Nutri-cereals and legumes help reduce malnutrition in Malawi and Tanzania

A positive change has been seen in the growth and health of children in just 21 days, by feeding them a nutritious complementary mix consisting of pigeonpea, finger millet, groundnut, carrot and amaranthus leaves; and by addressing factors that inhibit nutrient absorption – hygiene and aflatoxin contamination.

Nutrition studies involving 100 children in Malawi and 70 children in Tanzania, in the age group 6-23 months, showed an improvement in the weight and mid-upper arm circumference (MUAC) measurements of the children. During the 21-day study period the following activities were undertaken:

1. Nutritious complementary food package consisting of pigeonpea, finger millet, groundnut and maize along with carrot and amaranthus leaves was developed. The proportions were calculated, to provide the necessary nutrition to the children.

2. Hygiene practices were listed and followed by the women on all days. They included: using clean water for cooking and drinking; washing vessels and hands before cooking and feeding; maintaining cleanliness of the surroundings, etc.

3. Women were educated on the ill-effects of aflatoxin, how to avoid contamination, etc. They were taught post-harvest crop handling methods – segregating damaged and rotten grains, choosing good quality grains, grading and storing them appropriately.

4. Information on the importance of nutrition, the nutritional benefits of pigeonpea, finger millet, carrot, amaranthus, etc, were shared and the women got hands-on experience in cooking nutritious complementary meals for the children in the study group on a rotation basis during the study period.

Anthropometric measurements, ie, height, weight and the MUAC of the children in the test groups were taken on day 0, 7, 14 and 21. These were recorded in the health card maintained for each child. While the height did not change significantly, the weight and MUAC reading gives a good indication of the improved health of the children during the study period.
Nutri-cereals and legumes... from page 1

A baseline study carried out in 2015 had revealed the following:

- The current child feeding patterns, in terms of number of times the children were fed, as well as the diversity of foods they were given, fell short drastically of UNICEF guidelines. In Tanzania only 18% of the children in the study group met the nutritional requirements and in the Malawi group, only 2% met the UNICEF requirements. These children were primarily fed only maize, that too in inadequate quantities, in addition to breast milk in some cases. Maize consumed in boiled or roasted form or as Nsima (dish made of maize flour and water), though filling, does not provide the important micro- and macro-nutrients necessary for child growth.

- Poor hygiene levels in the study villages of Malawi and Tanzania were found to be a major reason for health issues, like widespread diarrhea among the children.

- The presence of aflatoxin biomarker AFM1 in the urine samples of study group children indicated that more than 60% of them were exposed to aflatoxin contamination.

Following the baseline survey, a study group of 50 children each, in the 2 districts of Mzimba and Balaka in Northern and Central Malawi respectively, and 70 children from 5 villages of the Dodoma Region in Tanzania, were selected, to test the impact of nutritious food, hygienic practices and controlling aflatoxin contamination, on malnutrition and stunting among children.

The Malawi study areas were selected based on government estimates of stunting in the region and the farming system in the region. Farmers in Mzimba district grow finger millet, but use the millet for brewing only, while farmers in Balaka district grow pigeonpea only for market sale.

Currently, the study is ongoing with the existing groups, and the project continues to provide complementary food mix on a monthly basis. The project will continue to record anthropometric measurements of the children.

While this was a short study, and non-conclusive on its impact on stunting, it showed positive results on improved growth, in terms of weight of the children. To study the impact on stunting, a long term study, involving more groups, across several districts needs to be undertaken.

The nutrition study is a component of three different projects (see box). The Irish Aid supported project “Malawi Seed Industry Development Project (MSIDP)-Phase II” has allowed for an expansion of the study area and to include more aspects in the study.

The MSIDP-Phase II will address issues pertaining to: quantity of aflatoxin that results in stunting among children; effect of different levels of hygiene on health and stunting; and nutrient levels in crops and its impact on stunting. Studies are therefore planned on each of the above components through different intervention groups. Different groups will monitor the aflatoxin, hygiene and nutrition component, and their impact on malnutrition and stunting. Bioavailability studies will also be carried out.

Taking a holistic approach to nutrition, the project will address the malnutrition and stunting issue from the breeder stage (identify varieties with dense nutrients) and ensure agronomic practices taking care of soil health (microdosing) and crop health (crop rotation, inter cropping), leading to an agronomic bio-fortification process. Once improved nutrient dense grains are available, the project will address the complementary food requirement not just for children, but also for women in the child bearing age group, pregnant women and lactating mothers, by formulating recipes for each group, by including ICRISAT mandate crops that are rich in folic acid, calcium, iron, zinc and other essential nutrients.

The study was led by Dr S Anitha, Consultant, ICRISAT-Malawi, along with five MSc students.

Watch video: [http://wp.me/p75LkR-49C](http://wp.me/p75LkR-49C)

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**Nutritious complementary food prepared for children.**
Developing a framework for cooperation and integration to enable holistic research

Development of a framework for cooperation and integration among different disciplines within ICRISAT to undertake holistic research for greater impacts, was a key focus of scientists from Eastern and Southern Africa (ESA) region at their recent regional planning meeting. They reviewed achievements and lessons learnt from past activities as well as shared and peer reviewed each other’s work plans.

Some key issues identified were:

- Need to align data management to ensure harmonization of what has been done through different breeding programs to avoid repetition.
- Biotechnology should be integrated into all breeding programs.
- Crop-livestock is an opportunity for integrating systems research and should be included in breeding programs and extended to more countries in the region.
- More work on crop and climate modeling is needed on ICRISAT mandate crops, particularly calibration of relevant varieties to support/inform breeding programs.

Scientists from various disciplines presented their research initiatives ranging from crop Improvement (legume and nutri-cereals breeding and biotechnology); crop-livestock systems, including soil and water management; crop and climate modeling; and social sciences.

The team broke out into three groups – crop improvement; soil and water management; and scaling out and impact sketched out an impact pathway and mapped different projects against the impact pathway.

The aim of the exercise was mainly to identify synergies and gaps in current activities. The identified gaps were then framed as research questions that could potentially be developed into project proposals. This process was facilitated by Dr Peter Carberry, Deputy Director General–Research, who mentioned that the ICRISAT West and Central Africa team had gone through the same exercise during their meeting earlier in the year. “This process will help identify a set of priorities that people think are critical to invest in, to fulfill our impact pathways and hopefully this can fit into the thinking around our country strategies,” he explained.

Impact pathway for crop improvement was identified as, priority setting, identifying the source of traits, pre-breeding, introgression of the traits into backgrounds – hybridization, selection, evaluation for the specific traits in the field and variety release.

The crop improvement team identified gaps and stressed the importance of collaboration across countries and crops, coordinate projects and activities better, to work more efficiently.

The soil and water management team defined their impact pathway as follows: Understanding the farming system (characterization), testing and demonstrating various technologies – based on identified constraints, engagement of partners and impact assessment. The main gap highlighted by the team was the need to develop synergies with other programs and focus on demand driven innovations.

The impact pathway for scaling out and impact was, research outputs/proven technologies, proof of concept, extension, piloting, scaling out and outcomes/system level objectives.

The key observation was that there is a need to plan strategically on how the ESA team can work more effectively on piloting and scaling out through partnerships. To enhance the efficiency of research in the region it was argued that there is need to have:

- Joint activities across various projects – for example, Tropical Legumes III (TL III), Harnessing Opportunities for Productivity Enhancement (HOPE) in Sorghum and Millets Phase 2 and AfricaRising
- Learning and collaboration across projects
Boosting agripreneurship development in Karnataka

Giving new dimensions to agripreneurship development and to enhance agricultural growth through innovation and partnerships, a Memorandum of Agreement (MoA) has been signed between the University of Agricultural Sciences, Raichur (UAS-R) and ICRISAT. This will lead to setting up an agribusiness incubator (ABI) at the UAS-R campus, in Karnataka, India.

As per the MoA signed, UAS-R and ICRISAT will jointly work towards:
1. Establishment of co-business incubation platform to promote agribusiness and related activities;
2. Technology transfer and exchange in their respective areas of competence to promote agribusiness;
3. Training and support to staff and entrepreneurs to promote agribusiness; and
4. Promotion of R&D and technical collaborations between ICRISAT and UAS-R, through increased involvement of scientific staff.

ICRISAT will help identify and promote agribusiness start-ups, as well as facilitate agro-technology transfer in the North Karnataka region, which is expected to enhance the impact of outreach activities for the University.

Entrepreneurs will get technical and business development support in seed production, farm machinery and food processing domains. This will be through technical support to develop business models, capacity building and training for incubator personnel, facilitate strategies and systems for technology commercialization, and consulting services for promotion of agribusiness in the region.

“This partnership with ICRISAT opens a new chapter for the University in promoting technology and agri-based entrepreneurship in the region,” said Dr PM Salimath, Vice Chancellor, UAS-R.

“ICRISAT and its partners have been successful in facilitating the establishment of agribusiness incubators in India and Africa aimed at engaging youth, women and farmers to initiate small and micro-level agribusiness ventures. We hope to achieve similar results through this partnership with UAS-R,” said Dr Peter Carberry, Deputy Director General-Research, ICRISAT.

The handholding and mentoring support for UAS-R will be provided through the co-business incubation initiative of the Agri-Business Incubation Program, that is part of the ICRISAT Agribusiness and Innovation Platform (AIP) that focuses on promoting agribusiness ventures and public-private partnership initiatives in the agricultural sector.

ICRISAT AIP provides prototype innovations, knowledge and expertise, training and co-location with researchers for close interaction; while the entrepreneurs fine-tune the prototypes and take them to market, as well as bearing the risks and reaping the rewards involved.

The MoA was signed on 4 May at the ICRISAT campus in Patancheru, India.

Developing a framework... from page 3

- Strong leadership to pull people together for integration in, proposal development, implementation and for learning
- Sharing calls for proposals – to improve collaborations
- Project management system with standardized frameworks for what projects should include and methodologies for the components, eg, data management, communications, gender, monitoring and evaluation, etc.
- Draw expertise from across the region.

Dr Moses Siambi, ESA Regional Director, in his concluding remarks, stressed the importance of team work. “To strengthen our program we must work together,” he said, urging the crop improvement team to continue to identify areas to work with the genomics team. He also emphasized on the need to strengthen crop-livestock work in the region. “We need to be clear on what our contribution is and what our competencies are.” He called on the ESA team to involve the socio-economics team in proposal development. “If we don’t incorporate the social research questions into our proposals then we won’t benefit from their expertise”, he concluded.

The ESA regional planning meeting was held in Harare, Zimbabwe, on 26-27 April.
New publications

Role of public-private partnerships in biopesticides and biofertilizers research and development for sustaining agriculture production

Authors: Gowda CLL, Sudini H and Gopalakrishnan S
Published: 2016. Pages 221-228 in Recent Trends in PGPR Research for Sustainable Crop Productivity. Scientific Publishers (India), Jodhpur, India. ISBN 978-81-7233-990-6

Abstract: This paper emphasizes the role of Public-Private-Partnerships (PPPs) in biopesticides and biofertilizers research towards attaining sustainability in agricultural production. The challenges faced by the smallholder farmers in Asia-Pacific region; the benefits of integrating modern and indigenous technologies and materials for increased food production are discussed in the paper. Particularly, the role of Plant Growth Promoting Rhizobacteria (PGPR) in sustainable agriculture production, their mechanisms of action in controlling plant diseases and promoting crop yields were highlighted. The role of Asian PGPR Society in building fruitful collaborations among scientific institutes, private enterprises, industries and academic institutions, and thus promoting PPPs in biopesticides and biofertilizers research are discussed. Lessons learnt from PPPs such as the Hybrid Parents Research Consortia (HPRC) model established by ICRISAT; and the Bioproducts Research Consortium (BRC) partnership with ICRISAT were elaborated. The future of PGPR research and the scope of PGPR as biofertilizers and biopesticides with commercial potential in AsiaPacific region are discussed. The role of Governments in forging PPPs in R&D for biofertilizers and biopesticides as in case of is emphasized. The future role of Asian PGPR Society in accelerating and revitalizing the existing PPPs and facilitating the future partnerships in biopesticides and biofertilizer sector are discussed.

http://oar.icrisat.org/9404/

Analysis of genetic variation in sorghum (Sorghum bicolor (L.) Moench) genotypes with various agronomical traits using SPAR methods

Authors: Satish L, Shilpa J, Pandian S, Rency AS, Rathinapriya P, Ceasar SA, Largia MJV, Ashok Kumar A and Ramesh M
Published: 2016. Gene, 576 (01 (3)): 581-585. ISSN 1879-0038

Abstract: Genetic variation among 45 genotypes of sorghum (Sorghum bicolor L.) representing seven subpopulations was assessed using three single primer amplification reaction (SPAR) methods viz., inter-simple sequence repeat (ISSR), random amplified polymorphic DNA (RAPD) and directed amplification of minisatellite-region DNA (DAMD). Totally 15 ISSR, 8 RAPD and 7 DAMD primers generated 263 amplification products, accounting for 84.6% polymorphism across all the genotypes. Assessment of population diversity indicated that the maximum intra population genetic diversity was recorded among high FeZn lines (HFL) having maximum values of Nei’s genetic diversity (h) (0.244), Shannon information index (I) (0.368) and the percentage of polymorphic loci (Pp) (72.65%) while the corresponding lowest values of 0.074, 0.109 and 17.95% respectively were observed among the members of MDT subpopulation. The mean coefficient of gene differentiation (GST) and the gene flow (Nm) between populations were observed to be 0.396 and 0.7680 respectively. The analysis of molecular variance (AMOVA) suggested that maximum genetic variation exists within populations (95%) than among populations (5%). Thus the information obtained from this study could be utilized in sorghum breeding programs for the development of varieties with improved nutrition and agronomic values in future.

http://oar.icrisat.org/9426/

Multi-scale vulnerability assessment for adaptation planning

Authors: Esteves T, Ravindranath D, Beddamatta S, Raju KV, Sharma J, Bala G and Murthy IK
Published: 2016. Current Science, 110 (07): 1225-1239. ISSN 0011-3891

Abstract: The study presents an approach to identify and prioritize the most vulnerable districts, villages and households in Karnataka State, through a multi-scale assessment of inherent vulnerability to current climate variability. It also identifies the drivers of inherent vulnerability, thereby providing a tool for developing and mainstreaming adaptation strategies, in ongoing developmental or dedicated adaptation programmes. The multi-scale assessment was made for all 30 districts of Karnataka, about 1,220 villages in Chikballapur district, and at the household level for two villages – Gundlapalli and Saddapalli – in Bagepalli taluk of Chikballapur district. At the district, village and household levels, low levels of education and skills are the dominant factors contributing to vulnerability. At village and household level, lack of income diversification and livelihood support institutions are key drivers of vulnerability. The approach of multi-scale vulnerability assessment facilitates identification and prioritization of drivers of vulnerability at different scales, to focus adaptation interventions to address these drivers.

http://oar.icrisat.org/9428/

Understanding and managing aflatoxin contamination in the groundnut value chain in Nigeria

Published: 2016. ICRISAT.

Abstract: This manual is conceived to support awareness raising campaigns of the groundnut value chain actors in and out of the States targeted for the implementation of the USAID funded Groundnut Technology Upscaling project in Nigeria. It is a fall-out of two capacity development
events of the project - Media Training and Training of Trainers Workshops organized by ICRISAT in Kano during the first six months of project implementation in Nigeria. In view of the focus of the groundnut technology upscaling project on ensuring that farmers produce and market groundnuts free of aflatoxins, the manual provides the general and specific information on aflatoxin contamination and its management at all stages of the groundnut value chain. Though considered to be a basic companion document for front-line officers of partner institutions of the groundnut technology project, it can also be used by other actors of the groundnut value chain. The manual is laid out in two parts; while part 1 provides general and specific information required for the understanding of aflatoxin, part 2 focuses on the management of aflatoxins at all stages of the groundnut value chain.

http://oar.icrisat.org/9430/

Promoting policy formulation at the state level in India

Authors: Raju KV and Ravindra A
Published: 2016. FPI’s Journal of Economics & Governance, 01 (01): 11-18. ISSN 2455-6483

Abstract: The process of policy formulation at the state level is critical to the success of various government programmes and schemes. The wide-ambit and criticality of the state-level development responsibilities is well-established but increasingly, states will have flexibility to use central funds for what they think is important. It is, therefore, imperative that the process of policy formulation at the state level is strengthened. Issues of public policy encompass more than one domain and involve a multiplicity of actors and considerations. Resolution of conflicts and interdepartmental coordination are important in arriving at major policy decisions.

http://oar.icrisat.org/9452/

Low permeability triple-layer plastic bags prevent losses of maize caused by insects in rural on-farm stores

Authors: Ng’ang’a J, Mutungi C, Imathiu SM and Affognon H
Published: 2016. Food Security. 01-13. ISSN 1876-4525

Abstract: Participatory on-farm trials were conducted to assess effectiveness of Purdue Improved Crop Storage (PICS™) bags for storage of maize in small-scale farmers’ stores in rural villages in eastern Kenya. A PICS bag is a three-layered hermetic bag-system that forms a barrier against the influx of oxygen and the escape of carbon dioxide. Jute, woven polypropylene or PICS bags were filled with shelled maize grain, purchased from the participating farmers, and the three sets of bags kept in the farmers’ own stores for 35 weeks. Oxygen and carbon dioxide levels in the PICS bags were monitored, as well as the temperature and relative humidity in all the bags. Grain moisture, live insect population, grain damage and weight loss were examined at intervals of seven weeks. Oxygen and carbon dioxide composition demonstrated that PICS bags are capable of sustaining good air-barrier properties under farmer storage conditions. Moreover, moisture content of maize stored in PICS bags did not change throughout the storage period whereas the moisture content of maize stored in polypropylene and jute bags decreased significantly in the final 14 weeks. Maize stored in PICS bags remained free from insect infestation and the weight loss due to insect damage was below 1%. On the contrary, polypropylene and jute bags permitted profuse build-up of insect populations. At 35 weeks, grain damage reached 77.6% and 82.3% corresponding to 41.2% and 48.5% weight loss in the polypropylene and jute bags respectively. These findings demonstrate that PICS bags are effective in controlling losses caused by storage pests under farmer storage conditions.

http://oar.icrisat.org/9431/

Soil and plant testing for iron: An appraisal

Authors: Sahrawat KL
Published: 2016. Communications in Soil Science and Plant Analysis, 47 (03): 280-283. ISSN 1532-2416

Abstract: This article presents an overview of the factors that influence soil and plant tissue testing results. It is clear that soil tests for Fe are dominantly influenced by soil pH, bicarbonate, and moisture regime rather soil test result per se. This is because the solubility of Iron (Fe) is more regulated by soil pH and moisture regime. Plant tissue testing for Fe can complement the results of soil testing for Fe. But at times, especially in calcareous soils, total Fe in plant tissue is not related to Fe deficiency, but metabolically active Fe is better at diagnosing the occurrence of the disorder. A combined use of soil and plant tissue testing seems more helpful in diagnosing Fe deficiency chlorosis disorder in crops.

http://oar.icrisat.org/9442/

Genetic dissection of seed-iron and zinc concentrations in chickpea

Authors: Upadhyaya HD, Bajaj D, Das S, Kumar V, Gowda CLL, Sharma S, Tyagi AK and Parida SK
Published: 2016. Scientific Reports, 06 (24050): 01-12. ISSN 2045-2322

Abstract: The SNP-based high-resolution QTL mapping mapped eight major genomic regions harbouring robust QTLs governing seed-iron (Fe) and zinc (Zn) concentrations (39.4% combined phenotypic variation explained/ PVE) on six chromosomes of an intra-specific high-density genetic linkage map (1.56 cM map-density). 24620 SNPs discovered from genome-wide GBS (genotyping-by-sequencing) and 13 known cloned Fe and Zn contents-related chickpea gene-orthologs were genotyped in a structured population of 92 sequenced desi and kabuli accessions. The large-scale 16591 SNP genotyping- and phenotyping-based GWAS (genome-wide association study) identified 16 genomic loci genes associated (29% combined PVE) with seed-Fe and Zn concentrations. Of these, 11 trait-associated SNPs in the genes linked tightly with eight
QTLs were validated by QTL mapping. The seed-specific expression, including pronounced differential-regulation of 16 trait-associated genes particularly in accessions/mapping individuals with contrasting level of seed-Fe and Zn contents was apparent. Collectively, the aforementioned rapid integrated genomic strategy led to delineate novel functional non-synonymous and regulatory SNP allelic-variants from 16 known/candidate genes, including three strong trait-associated genes (encoding late embryogenesis abundant and yellow stripe-like 1 protein, and vacuolar protein sorting-associated protein) and eight major QTLs regulating seed-Fe and Zn concentrations in chickpea. These essential inputs thus have potential to be deployed in marker-assisted genetic enhancement for developing nutritionally-rich Fe/Zn-biofortified chickpea cultivars.

http://oar.icrisat.org/9436/

Transcriptome-wide sequencing provides insights into geocarpy in peanut (Arachis hypogaea L.)


Published: 2016. Plant Biotechnology Journal, 14 (05): 1215-1224. ISSN 1647-7652

Abstract: A characteristic feature of groundnut (peanut) is the subterranean fructification, geocarpy, in which the gynophore (‘peg’), a specialized organ that transitions from upward growth habit to downward outgrowth upon fertilization, drives the developing pod into the soil for subsequent development underground. As a step towards understanding this phenomenon, we explore the developmental dynamics of the peanut pod transcriptome at 11 successive stages. We identified 110 217 transcripts across developmental stages and quantified their abundance along a pod developmental gradient in pod wall. We found that the majority of transcripts were differentially expressed along the developmental gradient as well as identified temporal programs of gene expression, including hundreds of transcription factors. Thought to be an adaptation to particularly harsh subterranean environments, both up- and down-regulated gene sets in pod wall were enriched for response to a broad array of stimuli, like gravity, light and subterranean environmental factors. We also identified hundreds of transcripts associated with gravitropism and photomorphogenesis, which may be involved in the geocarpy. Collectively, this study forms a transcriptional baseline for geocarpy in peanut as well as provides a considerable body of evidence that transcriptional regulation in peanut aerial and subterranean fruits is complex.

http://oar.icrisat.org/9438/

Characterization of potential probiotic bacteria isolated from sorghum and pearl millet of the semi-arid tropics

Authors: Kunchala R, Banerjee R, Mazumdar SD, Durgalla P, Srinivas V and Gopalakrishnan S


Abstract: The present study was conducted to isolate and characterize probiotic properties of bacteria isolated from flour and batter samples of sorghum and pearl millet. A total of five different selective media including plate count agar, yeast glucose chloramphenicol agar, Bifidobacterium agar, actinomycetes isolation agar and de ManRogosa and Sharpe agar were used and the most prominent bacteria (which were found abundantly in the plate) were isolated and maintained on the respective media slants at 4°C for further studies. The bacteria were characterized for various traits including Gram staining, morphology (color, size, shape, elevation, margin, form and surface), biochemical (urease, catalase, oxidase, hydrogen sulphide, nitrogen reduction, gelatin liquefaction, starch hydrolysis and carbohydrate utilization), IMViC tests (indole, methyl red, Voges Proskauer and citrate utilization), probiotic potentials [acid (pH 2, 3), bile (0.5%), NaCl (6 and 9%)], phenol tolerance [0.4%], antibiotic tolerance (tetracycline, streptomycin, kanamycin, chloramphenicol, ciprofloxacin, ampicillin, penicillin, erythromycin and vancomycin) and antimicrobial activity against human pathogens (Escherichia coli, Staphylococcus aureus and Salmonella typhi). A total of nine probiotic bacterial isolates were short listed based on these traits. The sequences of 16s rDNA gene of the nine isolates were found matched with Bacillus subtilis (two isolates), Bacillus cereus (three isolates), Bacillus pumilus (one isolate), Bacillus amyoliquefaciens (one isolate), Sphingobacterium thalipophilum (one isolate) and Brevibacterium sp. (one isolate) in BLAST analysis. The sequences of the nine bacteria were submitted to NCBI and accession numbers obtained. This study indicated that the selected bacteria could be exploited to develop new probiotic foods.

http://oar.icrisat.org/9432/

Call for Abstracts

The 1st International Agrobiodiversity Congress will be held on 6-9 November 2016, at New Delhi, India. Abstracts are currently accepted.

A satellite session on “Agrobiodiversity for Nutrition and Health”, is being organized on 7 November, and abstracts for two thematic areas are invited;

- Agrobiodiversity health and nutrition state of the art new knowledge
- Mainstreaming ABD into program and policies to improve food, nutrition and health.

Deadline: 31 May 2016

For more information and to submit abstracts online: www.iac2016.in
ICRISAT Vacancies

Dynamic and motivated aspirants - Join us in improving the lives of smallholder farmers in the semi-arid tropics.

Senior Scientist – Digital Agriculture

The incumbent will lead the theme, Digital Agriculture and report to the Research Program Director, Innovation Systems in the Drylands.

Position: Internationally Recruited Staff (IRS).
Location: ICRISAT headquarters, India
Deadline: 20 May 2016

Scientist – Digital Agriculture

The incumbent will be part of the Digital Agriculture team and report to the theme leader under the global research program, Innovation Systems in the Drylands.

Position: Scientific and Managerial Group staff (SMG).
Location: ICRISAT headquarters, India
Deadline: 12 May 2016

Scientist – Cereals Improvement

The incumbent will work on sorghum and millets improvement in a multi-disciplinary team comprising both biological and social scientists. S/he will report administratively to the Country Representative and technically to the Research Program Director-Eastern and Southern Africa.

Position: Internationally Recruited Staff (IRS).
Location: ICRISAT station in Bulawayo, Zimbabwe.
Deadline: 20 May 2016

All positions are for an initial period of 3 years and renewable depending on performance.

Applications should have a letter of motivation, latest curriculum vitae, and the names and contact information of three references that are knowledgeable about your professional qualifications and work experience.

All applications will be acknowledged, however only short listed candidates will be contacted.

ICRISAT is an equal opportunity employer and is especially interested in increasing the participation of women on its staff. ICRISAT has a flexible approach to international appointments and welcomes dual-career couples.

For further details and online application visit: http://www.icrisat.org/careers/