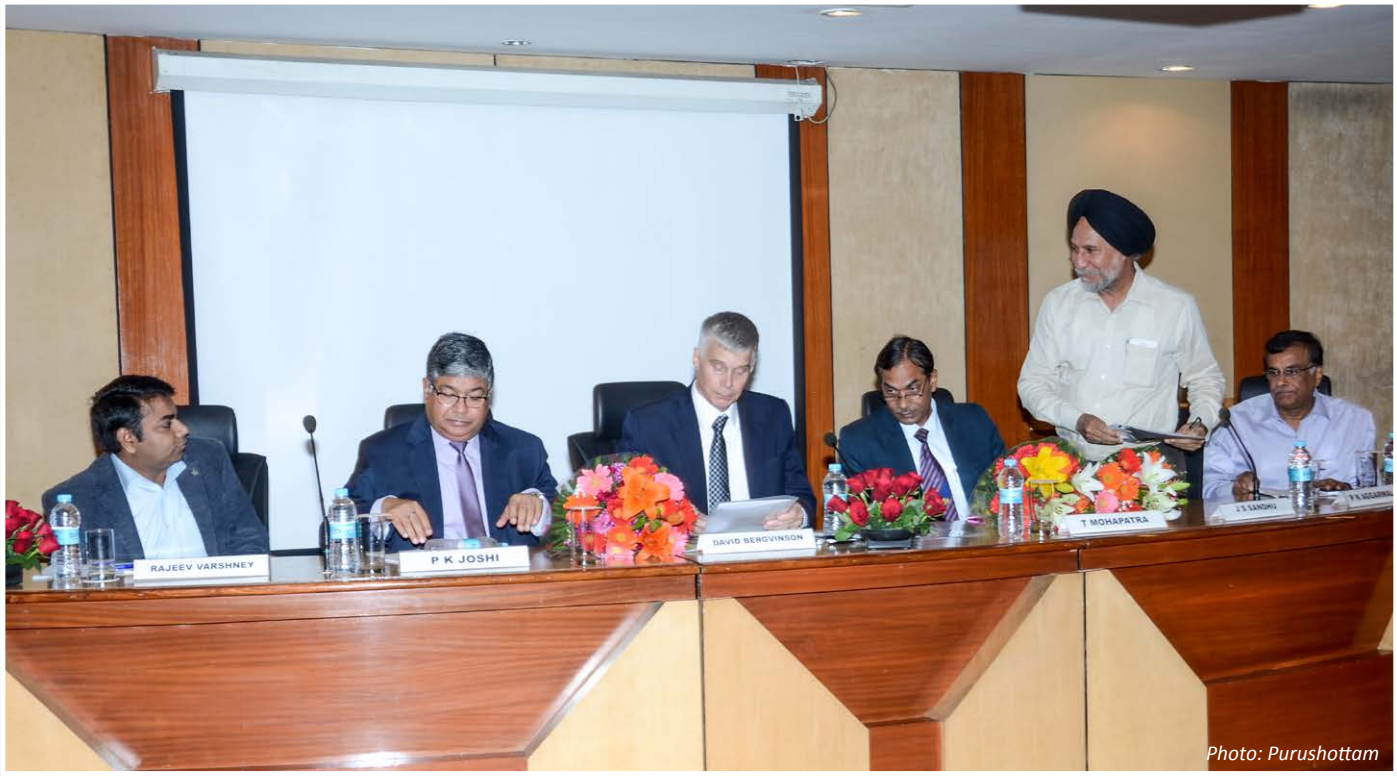
ICRISAT
Happenings
Newsletter

24 March 2016
No. 1720



Panel members on the dais (L to R) Dr Varshney, Dr Joshi, Dr Bergvinson, Dr Mohapatra, Dr Sandhu, and Dr Aggarwal.

Achieving greater impact by aligning with national priorities

With the objective of achieving greater impact at scale, CGIAR centers and the Indian government agreed to draw up a framework to identify gaps and opportunities that would align the work of centers and national partners with national priorities.

At the recent India Country Integration Consultation, centers also confirmed the need for a sustained mechanism to allow the sharing of research sites, facilities, technology and knowledge as well as developing joint proposals by the centers and CGIAR Research Programs (CRPs).

This is part of the global CGIAR effort to align its mission with national priorities which will allow the CGIAR centers to deliver value for money and put the research programs in a better position to serve the needs of farmers and make food systems sustainable. The challenge will be the integration of CRPs, commodity-based programs and cross-cutting platforms.

"The Indian Prime Minister has called for the doubling of income of smallholder farmers by 2022 or before. This can only be achieved if we work in concert towards improving the lives of smallholder farmers. All of us must come together to offer integrated solutions that are sustainable and equitable to improve the nutritional status of all consumers and to improve the welfare of farmer families," said Dr David Bergvinson, Director General, ICRISAT. He said there is a real urgency to bring all partners together to achieve the Sustainable Development Goals.

Dr T Mohapatra, Director General, Indian Council for Agricultural Research (ICAR), emphasized the importance of convergence to be successful in alleviating poverty in the country. "In certain areas we are suffering and unable to make headway. We need to identify what can be done together, in a time-bound manner by defining our roles and responsibilities clearly," he said.

Some of the areas he identified for action and where all CGIAR centers can contribute:

- Breaking the yield barrier in pulses;
- Using big data and genomics for crop improvement especially in the dryland areas;
- Improving water use efficiency;

to page 2...

Achieving greater impact..... from page 1

Participants in a group discussion.

Participants at the consultation.

- Developing heat tolerant varieties for the Gangetic plains, and
- Defining ways and means for assessing the impact of technologies, especially natural resource management technologies, in order to justify investments in agricultural research.

Breakaway groups discussed the individual CRPs and possible solutions to bridge the research gap areas; research priorities at the state level; and mechanisms for research collaboration in states.

There were five objectives set for the consultation:

- Review the current CGIAR research in India.
- Project the plans for Phase 2 of CRPs.
- Seek inputs from all partners in India for the evolving CRP global research plans.
- Develop a roadmap for different research portfolios and submit a consolidated feedback to CRP Directors and CGIAR centers.
- Commit to ongoing consultations with partners.

The India Country Integration Consultation was held in New Delhi, India, on 22 March and was attended by about 90 people including Dr JS Sandhu, Deputy Director General, Crop Sciences, ICAR, Dr PK Joshi, Director South Asia, International Food Policy Research Institute (IFPRI), Dr PK Aggarwal, Regional Program Director CRP on Climate Change, Agriculture and Food Security, along with other senior leaders of research centers, government and non-government partners.

In a follow up to the one-day consultation, a steering committee of the heads of the CGIAR centers in India met on 23 March and put forward a number of suggestions on ways to move forward. These included:

- Develop a mechanism to increase and deepen engagement with state governments in a joint manner.
- Develop joint proposals. Karnataka being a good model to emulate in other states.
- Identify broad areas based on national priorities – pulses, rice fallow, increase water efficiency, climate change, agricultural insurance. Draw up plans for scaling up and out.

These ideas can be developed further and then discussed with the government. ■

NASI-Scopus Young Scientist Awards 2016 – Nominations invited

National Academy of Sciences India (NASI) and Elsevier announce the NASI-Scopus Young Scientist Awards 2016. This year's awards will be given in the following areas - agriculture, biological sciences, physics, chemistry, engineering, mathematics, medicine, social sciences, earth sciences, oceanography and environmental sciences.

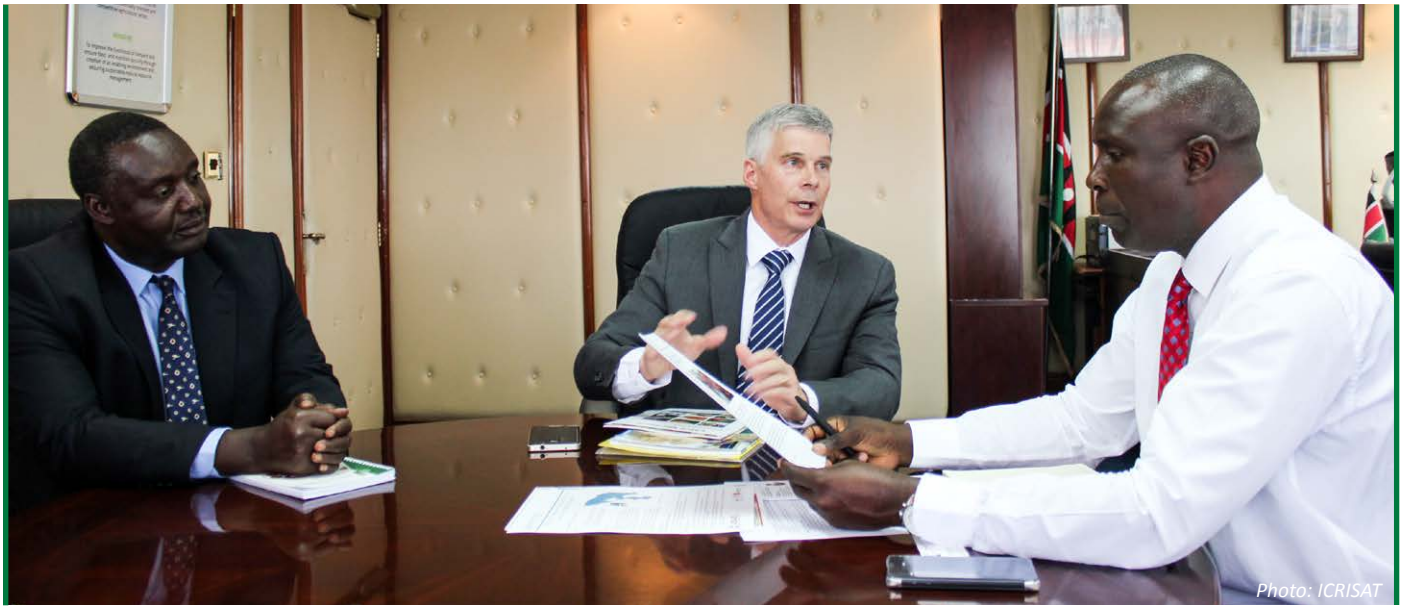
Over the years, the NASI-Scopus Scientist Awards has established itself as one of the premier awards amongst the Indian scientific fraternity and witnessed increasing number of quality applications from several academic and research institutions across the country. To date, 83 young scientists have been recipients of this award, for their outstanding research contribution in their early career.

Eligibility: Indian citizen, residing and working in India; completed at least PhD/MD or equivalent; born on or after 1 January 1976.

The last date for physical receipt of the application is 30 April 2016.

For further information: http://southasia.elsevier.com/ ■

Strengthening ties with Kenya



Mr Bett (R) in discussion with Dr Bergvinson and Dr Siambi (L).

The common interests of the Kenyan government and ICRISAT in improving the nutrition and income of smallholder farmers, involving youth in agriculture, use of information technology and involving private sector in agriculture were explored in a recent meeting between Mr Willy Bett, Cabinet Secretary, Kenya Ministry of Agriculture, Livestock and Fisheries and Dr David Bergvinson, Director General, ICRISAT.

ICRISAT's focus on improving nutrition is aligned with the 'Beyond Zero' initiative, spearheaded by the First Lady of Kenya, Her Excellency Margaret Kenyatta. "We see tremendous alignment between the First Lady's initiative and what ICRISAT does, around what we call Smart Food – sorghum, millets and legumes. We are very focused on creating awareness on nutritional diversity of these crops and promoting their utilization and consumption, so as to increase the nutritional status of both the rural and urban population in the country," said Dr Bergvinson. The Beyond Zero initiative aims at creating awareness and raising funds to tackle issues that affect maternal and child health in Kenya.

"We are calling them high value crops," said Mr Bett, referring to the drought-tolerant crops. "The Ministry of Agriculture is also trying to promote these crops now because for a long time they have been referred to as orphan crops and we have now changed the name to high value crops. They are critical food crops that can eradicate hunger and poverty in our country," he added.

Dr Bergvinson gave the example of finger millet which has three time more calcium than milk. "It is one of the most important cereals we have on this planet. It's especially important for young women in their childbearing years and for children in their first 1,000 days of life to have appropriate nutrition," he said. Farmers from Siaya county for instance, under an ICRISAT project, now grow finger millet instead of maize, earning three times more, thanks to an early maturing variety (80 days to maturity instead of 120 days).

"I think if we could come up with a combined strategy then we will be able to convince Kenyans that this is the way to go," said Mr Bett.

Highlighting the Smart Food initiative under the Feed the Future Kenya: Accelerated Value Chain Development (AVCD) Program, Dr Bergvinson said, "Our work is structured around the entire value chain – from creating economic opportunity for farmers to improving nutrition of consumers."

Mr Bett agreed with Dr Bergvinson that introducing processing is the key to market development for these crops. "We need to promote value addition in order to attract urban consumers," Mr Bett asserted.

Currently, under the Feed the Future Kenya: AVCD Program, ICRISAT is working to boost food and nutrition security of 110,000 farmers in Busia, Elgeyo Marakwet, Kitui, Makueni and Tharaka Nithi counties, as well as raising their incomes by 25%. The project seeks to increase yields of sorghum, finger millet, pearl millet, pigeonpea and groundnut and reduce post-harvest losses by 30%. The project is seeking to partner with the Kenyan government to raise awareness about the nutritional value of sorghum and millets, in a bid to raise the nutritional status of women and children in the country.

The meeting concluded with a resolution to develop a joint strategy for the Smart Food - nutrition behavior change initiative.

ICRISAT has been associated with Kenya since 1981 with the Semi-Arid Food Grain Research and Development Program, largely funded by the United States Agency for International Development. ICRISAT's office in Kenya is the regional hub for Eastern and Southern Africa overseeing other offices in Ethiopia, Zimbabwe, Malawi and Mozambique. ■

New publications

Use of sorghum on stepwise substitution of maize in broiler feeds in Niger

Authors: Issa S, Jarial S, Brah N, Harouna L and Soumana L

Published: 2015. Livestock Research for Rural Development, 27 (10) pp: 1-6. ISSN 0121-3784

Abstract: With an objective to demonstrate the merits of diets based on locally produced non-tannin sorghums as against maize a total of 240, one day-old broiler chicks (Early bird strain) were randomly allocated to 20 pens (12 birds per pen) with four pens per treatment and five treatments, at the Maradi Government poultry farm in Niger for a period of 12 weeks. The treatment diets were: i) maize, ii) 75% maize+25% sorghum, iii) 50% maize+50% sorghum, iv) 25% maize + 75% sorghum, and v) sorghum. Birds consumed water and feed on an ad-libitum basis with body weights recorded on day 0, 21, and 49. At the end of the experiment, 5 birds per pen were randomly chosen and slaughtered for carcass analysis. All growth and carcass data were analyzed as a randomized complete block design using the Proc Mixed procedure of R. Live weight was used as a covariate during carcass data analysis. Bodyweight means of 41g at d-0 and 1419g at d-49 were similar (P = 0.17) for birds fed on all five treatments. Mean Gain/Feed (G/F) ratios were similar with a mean of 540 g/kg to d-49. Birds fed maize, sorghum or maize-sorghum diets had similar growth performance and carcass characteristics. Thus, tannin free sorghum had nutritional value comparable to that of maize, and in West Africa local sorghum is a good alternative for poultry feeds when grain prices are similar.

http://oar.icrisat.org/9315/

Maize productivity and profitability in Conservation Agriculture systems across agro-ecological regions in Zimbabwe: A review of knowledge and practice.

Authors: Mafongoya P, Rusinamhodzi L, Siziba S, Thierfelder C, Mvumi BM, Nhau B, Hove L and Chivenge P

Published: 2016. Agriculture, Ecosystems and Environment, 220 pp: 211-225. ISSN 0167-8809

Abstract: Conservation Agriculture (CA) is increasingly promoted in southern Africa as a strategy to improve food security and reverse soil degradation in the face of climate change. However, the performance of CA under different environments and its ability to improve ecosystem services is still unclear. The effects of the CA options; direct seeding, rip-line seeding, and seeding into planting basins on maize grain yield, soil health and profitability across agro-ecological regions in Zimbabwe were evaluated through a review of literature in combination with meta-analysis. Overall, CA improved maize yield over conventional agriculture. Compared to conventional agriculture, direct seeding, rip-line seeding, and seeding into planting basins increased yield by 445, 258 and 241 kg ha^{-1}, respectively. However, there was an initial yield decline in the first two years. CA practices reduced soil erosion and bulk density, and increased soil water content in most studies. Under high levels of residue retention (6 mg ha^{-1}), CA systems exhibited greater macro fauna abundance and diversity than conventional agriculture, particularly termites. Weed pressure tended to increase labor requirement for hand-hoe weeding under CA compared to conventional agriculture. However, the use of herbicides reduced weeding labor demand during the early season. The benefits of CA are tied to the farmers' management intensity including: time of planting, weeding, fertilizer and herbicide application, and adequate training on equipment use. Economic analysis results showed that on average, a farmer incurs losses for switching from conventional agriculture to CA in the main maize growing regions of Zimbabwe. Based on the six seasons' data, the losses were least with the ripper in drier areas and worst with the direct seeder in wetter areas. Incorporation of chemical herbicides worsens the economic returns of CA tillage options in all the agro-ecological zones. Overall, the study showed that the rip-line seeding is more attractive in the drier areas than direct seeding. Although not costed in this study, critical is the cumulative reversal of soil degradation associated with consistent CA practice which can sustain agriculture. Results from this review suggest that the benefits of CA depend largely on the type and context of CA being practised. It is thus imperative to profile the technology, the farmer socio-economic circumstances and the bio-physical environment in which the farmer operates for proper geographical and beneficiary targeting to achieve greater impact. More longer-term studies are required to fully elucidate the benefits and context of CA options and practice.

http://oar.icrisat.org/9313/

Whole genome re-sequencing reveals genome-wide variations among parental lines of 16 mapping populations in chickpea (*Cicer arietinum L.*).

Authors: Thudi M, Khan AW, Kumar V, Gaur PM, Katta K, Garg V, Roorkiwal M, Samineni S and Varshney RK

Published: 2016. BMC Plant Biology, 16 (10) pp: 53-64. ISSN 1471-2229

Abstract: Background: Chickpea (*Cicer arietinum* L.) is the second most important grain legume cultivated by resource poor farmers in South Asia and Sub-Saharan Africa. In order to harness the untapped genetic potential available for chickpea improvement, we re-sequenced 35 chickpea genotypes representing parental lines of 16 mapping populations segregating for abiotic (drought, heat, salinity), biotic stresses (Fusarium wilt, Ascochyta blight, Botrytis grey mold, Helicoverpa armigera) and nutritionally important (protein content) traits using whole genome re-sequencing approach. Results: A total of 192.19 Gb data, generated on 35 genotypes of chickpea, comprising 973.13 million reads, with an average sequencing depth of ~10 X for each line. On an average 92.18% reads from each genotype were aligned to the

chickpea reference genome with 82.17% coverage. A total of 2,058,566 unique single nucleotide polymorphisms (SNPs) and 292,588 Indels were detected while comparing with the reference chickpea genome. Highest number of SNPs were identified on the Ca4 pseudomolecule. In addition, copy number variations (CNVs) such as gene deletions and duplications were identified across the chickpea parental genotypes, which were minimum in PI 489777 (1 gene deletion) and maximum in JG 74 (1,497). A total of 164,856 line specific variations (144,888 SNPs and 19,968 Indels) with the highest percentage were identified in coding regions in ICC 1496 (21 %) followed by ICCV 97105 (12 %). Of 539 miscellaneous variations, 339, 138 and 62 were inter-chromosomal variations (CTX), intrachromosomal variations (ITX) and inversions (INV) respectively. Conclusion: Genome-wide SNPs, Indels, CNVs, PAVs, and miscellaneous variations identified in different mapping populations are a valuable resource in genetic research and helpful in locating genes/genomic segments responsible for economically important traits. Further, the genome-wide variations identified in the present study can be used for developing high density SNP arrays for genetics and breeding applications.

http://oar.icrisat.org/9311/

Annotation of trait loci on integrated genetic maps of arachis species.

Authors: Guo B, Khera P, Wang H, Peng Z, Sudini H, Wang X, Osiru M, Chen J, Vadez V, Yuan M, Wang CT, Zhang X, Waliyar F, Wang J and Varshney RK

Published: 2016 Pages 163-207. in Peanuts: Genetics, Processing, and Utilization. Academic Press and AOCS Press, ISBN 978-1630670382

Abstract: Yield of peanut under stressed environments is an ultimate goal of improvement for enhanced production as it is usually susceptible to a range of abiotic and biotic stresses, such as drought, tomato spotted wilt virus (TSWV), early leaf spot (ELS) and late leaf spot (LLS), nematodes, rust, and aflatoxin contamination (Guo et al., 2012a). However, cultivated peanut is an allotetraploid (2n=4x=40) with a large genome, which greatly complicates interpretation of genomic data compared with the diploid wild relatives (2n=2x=20) (Guo et al., 2013). It is difficult to transfer alleles from wild species to cultivated peanuts (Simpson 1991). For the last ten years, extensive efforts in the area of peanut genomics have resulted in a large number of genetic and genomic resources such as mapping populations, expressed sequence tags (ESTs), a wide range of molecular markers, transcriptome and proteomics (Guo et al. 2013; Katam et al, 2014; Varshney et al., 2013). These genetic and genomic resources have been successfully used to construct genetic maps, to identify quantitative trait loci (QTLs) of traits of interest, and to conduct marker-assisted selection and association mapping for peanut improvement (Pandey et al. 2014a).

http://oar.icrisat.org/9326/

Soil information system: Web-based solution for agricultural land-use planning

Authors: Bhattacharyya T, Wani SP, Chandran P, Tiwary P, Pal DK, Sahrawat KL and Velayutham M

Published: 2016. Current Science, 110 (2) pp: 241-245. ISSN 0011-3891

Abstract: The soil-forming factors, especially climate, vegetation and topography, act on a range of rock formations and parent materials leading to the development of different kinds of soils. Through concerted efforts, soil datasets generated earlier are used to develop maps and soil information systems at different scales. Progress in basic and fundamental research on the formation of Indian soils has helped in developing the soil information system.

http://oar.icrisat.org/9314/

Identification and validation of reference genes and their impact on normalized gene expression studies across cultivated and wild cicer species

Authors: Reddy DS, Bhatnagar-Mathur P, Reddy PS, Cindhuri KS, Ganesh AS and Sharma KK

Published: 2016. PLoS ONE, 11 (02). 01-19. ISSN 1932-6203

Abstract: Quantitative Real-Time PCR (qPCR) is a preferred and reliable method for accurate quantification of gene expression to understand precise gene functions. A total of 25 candidate reference genes including traditional and new generation reference genes were selected and evaluated in a diverse set of chickpea samples. The samples used in this study included nine chickpea genotypes (Cicer spp.) comprising of cultivated and wild species, six abiotic stress treatments (drought, salinity, high vapor pressure deficit, abscisic acid, cold and heat shock), and five diverse tissues (leaf, root, flower, seedlings and seed). The geNorm, NormFinder and RefFinder algorithms used to identify stably expressed genes in four sample sets revealed stable expression of UCP and G6PD genes across genotypes, while TIP41 and CAC were highly stable under abiotic stress conditions. While PP2A and ABCT genes were ranked as best for different tissues, ABCT, UCP and CAC were most stable across all samples. This study demonstrated the usefulness of new generation reference genes for more accurate qPCR based gene expression quantification in cultivated as well as wild chickpea species. Validation of the best reference genes was carried out by studying their impact on normalization of aquaporin genes PIP1;4 and TIP3;1, in three contrasting chickpea genotypes under high vapor pressure deficit (VPD) treatment. The chickpea TIP3;1 gene got significantly up regulated under high VPD conditions with higher relative expression in the drought susceptible genotype, confirming the suitability of the selected reference genes for expression analysis. This is the first comprehensive study on the stability of the new generation reference genes for qPCR studies in chickpea across species, different tissues and abiotic stresses.

http://oar.icrisat.org/9325/

Reader's comment

The biggest challenge the globe is going to face is how to attract and hold respectfully the young generation in farming. India is already facing a serious challenge in this context and many farm families across the country are facing the problem of old age home. This issue needs a global debate, since the problem is increasing year after year. According to 2010-11 census the extent of migration in India is 50%. While in China it is 90%. One thing is certain, unless we make farming a profitable and respectable profession, it is difficult to hold the farm youth in farming.

Incidentally, I was the chairman of ARYA (Attracting and Retaining of Youth in Agriculture), a Committee constituted by ICAR during 2012 to develop a comprehensive proposal to attract and retain youth in farming. The council accepted the report and the model is being implemented during 2015-16 in 25 states on a pilot project basis. Nevertheless, the problem is more severe in countries in semi-arid tropics.

I congratulate you for having raised the issue and look forward to some meaningful deliberations to find lasting solution to this emerging problem and for latest updates.

Prof K Narayana Gowda
Former Vice Chancellor, Univ of Agri Sciences, Bangalore

Farewell

The following staff members are retiring on 31 March.

Mr S Manikyulu, Senior Associate (Communications), Asia Program, after serving ICRISAT for over 27 years.

Mr J Narsimloo, Senior Farm and Engineering Associate (Farm Operations), Asia Program, after serving ICRISAT for over 35 years.

Mr Mohd Khan, Senior Farm and Engineering Associate (FMO), Asia Program, after serving ICRISAT for over 39 years.

Mr P Anthi Reddy, Technical Officer, Asia Program, after serving ICRISAT for over 31 years.

Team ICRISAT wishes them all success in their future endeavors.