 1. Information management systems available on the intranet for local users and for download by external users.

All the software development work has been driven by the need to have software packages that do not have operating system or hardware dependencies. Today, the ideal computer languages that implement this approach are Perl or Java, each with their advantages in terms of applications. Database development has largely been in Java, while Perl with its excellent text processing capabilities efficiently handles sequence data, serving as the "glue" in the construction of what are called "software pipelines".

The impacts of the Bioinformatics Unit can be demonstrated by these examples of its activities:

- **Information management systems:** The Unit has developed a Laboratory Information Management System (LIMS) that meets the needs of a moderately high-throughput molecular genotyping facility. LIMS is presently used by ICRISAT's Applied Genomics Laboratory for the capture of high-throughput simple-sequence repeat (SSR) genotyping data of ICRISAT's mandated crops – chickpea, groundnut, pigeonpea, sorghum and millet. The application is also being tested for use at the French public institute, CIRAD, and the Brazilian national program, EMBRAPA. The Bioinformatics Unit at CIMMYT – a sister CGIAR center – recently conducted an evaluation of various LIMS applications and found ICRISAT's LIMS to be superior.
- **Data validation and quality:** A major concern when working with large volumes of data is the risk of errors being introduced at various levels of data generation, entry and manipulation. The LIMS helps to reduce these at the data capture point by validating data entry, checking for inconsistencies and annotating data at every step of the workflow. This assures that the raw data captured is as accurate as possible. A critical next step is often some form of data manipulation. For SSR genotyping using modern DNA sequencers, the manipulation step is to turn a "raw" allele size into its "actual" size – thus allowing more accurate comparisons between varieties to be made. Algorithms that provide a strong statistical basis for these "allele calls" have been implemented into a software package "Allelobin". The package is available both within the LIMS package, and as a standalone application – ensuring the highest data quality for analysis. Allelobin has been widely distributed at workshops and is being used by scientists

at CIRAD, IPGRI and Kasetsart University in Thailand.

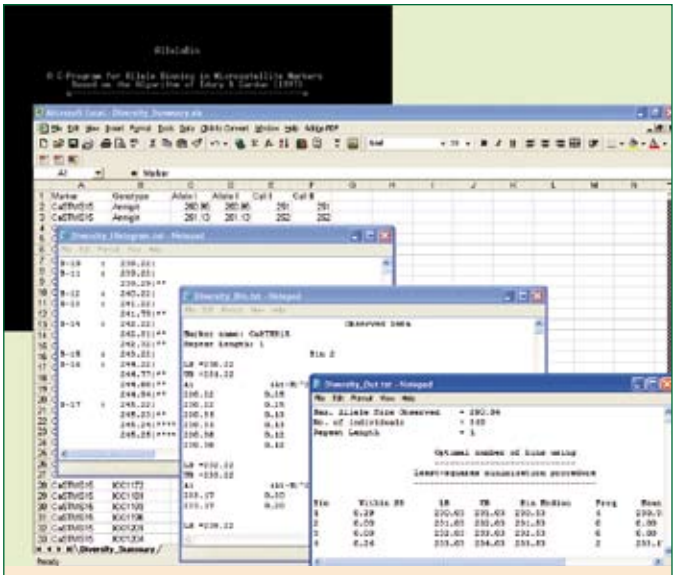


Figure 2. The Allelobin program for automated allele binning.

- **Sequence analysis tools:** When scientists deal with a single DNA sequence or even a few sequences, the desired analyses such as motif searching and primer design are relatively straightforward. It is when dealing with several thousands of sequences, that bioinformatics begins to have an impact. One of the first steps would be to break down the analysis into single components and identify measures needed to improve the efficiency of the entire process. This may be through building pipelines of software or implementing applications in parallel. Some examples undertaken by ICRISAT's Bioinformatics Unit include pipelines of open source software used for putative functional annotation from sequence homology, and parallelized versions of open source multiple alignment and assembly and parsing software, all of which are available as freeware. These tools are now being used extensively by students and scientists at ICRISAT and many other local and international institutes. All have been shared with potential users (eg, CIAT). Parallelized versions implemented on Linux clusters with easy-to-use interfaces have excited interest amongst external users at CIP and CIMMYT.

- **Strengthening capacity through collaborations:** Over the past few years, there has been increased interest to work in ICRISAT's Bioinformatics Unit by students from universities and institutions in India. During the last two years, ten graduate students have been accommodated in training programs each year. These students are working towards a degree in biotechnology or bioinformatics and the programs provide them with hands-on training opportunities. In-house capacity is also strengthened through working with collaborators from Central Institutes like the Centre for DNA Fingerprinting and Diagnostics, and the International Institute of Information Technology, both located in Hyderabad.

Figure 3. A range of analysis tools and databases available with user interfaces.

- **New linkages with the corporate sector:** ICRISAT cannot do it alone. We often seek out consultants and third-parties that can provide the required expertise in bioinformatics. One such company is the Tata Consultancy Services (TCS), a leading global information technology consulting, services and business process outsourcing organization. The Bioinformatics Unit has been working with scientists of the Advanced Technology Centre, the R&D wing for bioinformatics at TCS, to build partnerships in the areas of software platform development, high-throughput comparative biology and systems biology.

African Market Garden: A Sahelian Success

Introduction

The African Market Garden (AMG) is a low-pressure drip irrigation system developed by ICRISAT with the support of the International Program for Arid Land Crops (IPALAC). The AMG brings all the advantages of drip irrigation – irrigation based on crop water consumption, accurate and uniform water delivery, application of fertilizers with each irrigation (fertigation), savings in labor, fuel, water, fertilizers and pesticides, higher crop yields and higher quality products.

Over the last four years ICRISAT helped disseminate the AMG in nine Sahelian countries. The first dissemination drive was carried out in Niger with the support of the World Bank's Development Marketplace program. In 2005 an impact analysis was carried out by ICRISAT to evaluate this first attempt.

Highlights from impact analysis

Member of the Sadoré village women association with new, ICRISAT-selected bolting tolerant lettuce produced in a commercial AMG.

From June 2002 to May 2003, 827 drip irrigation systems were distributed in Niger by ICRISAT and partners. Two types of systems were developed: The Thrifty System (TS) of 80 sq meters, and a larger "Commercial" System (CS) of 500 sq meters. The small systems were targeted at women who are often excluded from the cash economy in rural and urban areas. The large systems targeted vegetable producers.

Development project partners used these systems to address community deficiencies in basic nutrients, and others used these in schools to teach biology and agronomic principles. These systems were distributed in the regions of Agadez, Tahoua, Zinder, Tillabery and Dosso, and in peri-urban Niamey.

To evaluate the spread of these systems, two zones were targeted – peri-urban Niamey and the Dosso regions. These areas differ significantly in the level of monitoring and evaluation. While in peri-urban Niamey, little monitoring and technical support was provided, in Dosso, these systems were largely supported by the Projet de Development Integree de la Region de Dosso and the "Ecole de Sante". The Luxemburg government funds these two NGOs.

In the Dosso region 47 systems were visited out of the 233 systems distributed. Overall, 44 systems (ie, **94%), were still functioning**. In peri-urban Niamey, 97 systems were randomly visited out of the 326 systems disseminated, where 56 systems **(58%)** were still functioning.

It was generally was found that the economic returns to land for those using the drip irrigation systems were estimated to be **826 FCFA/m²** against **336 FCFA/m²** for those using the traditional practice. The returns to water, labor and fertilizers were perceived to be high by farmers. In general, to enhance uptake of the drip irrigation systems, more demonstration, training and promotion is needed, and producers must be linked to better vegetable markets, and to credit markets.

Summary

In Dosso, where NGOs have technically supported the systems, practically all systems are still operating four years after installation. Around Niamey, with no technical support and follow up, about 60% are still operating. This is an exceptional rate of adoption clearly, demonstrating the feasibility of this new technology for dry Africa.

System development

After TS and CS, ICRISAT developed what is called the "Clusters System". In this system water is supplied to a cluster of AMGs from a large water reservoir such as those created by dams. This system is cheaper to operate than the first two and concentrates many AMG units in one place. So far 40 units were installed in Ghana using the cluster system approach and 40 more will be installed in 2006. ICRISAT has recently developed a low-pressure drip system for bigger producers. These new low-pressure systems are much cheaper than the pressurized systems and can irrigate commercial fields of up to 10 hectares in size.

Mr Mandela planted two crops of onions in Ouahigouya-Burkina Faso receiving a total yield of 7 tons of onions/1,000 m^2 (instead of a single crop of 2.5/1000 m^2 that he received previously from his conventional system). He bought a new 9,500 m^2 parcel with the savings.

Main ongoing projects

1. Burkina Faso and Ghana. This project, supported by USAID-West Africa, ends in October 2007. By then 570 AMG units should be installed in these two countries.

2. The Jean Paul II Foundation project is co-funded by the Israeli Department of International Cooperation (MASHSAV) and the Vatican through the Jean Paul II Foundation. ICRISAT provides technical support. About 300 AMG units were installed so far in nine Sahelian countries (Cape Verde, Mauritania, Senegal, Gambia, Guinea Bissau, Mali, Burkina Faso, Niger and Chad).

3. The Senegal project. Both the American Jewish World Service and World Vision support this project that started in mid-2006 and is aiming at the installation of 300 units in Senegal by mid-2007.

Project spillovers

Based on the success of the project in the region, the Bishop of Kaya in Burkina Faso installed (with technical support from ICRISAT) a 45-hectare field of pressurized drip irrigation to produce vegetables, fruit and date palms. Farmers in Bobo Dioulasou region of Burkina ordered 45 hectares and farmers in Niger ordered 90 hectares of pressurized and of low pressure drip systems.

Training pilot farmers at ICRISAT-Niger.

Supporting systems

ICRISAT is supporting the AMG project with intensive research from its Sadoré center in Niger. So far it has selected and started to disseminate seeds of ten quality varieties of vegetables and is in the process of screening improved varieties of fruit trees. Each year ICRISAT trains about 200 nurserymen and vegetables seeds producers and help them build their nurseries.

Conclusions

The dissemination of the AMG in nine Sahelian countries is an ICRISAT success story. Some 1480 systems have been installed in these countries since 2002. By 2007 this value will grow to 2,000 units.

The AMG and the accompanying new vegetable and fruit varieties selected and promoted by ICRISAT, plus its many other services (market studies, training, support of the supply chain, supporting technologies etc) should soon change the face of horticulture in Central and West Africa providing high income to scores of small-scale producers, while guaranteeing healthy and nutritious food to both the rural and the urban populations of this poor region.

An Alternative to Groundnut is a Better Groundnut

The crop

Groundnut (*Arachis hypogaea* L.) ranks 6th among oilseed crops and 13th among the food crops of the world. In addition to providing high quality edible oil (48–50%), easily digestible protein (26–28%), nearly half of the 13 essential vitamins and 7 of the 20 essential minerals necessary for normal human growth, it produces high quality fodder for livestock. It thus plays a significant role in the livelihoods of marginal-farmers through income and nutritional security. Groundnut is grown on 26.4 million ha worldwide with a total production of 36.1 million metric tons (FAOSTAT data, 2004). Developing countries account for 97% of the world's groundnut area and 94% of the total production.

The district

Anantapur is a drought-prone district in the rain shadow area of Andhra Pradesh State (AP), India. Despite frequent droughts and crop failures, over 70% of the cultivated area of the district (1.04 million ha) is sown to groundnut each year. Smallholdings (< 3.0 ha) dominate (60%) the district, making it the largest groundnut-growing district in the world. The soils in Anantapur are predominantly light textured, gravelly, shallow alfisols (max. depth 60 cm). These soils hold plant-available water ranging from 40 to 70 mm in the soil profile and are low in nutrients. The average annual rainfall in the district is 522 mm as against the State average of 926 mm. The district experiences prolonged dry spells of 45–50 days with an average of 36 rainy days in the rainy season.

Rainfall in Anantapur.

Groundnut in the rough terrain typical of Anantapur.

In the 1993–2004 period, there were only four 'good' rainfall years. The groundnut yield during these years averaged between 800 and 900 kg ha^{-1} and during 'drought' years between 300 and 400 kg ha^{-1}.

Shift in cropping pattern: During the 1960s, cereal crops dominated (50% area) the agriculture scenario here, and groundnut (20% area) was a relatively minor crop. Poor rains, prolonged dry spells and frequent crop failures, reversed the cropping pattern. Now, over 70% of the cultivated area is sown to groundnut due to its ability to survive long dry spells and for its cash value.

Groundnut varietal scenario: Despite many improved groundnut varieties released in AP during the last 20 years, old varieties TMV 2 (80% area, released in 1940), JL 24 (15–20% area, released in 1978) and Pollachi Red (a landrace) continue to dominate cultivation. New varieties fell short of farmers' expectations, seeds were not available and processors were reluctant to adapt their machinery to new varieties.

Farmer participatory on-farm varietal selection

Farmers in Anantapur are unwilling to give up groundnut cultivation despite the State government's initiative towards other dryland crops. They realize that groundnut can withstand long dry spells much better than other crops and can revive itself even with minimal rain after dry spells. Further, in case of complete crop failure, it still yields fodder for livestock. But they needed a new high-yielding disease-resistant variety for sustained improvement.

Enter ICGV 91114

Under the aegis of IFAD TAG 532-ICRISAT, a farmer participatory on-farm varietal selection (FPVS) program was launched in 2002 in collaboration with the Rural Development Trust (an NGO), Agricultural Research Station, Acharya NG Ranga Agricultural University, and active participation of farmers to find a replacement for the traditional TMV 2 variety. Five FPVS trials, each with nine improved varieties (eight from ICRISAT and one from NARS) and a local control, TMV 2, were conducted in two villages, Dhanduvaripalli and Rekulakunta. Soon after sowing in August, a dry spell of 45 days followed. After good rains during mid-September, another 25-day dry spell followed. Total rainfall received during the year was less than 400 mm, far below the district average.

The new varieties yielded the same as TMV 2 in both the villages. However, the farmers were impressed with ICGV 91114, which gave higher fodder yield than TMV 2 (1460 kg ha^{-1} vs. 1355 kg ha^{-1}), at par pod yield (385 kg ha^{-1} vs. 305 kg ha^{-1}) and larger seed size.

In the 2003 rainy season, this variety was sown in larger plots in five holdings of West Narsapuram and Rekulakunta villages. Again, there were long dry spells after sowing. Total rainfall received that year was 227.1 mm. Despite severe drought, ICGV 91114 produced significantly higher average pod yield (507 kg ha^{-1}) and haulm yield (1391 kg ha^{-1}) than TMV 2 (453 kg ha^{-1} and 1111 kg ha^{-1}) and recorded a higher average shelling turnover and number of pods $plant^{-1}$ (59% and 2.9 vs. 55% and 2.4).

Farmer-scientist interaction in farmer's field.

After observing ICGV 91114 during two drought years, a woman farmer of West Narsapuram village multiplied its seed and sold her produce to other farmers in the village as seed for the 2004 rainy season.

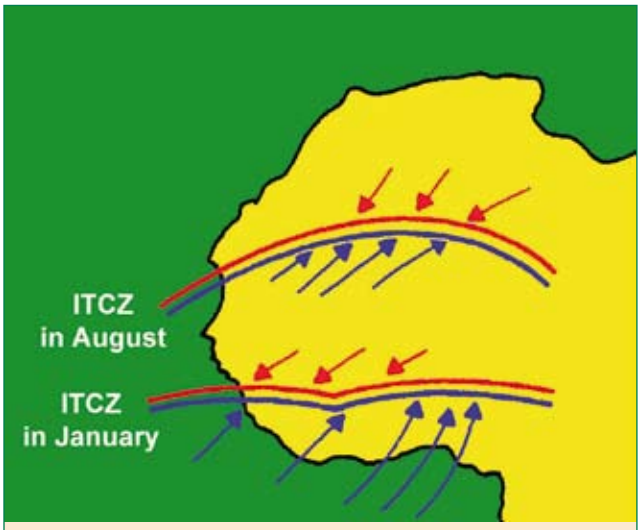
In 2004, farmers in West Narsapuram, Shivapuram and Rekulakunta sowed ICGV 91114 in their on-farm trials/ seed production plots with the onset of rains in mid-July. Soon after, there was a dry spell of 35 days. The crop got only 302 mm of the total annual rainfall of 495 mm, but ICGV 91114 outperformed TMV 2 again.

Farmers now decided to grow this variety in a big way. In the last two seasons there has been a substantial increase in the numbers of farmers growing this variety (506 farmers so far). Farmers are still saving their produce as seed for future seasons. ICRISAT is also producing Breeder Seed for distribution among farmers in new villages in Anantapur, and ICGV 91114 will be spread to neighboring drought prone areas in Andhra Pradesh and Karnataka.

Led by Light in West Africa

Living organisms use day-length to synchronize their daily and seasonal activities. Photoperiod-sensitivity is a spectacular expression of this phenomenon affecting reproduction, daily leaf movements or seasonal stem growth, dormancy and leaf fall.

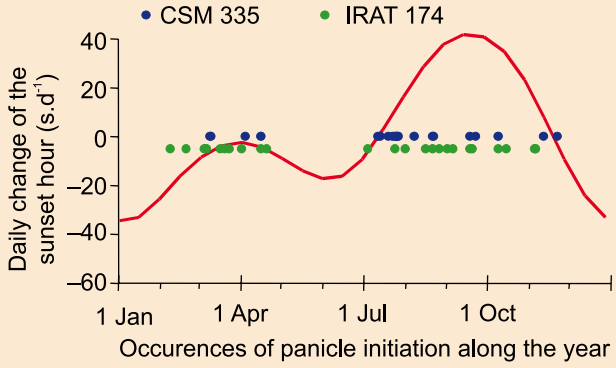
Date to flower



Rainfalls in the south of the ITZC move north and south during the year.

In the West-African savannahs the duration of the rainy season is linked with the latitude, and the movements of the Inter-Tropical Convergence Zone (ITCZ) – being gradually shorter from the south to the north of the area.

Sorghum and pearl millet have been cultivated in West Africa since millennia and have consequently co-evolved with their natural pests. The pest pressures suffered by both crops grown in the wet and warm climate of the rainy season are very high. Therefore, the crops must be sown within the days that follow the first large rainfall and must flower at the time of the last large rainfall of the season. The emergence-flowering cycle must consequently last two months in the far northern areas, and seven months in the far southern zones covering all the intermediate durations of the intermediate regions. The photoperiod-sensitivity allows the species to cover this whole range, since there are no late varieties that would be photoperiod-insensitive. The cycle duration within the species is lengthened by the delayed date of flowering. In each traditional late variety of sorghum and pearl millet, the flowering is triggered by the annual course of the sun on a precise day of the year, about 2 months before flowering. Thanks to this mechanism, farmers have selected varieties with the flowering date suitable for their zone.



The inhibition of the panicle initiation of two strongly photoperiod-sensitive varieties (negative values of the red curve).

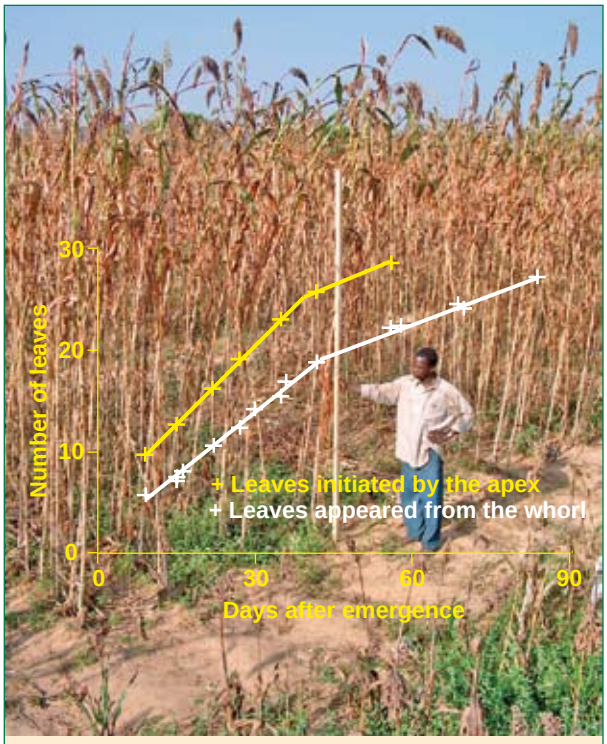
Triggering the flowering

Alteration of the days and nights synchronize a constant flowering date. Changes in day-lengths modify the duration of the vegetative phase, from emergence of the plantlet until the reproduction. Thus sorghum and pearl millet are classed as short-day plants, which flower only (or faster) under short photoperiods. Sufficiently late sorghum landraces from West Africa flower at a constant date, nearly independently of the sowing date, and the flowering is triggered from July to August, when days are the longest. The triggering was strictly repressed from March to June and allowed from the beginning of July, at a date that is genetically controlled. The

only environmental signal whose annual evolution can explain this pattern is the daily change of the sunset hour. Flowering would be inhibited by sunset delay (more than 24 hour-cycle), during spring, and allowed with a specific threshold by sunset earliness (less than 24 hour-cycle), during summer. The tropical landraces would therefore respond more to the daily variation of the sunrise and sunset hours than to the duration between the two events.

Altered development and growth

During the long vegetative phase of the West-African sorghum and pearl millet landraces, the rate of the leaf initiation by the apex and the rate of the leaf appearance from the whorl after they grew inside the sheaths, are reduced by half at the onset of the internode elongation, around the appearance of about the 15th leaf. The pattern is observed for sowings in the rainy season, before 1 July. These rates also depend on the sowing date, being minimal for sowing at the beginning of June and then increasing from July to September. Due to the internal co-ordinations, the rate of the stem elongation is thus reduced for plants sown early, while the growth of roots remain unchanged irrespective of early or late sowing. Since the stem is the heaviest organ in the tall tropical sorghums, instant mineral demand is reduced in photoperiod-sensitive sorghum during jointing, which lasts longer, giving more time for roots to explore a larger volume of soil. This strategy explains the rusticity of sorghum (known for its ability to grow in low fertile soils) to cope with severe droughts, and to fill grain after the offset of the rains. It also explains why in farmer's fields, yield is so heavily affected by late sowings inducing a faster growth of the plants during the stem elongation.



The rates of development and growth of a West-African sorghum landrace, CSM 335, sown at the beginning of July, decrease by half at onset of stem elongation.

Breaking the low yield stability?

The nodes of the panicle are produced at the same rate as the leaf, thus showing dependence on the sowing date. Since the growth rate is parallely changed, the time for the panicle development, between panicle initiation and flag-leaf apparition varies reversely with the sowing date. Consequently, the potential size of the panicle remains stable for plants sown within the rainy season, but is low when compared with the potential of the biomass of the tall plants to fill much more grain.

Thus the West-African landraces possess a multitude of adaptable characters needed in their environment, including the quality and taste of their grain. But their strong defect is their inability to respond to the increased soil fertility, linked with their yield stability. To improve the situation, the potential amount of grain per area has to be increased, possibly through the increase of the plant density, while keeping the other characters unchanged. Knowledge newly acquired on different aspects of the photoperiod-sensitivity will help to select future varieties based on the local biodiversity and to define their zone of adaptation. The next step will be to understand the genetics of the threshold that gives each landrace a particular calendar date for panicle initiation in order to derive varieties adapted to a range of latitudes from the best varieties and hybrids bred from the African diversity.

Rainfed *Rabi* Cropping in Rice Fallows of Eastern India

South Asia is one of the major rice-producing regions of the world, where about 50 million hectares (ha) are covered with this crop. Much of this area is under a single crop per year, usually rainy season rice, and no crop is grown after the rains, due mainly to lack of irrigation. Despite the growing population and increasing demands for food production in South Asia, there is little scope for expanding the crop area, as there is no area left. A practical solution therefore is to intensify the cropping and increase the yields on the existing agricultural lands.

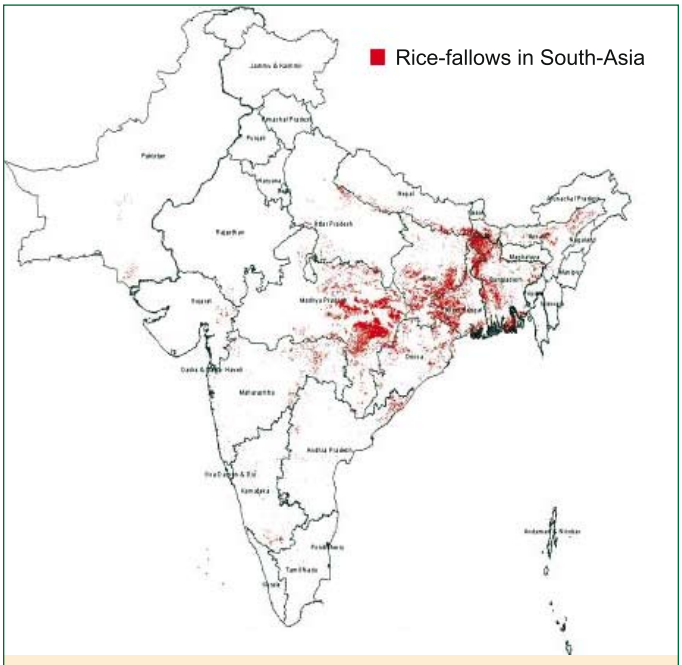


Figure 1. Spatial distribution of the rice fallows in South Asia.

Rice fallows present considerable scope for crop intensification and diversification if the appropriate technology is applied. Using satellite imagery and geographical information systems (GIS), it was estimated that about 30% of *kharif* (rainy season) rice area (14.3 million ha) remains fallow in the *rabi* (postrainy) season. The spatial distribution of the rice fallows in South Asia was documented (Figure 1). In India, the estimated rice area during the 1999 *kharif* season was 40.2 million ha and the total rice fallow area during the 1999–2000 *rabi* season was 11.7 million ha. Chattisgarh, Jharkhand, Orissa, West Bengal, eastern Madhya Pradesh and Assam states account for most of the rice fallows in India. These rice fallows represent an enormous underutilized resource.

The reasons why farmers do not sow a second crop after harvesting rice were explored in a combined survey and trials during the 2001–2002 season. The survey covered 320 farmers in 18 villages in the five Indian states mentioned earlier, and indicated that farmers were generally not aware of, or do not pursue opportunities for rainfed *rabi* cropping due to lack of protection from unsupervised grazing animals; lack of information on *rabi* cropping; various physical soil- and water-related issues predominantly drought, high cost, and the poor availability of inputs (particularly the non-availability of the seeds of short-duration chickpea varieties as tested in the preliminary trials); poor market opportunities; and limited access to institutional credit.

Rainfed *rabi* cropping (RRC) technology

Rainfall during the *kharif* season in these areas is usually more than enough to grow rice. However, rainfall in the *rabi* season is much less, sporadic and highly unpredictable, but the soil profile remains well-charged after the rice harvest with residual moisture that could sustain a short-duration crop such as chickpea. Unfortunately the surface layers of the soil dry out rapidly, so crop establishment is the key objective. Two things are essential to achieve this: (1) rapid tillage to cover the seeds whilst causing minimal disturbance to the soil and minimal loss of moisture; and (2) soaking the seed for 4–6 hours in water and surface drying before sowing (on-farm seed priming). This combination has proved outstandingly effective in growing chickpea in the rice fallow areas of the Barind region of Bangladesh. Farmers of eastern India who implemented the RRC technology in preliminary trials were almost unanimous in wishing to grow chickpea again.

Subsequent research with many more farmers (2002–05) in India (in collaboration with Catholic Relief Services (CRS)), India; Gramin Vikas Trust, India; Dept of Agriculture; and Bangladesh (in collaboration with People's Resource Oriented Voluntary Association and the Bangladesh Agricultural Research Institute), has refined the technology to include use of short-duration chickpea cultivars (ICCV 2, KAK 2, JGK 1), block planting so as to protect the crop from grazing animals, sowing using rapid minimum tillage as soon as possible after harvesting rice, seed priming with the addition of sodium molybdate to the priming water at a rate of 0.5 g L^{-1} (kg^{-1} seed) and *Rhizobium* inoculum at the rate of 5 g L^{-1} (kg^{-1} seed), application of manure and single superphosphate.

Chickpea yield following *kharif* rice ranged from 0.4 t ha^{-1} to 3.0 t ha^{-1} across various rice fallow areas in eastern India (Figure 2). Although yields were invariably low for the first year that farmers tested the package, making their own mistakes proved to be a valuable learning experience and farmers were always enthusiastic about growing chickpea in subsequent years. More than ten thousand farmers exposed to this technology are now convinced that a second crop can be grown without irrigation in rice fallows.

Figure 2. Chickpea after rainy season rice in Orissa, rabi 2004-05.

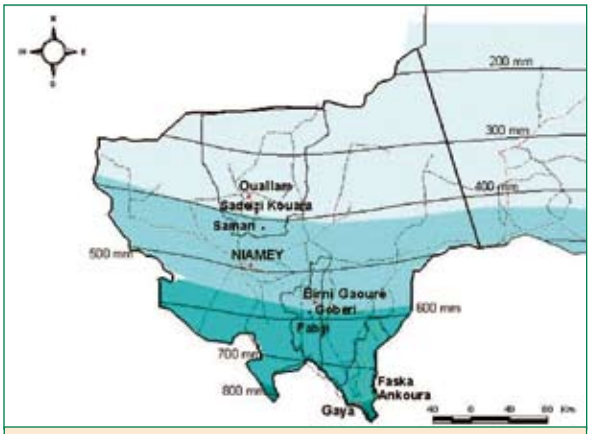
Use of short-duration varieties of rice (Ashoka 200-F and Ashoka 228) instead of the traditional long duration cultivar, Swarna, during the rainy season appeared very promising as they allowed the farmers to sow post-rice crops earlier (short-duration chickpea for example) and thereby maximize the potential of the whole system (Figure 3).

Figure 3. Ashoka, short-duration paddy variety ready for harvesting (in the foreground) while traditional variety Swarna, was still green. Chickpea following Ashoka rice had higher yields than that after Swarna.

An effective approach to dissemination of the RRC technology to new villages includes identification of farmers who will plant in a block to facilitate protection from grazing by free-ranging livestock; provision of training on crop production technology; provision of short-duration chickpea seed, starter packs of sodium molybdate, *Rhizobium* inoculum and P fertilizer; and technical backstopping.

The project, supported by the DFID–Plant Sciences Research Programme (CAZS/Natural Resources, University of Wales, UK), has improved the access to relevant information – appropriate crop varieties and other technologies directly relevant to marginal farm communities in the rice-fallow system. This has increased crop productivity as well as the technical capabilities and managerial skills of poor farm communities and hence income. In India, CRS has adopted the RRC technology as the central core of their plans to develop thousands of poor rural communities by scaling up the RRC approaches in 8000 villages.

Reviving the Think-Tank in West Africa



Sites of Village Level Studies in Niger.

Agriculture in Niger (one of the poorest nations) is the main source of livelihood accounting for 38% of Gross Domestic Product (GDP) and 94% of labor force. About 62% of households live below the poverty line (less than US$1 per/day). Despite donor and government investments in R&D during the last 30 years, the aggregate impacts of agricultural research in Niger are limited, and food insecurity remains widespread. There is a need to reassess agricultural research priorities and development interventions to transform the agricultural sector.

In 1982-85, ICRISAT collected a dataset on 114 households for 4 years in 4 villages in western Niger. Two villages (Samari and Sadeizi Koira) are located in the zarmaganda, a region north of Niamey with long-term rainfall averaging 400 mm, limited agricultural potential, a severely deteriorated resource base with poor road and market access. Two other villages (Goberi and Fabidji) are located in the Dallol Bosso, an intermediate crop area southeast of Niamey with 600 mm long-term annual rainfall and potential for irrigation in the Dallol; easily accessible by road with access to large markets. In 2004, a participatory rural appraisal was carried out to study changes in livelihood strategies and outcomes that might have occurred in these villages. From 2004 to 2006, data was collected from 182 households, of which 86 households were originally interviewed in 1982-85.

Collecting household data.

Survey results indicate that villages with easy access to roads (higher rainfall zone) have experienced significant economic improvement, whereas farmers in villages with low rainfall report their inability to secure food for their families.

1. Households have accumulated more assets and are using more modern technologies in the high rainfall zone than in the low rainfall zone.

The number of households owning carts have doubled in Fabidji and Gobery, and remain stable in Sadeizi Koira and Samari. Ownership of draft animals has also significantly increased. The proportion of households **using inorganic fertilizers** has increased significantly in the more favorable rainfall zones. In all villages many more households are using **organic fertilizers** than was used in 1982-87. There are signs of **agricultural intensification** in some villages as a result of increasing land scarcity.

2. Households are diversifying more within and outside the agricultural sector especially in more favorable rainfall areas.

In Gobery and Fabidji, the presence of the Dallol (with assured water) has provided opportunities for farmers to diversify into high value crops such as vegetables and fruits. Farmers have also diversified into

other sectors mainly due to market opportunities. In low rainfall areas of Samari and Sadeizi Koira, there are few opportunities to diversify within the agricultural sector due to poor climatic conditions. Long distance trading of wood, cowpea haulms or millet stalks and migration are the main activities. In all villages, non-farm income represents a larger share of household income in 2004-06 than in 1982-87.

Overall, access to roads and markets opens more opportunities for income diversification within and outside the agricultural sector. Policy, institutions and technological changes likely to bring about agricultural transformation are also those that would improve the access to infrastructure.

3. Livestock has increased in less favorable agricultural areas compared to more favorable rainfall zones

Livestock rearing is practiced in all the 4 villages surveyed. During the last 25 years, population density and subsequent reductions of grazing areas are forcing households to move into semi-intensive modes of livestock rearing. Both men and women practice livestock fattening. Crop-livestock interactions are stronger in the low rainfall zone than in the high rainfall area. There is a need to develop crop and production technologies that will increase the supply of feed resources, and to identify and develop institutions and policies that will enhance the development of the livestock sector.

Livestock market.

4. The use of modern varieties has remained very limited.

Despite numerous efforts at disseminating modern sorghum and pearl millet varieties in the 4 villages, farmers are still using their local varieties. Only limited yield gains have been obtained from the adoption of most new varieties, because these varieties have not been linked with the adoption of improved management practices.

Sorghum varieties.

In the past, crop improvement has been based largely on conventional breeding methods. Though highly successful, a number of biotic and abiotic stresses continue to limit yields. More investment in biotechnology to work on beneficial crop traits is needed.

One strategy for increasing research impacts was to promote more participatory methods of technology development. Research and development priorities should consider varying targeting technologies – *Rural poor who live in environments with poor agricultural potential, underdeveloped markets and infrastructure should be targeted for food security attainment purposes, whereas in areas with better farming conditions and market access, research programs should focus on market oriented production and value addition.* Overall, there is a need to better understand and identify the changes in the biophysical and socio-economic environment and how they impact on poverty, food security, and the natural resource base.

In high rainfall areas, there may be more potential to promote pearl millet based technologies provided farmers diversify and derive more income and cash to be able to purchase inputs. Technologies such as the African Market Garden pursued by ICRISAT are viable options to pursue, provided farmers have access to credit. Policies and programs that could help address the credit constraints will facilitate uptake of technologies.

In the low rainfall areas, a combined effort to develop crop production technologies that will increase the supply of feed resources, and to identify and develop institutions and policies that will enhance the development of the livestock sector is necessary. The use of biotechnology to address the drought stress issues in germplasm is highly desirable.

Capacity Building for Impact

ICRISAT programs and processes in knowledge sharing and capacity strengthening have had two kinds of impact:

1. They have triggered major new projects among the partner institutions, and

2. They have had demonstrable "impowerment" (information empowerment) effects.

A Grid

Dr William Dar and Sir John Daniel, President, COL, at a Roundtable Discussion on Educational and Extension Materials, and Capacity Strengthening (Jointly organized by ICRISAT and the COL).

In January 2005, ICRISAT joined a forum organized by the Commonwealth of Learning (COL) and a number of Indian State Agricultural Universities (SAU) to consider the importance of open and distance learning in agriculture. ICRISAT's experience in using advanced learning and content management systems was shared with the group, and subsequent engagement and dialogue with the partners continued intensively. By late 2005, ICRISAT was invited by five SAUs to organize a special workshop for them on learning management systems (LMS). The event, was organized with support from COL in two phases during November–December 2005. ICRISAT arranged to have an advanced training laboratory on LMS specially set up for the event and used audio and video conferencing methods to facilitate the participation of resource persons from five countries. The event was rated well by the universities and that led to the formation of a consortium for an online agricultural knowledge grid. At present, seven agricultural universities and four institutions specializing in IT research have come together with ICRISAT serving as the facilitator.

The members of AMS at talk on use of computers for communication of agricultural technologies.

Win-win for women

The women workers of the Adarsha Mahila Samaikhya (AMS) underwent training with ICRISAT in essentials of IT and in acquiring literacy in natural resource management (NRM) issues over a period of three weeks, partly online. Their perceptions changed to a considerable extent, and they were soon able to spot problems in farmers' fields and to accurately convey them to the experts online. A study that was conducted in early 2005 revealed that with such enhanced capacity, the women workers of AMS were able to reduce the time needed to get an expert answer from about seven days to as low as 14 hours.

Encouraged by this success the ladies continued to receive learning support online and have been able to localize some "learning objects" from the module on groundnut, which is now used by them to meet local information requirements. An external evaluation showed that the women in the three villages were called AOs (agricultural officers) although they are not employees of the Agriculture Department! The competence and leadership of these women had matured to a high degree. Two of them were elected in 2005 to the fellowship of the Indian National Virtual Academy for Rural Prosperity, and were felicitated by the President of India. The Indian Space Research Organization (ISRO), impressed with their dedication and performance, has donated a package of two-way video-conferencing equipment to their organization and to ICRISAT with the suggestion to develop the model learning support programs online.

Distance learning

The University of Florida (UFl) is a pioneer in the area of applying distance learning methods in agricultural sciences, and their programs cover supplementary as well as graduate education in various topics, especially soil and water science. During 2005,, extensive discussions with the UFl led to a new agreement to offer UFl courses in the distance mode involving the participation of ICRISAT scientists. In this regard, ICRISAT and CIAT are the two CGIAR centers working in collaboration with the UFl. The first course on GIS in land management was held in 2006.

Participants from Africa discussing groundnut stem and root diseases.

Learning Systems Unit

The Learning Systems Unit (LSU) at ICRISAT facilitates learning activities under three different categories – (a) Interns, (b) Research Scholars and (c) Research Fellows. In 2005, three hundred and twenty-two participants were accepted under different categories. This reflects a 32% increase over 2004. The internship is meant for graduate students to gain experience in their chosen field for specialization and to prepare and submit project reports in partial fulfillment of the degree programs. A hundred and ninety-six (196) students were given opportunities for hands-on experience to work with scientists in different research areas.

Students registered with universities for MSc and PhD degrees to conduct their thesis research at ICRISAT are accepted as Research Scholars to work under the supervision of ICRISAT scientists. The topics for their thesis research are part of the research agenda of ICRISAT. During the year, 18 students joined as Research Scholars – two for matters in the Technology program and 16 for doctoral program (includes one scholar each from Ethiopia and Japan). Scientists from NARS involved with on-going research projects with ICRISAT scientists are registered as Research Fellows. This provides opportunities for learning while working with the NARS scientists. One hundred and eighty four (184) scientists/technicians from 19 countries (Afghanistan, Australia, Bangladesh, China, Egypt, Holland, India, Iran, Japan, Kenya, Malawi, Mozambique, Nepal, Philippines, Sri Lanka, Syria, UK, Uzbekistan and Vietnam) were involved in various capacity building activities during 2005.

Nineteen learning courses were organized in 2005 by scientists belonging to different disciplines, compared to only five in 2004. The focus of the courses was on strengthening the capacity of NARS partners and to share information on new and emerging technologies. The resource persons were largely from ICRISAT, but some were drawn from the NGOs and the private sector where needed. Two hundred and eighty-five persons participated in these courses.

ICRISAT is thus aligned with at least the first three Millennium Development Goals to bring about a sea change in rural communities by 2015.

Protecting our Research Products

Not long ago, ICRISAT signed a Memorandum of Agreement (MoA) with the European Patent Office (EPO) based in the Hague, Netherlands. This MoA enables ICRISAT to disseminate knowledge of its research products in the EPO's Non-Patent Literature (NPL), which is in line with ICRISAT's strategy of making its intellectual property rights (IPRs) "prior art", approved by its Governing Board in September 2004 ("prior art" is the legal term used for all previous inventions in the field of an invention for which a patent is being sought. Prior art is used by the Patent Office to decide whether the invention is sufficiently unique and non-intuitive to qualify for patent protection).

Participants at the 17th Seminar on Search and Documentation Working Methods, European Patent Office, The Hague, 4–7 April 2005.

In line with its commitment to deliver international public goods to its stakeholders, ICRISAT effectively manages its intellectual property rights on research products by placing them in the public domain and making them prior art, thus preventing others from infringing on ICRISAT's rights. While publishing is carried out through journal articles and/or conference papers in internationally recognized journals, there are several publications (both external and internal) that ICRISAT produces, such as Technical Reports, Annual Reports and Monographs, which would be useful additions to materials included in the EPO's NPL database. As part of their dissemination activities, the EPO will also share their NPL database with other patent offices such as the United States Patent and Trademarks Office (USPTO), and those in Brazil and Canada.

To mark this historical collaboration, a first in the entire CGIAR system, ICRISAT provided a few publications on a trial basis in January 2006 for evaluation, which were successfully downloaded by the EPO and included in its NPL database. Full-fledged documentation was then shared through the Internet during May 2006, which paved the way for periodical sharing in future.

When this development was shared with CGIAR donor representatives from the EC, Belgium and Ireland in informal presentations on ICRISAT activities by Dr Dyno Keatinge (DDG Research) in July 2006, it resulted in favourable comment from the donors – it was seen as a cost-effective and innovative way for a member of the Alliance of CGIAR centers to help protect their IPRs.

ICRISAT is grateful to Dr Victoria Henson-Apollonio of the CGIAR Central Advisory Service (CAS) who sponsored Mr B Hanumanth Rao of ICRISAT's IP Office to attend a seminar on "Search and Documentation Working Methods at the EPO" in April 2005, which laid the foundation for this historical collaboration.

ICRISAT rated superior based on CGIAR Performance Indicators, 2005

Indicator	ICRISAT's Performance
Outputs and output targets	Success rate 99 percent. 65 were committed in MTP 2006-8.
Outcomes	The outcomes achieved were 12 on a 0-15 score
Impact assessment	Impacts were consistent with CGIAR goals and the Center's mission and objectives
Quality and relevance of research	The denominator reached was 91.7
Financial health indicators: Short-term solvency (liquidity) Long-term financial stability (adequacy of reserves) Efficiency of operations (indirect cost ratio) Cash Management on restricted operations	 280 days (CGIAR range: 90 to 120 days) 122 days (CGIAR range: 75 to 90 days) 23 0.58
Peer reviewed publications	2.7 per scientist
Workshops and poster paper publications	1.3 per scientist
Publications co-authored by NARES Publications co-authored by female scientists	43 percent 32 percent [83 publications out of 138 (60 percent) of journal articles were shown on the Thomas Scientific Master list]
Varieties released by NARES/PS with IARC	0.33 percent per scientist
Nurseries requested and dispatched to collaborators	10.6 per scientist
Person-days of partner scientist or NGO staff training	53 per scientist
Institutional Health: Board engagement with formulating or modifying the Center's strategic plan	Yes, fully
Any deviation from 2005 financial outcome from the budget planned	No
Board active involvement in establishing public relations and fund raising strategies	Yes, fully
IRS nationality concentration	India 23 percent, USA 11 percent
Scientists receiving PhDs in last 5 years	4 percent

GB = Governing Board
MTP = Medium term plan
NARES = National agriculture research and extension system
PS = Private Sector

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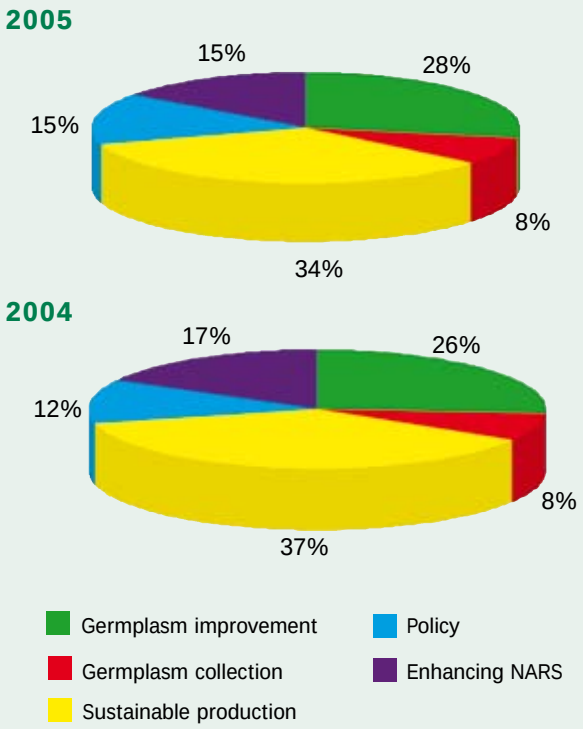
Financial Summary

Balance sheet

US$ thousands

	2005	2004
Assets		
Cash and cash equivalents	9,240	4,311
Investments	17,994	20,394
Accounts receivable	6,830	5,790
Inventories	549	512
Prepaid expenses	291	202
Property and equipment - net	5,123	5,515
Other assets	881	774
Total Assets	**40,908**	**37,498**
Liabilities		
Accounts payable	5,428	4,300
Accruals and provisions	405	1,328
Payments in advance from donors	7,615	5,976
Long-term liabilities	10,801	9,428
Total Liabilities	**24,249**	**21,032**
Net Assets		
Unrestricted		
Unappropriated	4,476	4,247
Appropriated	9,989	10,133
Permanently restricted	2,194	2,086
Total Net Assets	**16,659**	**16,466**
Total Liabilities and Net Assets	**40,908**	**37,498**

Expenditure by CGIAR Activity



Operating results and movements in net assets

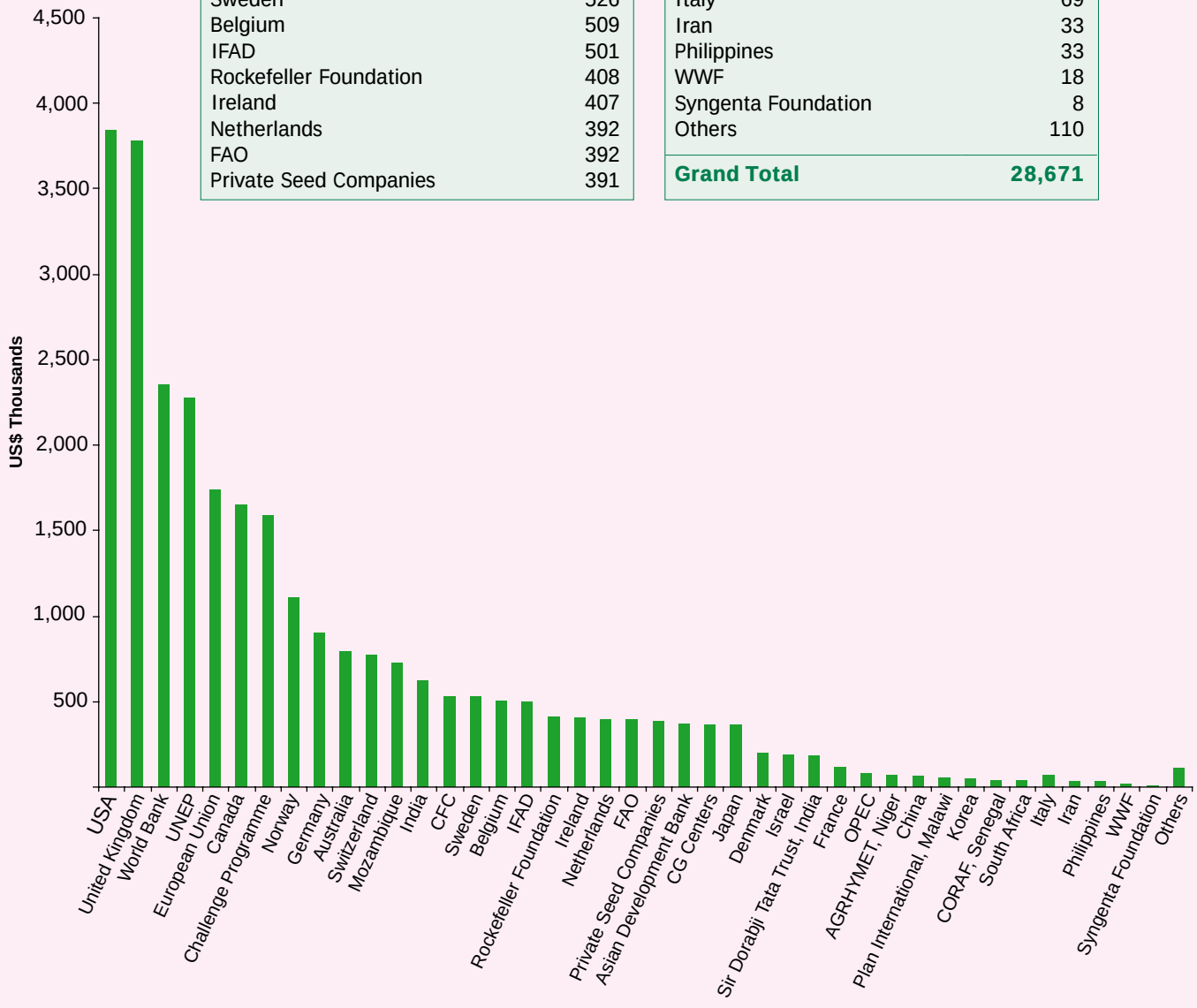
(US$ '000)

	2005	2004
Operating results		
Revenue	29,779	30,301
Expenditure	28,750	27,004
Change in net assets, operational	**1,029**	**3,297**
Net assets - unrestricted		
Unappropriated		
Balance, beginning of the year	4,247	4,117
Operating (deficit)/surplus for the year	1,029	3,297
Changes in accounting policies		
Employee benefits (Pension Fund & Gratuity)	-	(3,167)
Employee benefits (Relocation)	(800)	-
Balance, end of the year	**4,476**	**4,247**
Appropriated		
Balance, beginning of the year	10,133	10,133
Changes in accounting policies		
Acquisition of Physical facilities	(144)	-
Total Net Assets - Unrestricted	**9,989**	**10,133**
Net Assets - Permanently Restricted	**2,194**	**2,086**
Total Net Assets	**16,659**	**16,466**

Grant income from donors for 2005

Donor	US$ '000
USA	3,843
United Kingdom	3,783
World Bank	2,356
UNEP	2,280
European Union	1,738
Canada	1,656
Challenge Programme	1,592
Norway	1,109
Germany	898
Australia	794
Switzerland	773
Mozambique	725
India	621
CFC	528
Sweden	526
Belgium	509
IFAD	501
Rockefeller Foundation	408
Ireland	407
Netherlands	392
FAO	392
Private Seed Companies	391

Donor	US$ '000
Asian Development Bank	373
CG Centers	364
Japan	360
Denmark	197
Israel	190
Sir Dorabji Tata Trust, India	179
France	118
OPEC	82
AGRHYMET, Niger	68
China	60
Plan International, Malawi	57
Korea	50
CORAF, Seneghal	40
South Africa	40
Italy	69
Iran	33
Philippines	33
WWF	18
Syngenta Foundation	8
Others	110
Grand Total	**28,671**



ICRISAT in

HYDERABAD
THE HINDU • SATURDAY, SEPTEMBER 16, 2006 •

Agro, eco-tourism complex opened at ICRISAT

HYDERABAD: An agro and eco-tourism complex was recently inaugurated on the International Crop Research Institute for the Semi-Arid Tropics (ICRISAT) campus by its Director-General William D...

The new ...

track. To mark the inauguration, ICRISAT staff jogged along the track.

Inaugurating the complex, Dr. Dar ... ility demonstrated ... and environmen- ... could do when ... n and conserva- ... the 3,500-acre ... offers a placid scenic dry land.

Rusni sets up $7-m ethanol distillery

THE ECONOMIC TIMES HYDERABAD THURSDAY 12 OCT

Our Bureau
HYDERABAD

RUSNI Distillers, promoted by NRI technocrat ... has set up a $7-million distillery for ... sweet sorghum variety, ... 000 litres of

APRI

"Indian agriculture is to substantially increase agricultural productivity in the drylands"

Dr William D Dar, Director General of the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) near Hyderabad in Andhra Pradesh, India, since January 2000. ICRISAT is one of the 15 nonprofit, nonpolitical Centers and a member of the Future Harvest Alliance within the umbrella of the Consultative Group on International Agricultural Research (CGIAR). Dr. Dar, has made a big difference and continues with conviction his mission of helping alleviate the conditions of the poor people living in the semi-arid tropics of Asia and Sub-Saharan Africa. An exclusive interview with *Agriculture Today*.

Congratulations, on receiving the Best Technology Incubator 2005 Award from the Ministry of Science and Technology, GOI. What is the new strategy for the future, related to producing better results in this field? What role does this play in motivating and encouraging you to produce better results in the future?
Thank you. We will continue with our policy of partnership-based research, and we will strengthen our activities through the framework of integrated genetic and natural resource management. We will strengthen our partnerships with all our stakeholders – the governments, international and national agricultural research systems, the donors, the private sector, the civil society and the farmers.

India has the only International research centre; do you think that this is sufficient in catering to the needs of all the people concerned?
Though ICRISAT is headquartered in India, our research activities impact positively, the lives of farmers in 48 countries of Asia and sub-Saharan Africa. To deliver high-quality research, we have six offices in sub-Saharan Africa. They are in Nairobi (Kenya), Niamey (Niger), Bamako (Mali), Lilongwe (Malawi), Maputo (Mozambique) and Bulawayo (Zimbabwe).

Water happens to be the most critical input. The water table is also going down, and no proper water harvesting technique is employed yet at the village level. How according to you can this inevitable problem of water scarcity be overcome?
Water scarcity can be overcome with proper natural resource management at the point where the rain falls – in the watersheds. ICRISAT's model on watershed development, implemented first at Kothapally village in Andhra Pradesh, is now being propagated in many countries of Asia and sub-Saharan Africa. The depletion of the water table can be reversed only through proper water harvesting.

What is the biggest challenge for the growth of Indian Agriculture?
The biggest challenge to Indian agriculture is to substantially increase agricultural productivity in the drylands. This can be done only through cutting-edge research supported by effective institutional and market policies including effective delivery mechanisms and affordable credit.

Where does Indian Agriculture stand in the Global scenario?
Indian agriculture has made tremendous strides in the past decades. However, much more needs to be done. And that will be through the development of agriculture in the drylands of the country. This will result in better productivity, improved income and equality for the farmers in these regions.

Do you think the time for a second green revolution has come, as we are importing one of our major food crops-wheat?
Certainly. It is the time for the second Green Revolution, where the focus should be on improving agricultural productivity in the rainfed and dryland areas. The first Green

ICRISAT partn... in rural growth

HYDERABAD
THE HINDU • BUSINESS LINE
TUESDAY, FEBRUARY 28, 2006

Business linkages in backward dist...

Our Bureau
Hyderabad, Feb. 27

The International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) will join the Confederation of Indian Industry (CII) in a developmental programme launched by the latter in a backward Rajasthan district.

"Through the Dungarpur project, we would like to catalyse development by providing business linkages," Mr S. Sen, Deputy-Director General of CII, said.

He was speaking at a workshop on 'Corporate and science and technology institutions partnership for inclusive and sustainable development' here on Monday. Mr Sen said the programme would be a win-win situation for the people and corporates there. "The project seeks to improve livelihood options for the people," he said.

An ICRISAT official said the institute would soon join the developmental initiative launched in Dungarpur. The CII could replicate the model elsewhere also.

Mr N. Raghuveera Reddy, AP Minister for Agriculture and Civil Supplies, called upon the scientific community to focus on improving ... the tion op ... farm ... Se ... corp ... priva ... with ... institutions.

Mr S. Gangopadhyay of Yitagarh Biotech Ltd said that the industry has several doubts on bio diesel plantation, which need to be cleared.

A lot more information is needed on water management (of wastelands), nutrition and productivity. Mr H. Mahadevan, Project Director (Orissa) of BHP Minerals India Pvt Ltd, wanted to know how the farmers could improve productivity.

Livelihood options

ICRISAT will soon join the developmental initiative launched in Dungarpur while CII plans to replicate the model elsewhere.

వర్షాభావాన్ని తట్టుకునేలా ...

వాన్ని ... విత్తనాలు

اکریساٹ اور کوکا کولا کے تعاون سے واٹر شیڈ پراجکٹ کی شروعات

వ్యవసాయ మంత్రి రఘువీరారెడ్డి

- శాస్త్ర వేత్తలను కోరిన
- ఇక్రిశాట్‌లో రైతు దిన

THE HINDU
News Update Service
Tuesday, October 10, 2006 : 0215 Hrs

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Sci. & Tech.

ICRISAT to come out with 'BT' Chickpea, Pigeonpea

Hyderabad, Oct 10. (UNI): The International Crops Research Institute for the Semi-arid Tropics (ICRISAT) will soon come out with transgenic Chickpea and Pigeonpea varieties resistant to pod-borers, its Director General William D Dar said on Monday.

"We are working on BT Chickpea and Pigeonpea. I hope that by the time I re... (2009), the Institute will be able to come with BT varieties", he said, while participating in the Farmers Day celebrations organized by the ICRISAT.

It was also working on genetically-modified groundnut varieties resistant t... Indian peanut clump virus and 'Rosaretta' virus in Sub-Saharan Africa, he

the News

HINDU • TUESDAY, MARCH 28, 2006

unit all set to produce om sweet sorghum

rs to be benefited by the project

AN ACHIEVEMENT: A Uzo Mokwunye, Chairman of ICRISAT governing body, inauguration of th... village on Monday

THE HINDU • MONDAY, OCTOBER 9, 2006 HYDERABAD

Winged wonders and their colourful wor...

M. Sai Gopal

HYDERABAD: Their habitat may have been destroyed due to rampant urbanisation, but surely their numbers are thriving on the city outskirts. And what a colourful world there is!

Beauties in wings, butterflies, a vital part of the ecosystem, are finding ICRISAT and Chilkur Deer Park ideal habitats to breed and multiply, and in the process drenching the areas in bounteous colour.

Latest study

Latest study of these two habitats has revealed that ICRISAT alone is hosting a whopping 45 species of butterflies while Chilkur Deer Park has about 30 species most of which, hitherto, were considered to be wiped out from the city landscape.

Overall the State has about 125 species of butterflies out of which the outskirts of the twin cities alone account for a

WELCOME SIGHT: There has been an increase... number of butterflies on the city outskirts. — PHOTO: C.V. SUBRAHMANYAM

FRIDAY 21 JULY 2006 HYDERABAD Business Standard

Icrisat watershed model for rainfed areas

OUR REGIONAL BUREAU
Hyderabad, 20 July

The watershed development programme of the International Crops Research Institute for the Semi-Arid Tropics (Icrisat) and a consortium of partners will now be extended to the rainfed regions of the country, according to M S Swaminathan, chairman of the National Commission for Farmers.

Swaminathan, who visited Icrisat campus here on Thursday to take part in a planning workshop, told mediapersons that the road map for the next phase of the watershed project for covering the rainfed areas was currently being prepared.

He had recommended Icrisat approach for integrated watershed management to improve rural livelihoods in drought-prone districts.

According to him, the Icrisat watershed development project was reaching out to the world as a model of integrated genetic and natural resource management (IGNRM). After India, China, Vietnam and Thailand, the model had recently reached East Africa.

National Commission for Farmers chairman MS Swa... nathan (right) and Icrisat director-general William Dar at a... conference in Hyderabad on Thursday

Icrisat director general, William Dar, said that the institute's watershed model had become popular since it brought together as a package for rural development the best of expertise available with Icrisat and all the consortium partners.

"While using the micr... tershed as a geographic... for soil and water conse... and management, the i... strengthened with in... agronomical practice... versified income gene... tivities," he added.

रेगिस्तान के फैलते पंजों को रोकेगा ओएस...

एजेंसियां

नई दिल्ली, 27 जून। भारत समेत दुनिया के तमाम विकासशील देशों में शुष्क भूमि क्षेत्र में सूखे और मरुभूमिकरण की समस्या से निपटने के लिए अंतरराष्ट्रीय कृषि शोध परामर्शक दल (सीजीआईएआर) के फ्यूचर हार्वेस्ट केंद्रों ने ओएसिस नाम से एक अभियान शुरू किया गया है। यह अभियान संयुक्त राष्ट्र द्वारा वर्ष 2006 को मरुभूमि व मरुभूमिकरण का अंतरराष्ट्रीय वर्ष में योगदान देने के लिए शुरू किया गया है।

इस अभियान के तहत तमाम विकासशील देशों में विभिन्न शोध संस्थाओं, राष्ट्रीय, क्षेत्रीय और नगर समाज, निजी क्षेत्र, स्थानीय सरकारों एवं किसानों की व्यापक भागीदारी के जरिए मरुभूमिकरण रोकने संबंधी संयुक्त राष्ट्र के कार्यक्रम को अमल में लाया जाएगा। इकोसैट नामक एक अंतरराष्ट्रीय फसल शोध संस्थान (अर्द्ध शुष्क क्षेत्र) के महानिदेशक डा. विलियम डार ने आज यहां कहा कि मरुभूमिकरण पृथ्वी के शरीर पर चर्मरोग की तरह है और यदि इसका समय रहते उपचार नहीं किया गया तो यह धीरे-धीरे फैलता ही जाता है। मरुभूमिकरण का तात्पर्य भूमि का क्षय और उसके परिणामस्वरूप कृषि उत्पादकता का घटना, जैव विविधता में कमी आना, पर्यावरण संतुलन का बिगड़ना और उसके क्षय से है। डार ने कहा कि ओएसिस मरुभूमिकरण को रोकने, शुष्क भूमि क्षेत्र में सतत विकास को सुनिश्चित करने के लिए विज्ञान का रुख मोड़ने में मदद करेगा इसके लिए उपलब्ध वैज्ञानिकों, जानकारियों और दक्षता के साथ ही सुविधाओं को विकासशील देशों के साथ बांटा जाएगा। इसे मरुभूमिकरण के खिलाफ वैश्विक अभियान के साथ जोड़ा जाएगा।

सौजीआईएआर के फ्यूचर हार्वेस्ट केंद्रों के गठजोड़ के तहत 15 वैश्विक कृषि शोध संस्थान 'विकास के लिए शोध' की अवधारणा के साथ सूखा और मरुभूमिकरण के खिलाफ वैश्विक अभियान की सुदृढ़ता के लिए मिलकर कार्य कर रहे हैं। इकोसैट भी सीजीआईएआर के तहत आने वाले इन 15 शोध संस्थानों में से एक संस्थान है। फ्यूचर हार्वेस्ट एलायंस के कार्यकारियों में इन 15 केंद्रों के महानिदेशक शामिल हैं और उन्होंने काली कोलम्बिया में अप्रैल के में हुई अपनी बैठक में ओएसिस को शुरू करने का निर्णय किया था।

डार ने बताया कि भारत सहित 110 से भी अधिक देशों में लगभग 25 करोड़ लोगों के मरुभूमिकरण से एलायंस फार फ्यूचर हार्वे... शुष्क भूमि क्षेत्र में कृषि उ... सुधार लाने के साथ विभिन्न वैज्ञानिक उपायों के अलावा जागरूकता प्रसार के माध्यम से एशिया और दुनिया के अन्य हिस्सों में मरुभूमिकरण की रोकथाम में महत्वपूर्ण भूमिका अदा की है। उनके अनुसार मरुभूमिकरण पर प्रभावी अंकुश लगाने के उद्देश्य से कम वर्षा वाले क्षेत्रों में कृषि उत्पादकता का स्तर बढ़ाने के लिए जैव प्रौद्योगिकी की मदद से उन्नत बीजों के प्रयोग को बढ़ावा देना होगा और किसानों तक इसकी पहुंच को सुनिश्चित करने के लिए स्थानीय सरकार को नीतिगत स्तर पर प्रभावी

...with th... science & technolog...

വരൾച്ചയെ നേരിടാനുള്ള കൃഷി രീതികൾ വിജയകരം

ന്യൂഡൽഹി: പ്രതിരോധ ശേഷിയുള്ള വിത്തുകൾ വികസിപ്പിച്ചെടുത്തും മണ്ണ്, ജല മേൽനോട്ടത്തിലൂടെയും വരൾച്ചയ്ക്കെതിരെയും മരുഭൂമിവൽക്കരണത്തിനെതിരെയും ഗവേഷണ പ്രവർത്തനങ്ങൾ നടത്തുന്നതിനുള്ള സാങ്കേതിക വിദ്യ ഇക്രിസാറ്റ് (ഇന്റർനാഷനൽ ക്രോപ്സ് റിസർച്ച് ഫോർ അഗ്രിക്കൾച്ചറൽ റിസർച്ച് ഇൻ ഡ്രൈ ഏരിയാസ്) (ഇക്രിസാറ്റ്) വികസിപ്പിച്ചെടുത്തത് ഇ... പല സ്ഥലങ്ങളിലും...

ണ്ടെന്നും സെമിനാർ വിലയ... ത്തി. ഊഷരപ്രദേശത്തെ തന... ചെടികളും മരങ്ങളും നട്ടുവ... ത്തി മരുഭൂമിവത്ക്കരണവും... ണ്ണൊലിപ്പും തടയാനുമുള്ള ര... കൾ ഇന്റർനാഷനൽ സെ...

curb Indian

National awar... crisat incubat...

ICRISAT Senior Staff

(Name, Designation, *Nationality*, (Location))

Patancheru (Headquarters)

DG's Office

William D Dar, Director General, *Philippines*

C Geetha, Senior Manager, DG's Office, *India*

TN Menon, Head, Internal Audit, *India*

Prabhat Kumar, Director, Business and Country Relations, *India* (New Delhi)

Communication Office

Rex L Navarro, Director of Communication and Special Asst to the DG, *Philippines*

Lydia Flynn, Editor-in-Chief, *India*

Project Development and Marketing Office

Barry I Shapiro, Director, Project Development and Marketing Office, *USA*

Mark D Winslow, Marketing Specialist, *USA*

Human Resource and Operations

IR Nagaraj, Director, Human Resources and Operations, *India*

C Narasimha Reddy, Senior Manager - Medical Services, *India*

AJ Rama Rao, Senior Manager, Human Resources Services, *India*

Housing and Food Services

K Ravi Shankar, Head, Housing and Food Services, *India*

Transport Services

K Jagannadham, Senior Manager – Transport, *India*

Security Office

TD Peter, Head, Security Services, *India*

Purchase, Supplies and Disposal Services

T Kulashekar, Senior Manager, Purchase, Supplies and Disposal, *India*

Financial Services

Rajesh Agrawal, Director-Finance, *India*

S Sethuraman, Head, Financial Services, *India*

Deputy Director General's Office

JDH Keatinge, Deputy Director General-Research, *Ireland*

Global Theme – Agroecosystems (GT-AE)

AVR Kesava Rao, Scientist (Agrometeorology) *India*

JVDK Kumar Rao, Special Project Scientist, *India*

S Marimuthu, Scientist (Agronomy), *India*

Rosana P Mula, Special Project Scientist (Post Doctoral), *Philippines*

Prabhakar Pathak, Principal Scientist (Soil and Water Management), *India*

Piara Singh, Principal Scientist (Soil Science), *India*

TK Sreedevi, Scientist-Watershed Development, *India*

Ch Srinivasa Rao, Scientist (Soil Science), *India*

Suhas P Wani, Principal Scientist-Watersheds, *India*

Global Theme – Biotechnology (GT-Biotech)

David Hoisington, Global Theme Leader-Biotechnology, *USA*

Vanamala Anjaiah, Special Project Scientist, *India*

Jayashree Balaji, Scientist-Bioinformatics, *India*

Subhash Chandra, Principal Scientist (Statistics) & Head-Bioinformatics, *India*

CT Hash, Principal Scientist (Breeding), *USA*

Junichi Kashiwagi, Associate Scientist, *Japan*

L Krishna Murthy, Scientist (Plant Physiology), *India*

Nalini Mallikarjuna, Senior Scientist (Cell Biology), *India*

T Nepolean, Special Project Scientist, *India*

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Rajeev K Varshney, Senior Scientist (Applied Genomics Laboratory), *India*

Global Theme - Crop Improvement (GT-CI)

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Ashok Alur, Project Coordinator-CFC Project, *India*

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PM Gaur, Principal Scientist (Breeding), India

Lava Kumar, Scientist-Virology, *India*

K Madhavi Latha, Scientist (Pigeonpea Breeding), *India*

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Suresh Pande, Principal Scientist (Pathology), *India*

KN Rai, Principal Scientist (Breeding), *India*

GV Ranga Rao, Special Project Scientist-IPM, *India*

Belum VS Reddy, Principal Scientist (Breeding), *India*

Aruna Rupakula, Scientist (Breeding), *India*

OP Rupela, Principal Scientist (Microbiology), *India,*

KB Saxena, Principal Scientist (Breeding), *India*

HC Sharma, Principal Scientist (Entomology), *India*

Rajan Sharma, Scientist (Cereals Pathology), *India*

RP Thakur, Principal Scientist (Pathology) and Head, Plant Quarantine Unit, *India*

HD Upadhyaya, Principal Scientist (Genetic Resources), *India*

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Global Theme - Institutions, Markets, Policy and Impacts (GT-IMPI)

MCS Bantilan, Global Theme Leader-Institutions, Markets, Policy and Impacts, *Philippines*

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K Purnachandra Rao, Principal Scientist (Village Level Studies), *India*

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MS Karuppan Chetty, Manager, ABI, *India*

Agri-Science Park (ASP)

Abdul Rahman Ilyas, Chief Operating Officer, ASP, *India*

Farm Engineering Services (FES)

NSS Prasad, Head, FES, *India*

KRC Bose, Manager, Engineering Services, *India*

M Prabhakar Reddy, Head, Farm Services, *India*

Knowledge Management Sharing (KMS)

V Balaji, Head, KMS, *India*

Pradyut Modi, Manager, Information Systems Unit, *India*

S Srinivas, Head, Library and Documentation Services, *India*

West and Central Africa (WCA)

Niamey, Niger

Saidou Koala, Director, WCA *Burkina Faso*

Ramadjita Tabo, Asst Regional Director and Principal Scientist (Agronomy) *Chad*

MS Diolombi, Regional Administrator, *Nigeria*

Bruno Gerard, Senior Scientist, GT-AE, *Belgium*

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Eastern and Southern Africa (ESA)

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Philip Ndungu, Regional Administrator, *Kenya*

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Bulawayo, Zimbabwe

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Steven J Twomlow, Global Theme Leader, GT-Agroecosystems, *UK*

Paul Belder, Associate Professional Officer (Dryland Agrohydrology) *Netherlands*

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Kizito Mazvimavi, Post Doctoral Fellow, *Zimbabwe*

Isaac J Minde, Senior Scientist (Economics), GT-IMPI, *Tanzania*

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Maputo, Mozambique

Carlos E Dominguez Otero, Country Representative and Seed Systems Specialist, *Colombia*

Collaborative Staff

AVRDC

Madan L Chadha, Director AVRDC-RCSA, *India* (Patancheru)

CIP

Sarathchandra G Ilangantileke, Post Harvest Specialist, *Sri Lanka* (New Delhi)

CIMMYT

Ashish Srivastava, Senior Scientist, *India*

CIRAD

Benoit Clerget, Principal Scientist-Echo-Physiology, *France* (Bamako)

Fabrice Sagnard, Principal Scientist - Population Genetics, *France* (Bamako)

ILRI

Augustine Ayantunde, Team Leader, *Nigeria* (Niamey)

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Oumar Diall, Veterinary Scientist, *Mali* (Bamako)

IPGRI

PN Mathur, Principal Scientist, *India* (New Delhi)

IWMI

Madar Samad, Theme Leader, *Sri Lanka* (Patancheru)

JIRCAS

Ryoichi Matsunaga Team Leader and Soil Scientist, *Japan* (Niamey)

Keiichi Hayashi Soils Scientist, *Japan* (Niamey)

Akira Kamidohzono, Soil Scientist, *Japan* (Niamey)

ODI

Catherine Longley, Special Project Scientist-ODA, *UK* (Nairobi)

ROCARS

Aboubacar Toure, Associate Coordinator, *Mali* (Bamako)

Suri Sehgal Foundation

MD Gupta, Technical Director, *India* (Patancheru)

WWF

Biksham Gujja, Special Project Scientist, *India* (Patancheru)

Development Investor Partnerships Initiated in 2005

Supplementing the CGIAR's core support to carry out new targeted projects

Donor	Project	Collaborators
ASARECA/EU	Making the Best of Climate - Adapting Agriculture to Climate Variability	University of Nairobi, Kenya
	Fighting *Striga*: Resistance genes deployed to boost sorghum productivity	National Agricultural Research Institute, Eritrea; University of Nairobi, Kenya; Kenya Agricultural Research Institute, Kenya; Agricultural Research and Technology Corporation, Sudan
	Market-orientied Approaches for Integrated Management of Soil-Water and Nutrients for Crops in East and Central Africa: Managing nutrients and water together in response to markets	Agricultural Research Institute, Tanzania; Ethiopian Agricultural Research Organization, Ethiopia; Centre National de Recherche Appliquee au Developpement Rural, Madagascar
	Marker-Assisted Breeding of the Stay-Green Trait of Sorghum to Enhance Terminal Drought Tolerance in Eastern Africa	University of Nairobi, Kenya; Makerere University, Uganda; NARS of Kenya, Uganda, Ethiopia, Sudan and Eritrea
ASARECA/IFAD	The implementation of the establishment and Start-Up Phase activities of Improved Management of Agricultural Water in East and Southern Africa (IMAWESA) project	Agricultural Water Management and Irrigation Development Projects in 23 countries in East and South Africa
Australia	Grafting Hybrid Plants (*Cicer arietinum* × *C. pinnatifidum*) to Chickpea Stocks and their transfer to Soil and Investigation of Albinism in Rescued Hybrids in Chickpea	Centre for Legumes in Mediterranean Agriculture, Australia
	Accelerated Genetic Improvement of Desi Chickpea: An International Partnership Between DAWA, CLIMA, ICRISAT and COGGO	Council of Grain Growers Organization, Australia
Canada	Travel costs for the IDRC participants attending the training course being organised by CGIAR System-Wide Program on Collective Action and Property Rights	International Food Policy Research Institute, USA
	Training Programme on Learning Management Systems (LMS)	Dr BR Ambedkar Open University, India
CFC	Enhanced Utilization of Sorghum and Pearl Millet Grains in the Poultry Feed Industry to Improve Livelihoods of Small-Scale Farmers	Acharya NG Ranga Agricultural University, Andhra Pradesh, India; Marathwada Agricultural University, Maharashtra, India; Sorghum Research Institure, Liaoning Academy of Agricultural Sciences,Shenyang, China; Federation of Farmers Association of Andhra Pradesh, India; Krishi Vigyan Kendra, Ambajogai, Maharashtra, India; JK Agri-Genetics, Andhra Pradesh, India; Field Crops Research Institute, Bangkok,Thailand; Janaki Feeds, Andhra Pradesh, India; Venkateshwara Hatcheries, Maharashtra/ Andhra Pradesh, India; Andhra Pradesh Poultry Federation, Andhra Pradesh, India
CORAF	Combining Water Harvest Techniques and Nutrient Management to Sustain Food Production in the Dry Lands of West Africa	African Network for Soil Biology and Fertility of the TSBF Institute of CIAT, Kenya; Institut National de Recherche Agronomique du Niger, Project INTRANTS FAO, Niger; Institut de l'Environnement et de Recherches Agricoles (INERA), Burkina Faso; Groupement

Donor	Project	Collaborators
		Nabonswende de Tougouri, Burkina Faso; Institut d'Economie Rurale, Mali; Centre d'Etude Regional pour l'Amelioration et l'Adaptation a la Secheresse (CERAAS), Senegal; Entente des Groupements Associes de Toubacouta (EGAT), Senegal; Caritas-Kaolack, Senegal.
	Promoting Use of Indigenous Phosphate Rock for Soil Fertility Recapitalization in the Sahel	Centre d'Etude Regional pour l'Amelioration et l'Adaptation a la Secheresse (CERAAS), Senegal; African Network for Soil Biology and Fertility of the TSBF Institute of CIAT, Kenya; Institut National de Recherche Agronomique du Niger, Project INTRANTS Fao, Niger; Institut de l'Environnement et de Recherches Agricoles (INERA), Burkina Faso; Groupement Nabonswende de Tougouri, Burkina Faso; Union des Comites Ruraux Villageois de la Zone de Latmingue (UNICOM), Senegal; Entente des Groupements Associes de Nganda (EGAN), Senegal
	Fertilizer micro-dosing and drought tolerant varieties technology for small farmer prospertiy in the Sahel	Centre d'Etude Regional pour l'Amelioration et l'Adaptation a la Secheresse (CERAAS), Senegal; African Network for Soil Biology and Fertility of the TSBF Institute of CIAT, Kenya; Institut National de Recherche Agronomique du Niger (INRAN), Project INTRANTS Fao, Institut de l'Environnement et de Recherches Agricoles (INERA), Burkina Faso; Hunger Project, Burkina Faso; Groupe d' Action pour le Developpement Communautaire (GADEC), Senegal; Union des Groupements Paysans de Mekhe (UGPM), Senegal
EU	Intergration of Mycotoxin and Toxigenic Fungi Research for Food Safety in the Global System (MYCO-GLOBE)	National Research Council, Italy
FAO	Support for Sustainable Conservation and Enhanced Utilisation of Genetic Diversity in Foxtail Millet Germplasm Collections Held in Trust by ICRISAT and Support for Global Plan of Action on the Conservation and Sustainable Utilization of Plant Genetic Resources for Food and Agriculture	NARS in Asia and Africa
	Post-planting Assessment of 2004/2005 Agricultural Relief programmes in Zimbabwe	World Vision, CARE, Oxfam GB, COSV, Save the Children UK, Catholic Relief Services, Agricultural Research and Extension Services, Zimbabwe
	Support for Relief Seed Quality Assessment through Seed Sampling and Testing and a Review of the Regulatory Framework for Seed in Zimbabwe	World Vision, CARE, Oxfam GB, COSV, Save the Children UK, Catholic Relief Services, Agricultural Research and Extension Services, Zimbabwe
	Support of the Monitoring and Assessment of Agricultural Relief Programmes in Zimbabwe	World Vision, CARE, Oxfam GB, COSV, Save the Children UK, Catholic Relief Services, Agricultural Research and Extension Services, Zimbabwe
	Monitoring Implementation of Seed Fairs in Zimbabwe	World Vision, CARE, Oxfam GB, COSV, Save the Children UK, Catholic Relief Services, Agricultural Research and Extension Services, Zimbabwe

Donor	Project	Collaborators
Finland	The International Program for Arid Lands Crops (IPALAC) Activities	NARS in Africa; Pedalogues, USA; University of Califonia-Davis, USA; Vikki Tropical Resources Institute, Finland; University of Copenhagen, Denmark; University of Niamey, Niger; Savannah Agricultural Research Institute, Ghana; Centre of International Research, University of Kassel, Germany.
Germany	Postdoc Position in Dry Season Feeding of Livestock in the SAT of Zimbabwe	NARS in Zimbabwe; Ministry of Agriculture, Zimbabwe
India	Improved Livelihood Opportunities through Productivity Enhancement in Watersheds Collection, Evaluation of Germplasm, Standardization of Agrotechniques and Pilot Demonstrations for *Jatropha curcas* L in Rain Shadow districts of Andhra Pradesh	Rural Development Department, Govt of Andhra Pradesh, India; Acharya NG Ranga Agricultural University, India; Rain Shadow Areas Development Department, State Government of Andhra Pradesh, India; National Bureau of Plant Genetice Resources, India; Directorate of Oilseeds Research, India; Central Research Institute for Dryland Agriculture, India; HELP (NGO), India; Rural Education and Agricultural Development (NGO), India; Weaker Communities Upliftment Service Society, India;
	Establishing Participatory Research-cum-Demonstrations for Enhancing Productivity with Sustainable Use of Natural Resources in III Phase Sujala Watersheds of Karnataka	State Government of Karnataka, India; Watershed Development Department; Krishi Vignan Kendras; Farmers' Training Centers; Central Research Institute for Dryland Agriculture; University of Agricultural Sciences; National Remote Sensing Agency, India
	Preparation of Perspective Plan under National Food for Work Program (NFFWP) Plan in Lakshmipur Kheri, Sitapur and Barabanki Districts in Uttar Pradesh	State Government of Uttar Pradesh, India
	Building on Advantages: Enhancing Yield and Stability of Pigeonpea through Heterosis Breeding	Ministry of Agriculture & Cooperation, Government of India; Indian Institute of Pulses Research, India;
	Development of Elite Planting Material and Model Plantation	National Oilseeds and Vegetable Oils Development Board, India; HELP, India; Rural Education and Agriculture Development, India
	Farmer's Participatory Groundnut Improvement in Rainfed Cropping System	Ministry of Agriculture & Cooperation, Government of India; NARS and NGOs in India
Iran	Aflatoxins in Cereals and Pistachio	Plant Pests and Diseases Research Institute, Pistachio Research Institute, Iran
Japan	Research on Improvement of Chickpea drought tolerance	Hokkaido University, Japan.
	Fellowship Program - Training of Mr Maki Eguchi and Mr Masayuki Kusaka	Japan International Research Center for Agricultural Sciencies, Japan
Netherlands	Associate Expert Programme – Ms Janneke PE Verheijen; Dr Paul Belder; Mr Lennart Woltering; Ms Margret Anna Loeffen; Mr Tom van Mourik	Netherlands Minister for Development Cooperation
OPEC Fund	Improved Rural Livelihoods and Better Health: Promoting and improving groundnut for poor farmers in Asia	NARS and NGOs in China, India, Nepal, Tajikistan, Uzbekistan, and Vietnam
Philippines	Introduction, Promotion and Efficient Seed Support System of ICRISAT 'Asha' Peanut Variety in Region 2, Philippines	Department of Agriculture, Philippines

Donor	Project	Collaborators
Rockefeller Foundation	Improved Sorghum Hybrids for Africa and Methods on Large-Scale Production of Hybrid Sorghum Seed	Institut d'Economie Rurale, Mali
	Characterization and More Effective Utilization of Genetic Diversity for Sorghum Improvement in Eastern and Central Africa	Kenya Agricultural Research Institute, Kenya; Agricultural Research and Technology Cooperation, Sudan; Melkasa Agricultural Research Centre, Ethiopia; Agricultural Research Institute Ilonga, Tanzania; Serere Agricultural and Animal Production Research Centre, Uganda; National Agricultural Research Institute, Eritrea; Rwanda Agricultural Reserch Centre, Rwanda. Institut des Sciences Agronomiques du Burundi (ISABU), Burundi
Switzerland	Compatibility of Bt-transgenic pulses with biological control	Swiss Federal Institute of Technology, Switzerland; Swiss Federal Research Station for Agroecology and Agriculture, Switzerland; CSIRO, Australia; Centre for Terrestrial Ecology, Netherlands Institute of Ecology, Netherlands; Department of Biotechnology, Government of India, India
UK	Building Strengths Towards Sustainable Management of Sterility Mosaic Disease for Enhanced Pigeonpea Production in the Indian Sub-continent	Research in Environment and Education Development Society, India; Centre for Sustainable Agriculture, India; University of Agricultural Sciences, India
	Safer and Better Groundnut Production for Southern India	University of Reading, UK; Acharya NG Ranga Agricultural University, India; Society for Transformation, Agriculture and Alternatives in Development, India
	Promotion of Farmers' Participatory Management of Groundnut Diseases for Higher Yield and Nutritive Value of Crop Residues (haulm) used for Peri-Urban Dairy Production on the Deccan Plateau in India	International Livestock Research Institute (South Asia Project), Acharya NG Ranga Agricultural University, India; Ecology Action for Rural Development Trust, India; Agriculture, Man and Ecology, India; Re-organization of Rural Economy Society, India; MYRADA, India
	Facilitating the Promotion of Improved and Blast Resistant Finger Millet Varieties to Enhance Production	Warwick University, UK
UNEP/GEF	Desert Margins Program (DMP) - Phase II	NARS in Burkina Faso, Botswana, Kenya, Mali, Niger, Namibia, Senegal, South Africa, Zimbabwe. International Livestock Research Institute, Kenya; International Fertilizer Development Center, USA; TSBF/CIAT, Kenya; ICRAF, Kenya; CIRAD, France; IRD, France; CEH, UK
USA	Agricultural Policy Research Harmonization Project	SADC Seed Security Network, SADC; Iowa State University, USA
	Facilitating Access to Improved Seed for Farmers in Mali	Programme de Developpement de la Production Agricole Au Mali, Mali; Asian Vegetable Research and Development Center; West Africa Rice Development Association, Cote de Ivoire; IER, Mali.
	Developing Sustainable Seed Systems to Support Commercialization of Small-scale Agriculture in sub-Saharan Africa	SADC Seed Security Network, International Fertilizer Development Center, USA; Iowa State University, USA; ILRI, Kenya; NARS and SROs in Africa

Donor	Project	Collaborators
	Environmental Risk Management of Genetically Engineered Sorghums in Mali and Kenya	Western Michigan University, USA; Institut d'Economie Rurale du Mali, Mali; Kenya Agricultural Research Institute, Kenya; Universite de Bamako, Mali
	Management of Aflatoxin in Peanut through the Use of Atoxigenic Strains in *Aspergillus flavus*	University of Georgia, USA
	Catalyzing Partnerships for Policy and Institutional Reform in Sat Asia and sub-Saharan Africa: Village Level Investigations for Development Pathways of Rural Households	Yale University, USA, Cornell University, USA, Brown University, USA,
	Elucidation of the peanut/*Aspergillus* interaction	University of Wisconsin-Madison, USA
	Strategic Analysis and Knowledge Support Systems	IWMI, South Africa; IFPRI, USA
World Bank	Development Market Place : Traditional Technology with a Modern Twist	Banaras Hindu University, India; Nepal Agricultural Research Council, Nepal; Community Action for Rural Development, India; Forum for Rural Welfare and Agricultural Reform for Development, Nepal; Department of Agriculture AP, India; Center for World Solidarity, AP, India; Indian Institute of Pulses Research, Kanpur, India
	Survey of Farming Households in the Districts of Mahabubnagar and Ananthapur	Basix/KBS Bank, AP, INDIA
World Bank and Oxford University, UK	Village Level Study (VLS) Surveys	Oxford University, UK; Cambridge University, UK
Others Bill and Melinda Gates Foundation (BMGF), USA, thru Africa Harvest Biotech Foundation International (AHBFI), Kenya	Africa Biofortified Sorghum for Humanitarian Purposes (ABS Project)	Africa Harvest Biotech Foundation International, Inc., Kenya; Pioneer Hi-Bred, USA; Council for Science and Industrial Research, South Africa; University of Pretoria, South Africa; Agricultural Research Council South Africa; University of California, Berkley, USA; African Agricultural Technology Foundation, Kenya; Forum for Agricultural Research in Africa, Ghana
COSV, Zimbabwe	Support to Rural Households at Risk in their Livelihood Strategies in Hwange, Lupane and Nkayi districts, Zimbabwe	AREX, Zimbabwe, COSV, Zimbabwe
Effem India Pvt Ltd	Assessment of Aflatoxin Contamination in Maize Production Systems in Andhra Pradesh: A Step Towards Developing Aflatoxin-free Maize Production Technologies	NGOs, India; Effem India Pvt Ltd., India.
IFDC	Evaluation of Input Delivery Programs in Malawi	NGOs, NARS in Malawi
WWF	Exploring Soil Biology to Understand High Yields due to SRI method of Cultivation	
WWF	Quantifying the Nutrients of Tank-Silt for Knowledge-based Policy Dialogue on Tank Restoration	Institute for Social and Economic Change, India; Modern Architects of Rural India, India.
Seed companies	Diversification of Sorghum Hybrid Parents for Increased Stable Production	Ajeet Seeds Private Limited, Ankur Seeds Private Limited, Basant Agro Tech (India) Limited, Bioseed Research India Private Limited, Biostadt MHseeds Limited, Emergent Genetics India Private Limited, Ganga Kaveri Seeds

Donor	Project	Collaborators
		Private Limited, JK Agri Genetics Limited; Kanchan Ganga Seed Company Private Limited; Kaveri Seed Company Private Limited, Sehgal Family Foundation, Nuziveedu Seeds Limited, Proagro Seed Company Private Limited, Vikky's Agrisciences Private Limited
	Diversification of Pearl Millet Hybrid Parents for Increased Stable Production	Ajeet Seeds Limited, Ankur Seeds Private Limited, Bioseed Research India Private Limited, Biostadt MHseeds Limited, Emergent Genetics India Private Limited, Energy Seed International Private Limited, Ganga Kaveri Seeds Private Limited, JK Agri Genetics Limited, Kanchan Ganga Seed Company Private Limited, Kaveri Seed Company Private Limited, Mahodaya Hybrid Seeds Private Limited, Maharashtra Hybrid Seeds Company Limited, Metahelix Life Sciences Private Limited, Nandi Seeds Private Limited, Navbharat Seeds Private Limited, Nuziveedu Seeds Limited, Pioneer Overseas Corporation, Proagro Seed Company Private Limited, Rasi Seeds Private Limited, SM Sehgal Foundation, Syngenta India Limited, Tulasi Seeds Private Limited, Vibha Agrotech Limited, Zuari Seeds Limited
	Diversification of Pigeonpea Hybrid Parents for Increased Stable Production	Ankur Seeds Private Limited, Bioseed Research India Private Limited, JK Agri Genetics Limited, Krishidhan Seeds Limited, Maharashtra Hybrid Seeds Company Limited, Nuziveedu Seeds Limited, Pradham Biotech Private Limited, SM Sehgal Foundation, Zuari Seeds Limited
Biopesticide Companies	Protecting Crops and Promoting Businesses, Eco-friendly Materials for Protecting Crops of SAT Farmers	Romvijay Bio-Tech Limited, Nirmal Organo Bio-Tech Private Limited, AG Bio-Systems Private Limited, Biotech International Limited, Multiplex Bio-Tech Private Limited, Ecosense Labs (I) Private Limited, Agro Bio Tech Research Centre Limited, Indore Bio Tech Inputs & Research Private Limited, Mekins Biotech Limited, Gujarat State Fertilizers & Chemicals Limited, Navaneeta Evergreens Ltd.
Consortia of donors (via CGIAR)		
CIMMYT: Generation Challenge Program	Cultivating Plant Diversity for the Resource Poor	National Center for Genetic Engineering and Biotechnology, Thailand; University of Hyderabad, India; The International Centre for Genetic Engineering and Biotechnology, India;
	Unlocking the Genetic Diversity in Peanut's Wild Relatives with Genomic and Genetic Tools	EMBRAPA- Empresa Brasileira de Pesquisa Agropecuária, Brazil; UCB - Universidade Católica de Brasília, Brazil; CERAAS - Centre dEtude Régional pour l'Amélioration de l'Adaptation à la Sécheresse, Senegal; CIRAD - Centre de coopération internationale en recherche agronomique pour le développement, France; IBONE - Instituto de Botánica del Nordeste, Argentina; Laboratory of Gene Expression, University of Aarhus, Denmark

Donor	Project	Collaborators
	Tapping Crop Biodiversity for the Resource Poor in East and Central Africa	Kenya Agricultural Research Institute, Kenya; Agricultural Research and Technology Cooperation, Sudan; Melkasa Agricultural Research Centre, Ethiopia; Agricultural Research Institute Ilonga, Tanzania; Serere Agricultural and Animal Production Research Centre, Uganda; National Agricultural Research Institute, Eritrea; Rwanda Agricultural Reserch Centre, Rwanda. Institut des Sciences Agronomiques du Burundi (ISABU), Burundi
IFPRI (thru CIAT) CP-HarvestPlus	Review of Consumption and Nutrition Related Literature with Specific Reference to Sorghum and Pearl Millet	Helen Keller International, Mali
IWMI – Water and Food Challenge Program	Integrated Water Resource Management for Improved Rural Livelihoods-AREX	WATERNET, Zimbabwe - CP-Water & Food
	Crop Water Technology and Markets	International Rice Research Institute, Philippines
ICARDA	Utilisation of Intelligent Systems for Plant Protection Supported by the ICT-KM Program of the CGIAR	NARS, India
IFAR	Screening for Salinity Tolerance in the Mini-Core Collection of Pigeonpea and Groundnut - Fellowship grant to Ms Namitha Srivastava	
	Development/Introduction of New Groundnut Varieties Suitable for Uzbekistan and their Seed Multiplication in Collaboration with ICRISAT - Fellowship Grant to Ms Makurat Amanova	NARS in Uzbekistan
IFPRI/CAPRi	Natural Resources Management and Institutions: The Links between Property Rights, Collective Action and Natural Resources Management	Egerton University, Kenya; Humboldt Univesity, Germany; Technoserve, Kenya; Catholic Relief Services, Kenya; Centre for Economic and Social Studies, India; BAIF Research and Development Foundation, India
	Updating Union Catalog of Serials	Libraries of CGIAR Centers
ILRI	Scoping Study of Major Trends in Crop-Livestock Systems in Southern Africa and also Undertake a Regional Stakeholders Meeting to Assess Corresponding Priorities for System Development	
	Improving Productivity and Market Access for Chickpeas in Ethiopia : Analysis of Technologies, Input Supply Systems and Markets	
	Assessment of Markets and Value Chains for Chickpeas in Ada District	Ethiopian Institute of Agriculture Research, Ethiopia
	Publication of the Book on Crop Livestock Systems in South Asia	National Center for Agricultural Policy and Research (NCAP), ICAR, India
Attributed support for core programs from Canada, Commission of the European Communities (CEC), India, Iran, Japan, France, and South Africa is not listed but is included in Financial Summary.		

Research Scholars

Names	Country	Degree	Topic
Completed during 2005			
S Srinivasan	India	MSc	Allelic relationships penetrance and expressivity of genes controlling number of flowers per axis in chickpea
S Venkateswara Rao	India	MSc	Marker assisted backcrossing of sorghum staygreen QTLs
Damaris Achieng Odeny	Kenya	PhD	Development of SSRs and mapping of resistance to Fusarium wilt in pigeonpea
G Sujana	India	PhD	Studies on mechanisms of resistance to pod borer in wild relatives of pigeonpea (*Cajanus cajan* (L))
Ch Anuradha	India	PhD	Genetics and Molecular Marker Studies in Chickpea (*Cicer arietinum* L.)
Dev Vart	India	PhD	Genetics of cytoplasmic-nuclear male sterility and molecular markers of their restorer genes in pearl millet
SV Siva Gopala Swamy	India	PhD	Pigeonpea transgenics for resistance to *Helicoverpa armigera*
V Girija Shankar	India	PhD	Bioinformation of sorghum explants using Bt and other gene constructs
D Ramgopal	India	PhD	Studies on phenotypic and molecular characterization and evaluation in Cicer wild species and their interspecific populations
Hameeda Bee	India	PhD	Studies on agriculturally beneficial microorganisms: Diversity and dynamics in cropping systems contrasting for crop residues and pest management
Mukesh Kumar	India	PhD	Effects of cytoplasmic male-sterility on expression of resistance to Sorghum shoot fly
Santhosh P Deshpande	India	PhD	QTL analysis for shoot fly resistance in sorghum (*Sorghum bicolor* L Monech.)
M Pooja Bhatnagar Mathur	India	PhD	Studies on the development of abiotic stress tolerance in groundnut *Arachis hypogaea* by genetic transformation
V Lakshmi Narayanamma	India	PhD	Genetics of resistance to pod borer *Helicoverpa armigera* in chickpea
Christophe Coq	Belgium	MSc	Sahelian land uses from image segmentation of Spot 5 images
Melanie Weynants	Belgium	MSc	Assessing the variability of soil physical properties at the landscape scale in the Fakara region of Niger
Olivier Ska	Belgium	MSc	Assessing the variability of soil chemical properties at the landscape scale in the Fakara region of Niger
Aline Robert	France	MSc	Influence of vegetation changes on the laterite plateau to water runoff in the Fakara

Names	Country	Degree	Topic
Tulole Bucheyeki	Zambia	Msc	Characterization of sorghum [*Sorghum bicolor* (L) Moench] landraces collected from Central and Southern Tanzania
Ncube Nompumelelo	Zimbabwe	BSc	Effect of Different Sources and Levels of P on Total Biomass and Yield of Cowpea (*Vigna Unguiculata* L) in Sandy Soils
Patricia Masikate	Zimbabwe	MPhil	Tillage and manure interactions under Dryland cropping in Semi-Arid Zimbabwe
Lennart Woltering	Netherlands	MSc	Assessment impact of land use and land management changes on the hydrology using a conceptual model, case of the Mzingwane River
Richard Moyo	Zimbabwe	MSc	Potential and constraints of low-cost drip irrigation kits in improving rural livelihoods: A case study of water scarce areas of Mzingwane Catchment
Continuing during 2005			
Sarbani Mukherjee	India	PhD	Impact of subsidies on natural resource extraction – with special reference to groundwater
Vanam Sunitha	India	MSc	Population dynamics and management of *Maruca vitrata* on short duration pigeonpea
V Raja Ram	India	MSc	Development of TRAP markers for genes in carotenoid biosynthesis pathway in sorghum and pearl millet
Ch Siva Kumar	India	PhD	Biochemical mechanisms of resistance to sorghum shoot fly *Atherigona soccata*
Reshma Rizvi	India	PhD	Physiology genotypic variation and marker assisted selection for efficient soil phosphorus acquisition in pearl millet
G Velu	India	PhD	Genetic variability for iron and zinc content in pearl millet
Shivaji Pandurang Mehtre	India	PhD	Genetic diversity analysis QTL mapping and marker-assisted selection for shoot fly resistance in sorghum
Vijay Abarao Dalvi	India	PhD	Study genetics cytology and stability of cytoplasmic genetic male sterility system in pigeonpea
V Thirumala Rao	India	PhD	Breeding approaches to exploit heterosis for grain mold resistance in sorghum
Tsunashima Hiroyuki	Japan	PhD	Low input agriculture for sustainable development and ecosystem maintenance
G Kalyani	India	PhD	Transgenic groundnut with resistance to foliar diseases
K Baskaran	India	PhD	Use of SSR markers in characterizing responses to population improvement during breeding of released pearl millet variety
M Rupasree	India	PhD	Salt stress tolerance in pearl millet and development of molecular markers

Names	Country	Degree	Topic
M Swathi Sree	India	PhD	Analysis of biochemical and physiological response of legumes to drought
A Ramakrishna Babu	India	PhD	Evaluation of transgenic chickpea for resistance to pod borer *Helicoverpa armigera* Hübner
D Srinivasa Reddy	India	PhD	Gene expression in groundnut transgenics under abiotic stress conditions
G Sreelatha	India	PhD	Genetic transformation for pod borer resistance through Agrobacterium in pigeonpea [*Cajanus cajan* (L.)]
T Jyothi	India	PhD	SSR-marker assisted backcross introgression of QTLs for host plant resistance to Shoot fly in sorghum
R Prathibha	India	PhD	Molecular mapping of Ascochyta blight resistance in chickpea
S Chander Rao	India	PhD	Studies on transgenic resistance to viral diseases in groundnut
S Nedumaran	India	PhD	Assessing the impacts of policy and technological interventions in micro-watersheds: A bio-economic modeling approach
M Jyostna Devi	India	PhD	Identification of mechanisms for drought response in groundnut (*Arachis hypogaea* L.)
K Sireesha	India	PhD	Determination of efficacy of different HaNPV strains and standardization of production procedures
Bongani Ncube	Zimbabwe	PhD	Improving Legume Cultivation and Residual Nitrogen Benefits to Subsequent Sorghum (*Sorghum bicolor*) under Semi Arid Conditions in Southern Zimbabwe
Walter Mupnagwa	Zimbabwe	PhD	Water Management Systems for Risk Mitigation and Improved Crop Yields in Rainfed Cropping Systems of the Semi-Arid Tropics.
David Love	Zimbabwe	PhD	Multi-scaled scenario modeling of agricultural, climatic and land use changes and water resources in the Mzingwane Catchments, Limpopo Basin
Clever Dhliwayo	Zimbabwe	MSc	An On-farm Comparison of Conservation Agriculture Practices and Conventional Farmer Practices on Soil Hydrology and Maize Yield
Liberty Moyo	Zimbabwe	MSc	An assessment of the soil water management practices for increased seasonal rain water productivity to mitigate against climatic risks: A case study of the small holder farmers in Gwanda district, Limpopo Basin.
Thobekele Ngwenya	Zimbabwe	MSc	Effect of soil degradation from grazing pressure on rangeland hydrology
Moussa Kanote	Mali	MSc (DEA)	Methodologies for Farmer Participatory Varietal Testing of Sorghum
Sonia Siart	Mali/Germany	PhD	Understanding Institutional and Social Issues Impacting on Access to Seed

Names	Country	Degree	Topic
Tom van Mourik	Mali/ Netherlands	PhD	Analysis and modeling dynamics of *Striga* management practices
Sokona Dagnoko	Mali/USA	PhD	Assessment of Heterosis in Guinea-race Sorghums
Abdul Ky (Burkina Faso)	Mali	Technicien Superieure	Evaluation varietal du sorgho avec la participation des producteurs.
Gaoussou Traore (Mali)	Mali	Apprenticeship	Sorghum Breeding Techniques
Dmitry Iwanov (Russia)	Mali/ Russia	Apprenticeship	Photo documentation of sorghum research activities
Leif Tore Tredal (Norway)	Mali/ Norway	Apprenticeship	Institutional Analysis of farmer Organizations in Dioila and Mande areas of Mali
Joined during 2005			
G Dileep Kumar	India	PhD	Reusable Learning Objects (RLO) for rapid content generation and localization: A new paradigm for agricultural education.
Kassahun Bantte Bisetegn	Ethiopia	PhD	Drought tolerance in sorghum
Srinivasa Reddy Srigiri	India	PhD	Equity and poverty issues in watershed development projects in India
Bhushan Rameshrao Kavimandan	India	PhD	Molecular markers for identification of sorghum varieties and hybrids
Madhurima Bhatnagar	India	PhD	Development and characterization of transgenic groundnut plants for enhanced production of B-carotene to combat vitamin A malnutrition
Namita Srivastava	India	PhD	Molecular and physiological characterization of genetic variation for salinity tolerance in the core germplasm of pigeonpea and groundnut
B Valentine Joesph Gandhi	India	PhD	Migration and HIV Aids
Kanako Suzuki at Niger	Japan	PhD	Dynamics of organic N in the sandy soils of the Sahelian region
P Ramu	India	PhD	Development and application of EST-SSR marker in sorghum
Fatema S Husain	India	PhD	Introgression of fungal disease resistance from wild *Arachis*
V Vengadessan	India	PhD	Genetics of panicle and seed size in pearl millet
T Padmaja	India	PhD	Evaluation of Bt toxins and its metabolites against *Helicoverpa*
Sowmini Sunkara	India	MTech	Development of transgenics for resistance to *Aspergillus flavus* in the Lipoxiginase genes
P Naga Padmini	India	MTech	Tissue culture and transformation of chickpea for insect resistance
T Mahender	India	PhD	Genetic and genomic mapping of pearl millet using EST and other markers for abiotic stress tolerance
V Surekha Devi	India	PhD	Interaction of acid exudates in chickpea on the biological activity of cry toxins from *Bacillus thuringinensis* against *Helicoverpa armigera*

Names	Country	Degree	Topic
Ch Sridhar Kumar	India	PhD	Influence of abiotic factors on infection and response of immune systems of Helicoverpa to bio-pesticides Metarhizium and NPV
Margret Loeffen	Netherlands	MSc	Collective marketing to increase market access and farm household income: the case of pigeonpea commercialization in Eastern Kenya
Amadou Boubacar	Niger	BSc	Caractérisation des Ressources Génétiques du Mil de l'Afrique de l'Ouest pour les Caractères Morphologiques et Phénologiques et la Resistance au Striga
Kassari Ango Issoufou	Mali	BSc	Evaluation participative des préférences paysannes pour les variétés de mil (Sud Ouest Niger) : Cas de Sadoré et Léléhi"
To be completed in 2006			
Comfort Manayme	Zimbabwe	PhD	Spatial modeling of regional soil water balance from remotely sensed data and indigenous knowledge to predict crop stress and mitigate food deficit in Niger
Josua Leistner	Germany	MSc	Modeling nutrient flows at the farm scale in the Fakara region of Niger
Caroline Dandois	Belgium	MSc	Contribution to the analysis of the effect of organic and inorganic amendments and water interactions on millet yields
Nathalie van Vive	Belgium	MSc	Spatio-temporal analysis of rainfall events at the landscape scale: the case of Fakara
On-going			
Mehdi Saqalli	Morocco	PhD	Decision-making processes of Sahelian farmers
Irenikatche Akponikpe	Belgium	PhD	Modeling intensification strategies for pearl millet under Sahelian conditions
Kaisu Lenna Rajala	Finland	MSc	Interaction between Leaf Area Index and length of dry spells on grain yield of pearl millet
S Anitha	India	MPhil	Aflatoxin estimation in human serum



Workshops, Conferences, Meetings during 2005

Event/Topic/Date	Location	Participants	Participating countries/Institutes	Resources and collaborative support
Integrated Crop and Disease Management in Groundnut for more pods, nutritious haulms and healthy milk, 3-4 January	ARS, Ananthapur	Several Farmers	ICRISAT, ILRI, and ANGRAU	ICRISAT, ILRI, and ANGRAU
Chickpea Scientists' Meet, 6 January	ICRISAT-Patancheru	45	ICRISAT, ICAR, NARS	ICAR, ICRISAT
International Peanut Conference from 9–12 January	Bangkok, Thailand	142	17 Countries participated	Kesetsert University, USAID Peanut CRSP, University of Georgia, Khonkhen University and Ministry of Agriculture, Thailand
Video conferencing steering committee meeting, 19 January	ICRISAT-Patancheru	5		ICT KM
Inception workshop CPWFPN1: Increasing food security and income in the Limpopo through integrating crop varieties, soil and water management and linking to markets, 25–27 January	Polokwane South Africa	51	Mozambique, South Africa, Zimbabwe, ICRISAT, CIMMYT, CIAT, IWMI	Challenge Program Water for Food Project no 1
FARA CP Planning workshop, January	Accra			
CGIAR Priority Setting Exercise, January	FAO, Rome			
DFID Partners planning meeting, January	Harare			
IECWSL meeting on 28 January	ICRISAT-Patancheru	350	ICRISAT Employees (Society members)	IECWSL
Innovations for Watershed Management: CAPRi from 3–4 February	ICRISAT-Patancheru	30	ICRISAT, CRIDA and others	
Strategic Analysis and Knowledge Support Systems (SAKSS) Stakeholders Meeting, 3–4 February	Pretoria	33	ICRISAT, IWMI, IFPRI, Policy analysts from South Africa, Zambia, Namibia, Malawi, Zimbabwe, Swaziland, Mauritius, Lesotho, USAID, DFID	ICRISAT, IWMI, IFPRI
ESA Regional Research Management Committee, February	Maputo			
Mozambique sites, February				
ESA Regional Research Management Committee, February	Maputo			

Event / Topic / Date	Location	Participants	Participating countries / Institutes	Resources and collaborative support
CGIAR Committee Meetings viz., Centers' Deputy Directors Committee (CDDC), Genetic Resources Policy Committee (GRPC) and Inter-Center Working Group on Genetic Resources (ICWG-GR) during 28 February–5 March	ICRISAT-Patancheru	35	DDGs of all Centers, GRPC members and other CG scientists	ICRISAT and IPGRI
Atelier de Restitution de Résultats de la campagne 2004/05 et Planification pour le Project : Access a la diversite varietale du sorgho dans la zone du Mande, 8–11 March	Siby			
Review and Planning Meeting of Tata-ICRISAT-ICAR Project, 22–23 March	ICRISAT-Patancheru	40	ICRISAT, ICAR, NARS, NGOs	ICRISAT-Tata Project
Project Advisory Committee Meeting of Tata-ICRISAT-ICAR Project, 24 March	ICRISAT-Patancheru	10	ICRISAT, ICAR, NARS, NGOs	ICRISAT-Tata Project
Annual Review Workshop of Field Activities of "Access to Varietal Diversity in Sorghum" Project 24–26 March	Dioila, Mali	80	Mali	ICRISAT, Union Local de Producteurs Cereals (ULPC). SLACAER, BMZ/GTZ
Brainstorming Workshop on Food, Livelihoods and Health 28–29 March	ICRISAT-Patancheru	50	ICRISAT, Ministries (Gov of AP), ANGRAU, APSACS and NGOs	ICRISAT and Gov of AP
CBNRM workshop, March	Harare			
CA task force for Zimbabwe review meeting, March	Harare			
CBNRM workshop, March	Harare			
CA task force fro Zimbabwe review meeting, March	Harare			
Variety evaluations and culinary testing of selected varieties, 5, 6, 7, 17, 28, 29 and 30 March 2005	Kegnero, Teneya, Siranikoro, Tonga, Banco, Seyla, Seribila	439	Mali	ACOD, AOPP, OHVN, UPLC, SLACAER, ICRISAT, IER, BMZ / GTZ
Desert Margins Program (DMP) 2nd Steering Committee Meeting, 5–7 April	North-West University, Potchefstroom, South Africa	17	ICRISAT, TSBF-CIAT, UNEP, Burkina Faso, Botswana, Kenya, Mali Namibia, Niger, Senegal, South Africa, Zimbabwe	DMP/GEF
ADB Review and Planning Workshop, 27–29 April	Kunming, China	27	5 countries participated	ICRISAT-ADB Project
PLS Inception workshop for FARA CP in SADC region, April	Malawi			
PLS Inception workshop for FARA CP in SADC region, April	Malawi			

Event / Topic / Date	Location	Participants	Participating countries / Institutes	Resources and collaborative support
Pearl Millet Top Cross Hybrid Meeting and BMZ project planning workshop, 3–6 May	ICRISAT-Bamako	15	ICRISAT, LCRI, INRAN, INERA, IER, ISRA, University of Hohenheim	Rockefeller Foundation
Pearl Millet Top Cross Hybrids: Evaluating Potentials and Future Priorities, 3–6 May	ICRISAT-Bamako	14	Mali, Burkina Faso, Germany, India, Nigeria, Niger	ICRISAT, University of Hohenheim, Syngenta Foundation, Rockefeller Foundation
Methods of on-farm trial outlay and planting, 5–11 May	Siby, Dioila	60	Mali	ACOD, AOPP, OHVN, ULPC, SLACAER, IER, ICRISAT, BMZ/GTZ
The Third Project Steering Committee Meeting of IFAD TAG 532-ICRISAT Project, 12-17 May	Hanoi, Vietnam	47	China, India, Italy, Nepal, Vietnam and ICRISAT	IFAD
Techniques for producing high quality sorghum seed on-farm, 15, 21 May	Dioila, Siby	20	Mali	ACOD, AOPP, OHVN, ULPC, SLACAER, IER, ICRISAT
Seed Fair, 13–14 May	Siby, Mali	100	Mali	Farmers, Seed Association, World Food Program, BMZ/ GTZ
STST meeting of DST, 25–26 May	ICRISAT-Patancheru	20	Dept. of Science & Technology, Govt. of India and Agri Business Incubator, ICRISAT	Dept. of Science & Technology, Govt. of India
A three-day training course on Design and analysis of participatory on-farm trials, 25–27 May	ICRISAT-Patancheru	20	India	ICRISAT
Launching of Soil Fertility Consortium for Southern Africa, May	Harare			
Desert Margins Zimbabwe review and planning meeting, May				
Launching of Soil Fertility Consortium for Southern Africa, May	Harare			
Desert Margins Zimbabwe review and planning meeting, May				
Planning workshop with DFID for the September 2005 regional workshop, May	Harare			
Seminars to Agric Dept Midlands State University, May				
Operational Workshop for Project Stakeholders on the Biodiesel Project, 3 June	ICRISAT-Patancheru	15	India, GTZ, Germany, ICRISAT and Private companies	ICRISAT-GTZ project

Event / Topic / Date	Location	Participants	Participating countries / Institutes	Resources and collaborative support
Rythu Sadassu, 5–6 June	Tunki Village Medak Dt	10,000 farmers	Scientists NGOs	Government of Andhra Pradesh
CFC funded project Launching meeting, 6–8 June	ICRISAT-Patancheru	50	Agri. Institutes NGO, Poultry feed mfg and Poultry growers and farmers	CFC and FAO
Workshop on standing panel of SPIA of the CGIAR INRM, 13–16 June	IRRI, Los Banos, The Philippines			
Assessment of Challenges and Opportunities for Improving Seed Supply for Relief and Recovery Programs, 14 June	Harare	25 approx	ICRISAT, FAO, Zimbabwe NARS, Seed companies	ICRISAT, FAO
Workshop on standing panel of SPIA of the CGIAR INRM, 13–16 June	IRRI, Los Banos, The Philippines			
Workshop on Integrated Watershed Management in the Philippines, 17 June		30	FFF,BAR, BSSM other partners from Government of Philippines	Team ICRISAT
Workshop on weather forecasting systems and their implications to South Asian Agriculture, 24–25 June	ICRISAT-Patancheru	20	Across CGIAR Institutions	ICRISAT and TERI
Workshop on Regional Variety Release Procedures, 27–29 June	Lilongwe, Malawi	27 approx	ICRISAT, SADC, Iowa State University, NARS from all SADC countries	ICRISAT, SADC, Iowa State University
Limpopo Dept Agriculture Seminars and field visits to ICRISAT Bulawayo, June	Bulawayo			
Joint workshop on SPIA and IGNRM, June	Los Banos, Philippines			
Microdosing and Conservation Agric – Ward, June		15 farmers from Matobo		
Watersheds Inception Workshop for Philippines, June				
Workshop on Harmonization of Seed Certification and Quality Assurance, 30 June–3 July	Lilongwe, Malawi	25 approx	ICRISAT, SADC, Iowa State University, NARS from all SADC countries	ICRISAT, SADC, Iowa State University
Workshop on Harmonization of Phytosanitary Standards and Procedures for Seed, 4-6 July	Lilongwe, Malawi	22 approx	ICRISAT, SADC, Iowa State University, NARS from all SADC countries	ICRISAT, SADC, Iowa State University
Workshop on Village Level Studies, 23-24 July	Brown Univ. Providence, RI, USA	23	ICRSAT and Yale University, Brown Univ, Harvard Univ, Univ of California, Univ	ICRISAT and Yale University

Event / Topic / Date	Location	Participants	Participating countries / Institutes	Resources and collaborative support
			of Arizona, Michigan State Univ, Univ of Pennsylvania	
CGIAR meets Media on Healing Wounds Initiative in New Delhi on 27 July	Le Meridian New Delhi	27 Rep from Media	MSSRF, IRRI and ICRISAT	ICRISAT
A Workshop on Agri-Biotechnology for extension workers from Andhra Pradesh, 27–28 July	ICRISAT-Patancheru	53	Government Extn workers Village sarpanchs, farmers	ICRISAT and SABA Program
ESA Regional Management Committee, July	Nairobi			
Team Building Workshop for Sujala-ICRISAT Project, 8 August	Bangalore	85	ICRISAT, Govt. of Karnataka and NGOs	ICRISAT-Sujala Project
Consultation Meeting on Hybrid Parents Research at ICRISAT, 30 August	ICRISAT-Patancheru	40	Partners of PS Seed Companies	ICRISAT-PS Hybrid Parents Research Consortia
FAO CA task force meeting and preparation of presentation to AREX, August	Harare			
Acting in the role of smallholder farmers managing with limited resources, 31 August-1 September	Polokwane	27	LPDA, Sasol, Landbank, Panaar, ARC, LIMPAST, AGES, Univ Limpopo, Univ Venda, Univ FreeState, SRI, CSIRO, ABSA, FNB, IWMI	RSA, Zimbabwe, Australia
A short-term course on Plant genetic diversity analysis and marker-assisted breeding, 20 August–4 September	Kamphaeng Saen Campus, Kasetsart University, Thailand	20	10 countries participated	Funded by Generation Challenge Program
3 District workshops COSV/ AREX report back and planning meeting for 2005 – July/ August				
Workshop cum Training program on “Management of Aflatoxin in Maize”, 1 September	ICRISAT-Patancheru	16		
Modelling Workshop – Engaging smallholder and emerging farmers using systems simulation	Polokwane	15	LPDA, SRI, CSIRO, FNB, University Veda, ARC, 2 groups of 30 farmers	RSA, Zimbabwe, Australia
JIRCAS and ICRISAT Symposium on the improvement of fertility of sandy soils in the semi-arid zone of West Africa through organic matter management, 10 September	ICRISAT-Niamey	50	JIRCAS, ICRISAT, ILRI, INRAN and INERA and other	JIRCAS

Event / Topic / Date	Location	Participants	Participating countries / Institutes	Resources and collaborative support
Mid-term review meeting for the ICRISAT-JIRCAS Collaborative Project, 11–12 September	ICRISAT-Niamey	20	JIRCAS, ICRISAT, ILRI and other	JIRCAS
Training workshop on Participatory Research and Scaling it-up and Out, 19–30 September	ICRAF, Nairobi	38	TSBF-CIAT, ICRISAT, Burkina Faso, Ghana, Kenya and Niger	TSBF-CIAT, ICRISAT, Desert Margins Program (DMP), Challenge Program on Water and Food (CPWF)
Project launching on Enhancing yield and stability of pigeonpea through heterosis breeding, 20 September	ICRISAT-Patancheru	14	ICRISAT – ICAR	
Sorghum seed stakeholders meeting in Nigeria, 22 September	Nigeria	40		IAR
Stakeholder Workshop: Sorghum in Nigeria, 26 September	Zaria, Nigeria	50	Nigeria	IAR, Private sector, ADP's from neighboring states, USAID- SCOSA
2 Day Workshop on Finger millet September last week	Nairobi	38	ICRISAT	NGO's private milling companies, farmers and universities
The Groundnut rediscovery Summit 2005 for Nigeria, 28–29 September	Nigeria	200	Opportunity Africa an NGO and IAR	
Seedworks Field day, 28-30 September				ABI ICRISAT
CP 17 Management Committee Meeting at IWMI RSA, September	Pretoria			
ICRISAT September Board Meeting, September	Nairobi			
ESA In-house Review, September	Nairobi			
Rabi/Summer Groundnut Research Workers' Group Meeting (AICRPG), 2–3 October	ICRISAT-Patancheru	>60	ICRISAT-Patancheru	ICRISAT-Patancheru
ICAR-SAU-BARC- ICRISAT Scientist meet, 3–4 October	ICRISAT-Patancheru			
Gender Diversity Planning Workshop 5 October	ICRISAT-Patancheru	>20	ICRISAT-Patancheru	
Training Program on 'Chickpea Cultivation in Rice Fallows of Eastern India with emphasis on IPM of *Helicoverpa armigera*, 5–6 October	ICRISAT-Patancheru	24	CRS-India and its partners	ICRISAT/DFID-PSRP

Event / Topic / Date	Location	Participants	Participating countries / Institutes	Resources and collaborative support
Participatory Variety Evaluation with Farmers, 5–6 October	Zaria, Nigeria	55	Nigeria	IAR, ADP's, Private sector, USAID- SCOSA
NRM Consultation meeting, 14 October	ICRISAT-Patancheru	20 approx		ICRISAT – ICAR and Ministry of Rural development
Bio-informatics workshop, 17–21 October	ICRISAT-Patancheru	14	India	ICRISAT
Advanced DSSAT 4 (Decision Support for Agro-Technology Transfer) training workshop on "Assessing crop production, nutrient management, climate risk, 19–30 October	Accra, Ghana	40	ICRISAT, TSBF-CIAT, IFDC, University of Florida, University of Georgia, Burkina Faso, Ghana, Kenya, Mozambique, Niger, Togo	ICRISAT, TSBF-CIAT, Challenge Program on Water and Food (CPWF)
VLS workshop cum training, 26–27 October	ICRISAT-Patancheru	29	ICRISAT, Yale University, and Oxford University.	Oxford University
Consortium for Southern Africa, 27–28 October	Pretoria, South Africa	15	ICRISAT and all other CGIAR Centers operating in southern Africa	All paid own way
DFID Aflatoxin management project meeting, 28–29 October	Ananthapur, AP	>30	DFID	ICRISAT, ANGRAU, University of Readings UK
3rd International Symposium on Conservation Agriculture, October	Nairobi			
Inter center Working Group on Climate Change, October	Nairobi			
APAARI-AVRDC-ICARDA-ICRISAT Joint CLAN Steering Committee Meeting, 3–5 November	Water Resources Management Center, CLSU, Nueva Ecija, Philippines	45	All CLAN countries	APAARI, AVRDC, ICARDA, ICRISAT, DA-BAR, PCARRD and CLSU
APN-CLIMAG Workshop, 9–11 November	ICRISAT-Patancheru	25	5 countries participated	APN-CLIMAG, Australia
Plant Breeder's Rights Workshop, 21–25 November	Lusaka, Zambia	35 approx	ICRISAT, SADC, Iowa State University, NARS from all SADC countries	ICRISAT, SADC, Iowa State University
ICRISAT-WWF Dialogue event, 24–25 November	ICRISAT-Patancheru	30	ICRISAT, NGOs and Civil Society Organizations	ICRISAT
ICBA-ICRISAT Salinity research review and planning meeting, 29–30 November	ICRISAT-Patancheru	2 member team		
Management Committee meeting PLS-SADC, FARA CP, November	Harare			
ICRISAT-Bulawayo Visioning exercise, November	Bulawayo			

Event / Topic / Date	Location	Participants	Participating countries / Institutes	Resources and collaborative support
ASIA In house review, November	ICRISAT-Patancheru			
ICRISAT Visioning Exercise, November	ICRISAT-Patancheru			
Consortium for Southern Africa, 1–2 December	Johannesburg, South Africa	13	ICRISAT and other CGIAR Centers operating in southern Africa, SADC, NEPAD	All paid own way
AGM meeting from 5–9 December	Marrakech in Morocco	1000		CGIAR
Technology based entrepreneurship training program, 5–10 December	ICRISAT-Patancheru	40	ETC Consultants, SKAL, Netherlands and Ministry of agriculture, Government of India	NSTEDB of DST
Two day Stakeholders meeting, 6–7 December	Samanko	25	Seed producers, National seed services, IER, IPR, ICRISAT, and AVRDC	ICRISAT, IER
ICRISAT's Visioning Day – Partners' Perspective on 14 December	ICRISAT-Patancheru	40 approx	ICRISAT – ICAR Private sector-ADB-World Bank	ICRISAT
RSAD-Biodiesel meeting, 13 December	ICRISAT-Patancheru	15	India	ICRISAT-Government of AP Project
Joint IPGRI-ICRISAT-University of Birmingham Expert Consultation Meeting on Genetic Erosion Monitoring and Indicators, 19-21 December	ICRISAT-Patancheru	20	ICARDA, ICRISAT, CIAT, FAO and IPGRI	IPGRI and ICRISAT
Advisory Committee meetings of ICRISAT-PS Hybrid Parents Research Consortia on 4 February, 29 March and 26 December	ICRISAT-Patancheru	08	India (ICRISAT and Seed Co AC members)	ICRISAT-HPRC
Seminar on ICRISAT activities in southern Africa – University of the Free State	Bloemfontein			
Two week training workshop on "Genetic Diversity and Marker-Aided Plant Breeding"	Kasesart University Thailand	20	10 Asian countries	GCP
Three day training course on "Experimental Design and Data Analysis Using Genstat"	ICRISAT-Patancheru	15	ICRISAT and local ICAR Institutes	ICRISAT
Two One day workshops on "iMAS: A Unified Computing and Decision Support System for Marker-Aided Breeding"	ICRISAT-Patancheru	35	ICRISAT, local ICAR Institutes, Mahyco, Barwale Foundation	GCP-ICRISAT

Event / Topic / Date	Location	Participants	Participating countries / Institutes	Resources and collaborative support
CAPRi-ISEC-UAS-ICRISAT Training Workshop on Natural Resource Management and Institutions: The Links between Property Rights, Collection Action, and Natural Resource Management	ICRISAT-Patancheru	60	10 countries participated	IFPRI
Participatory Breeding Options for Sorghum Improvement	Samanko	22	Mali	IER, ULPC, ACOD, AOPP OHVN, ICRISAT, BMZ/GTZ
Second Regional planning and Project coordination meeting for the CFC funded groundnut seed project	Dakar, Senegal	14	7 countries, ICRISAT	CFC
Workshop to review seed harmonization efforts in sub-Saharan Africa	Centurion, South Africa	12	SADC, WAEMU, ASARECA, ISU, CIMMYT, CIAT	USAID through SCOSA

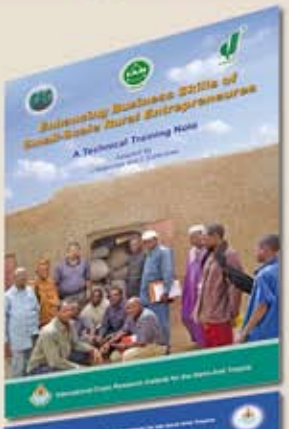
Training Courses held during 2005

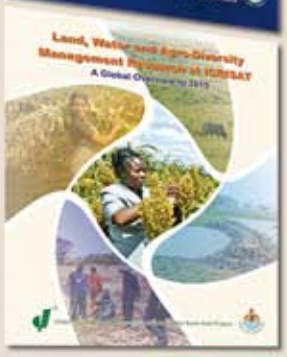
Title	Venue	No. of Participants	Participating countries	Resource/ Collaborators
Basic course on crops and livestock management in drought-prone areas, 17-19 Jan	ICRISAT-Patancheru	15	India	ICRISAT
Training Course on Sorghum Hybrid Production and Development, 7-11 Feb	ICRISAT-Patancheru	12	Egypt, Holland, Iran, India	ICRISAT
Interaction Workshop on Biological Approaches for Growing and Protecting Crops, 8-10 Feb	ICRISAT-Patancheru	10	India	ICRISAT
Training course on Enhancing Legume Production for Food and Fodder in Bangladesh, 21 Feb-17 Mar	ICRISAT-Patancheru	10	Bangladesh	BARI/ICRISAT
Training Workshops on ICT-based information exchange to support watersheds and rural livelihoods, 25 Feb	ICRISAT-Patancheru	13	India	ICRISAT
Training on the Establishment and Management of Bio-diesel Plantations – *Jatropha* and *Pongamia*, 11-12 Mar, 14-15 Mar, 16-17 Mar	ICRISAT-Patancheru	40	India	ICRISAT
Training Course on Aflatoxin Detection and Estimation, 4-15 Apr	ICRISAT-Patancheru	5	India	ICRISAT
Orientation Workshop on Instructional Design and Learning Management Systems, 11-15 April	ICRISAT-Patancheru	9	India	ICRISAT
Training Workshop on Computer Applications for Designing, Measuring and Data Analysis of Agricultural Experiments, 9-13 May	ICRISAT-Patancheru	6	India	ICRISAT-ASK
Training Course on Aflatoxin Detection using ELISA and Management Options in Groundnut, 16-27 May	ICRISAT-Patancheru	15	India	ICRISAT
Training on vermi-composting, 6-17 June	ICRISAT-Patancheru	Daily 30 farmers	AP	ICRISAT
Training Course on Aflatoxin Detection using ELISA and Management Options in Groundnut, 13-17 June	ICRISAT-Patancheru	8	India	ICRISAT
Training-workshop on project development and resource generation for the Philippines NARES, 15-19 July,	ATI, Philippines	34	Philippines	ICRISAT-ATI-PBAR
Training Course on Biometrical techniques in crop improvement, 16-21 Jul	Joydebpur, Bangladesh	17	Bangladesh	ICRISAT-ICARDA
Training of Trainer's Workshop on Agriculture Biotechnology, 27-28 July	ICRISAT-Patancheru	53	India	ICRISAT
Training course on `Uses of Genstat', 22-25 Aug	ICRISAT-Niamey	14	Niger	ICRISAT

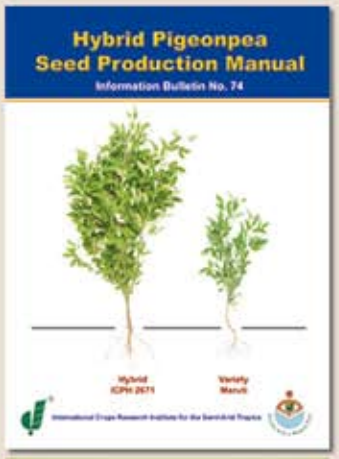
Title	Venue	No. of Participants	Participating countries	Resource/ Collaborators
Training program on improved production technologies for sorghum and pearl millet, 26-27 Aug	Mahabubnagar	200 farmers	Mahabubnagar	CFC-FAO-ICRISAT
Training program on improved production technologies for sorghum and pearl millet, 30-31 Aug	Maharashtra	200 farmers	Maharashtra	CFC-FAO-ICRISAT
Workshop-cum-training program entitled Management of afltaoxins in maize, 1 Sep	ICRISAT-Patancheru	31	AP	ICRISAT
Training program on Sampling methodology for aflatoxin analysis, 21 Sep	ICRISAT-Patancheru		AP and Maharashtra	CFC-FAO-ICRISAT
Workshop on Administration and Management of Agricultural Research Stations, 26-30 Sep	ICRISAT-Patancheru	7	India	ICRISAT-ASK
Training program on tools and methods for effectively involving farmers in the evaluation of a broad range of sorghum varieties, 5-6 Oct	Nigeria		Nigeria	Nigerian Institute of Agril. Research
Training program on Creating awareness and training farmers in harvest and post harvest methods to mitigate aflatoxin contamination in maize, 7 Oct	ICRISAT-Patancheru	45 Farmers	AP, India	ICRISAT
Training Workshop on Biological Approaches for Crop Production and Protection, 18-21 Oct	ICRISAT-Patancheru	13	India	ICRISAT
Training Workshop on Bioinformatics, 17-23 Oct	ICRISAT-Patancheru	12	India	ICRISAT
Training course on `Entrepreneurial opportunities on organic farming', 5-10 Dec	ICRISAT-Patancheru	23	India	ICRISAT-ABI
Training Workshop on Design and Analysis Data for Plant Breeding Trails, 19-23 Dec	ICRISAT-Patancheru	16	India	ICRISAT-ASK

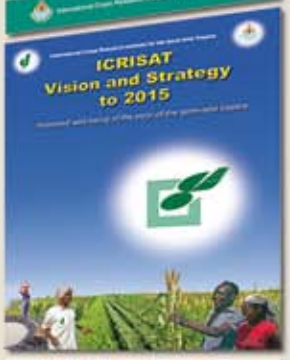
Publications

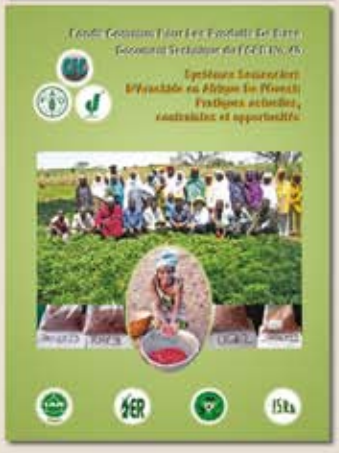
(List available on CD version. Distribution on request.)

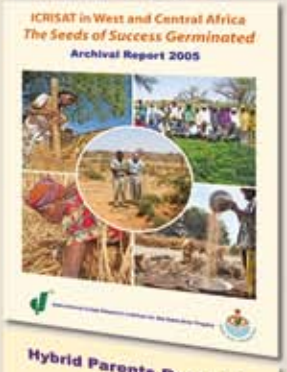


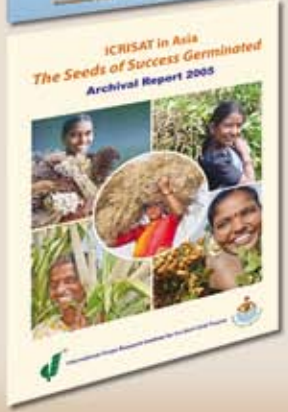


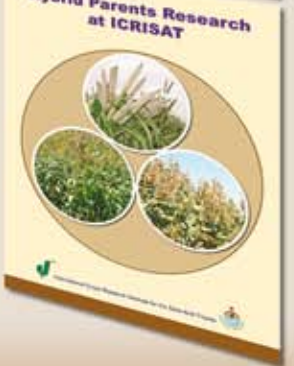










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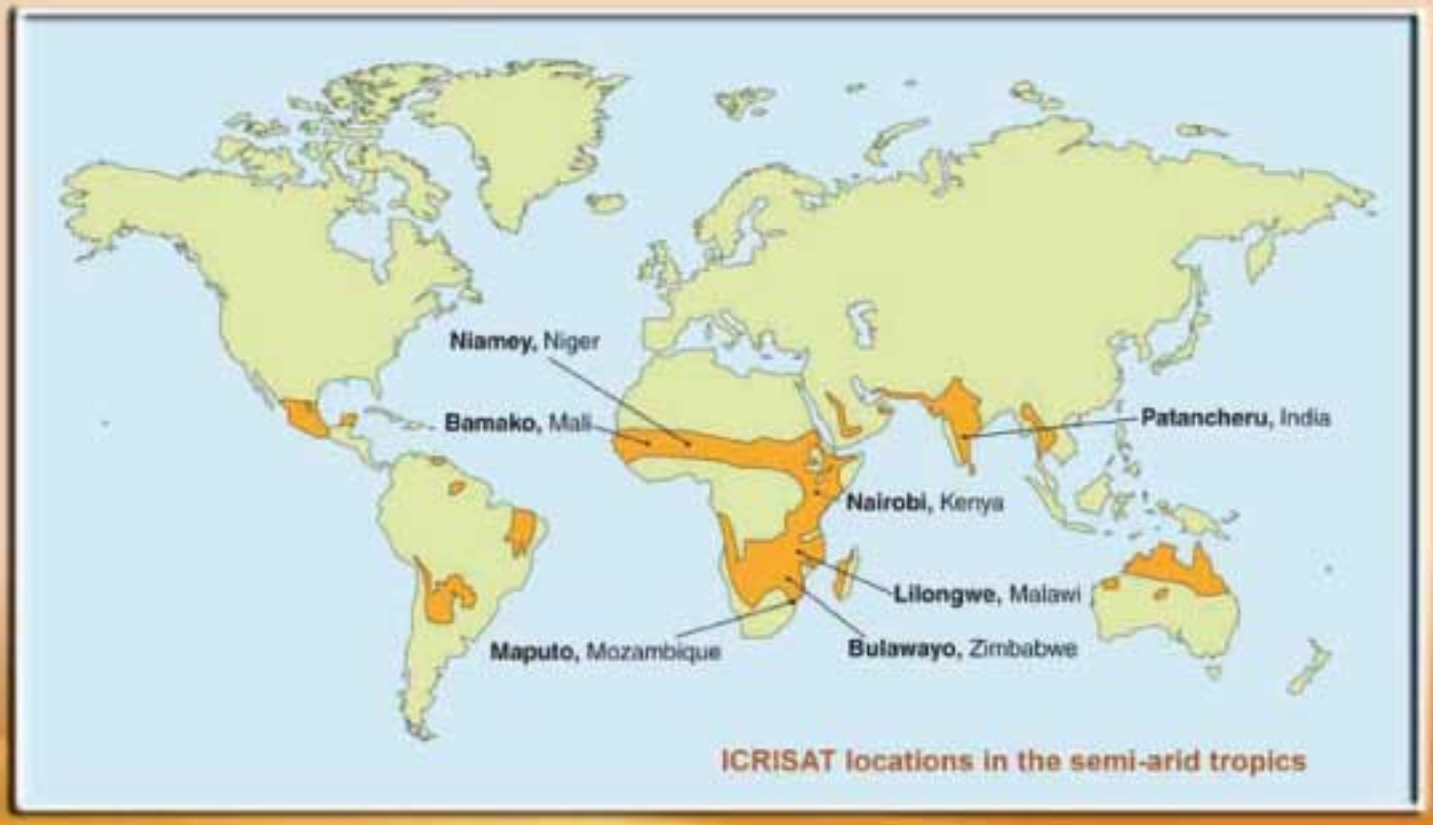

ICRISAT locations in the semi-arid tropics

About ICRISAT®

The International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) is a nonprofit, non-political organization that does innovative agricultural research and capacity building for sustainable development with a wide array of partners across the globe. ICRISAT's mission is to help empower 600 million poor people to overcome hunger, poverty and a degraded environment in the dry tropics through better agriculture. ICRISAT belongs to the Alliance of Centers of the Consultative Group on International Agricultural Research (CGIAR).

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ISSN 1017-9933 IRE 016 A43–06