Team ICRISAT is Outstanding

A Compendium of Speeches and Presentations by William D Dar January-December 2007

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Contents

Speeches

Biographical Sketch

William D Dar, PhD, is 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 a non-profit, non-political and pro-poor institute and a member of the Alliance of Centers supported by the Consultative Group on International Agricultural Research (CGIAR).

Dr Dar holds the distinction of being the first Filipino and Asian to be Director General of ICRISAT and Chair of the Alliance Executive of the Alliance of Centers in 2005, a collegial body that facilitates collective action among the fifteen (15) CGIAR Centers. He was recently elected Chair of the Committee on Science and Technology (CST) of the United Nations Convention to Combat Desertification (UNCCD). Dr Dar was Member of the UN Millennium Task Force on Hunger.

Prior to joining ICRISAT, he served as Presidential Adviser for Rural Development, and Secretary of Agriculture in the Philippines (equivalent to Minister of Agriculture), the first ever alumnus of the University of the Philippines Los Baños (UPLB) to become one. Before this, he was Executive Director of the Philippine Council for Agriculture, Forestry, and Natural Resources Research and Development (PCARRD) and Director of the Bureau of Agricultural Research (BAR) of the Philippine Department of Agriculture (DA).

Dr Dar also served on the governing boards of the Australian Center for International Agricultural Research (ACIAR) and the CGIAR's International Maize and Wheat Improvement Center (CIMMYT) as well as of ICRISAT. Moreover, he was Chair of the Asia-Pacific Association of Agricultural Research Institutions (APAARI) and the Coarse Grains, Pulses Research and Training (CGPRT) Center based in Indonesia.

Dr Dar received a Doctor of Philosophy (PhD) in Horticulture from the University of the Philippines Los Baños and an MS (Agronomy) and BS in Agricultural Education from Benguet State University (BSU) in La Trinidad, Benguet, Philippines. He taught at BSU for 11 years and rose from the ranks to become full Professor and Vice President for Research and Extension.

He has received a number of awards and honors, including the Ten Outstanding Young Men (TOYM) of the Philippines, Outstanding Young Scientist of the Year, Crop Science Society of the Philippines Achievement Award for Research Management and Outstanding Science Administrator given by the Philippines Department of Science and Technology. He was also awarded as Distinguished Alumnus of UPLB and the Most Outstanding Alumnus of BSU and the Ilocos Sur Polytechnic State College (ISPSC). In November 2002, PCARRD honored him with its highest and most prestigious award, the Symbol of Excellence in R&D Management.

In November 2007, The Benguet State University conferred the honorary degree of Doctor of Resource Management on Dr Dar. Earlier in April 2003, he was conferred the honorary degree of Doctor of Science by the Mariano Marcos State University (MMSU) in Batac, Ilocos Norte, Philippines.

In October 2003, the Vietnamese Government honored him with the "For the Sake of Agriculture and Rural Development in Vietnam Award" while the Philippine Bureau of Agricultural Research awarded him with a Plaque of Recognition for his outstanding performance as its First Director. He is also the recipient of the "Anahaw Leaf Award" for being the Most Outstanding Alumnus of the Ilocos Sur Polytechnic State College High School Class of '69.

In April 2004, the Central Luzon State University in the Philippines awarded him the Golden Grain Award, commending him for his "deep concern and intense advocacy for the promotion of a global yet equitable program for food security and reduction of poverty through pioneering scientific and technological innovations".

In the same year (2004), he was given the Research Leadership Excellence Award, the most prestigious award of the Philippine Association of Research Managers (PhilARM). In 2005, he was given a plaque of recognition by the Philippine Department of Agriculture for his outstanding contributions when he was

Secretary of Agriculture. In 2006, he was awarded the "KALSA: The Most Distinguished Alumnus Award" by the Benguet State University in recognition of his being the first Filipino and Asian to serve ICRISAT and for the heights he has reached in the management of research and agricultural resources, through Science with a human face. Recently, the Professional Regulation Commission (PRC) of the Philippine Government awarded him the 2007 Outstanding Professional of the Year Award in the field of Agriculture for displaying professional excellence in both private and public practice in the Philippines and abroad and for his noble advocacy of promoting a global yet equitable program of food security in Asia and Sub-Saharan Africa (SSA).

With his outstanding leadership as Chair of the Alliance Executive (2005), the Alliance of Centers was made the third pillar of the CGIAR system.

Since leading ICRISAT, Dr Dar has intensively advocated a *Grey to Green Revolution* in the dry tropics of Asia and SSA through Science with a human face. Towards this, he spurred the development of a new vision, mission and strategy for the Institute. In pursuing it, he has strengthened strategic partnerships with an array of stakeholders – NARS, ARIs, NGOs, development agencies and the private sector. These initiatives led to a stronger ICRISAT working for a food-secure SAT.

In 2004, ICRISAT led by Dr Dar, won for the fourth time the King Baudouin Award (the most prestigious in the CGIAR) together with CIMMYT, IRRI, IWMI and other national systems in the CIMMYT-led Rice-Wheat Consortium for the Indo-Gangetic Plains. Earlier in 2002, again under his leadership, the Institute together with ICARDA had bagged the award for developing new chickpea varieties with higher tolerance to drought and heat, greater resistance to pests and diseases that provide stable and profitable yields. ICRISAT is the only CGIAR Center to have bagged this award four times.

In 2003, ICRISAT underwent two external reviews from the CGIAR, acknowledging outstanding science quality and sound and excellent management under Dr Dar. These reviews gave the impetus for ICRISAT to carve out a new strategy for its transformation and renewal as a premier center of scientific excellence for the people of the dry tropics in the 21st century. In

the same year, ICRISAT stood second among the 15 CGIAR Centers in terms of financial health indicators developed by the World Bank. Dr Dar's astute and decisive leadership was repeatedly manifest in the Institute's surplus budgets in the years 2000, 2003, 2004, 2005 and 2006.

There were more research outputs and impacts created by the Institute during the last seven years as well, both in Asia and sub-Saharan Africa. The turnaround for the Institute was possible because of his effective and human-oriented management, big-picture decisions and innovations and the positive attitude and high morale he infused in the staff. As a demonstration of the strong faith in his outstanding leadership in turning ICRISAT around, the Governing Board awarded Dr Dar a new five-year term starting January 2005. In 2006, he led the whole Institute in the formulation of the new ICRISAT Vision and Strategy to 2015, a road map to empowering the poor in the drylands.

Dr Dar's transformational leadership has turned ICRISAT into a forward looking institution, which is now ranked 'Outstanding' among the CGIAR Centers. A man on a mission and a champion of the poor, 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 drylands of Asia and SSA.

Foreword

I am a member of the Indian Administrative Service from 1970 and am generally based in Andhra Pradesh. In the past decades, I had several occasions to interact with the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), first as an outsider and for the past year and a half, as a Member of the Board of this institution. Earlier, I had occasion to notice with considerable dismay, certain managerial and cultural traits in ICRISAT, which were wholly unacceptable and even offensive. But that was in the past.

Under the able leadership of Dr William Dar, and in large measure due to his relentless efforts, ICRISAT has grown into an organization which the international community can be proud of. The team spirit, the determination and the sheer quality of the research which this institution has now been recognized for, augurs well for the future. It is undoubtedly Dr William Dar's initiatives which have brought out such a welcome change in the institute.

When I first joined the Board, I was struck by the fact that the focus of the Board and its research programmes were largely to address the concerns of CGIAR rather than the concerns of those directly engaged in the semi-arid tropics.

As Member of the Board, it is my opinion that such an approach was prescriptive rather than participatory. The world of tomorrow which all of us are striving to build in our own humble ways, will surely be an inclusive world. The development of a constant evolutionary mode of learning in order to produce global public goods of particular significance to the semi-arid tropics, will need such inclusive approaches and that is what Dr William Dar has so richly enabled.

Whether the focus is on finding lasting solutions to the pervasive effects of climate change threatening to turn livelihoods topsy-turvy or the issue of desertification that ICRISAT is actively leading with Director General William Dar as Chair of the Committee on Science and Technology (CST) of the United Nations Convention to Combat Desertification (UNCCD), there is a sense of urgency and dedication that permeates the institute.

I can say that ICRISAT's achievements are the result of the combined efforts of each individual anchored on the firm foundation of teamwork and a strong, servant leadership, all striving towards reducing rural poverty, hunger and land degradation.

"Team ICRISAT is Outstanding", a compendium of speeches by Director General William Dar, reflects the true spirit of teamwork that makes ICRISAT truly remarkable and is a tribute to team ICRISAT.

Government of Andhra Pradesh

Investing in the Fuel of the Future

Honorable Arthur C Yap, Secretary, Department of Agriculture, colleagues from the industry, investors and scientists, good morning.

I am honored to be here today to share with you our experience and expertise in the production of ethanol using one of our mandate crops, specifically sweet sorghum.

The International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) is a nonprofit, nonpolitical organization that

Welcome address, Technology-Investment Forum on Sweet Sorghum for Ethanol Production, 19 January 2007, Bureau of Soils and Water Management, Diliman, Quezon City, the Philippines.

does innovative agricultural research and capacity building for sustainable development in partnership with an array of stakeholders across the globe. Our mission is to reduce poverty, enhance food and nutritional security and protect the environment of the semi-arid tropics (SAT) by helping empower the poor through *Science with a human face*. We have charted the path in achieving this mission by mobilizing cutting-edge science and institutional innovations to enhance production systems in Asia and Sub-Saharan Africa (SSA).

Towards this end, ICRISAT has joined the effort in finding alternative sources of renewable energy that greatly benefit countries highly dependent on oil-based energy yet rich in resources for minimizing such dependency. ICRISAT has been successful in such a venture with sweet sorghum. Apart from meeting the food, feed and fodder needs of poor dryland farmers, sweet sorghum can be used to produce ethanol – the world's largest fuel additive.

Ethanol is becoming increasingly attractive to oil-importing countries like India, China and the Philippines. In India, ICRISAT's host country, bioethanol is produced from molasses, which is left over from refined sugar. However, the supply of molasses is insufficient and not reliable for the adequate production of ethanol. Hence, we have explored the potential of sweet sorghum to help fill the supply gap in ethanol.

Sweet varieties of sorghum contain large quantities of energy in the form of sugar in their stalks, while at the same time producing reasonable grain yield. As a dryland crop, sweet sorghum matures earlier and requires nine times less water than sugarcane, making it more accessible to the poor. The juice from sweet sorghum stalks contains about 15 to 20% sugar that can be fermented into ethanol, which is significantly cheaper than ethanol from sugarcane molasses.

Sweet sorghum is likewise more efficient than corn. Ethanol from sweet sorghum like corn ethanol, can be used for the production of steam and electricity. However, the added advantage of sweet sorghum is that it requires comparatively less processing compared to maize, where the grains need to be hydrated and converted from starch to sugar before fermentation.

The ethanol produced from sweet sorghum is less polluting, has cleaner burning quality and a high octane rating. Likewise, the bagasse from sweet sorghum after the extraction of juice has a higher biological value than that of sugarcane when used as forage.

At ICRISAT, we have developed improved sorghum hybrid parents and tested them with our partners through various institutional arrangements. We have enjoined the private sector to incubate

ethanol technology for commercialization through our award-winning Agri-Business Incubator (ABI) mechanism.

Rusni Distilleries Pvt Ltd, one of our partners, has begun the production of sweet sorghum-based ethanol on a commercial scale. Our partnership has led to the identification of the best varieties of seeds to be distributed to small farmers. In line with these are also innovations to enhance livelihood opportunities of farming households: One is on stalk-crushing techniques to extract sugar from sorghum, allowing more cost-effective transportation to the processing plant and another is crafting a good linkage of sweet sorghum farmers with the distillery to ensure income and a more secure livelihood.

At present, the Philippines is importing $3.9 billion worth of crude oil and petroleum products every year. The enactment of the Biofuels Act of 2006 provides the strongest force for the country to reduce dependence on imported fossil fuels to save on foreign exchange and protect public health, the environment and natural ecosystems. Likewise, this presents a better opportunity to improve the livelihoods of resource-poor farm households since sweet sorghum cultivation can yield about Php 50-60 thousand per year (with two crops).

Through its biofuels research program, ICRISAT is in a very good position to lend a hand in the pursuit of the implementation of the Biofuels Act of 2006 by sharing the best practices and technologies obtained from its 25 years of strategic and on-farm development research.

Our joint initiatives with the Philippine national agricultural research system (NARS) led to the identification of several sorghum varieties and hybrid parents with high sweet stalk yield. Eight sweet sorghum varieties have been shared through the Cereals and Legumes Asia Network (CLAN), of which 157 seed samples of sweet sorghum hybrid parents and varieties have been supplied to different R&D

organizations in the Philippines. A vigorous hybrid sweet sorghum development program can be initiated with these parents.

At the Mariano Marcos State University (MMSU), five sweet sorghum varieties developed at ICRISAT have been found to mature in 100 days. Seeds of several sweet sorghum varieties are now available at MMSU. The provinces of Isabela, Apayao, Ilocos Norte and Ilocos Sur have shown interest in planting sweet sorghum.

Amidst the escalating world price of crude oil, the country's plan to launch a program on biofuels is a timely initiative. We praise the bold move and hope that this will establish a strong foundation for an integrated and sustainable biofuel production program in the country.

On the whole, the cultivation of biofuel crops like sweet sorghum, Jatropha and Pongamia offer immense potential in conserving the environment and generating livelihood opportunities for resource-poor farm households.

However, we must develop a science-based and integrated roadmap for biofuel production in the country. Therefore, allow me to reiterate the urgent need to undertake action research for development on the best management practices, high-yielding varieties, mass multiplication techniques and suitable market supply models of appropriate crops for a viable biofuel industry.

Concerted efforts from financial institutions, investors, small farmers and the government, coupled with the right science and technology support, capacity building, infrastructure development and resource mobilization, will address the social, economic and environmental issues plaguing the Philippines.

Investing in biofuels likewise means investing in an improved livelihood of resource-poor farm households and ultimately, a secure future for our country.

It also means sustaining the viability of our living planet.

We can do it together!

Thank you.

Turning the Country Around Through Higher Agricultural Education

Dear colleagues and friends,

First of all, I would like to thank President Zosimo Battad for inviting me to speak here before you today. Let me take this opportunity to congratulate Zosing for assuming the office of President of the Association of Colleges of Agriculture in the Philippines (ACAP). Let me also thank Dr Fortunato Battad, who has guided me since the early parts of my professional life and continues to be a true friend and mentor to this day.

It is indeed an honor to be here in this gathering of the country's leaders in higher agricultural education. During these challenging times, a gigantic responsibility rests upon you — that of sharing knowledge and kindling hope in the hearts of our people, especially our poor countrymen.

Delivered at the Association of Colleges of Agriculture in the Philippines (ACAP) Convention, 1 February 2007, PAC, Pampanga, the Philippines.

But higher education itself is faced with big challenges in its aim to not only give quality outputs but also in creating impact with regard to agricultural and rural development. Indeed, Philippine education should be made very competitive for us to be key players not only in our country but also in the global arena. At this point, let me share my thoughts on the bigger challenge of turning around the country from where it is today. I will do this by sharing our humble experience of ICRISAT's renaissance and turnaround to excellence and relevance at the onset of this century.

There is an inexplicable web that connects hope, science and agricultural and rural development. Over the last 34 years, research at the International Crops Research Institute for the Semi-Arid Tropics has helped bring about hope in the lives of the poor in Asia and Sub-Saharan Africa.

The mid-nineties were very tough times for ICRISAT, with financial and human resource challenges hampering our organizational development. When I took over as Director General of ICRISAT in 2000, I immediately laid out a battlecry that would rally my staff in turning the Institute around and bring hope to the poor of the dry tropics. We called this battlecry *Science with a human face*. Beyond producing quality science, our work at ICRISAT is focused towards empowering the most marginalized, disadvantaged and hungry. ICRISAT and its partners mobilize cutting edge science and agricultural innovations to help developing countries reduce poverty, hunger, malnutrition, and environmental degradation. Science is a means that we use to serve the poor, not an end in itself.

Guided by a new vision, we mapped a new organizational structure and re-engineered institutional processes in 2001. ICRISAT also adopted a strategy of greening the grey drylands through Integrated Genetic and Natural Resource Management (IGNRM). Decentralization, strategic partnerships, intensive resource

mobilization, strategic communication, enhanced teamwork, transparency and participative decision-making were adopted as our instruments for institutional transformation.

Turning ICRISAT around involved making bold decisions, refocusing research programs, motivating people, and doing innovative resource mobilization and communication.

Through the foregoing institutional innovations, an organizational culture of excellence and relevance has transformed ICRISAT in recent years. We have turned ICRISAT around and propelled it to a period of renaissance, boosting its status as the premier center of scientific excellence in improving agriculture in the dry tropics.

As recognition of its scientific excellence, ICRISAT has been awarded four King Baudouin Awards, CGIAR's most prestigious. So far, no other CGIAR Center has matched this feat. Two of these awards were won under my humble stewardship. We have also won four Most Outstanding Scientist Awards and two Most Promising Scientist Awards from the CGIAR.

ICRISAT's transformation into a financially vibrant and healthy organization is seen in the increase of its budget from $22 million in 2000 to $33 million in 2007.

But we cannot rest on our achievements. Last year, we mapped out a new vision and strategy for ICRISAT, aligned with the new research priorities of the CGIAR. This new vision and strategy will further drive ICRISAT to achieve new heights of scientific excellence to 2015.

Today you are celebrating a major breakthrough — the launch of the first Philippine sweet tamarind variety *Aglibut Sweet*. Other sweet successes will follow soon. With the Biofuels Act of 2006 in place and ongoing sweet sorghum projects with ICRISAT, our country is poised for a revolution in biofuels.

Four local companies with foreign partners have plans to set up bioethanol distilleries using sweet sorghum as feedstock in Northern Luzon, costing $160 million. Today, we take pride in being part of the launch of the CHED-ICRISAT Sweet Sorghum for Ethanol Initiative. Let me congratulate Chairman Carlito Puno for championing sweet sorghum for bioethanol. I am proud to say that ICRISAT will be tapped as a source of plant material for these companies and the ACAP member institutions. Since sorghum is known for its capacity to tolerate hot, dry seasons, and to produce during periods of extended drought, it can also be explored as a low-cost health food for the malnourished in our country.

Hope is the bread of the poor, but they cannot live by hope alone. When empowered, poor people hold the potential of wiping out their poverty, hunger and malnutrition. ICRISAT and its partners are committed to help fulfill this potential with their cutting edge innovations mobilized through a global network of government, private sector and civil society organizations.

Turning the Country Around Through Higher Agricultural Education

Notwithstanding the gigantic challenges of the country today, I firmly believe that there is hope for the Philippines. As ICRISAT has undergone a process of transformation through excellence, relevance and renaissance, we can turn the country's situation around.

We must empower the people, especially the poor, with tools and opportunities to improve their livelihoods. This requires a strong political will, propelled by pro-poor policies and programs implemented through sound governance.

Under the aegis of ACAP, higher agricultural education plays a major role in advancing and sharing of knowledge that will spur the country's turnaround by producing professionally competent, service-oriented, dedicated, principled, and productive citizens needed to transform the country. Through its fourfold function of teaching, research, extension and production, higher agricultural education is a prime mover of the country's socio-economic growth and sustainable development.

Our higher education system continues to experience rapid and dramatic changes in the face of globalization and competition. I am pleased to note that in the last few years, significant changes in philosophy, framework and policies have been introduced to improve tertiary education in the country.

Turning the country around today lies in the hands of education leaders like you. Lead the way to excellence, relevance and renaissance in higher education and success shall be ours. In doing this, I encourage you to emerge from the confines of your comfort zones and think out of the box. We at ICRISAT have done this with tangible rewards.

Towards this end, I challenge you to pursue the strategic directions laid out by the Long-Term Higher Education Development Plan for 2001-2010 in improving the quality, excellence and relevance of tertiary education in the country:

- Offer quality undergraduate and graduate education programs comparable with international standards;
- Become a regional center of excellence in selected disciplines, particularly in areas where we have a comparative advantage;
- Generate, adapt and share knowledge that equips graduates with competencies, values and skills in a rapidly changing domestic and international job market; and
- Utilize state-of-the-art and appropriate information and communication technology and other emerging innovations in higher education.

Yes, there is indeed hope for the country, and the fulfillment of this hope rests with all of you who are gathered here today.

Let us remember that bringing hope to our people boils down to good leadership and high quality education.

So take the lead and show the way to turn the Philippines around.

Together, we can do it!

Mabuhay kayong lahat!

Model Seed Systems and Early Wins

Mr SM Desalphine, Additional Secretary, Ministry of Agriculture; Mr PK Sharma of TMOP; Mr BB Pattanaik, Chairman and Managing Director, National Seeds Corporation; Dr MS Basu, Director, NRCG; Drs IP Singh and SK Chaturvedi, senior scientists, IIPR; and ICRISAT scientists and friends, good morning.

Welcome to this review meeting of the Integrated Scheme of Oilseeds, Pulses, Oilpalm and Maize (ISOPOM) projects wherein our joint research seeks to empower the rural poor, improve their incomes and livelihood opportunities and protects the environment.

India's low legume productivity and rising cost are a cause of concern among farmers and policy makers. Given the constraints in production of oilseeds and pulses, adoption of improved varieties and crop production practices could substantially increase their productivity.

Opening message, ISOPOM project review meeting, 14 February 2007, ICRISAT, Patancheru 502 324, Andhra Pradesh, India.

Working on four components of the ISOPOM project, we have together sown the seeds of hope for the poor farmer of the drylands, which in time will lead to better livelihoods and nutritional security. But we have to do more and use the power of partnerships to realize all the objectives of these projects.

The concept of hybrid pigeonpea developed at ICRISAT in 1974 took us long to perfect, showing a way out of stagnant productivity. The new hybrids have a yield advantage of 30-100%. The funding provided by ISOPOM has helped us in enhancing the pace of hybrid breeding. We are collaborating with a number of Indian Council of Agricultural Research (ICAR) institutions and public and private seed companies to take this technology to Indian farmers by 2008. Scientists in the Philippines, China and Myanmar too have shown keen interest in hybrid technology.

We believe that hybrid pigeonpea will catalyze and enhance the pulse revolution, if not the second green revolution in India and the rest of the developing world.

Coming to the project on groundnut, preliminary results of farmer-participatory varietal selection trials have been encouraging. A few varieties (ICR 3, TIR 17, ICGV 87846, JUG 16 and ICGV 02266) did well across all the four villages in Gujarat. Farmers also rated them highly because of their desirable traits.

In the case of Orissa, OG 953 was a clear winner for the rainy season cultivation of groundnut. It also ranked first in farmers' choice followed by ICGV 91114.

The model seed systems project we started in November last year is picking up. The 2006/2007 postrainy season (rabi/summer) program of chickpea whose main components during this season are farmer-participatory varietal selection, farmers' seed production and capacity building, is being implemented in two districts in Madhya Pradesh and one in Uttar Pradesh.

In groundnut, the focus is on seed multiplication in two districts each in Andhra Pradesh and Orissa. The pigeonpea program will start in the rainy season (kharif) in Maharashtra and Uttar Pradesh.

There is growing demand from farmers for large and extra-large seeded kabuli varieties that are prohibitively expensive in the market. Consumer demand for such chickpea is presently being met through imports. Farmers thus desperately want improved varieties in this seed size category.

The ISOPOM project on "Development of extra-large kabuli chickpea varieties" has helped us in accelerating our efforts in this direction. Large number of crosses were made and advanced rapidly by taking 2-3 generations per year. During the first year, we supplied the required breeding material to all collaborating institutes. We will be sending several advanced breeding lines next year.

We are hopeful that with the solid achievements that ICRISAT has made and with the early wins we now have under ISOPOM funding, we believe that small farmers will benefit, thereby giving them more opportunities through higher productivity and income. We should learn lessons from our earlier work in Ananthapur on the groundnut and chickpea revolutions in Andhra Pradesh. We need as well to go beyond seed systems to embrace integrated natural resource management, particularly the introduction of soil and water conservation measures in the areas of the projects funded by ISOPOM.

I would like to thank the Government of India for supporting these projects and look forward to more of such fruitful partnerships. And we would like to see the day when India will be self-sufficient in pulses and oilseeds.

Thank you.

Innovative Knowledge Initiatives for Efficient Water Management

Dr Kirby Barrick, Dean, College of Agricultural and Life Sciences, University of Florida; Dr Raghuvardhan Reddy, Vice Chancellor of Acharya NG Ranga Agricultural University; representatives from the US Department of Agriculture, Agricultural Universities of Punjab, Tamil Nadu and other states, extension specialists, educators and scientists, good morning.

Welcome to this workshop on Innovative E-technologies for Distance Education, Extension/Outreach in Efficient Water

Special remarks, Indo-US workshop on Innovative E-technologies for Distance Education, Extension/Outreach in Efficient Water Management, 5 March 2007, ICRISAT, Patancheru 502 324, Andhra Pradesh, India.

Management here today, as part of the India-US Agriculture Knowledge Initiative (AKI).

I would like to welcome Dr Barrick who visited us last January and his colleagues from the UFL, especially Dr Ramesh Reddy who has played the key role of a bridge-builder in this endeavor and Sabine Grunwald. The University of Florida, a pioneer in developing a flexible approach to advanced learning in agriculture, is our valued partner.

Dr Raghuvardhan Reddy too has been a very special partner who has been generous in making resources available to the participants. Though Dr Mangala Rai, who is the Vice Chair of our board and a keen supporter of international cooperation, could not be here today, he along with Dr JS Samra and colleagues at ICAR, have ensured good support to the workshop.

I would also like to mention the support of the Vice Chancellors of Tamil Nadu Agricultural University (TNAU), Punjab Agricultural University (PAU) and the GB Pant University of Agriculture and Technology and the participation of IT resource persons in this workshop.

ICRISAT is a keen partner in the Indo-US AKI, which has significant potential to improve capacities of the partners. We have always recognized the role of US-based universities and ARIs in the Green Revolution in Asia and I am glad there is a new phase in their relationship with India. We are happy to be a facilitator and partner in this initiative.

I began my career as a university faculty, and have always encouraged flexible learning and anytime learning opportunities for students in agricultural sciences. The demand for skilled workers and professionals in agricultural education and extension has outstripped supply in many countries; moreover the quality of graduates available does not conform to the needs in the field.

ICRISAT, known for its mantra of *Science with a human face*, believes in the power of modern ICT to provide novel forms of facilitation to learners. We are leading the work on re-usable learning objects on behalf of the Global Open Agriculture and Food University (GOFAU). We would like to ingrain the approach of learning objects and granules in education at all levels. This will facilitate adaptability for the national partners even as quality will be guaranteed.

We have just signed special MOUs to offer agro-ecology courses at the masters' level in the Philippines and in Thailand while we have a long-standing arrangement with the YCMOU in India on Open Distance Learning (ODL) in agriculture. The Commonwealth of Learning (COL), another valued partner of ICRISAT and the CGIAR Centers, has given us plenty of technical guidance in our efforts in new approaches to ODL and I am glad they are partnering us in organizing this workshop.

Information and Communication Technology (ICT) is the means by which agricultural and rural intermediaries, small farmers and

women can be empowered with knowledge. Linking a knowledge source to knowledge seekers lies at the crux of E-technology.

Drought and desertification are two scourges that are slowly decimating populations in pockets of Asia and Africa. Climate change too threatens to wreak havoc across the world. Managing water resources therefore assumes great urgency today.

Since we are dealing with a vital resource such as water, new and modern information technologies can build capacity to solve problems pertaining to efficient water management. Tools such as geographical information systems (GIS), remote sensing and internet-based education provide new, efficient and effective ways to assess land use management, water resource and its quality. Generating such a repository of accessible and timely knowledge is part of an agriculture knowledge system.

This workshop, apart from identifying knowledge gaps in addressing water management issues, will tackle the other side of the coin – modes of instruction and training for capacity building, share experiences in current approaches used in integrated water management, identify topics suitable to develop into e-materials as well as deal with the tricky technical glitches and pitfalls in the process.

I am sure that this extensive and meticulous exercise that will be conducted over the next few days will in the long run substantially benefit the poor farmer. I wish the workshop participants fruitful deliberations.

Thank you.

Bringing the Farmer to the Forefront

Members of the evaluation team from the Common Fund for Commodities (CFC) and the Food and Agriculture Organization (FAO), farmers, bankers, partners from India, China and Thailand and colleagues, good morning.

Welcome to the midterm evaluation exercise of the CFC-FAO-ICRISAT project on "Enhanced utilization of sorghum and pearl millet in poultry feed industry to improve the livelihoods of the small-scale farmers in Asia".

It is stocktaking time for this project that began nearly two years ago. A similar exercise was conducted in Thailand recently. The current project has helped farmers immensely. The provision of facilities to harvest the crop at physiological maturity, earhead driers to overcome the deleterious effect of grain mold, and storage structures have given farmers immense confidence.

Opening address, Midterm evaluation exercise of the CFC-FAO-ICRISAT project on Enhanced utilization of sorghum and pearl millet in poultry feed industry to improve the livelihoods of the small-scale farmers in Asia, 8 March 2007, ICRISAT, Patancheru 502 324, Andhra Pradesh, India.

The Save Grain Campaign of the Government of India (with Pune and Hyderabad offices) has provided technical guidance and support in this regard. No longer do farmers talk of distress sale of produce; instead, they are realizing better prices by deferring sale. This has also improved their bargaining power.

Another remarkable aspect of this project has been the formation of Farmers' Associations focusing on commodities such as sorghum and pearl millet and linking these groups to markets.

The joint project has been emphasizing the enhanced production of sorghum and pearl millet — crops with great potential as ingredients in poultry feed and other industrial uses — using superior cultivars and technological options. At ICRISAT, we are working on aflatoxins, tannins and mycotoxins in these grains in order to overcome the difficulties associated with grain mold infestation in kharif sorghum.

Efforts are on to modify the conventional supply chain by eliminating middlemen and instead linking producers directly to poultry feed manufacturers. I understand a lot of progress has been made in this direction during this year. Farmers have practiced bulking, grading and bulk marketing of sorghum and pearl millet grains, leading to:

- Better price realization;
- Greater bargaining power;
- Minimizing middlemen charges; and
- Improving market intelligence and expansion.

Poultry feed manufacturers who now buy the produce don't have to agonize over multiple transactions, supply and guarantee of grains and middlemen charges.

Coming to farm credit, banks like the State Bank of India and State Bank of Hyderabad have taken a lot of interest in the initiative by

helping farmers link up with banks. I understand the project has developed very productive collaboration with various partners from research, private and NGO sectors.

The credit for promoting this farmer-centered, farmer-owned and farmer-managed participatory project and accelerating their true participation goes to all you partners. But for this, the construction of storage structures in the Indian clusters that are fully managed by farmers' associations would not have been possible.

I take this opportunity to thank CFC and FAO for their financial support. Their feedback and constructive suggestions during this evaluation exercise will lead to greater impact in the lives of small farmers in Asia.

Thank you!

Conserving Sorghum's Genetic Diversity the Sustainable Way

Drs Bob Henzell, Brigitte Laliberte, J Chantereau, Jeff Dahlberg, D Rosenow, N Seetharama, SK Sharma, and scientists from the NARS and ICRISAT, good morning. Welcome to this expert consultation for developing a strategy for the global conservation of sorghum genetic resources!

Conserving plant genetic resources for food and agriculture (PGRFA) is an efficient and cost-effective way of ensuring the sustainable utilization of biological resources.

We have a rich diversity of genetic resources. There are almost 1,500 genebanks in the world housing around 6.5 million samples of plant germplasm, of which 1-2 million are thought to be distinct. No doubt there is a high degree of duplication among samples;

Inaugural address, Expert consultation meeting for developing a strategy for the global conservation of sorghum genetic resources,12 March 2007, ICRISAT, Patancheru 502 324, Andhra Pradesh, India.

nevertheless, many samples are unduplicated and are maintained under conditions that threaten their long-term survival.

Recognizing this situation, the FAO Global Plan of Action (GPA) adopted by 150 countries in 1996, called for action to safeguard "as much existing unique and valuable diversity as possible in *ex situ* collections of plant genetic resources for food and agriculture." It urged countries to "develop an efficient goal-oriented, economically efficient and sustainable system of *ex situ* conservation" and also "develop and strengthen cooperation among national programs and international institutions to sustain *ex situ* collections…"

The Global Crop Diversity Trust, an independent fund under international law and co-sponsored by FAO and the Alliance of Centers of the CGIAR through Bioversity International, was created in 2004 in response to such calls. Funds come from several countries, foundations, private companies and individuals.

The Trust plans to achieve its objective by helping existing institutions safeguard distinct and valuable plant genetic resources held *ex situ*, with priority given to collections that come under the International Treaty.

It supports the development of a set of conservation strategies that will guide the allocation of resources to the most important and needy crop diversity collections. Sorghum is one such crop.

Grown mostly by resource-poor farmers in the semi-arid tropics as a subsistence crop under traditional management conditions, sorghum has low productivity. But today, sorghum being a versatile crop, it has the potential for use as food, feed, fodder, fuel and raw material for industrial products.

Traditional foods made from sorghum include fermented bread, porridge, couscous, boiled rice-resembling foods, snacks and alcoholic beverages. Sorghum blended with wheat flour is used to

produce baked products. Grain sorghum is used to make potable alcohol, malt, beer, liquids, gruels, starch, adhesive, core binders, for metal casting, core refining, and grits as packaging material.

Sorghum grains are a rich and cheap source of starch and have applications in the food, pharmaceutical, textile and paper industries. Malt drinks and malt cocoa-based weaning food and baby food industries are popular in Nigeria.

Besides its use as animal feed in the USA, China, and South America, sorghum grain is used as human food either directly or after brewing in Africa and Asia. Sweet sorghum is used in producing sorghum syrup and jaggery in India and as a source in bioethanol in Brazil and recently in India.

Sorghum grain is a major ingredient in swine, poultry and cattle feed in the western hemisphere. Sorghum therefore is a high value crop assuming greater importance in the economies of several countries in Africa and Asia, largely inhabited by resource-limited farmers.

Hence the need to improve its production by utilizing the existing variability in the crop. ICRISAT has been working in this direction. To enhance utilization of germplasm, core collections (2,246 accessions) consisting of 10% of the accessions representing the genetic diversity of the entire collection in our genebank have been developed that enhance utilization in crop improvement programs.

Realizing the need for a smaller collection with varied maturity groups and purposes, a mini core collection (10% of the core and 1% of the entire collection) with 242 accessions was constituted, in which almost the entire genetic variation in the core collection has been preserved.

This subset will provide a starting point for a more economical and proper exploitation of sorghum genetic resources for crop improvement for important traits.

ICRISAT has also supplied 249,575 samples to scientists in 105 countries, which have been used to develop several improved cultivars. Thirty-three sorghum germplasm accessions were released directly as cultivars in 17 countries.

ICRISAT believes that conserving its precious genetic resources will directly and indirectly lead to the fulfillment of its mission to reduce poverty, enhance food and nutritional security and protect the environment of the semi-arid tropics by helping empower the poor through *Science with a human face*. I am sure your deliberations will result in efficient strategies in this direction.

I wish you a productive meeting.

Good day!

A Glorious 100 Years of CLSU

President Rodolfo C Undan, Central Luzon State University Board of Regents, officials and alumni of the University and friends, good morning.

Thank you for bestowing on me the honor of speaking here today. Let me first congratulate CLSU on its glorious 100 years as a renowned institution of higher learning.

I also congratulate President Undan for being given the opportunity to continue serving as your President to lead the preparations for this centennial celebration.

Guest of Honor and Keynote Speaker, International conference on Bridging the Gaps in Agricultural Research and Development Towards Sustainable Development, 11 April 2007, Central Luzon State University, Science City of Muñoz, Nueva Ecija, The Philippines.

Let me also pay tribute to the 19 retirees and 83 awardees who have loyally served CLSU with utmost dedication for 20 years and beyond.

Your centennial celebration is quite meaningful, for CLSU has come a long way since it was founded in 1907 as a farm school promoting agriculture and the mechanical arts.

Over the years, CLSU has been noted as an agriculture-oriented educational institution. Today, it has become a comprehensive university, designated as the zonal university for Luzon, being one of the more advanced learning institutions of the country.

As a former educator myself, I salute CLSU as one of the premiere institutions for agriculture in the Philippines and in Southeast Asia. CLSU is now known for its breakthroughs in aquaculture, ruminants, crops, orchard and water management research.

Indeed, as your centennial theme indicates, CLSU has had a century of leadership and excellence in agricultural education and countryside development.

Let me now shift to the theme of this conference on bridging gaps in agricultural research and development towards sustainable development. The concept of sustainable development was introduced in 1987 by the Brundtland Commission on Environment and Development. This was done to shift narrow interests towards a more comprehensive approach embracing environmental, social and economic goals.

This was further advanced in 1991 when the concept of Sustainable Agriculture and Rural Development (SARD) was put forward by the Food and Agriculture Organization. SARD has a threefold dimension:

1. Sustainable food chains from producers to consumers, including interfaces related to input supply, processing, marketing and primary production;

2. Sustainable use of land and water resources; and
3. Sustainable trade practices to ensure adequate livelihoods and food security within and across regions.

However, SARD was further expanded in 2000 when member states of the United Nations unanimously adopted the Millennium Declaration – a global commitment to end global poverty and suffering. The UN General Assembly then declared the Millennium Development Goals (MDGs) as the road map for implementing the Millennium Declaration.

In general, the MDGs commit the international community to an expanded vision of sustainable development. This vision promotes human development as the key to sustaining social and economic progress throughout the world. The MDGs aim to:

- Eradicate extreme poverty and hunger;
- Achieve universal primary education;
- Promote gender equality and empower women;
- Reduce child mortality;
- Improve maternal health;
- Combat HIV/AIDS, malaria and other diseases;
- Ensure environmental sustainability; and
- Develop a global partnership for development.

Recognizing the importance of the MDGs, the Consultative Group on International Agricultural Research (CGIAR) where ICRISAT belongs, adopted a new set of research priorities in 2005. These are:

1. Sustaining biodiversity for current and future generations;
2. Producing more and better food at lower cost through genetic improvements;
3. Reducing rural poverty through agricultural diversification and emerging opportunities for high value commodities and products;

4. Promoting poverty alleviation and sustainable management of water, land, and forest resources; and
5. Improving policies and facilitating institutional innovation to support sustainable reduction of poverty and hunger.

As a proactive organization, ICRISAT mapped out a new vision and strategy and anchored its research agenda to the CGIAR priorities in 2006.

Today, the global research community is committed to addressing the challenges of sustainable development in a rapidly changing task environment.

As CLSU enters the threshold of its second century, it must re-assess its priorities and synchronize them with the MDGs and the global agricultural research agenda. Doing this is the best way to bridge research and development gaps towards sustainable development.

As you do this, please note that the global environment of agricultural research, development and extension (RD&E) has changed significantly. The MDGs have

tremendously broadened the agricultural RD&E agenda. From merely increasing food production, it now embraces poverty and hunger reduction, environmental sustainability and social issues such as gender equality, health and nutrition. Publicly funded agricultural research has declined by more than 50%. At the same time, the private sector has increased its share of agricultural research and ownership of new technologies.

Likewise, the emergence of global markets, biotechnology and information and communication technology are changing the strategic direction of agricultural RD&E.

These changes are happening at a time when agricultural RD&E is done within a new set of institutional arrangements. Under this setting, public-private partnerships are pursuing the new vision of agriculture and sustainable development. Similarly, new patterns of governance are changing the role of public research and its relationship with the private sector and civil society.

Due to the foregoing, newer challenges to agricultural RD&E have emerged:

1. Improving farm productivity through sustainable agriculture;
2. Promoting equitable distribution of benefits from the dramatic gains in agricultural production;
3. Shifting the focus of research and development to less favorable environments like the drylands;
4. Empowering people and their communities; and
5. Synergizing public, private and civil society organizations involved in the agricultural innovation process.

In addressing these emerging challenges, the conventional paradigm of agricultural RD&E is no longer adequate in bringing about sustainable development. Global experiences show that this changing agenda requires new ways of doing things as reflected by the emerging paradigm of agricultural innovation.

The agricultural innovation process involves the dynamic interaction of multiple stakeholders within a knowledge system such as CLSU. These interactions result in the initiation, generation, modification, accumulation and utilization of agricultural technology.

The innovations paradigm departs from traditional agricultural RD&E which is primarily concerned with generating and transferring new technology to passive end-users. Instead, agricultural RD&E is now widely seen as a learning process that:

- Encompasses a diverse set of activities for generating, sharing, exchanging and utilizing knowledge;
- Results in a wide range of knowledge products, from technological to socio-institutional;
- Synergizes local capacities, resources and innovations;
- Draws upon diverse sources of knowledge, from local to global;
- Provides decision-support tools and information that enable users to make strategic choices and actions; and
- Requires a holistic perspective of agriculture and natural resource management with people empowerment at the core.

This new perspective indicates that agricultural RD&E is no longer the exclusive domain of scientists. It is a collaborative process participated in by a wide range of actors and stakeholders such as researchers, extensionists, farmers, development agencies, the private sector, entrepreneurs and civil society organizations.

Hence, the agricultural innovation process involves not only scientific research institutions, but also a range of other non-research organizations. This brings in the importance of strategic partnerships, alliances and coalitions, and the way these facilitate technology generation and utilization. Since the process depends on relationships among different people and organizations,

managing these relationships is a central task of agricultural RD&E.

Indeed, building partnerships in the innovation process is one of our most crucial tasks in bridging gaps in agricultural RD&E towards sustainable agriculture.

At ICRISAT, we do this through an Agri-Science Park (ASP) which is a hub for public-private partnerships to develop and commercialize our agricultural innovations. The Agri-Science Park brings together world class expertise available at ICRISAT, our host state government and renowned private sector companies. It essentially converges innovations, products and partnerships for the poor.

Three years since its inception, the Agri-Science Park @ ICRISAT has built pathbreaking models of public-private partnership in agribusiness and agri-biotechnology. More specifically, it has achieved the following milestones:

- Over $1 million dollars generated to complement our research budget for the poor;
- 60 partnerships and 20 shared technologies;
- Improved products like sweet sorghum for bioethanol, multi-purpose groundnut and hybrid pigeonpea;
- Innovative ventures in biofuels, nutraceuticals, agri-clinics and crop biotechnology;
- Reduced gestation period from laboratory to land; and
- Best technology business incubator award in 2005 (Government of India).

On a broader context, let me mention that over the last 35 years, research by ICRISAT and its partners has improved the lives of millions of poor people in the drylands of Asia and Sub-Saharan Africa.

When I took over as Director General of ICRISAT in 2000, I immediately declared a battlecry for us to bridge the gap between science and the poor people of the dry tropics.

This battlecry is *Science with a human face*. I made sure that our scientists understood that ICRISAT is an organization that serves poor people first and foremost. *Science is a means that we use to serve the poor, not an end in itself.*

ICRISAT and its partners mobilize cutting edge agricultural innovations to help developing countries reduce poverty, malnutrition and environmental degradation.

Beyond producing quality science, our work at ICRISAT is focused towards empowering the most marginalized people. Hence, bridging the gap between science and poor people was brought about through our mantra of doing *Science with a human face.*

As I end my speech, let me pose a challenge to CLSU to seek new horizons of excellence in higher education as it enters its next century. Higher education plays a key role in producing competent, pro-poor, dedicated and principled citizens who can lift our country from its sad state.

Amidst this challenge, our educational system has not been at par with the demands of globalization, informatization and competitiveness. Towards this end, I challenge you to pursue strategic initiatives in improving the quality, excellence and relevance of higher education in the country:

- Become a center of excellence in disciplines beyond agriculture, particularly in areas where you have a comparative advantage;
- Offer quality undergraduate and graduate education programs comparable with international standards;
- Equip graduates with competencies, values and skills for them to compete in a globalized job market; and

- Utilize state-of-the-art and appropriate information and communication technology and other emerging innovations in higher education.

On top of the foregoing, let us educate our youth so that they will bring in pride, hope and a brighter future for the Filipino people.

Again, let me congratulate all of you on this historic event of CLSU's centennial.

Mabuhay ang CLSU!

Mabuhay kayong lahat!

A Time to Unite and a Time to Share

President Alejandro V Directo, Alumni President Marben Z Lagmay, Dr Francisco Zamora, my fellow ISPSC-CA alumni who are here, *naimbag nga malemyo amin!*

I am indeed very delighted to be home with all of you again. Congratulations to the awardees! I would like to thank the people who have made our homecoming possible. It is always re-energizing to come home to Ilocos Sur and relive unforgettable memories of our glorious past.

Inspirational message, Grand Alumni Homecoming, Ilocos Sur Polytechnic State College (ISPSC), 14 April 2007, Santa Maria, Ilocos Sur, the Philippines.

Since it was established as a multi-campus institution, ISPSC has achieved great strides in implementing a comprehensive higher education program for our beloved province. For this, let me congratulate ISPSC's leaders and faculty for a job well done. *Agbiag kayo Apo!*

The phenomenal transformation of our alma mater has brought the momentum for it to face bigger challenges in serving the Ilocos region.

Over the years, ISPSC's quest for excellence, upliftment of the people and the development of the Ilocos have served as guiding principles in its operations. But we can do more to make a bigger difference.

As we gather here today, the Ilocos region faces tremendous challenges and opportunities which ISPSC must address. Foremost of these is the current move to restructure the country into five 'super' regions to accelerate economic growth, spread progress to all areas, and propel the Philippines to agro-industrial development.

Based on their natural competitive advantage, the country's 16 regions have been grouped into five 'super' regions, one of which is the North Luzon Northern Luzon Quadrangle. This is composed of Regions I, II, Cordillera Administrative Region, and the northern parts of Aurora, Tarlac, Nueva Ecija and Zambales.

The 'super' regions are not meant to supersede current political boundaries or alter regional development councils. They will follow distinct but not exclusive development themes. Hence, the Northern Luzon Agribusiness Quadrangle will have agribusiness as its theme and we are lucky to have no less than Agriculture Secretary Arthur Yap as our champion.

The Ilocos region's economy is primarily anchored on the agriculture sector, driven by agro-industrial enterprises such as milkfish production and processing, livestock raising and fish paste *(bagoong)* processing.

Despite initial successes, there are challenges to face such as linking our farmers with industries and markets. We also need to capitalize on the region's strategic commodities and its proximity to lucrative Asian markets such as China, Japan, Taiwan and Hong Kong.

To address the foregoing, an agribusiness plan has been mapped out which envisions Ilocos region as the northern agribusiness and food capital of the Philippines. To be implemented with agribusiness enterprises, the plan aims to:

- Improve agricultural productivity;
- Strengthen small- and medium-scale enterprises and co-ops;
- Develop strategic commodities;
- Shepherd agribusiness enterprises to bigger markets;
- Strengthen R&D support for sustained product competitiveness;
- Establish model agribusinesses; and
- Maximize agribusiness potential by value addition and access to better markets.

ISPSC must strategically position itself to exploit these opportunities by producing the manpower and pursuing research and extension needed in going through with this plan. I pose a challenge to ISPSC to map out a strategic plan and synchronize it to this regional plan. By doing this, ISPSC will be in a commanding position to help develop the Ilocos region. Let's again have a more proactive engagement to make a big difference.

Shifting to the national level, I was appalled to read more than a month ago that nearly one in five Filipino families have experienced hunger at least once in the last three months. I am saddened to learn that while hunger declined in the Visayas, it worsened in Metro Manila and the rest of Luzon, while it barely changed in Mindanao.

Moreover, 53% of household heads rated their families as poor during the first quarter of this year, and 10% of our countrymen work abroad.

At the global level, the earth is now populated by 6.6 billion people. More than 800 million of them are hungry, while about 1 billion live in poverty. Every five seconds each day, one child dies from hunger-related causes.

In essence, hunger is the most extreme form of poverty, where individuals and families cannot afford to meet their most basic need for food. Hence, the biggest challenge of our country and the world today is still overcoming hunger and poverty.

We must then work together to help win the global war against hunger and poverty. In order for us to win this war, we must recognize and act on eight contemporary developments in this century:

1. *Globalization and trade liberalization.* We must promulgate pro-poor policies, institutions and livelihood opportunities so that globalization will not bypass poor people in developing countries.
2. *Degradation of natural resources and increasing water scarcity.* We must prevent the degradation of our natural resources, especially in dryland areas with poor soils, irregular rainfall and low agricultural productivity.
3. *Climate change.* We must empower rural people and make them resilient to the changing climate which is leading to more frequent and severe natural disasters.
4. *Technological change.* We must harness advances in biotechnology, bio-power, and information and communication technology to help achieve food security for the poor.
5. *Disease and malnutrition.* We must prevent the spread of HIV-AIDS, micronutrient deficiencies, malaria, tuberculosis and chronic diseases.

6. *Social conflict.* We must end social conflicts since they cause severe human misery in the developing world, especially in Sub-Saharan Africa.
7. *Rapid urbanization.* We must minimize population surge in urban areas, where people make heavy demands on jobs, education, health care and food.
8. *The changing face of farming and role of government.* We must recognize the changing nature of farming due to an aging farm population, feminization of agriculture and labor shortages resulting from HIV/AIDS in developing countries. Moreover, the role of the public sector is changing since the private sector and civil society organizations are taking over many development functions previously performed by them.

Let me also reiterate the need to increase investments in science and technology. We need to generate new knowledge on sustainable agriculture, environmental management, drought management, bioenergy and tropical diseases.

Bolstering the world's scientific and technological capabilities in sustainable development would lead to secure, prosperous and peaceful lives for the poor.

In fighting hunger and poverty, we can learn a lot from the experiences of our neighbors, especially China and India. These countries became prosperous through large-scale agricultural reforms together with improved health, education, rural infrastructure and sound public investments.

As alumni of ISPSC, we have the choice and the opportunity to help win the war against hunger and poverty. We are the new breed of leaders and citizens who will help bring hope and prosperity to our people. We can make a difference by committing our collective talents in rebuilding our country.

I especially thank God for providing me the opportunity to be an international servant devoted to the poor. Even as my role is global, I am at the service of our people through the active collaboration of ICRISAT with various institutions in the country.

But my ability to help our people was not achieved overnight. I come from a farm family of six children. I began farming when I was a young boy. I have done it all – plowing, harrowing, planting and harvesting. Being raised in the farm, I know what subsistence living is all about. I know what poverty is all about.

One day, when I took our carabao in the field, I lay on its back looking at the blue sky and dreamt about the future. I then set a vision for myself to help the poor and resolved to pursue it. The summer right after high school graduation, I was determined to go to college. But knowing that my parents had little money then, I had to earn and save for my education.

The hardships I experienced during my childhood gave me the tenacity to succeed. I went to college with a scholarship and finished my degree in MSAC, now BSU. Upon graduation, I knew I had a mission to help the poor, and I was determined to succeed. I then set my sights on a career in the public service.

I worked very hard, starting as a government farm management technician. Inspired by my vision, I eventually worked my way to

the top, beginning in our home province, then to the neighboring province of Benguet, the whole country and now, in 55 developing countries of the world.

My work as an international servant enables me to meet eminent scientists, development leaders and policy makers from all over the world. Through these interactions, I became exposed to the problems of poor people in places far less fortunate than our country.

Through my humble experiences, I developed a deeper commitment and further strengthened my resolve to pursue my childhood vision of helping the poor.

I feel fulfilled to realize that I am helping overcome the global challenges of poverty, hunger, malnutrition, environmental degradation, and now, social and political conflict—problems that are also besetting our country.

Let me emphasize that ICRISAT is an organization that serves people first and foremost. Quality science is only a means for us to serve the poor, not an end in itself. Hence, even if we do excellent research, but do not make an impact on the poor, we will have failed. Only by mobilizing science to help poor countries reduce poverty, malnutrition and environmental degradation, can we ensure that we have made a big difference.

We therefore tailor our research programs to meet real human needs: reducing poverty, hunger, environmental degradation and social inequity. *This is the human face of the science and agricultural research that we do*. This is the guiding light of our efforts and the paramount theme of our endeavors at ICRISAT.

As I close, let me say that the Filipino people have been appreciated many times in many ways in many places. This is because we are the kind of people who find hope and will still be happy even in the most challenging circumstances.

It is our resilience and hopeful character as a people that guarantee a bright future for our country. Since Jose Rizal and Andres Bonifacio, our dreams of greatness have never wavered. The great Filipino dream is to emerge as a strong republic built under an era of peace, stability and prosperity. On our way to realizing our dream, we must share with our poor people the best that they deserve.

Over the years, we have taken bold steps to pursue that great dream from revolution, to constitutional change, to martial law, to people power. But the great dream has eluded us, so we must move on.

Soon, elections will be held. As we will write down our choices, we should think of our country's great dream. And those whom we elect should heal the wounds and unite our country to realize that dream.

For all of us, this means being one and united. It means sharing more and taking less. It means working harder and longer, especially for our poor countrymen. It means producing more and consuming less. It means more cooperation and less competition.

It just means being more Filipino – loving God, country and people above all.

Agbiag ti Pilipinas!

Agbiag ti Amianan!

Agbiag tayo amin nga Filipino!

Thank you and good day.

Improving Pearl Millet Jointly for the Benefit of the Poor

I welcome all of you to this 42nd Annual Group Meeting of the All India Coordinated Pearl Millet Improvement Project. I would first like to thank the Indian Council of Agricultural Research for agreeing to hold the meeting on our picturesque campus for the first time. There is a dual advantage in this – scientists will be able to visit our summer season pearl millet breeding nursery while at the same time attend the meetings.

ICRISAT has had a strong and productive partnership with AICPMIP and State Agricultural Universities in India. The success

Inaugural address, AICPMIP group meeting, 15 May 2007, ICRISAT, Patancheru 502 324, Andhra Pradesh, India.

of our ties is evident in the fact that within three years of ICRISAT being set up, it was able to develop the first open-pollinated variety of pearl millet (WC-C 75) that was later released in 1982. This partnership has grown over the years and is reflected in the large-scale use of ICRISAT-bred materials in joint varietal and hybrid development programs.

Sharing germplasm, breeding materials and scientific information has been the key to the success of India's pearl millet improvement program. It is your success; and in that lies our success. In recent years, our partnership with the private sector has grown rapidly. Today, the ICRISAT-Private Sector Pearl Millet Hybrid Parents Research Consortium has 35 members from seed companies and a research foundation. This partnership provides us the financial support to carry out pearl millet research from which not only the private sector but the public sector in India and the world benefit. Also, this partnership encompasses impact assessment, specific field trials and nurseries, training and research priority setting.

I am told that more than 70 hybrids are under cultivation in India which have contributed to yield enhancement and stability. I would like to refer here to the first biotechnological product (HHB 67-improved) produced by marker-assisted selection. None of these advancements and impacts could have occurred if ICRISAT had worked in isolation, or devoid of ICRISAT's support in generating desired breeding materials and appropriate technologies. In other words, a lot has been gained by harnessing partnership power, and a lot more remains to be achieved using this mechanism.

While continuing the productive work that has been going on, there is a need for this partnership to visualize and address new challenges that relate to environmental stresses and nutritional security. Pearl millet productivity needs to be enhanced in the arid zone which has been largely left out of the progress made in relatively better-endowed environments. Though pearl millet is a

highly water use-efficient crop, there is scope to further improve its drought tolerance, more appropriately through marker-assisted selection.

Soil salinity is another problem in pearl millet-growing areas. Again, pearl millet is highly salinity tolerant but breeding for more salt-tolerant lines is required. Though a highly nutritious cereal with very high levels of iron and zinc, recent studies show large variability for these micronutrients in pearl millet germplasm and breeding lines. This can be used to breed hybrids with high levels of iron and zinc.

Such is pearl millet's versatility that some hybrids tolerate and yield well at as high as 46º C air temperature during flowering. Understanding these traits better and using them in breeding more productive and adapted parental lines of hybrids is essential.

ICRISAT has incorporated these research areas in its Medium Term Plan and also in the ICAR-ICRISAT Pearl Millet Research Partnership agenda. We need to pursue this research vigorously in a strong partnership framework involving ICRISAT, AICPMIP and the private sector. I am sure all of you have good results to report from the 2006 trials and studies and will also plan for the year to come.

I look forward to the outcome of this meeting and wish you all productive deliberations and an enjoyable stay at ICRISAT.

Thank you.

Harvesting Diversity Through Gender-positive Policies

Good morning! I would like to welcome all of you to this Annual Gender & Diversity Associates Jamboree, which ICRISAT has the honor of hosting. This is a great opportunity for all of us to collectively enhance G&D awareness and also a chance to share the collective wisdom of all the CG Centers towards this goal.

At ICRISAT, gender and diversity policies are in place. We have a diversity-positive recruitment policy, conditions conducive to ensuring work-life balance, workplace of dignity and also a health policy.

Inaugural address, Annual Gender & Diversity Associates Jamboree, 4 June 2007, ICRISAT, Patancheru 502 324, Andhra Pradesh, India.

Our staffing goals have been such that 21% comprise women scientists, 10.3% are women managers and 10% are women scientists from developing countries. Over 70% of the Principal Scientist positions are now supported by young successor scientists, of which 40% are again women.

Along with our research, we are constantly striving to ensure diversity awareness through workshops, meetings, cultural events, etc. G&D associates have been nominated at all locations to facilitate greater awareness.

Coming to the sensitive issue of HIV/AIDS, location-specific practice guidelines are in place.

ICRISAT is a strong votary of diversity-positive recruitment. We have broad guidelines to ensure a diversity-positive focus while recruiting, short-listing, during interviews, etc. Search committees are briefed on diversity-positive measures and career development for women is actively encouraged, wherein potential candidates are identified and 1-2 women nominated every year for CG courses for women. I am proud to say that over 60% of our women scientists/managers are well trained.

TEAM ICRISAT is a term that resonates from every corner of this institute. Team building exercises have been a feature of the institute since nearly eight years. Over 80% staff has been trained in team effectiveness, with the focus now veering towards building functional teams.

Since we are working in stressful times, maintaining work-life balance is crucial to be able to deliver our best. We are exploring small but effective interventions such as discouraging overtime work, providing additional guards and ensuring a five-day week instead of 6, and outsourcing late night and odd-hour duties for drivers and flexible working arrangement in specific instances.

I am sure that this jamboree will lead to a sharing of creative ideas towards the larger goal of ensuring a pleasant and conducive working environment for all.

Thank you.

A Partnership to Empower the Poor

Mr AR Palaniswamy, Managing Director, Rusni Distilleries; Mr S Sen, Coordinator Special Development Projects, CII; Dr JV Patil, Senior Sorghum Breeder, MPKV; members of the Watershed Organization Trust and ICRISAT scientists, good morning.

Welcome to this meeting to develop a full proposal to the National Agricultural Innovation Project (NAIP) on "Improved livelihoods through collective action and value chain of bio-fuel crops in rainfed areas".

Interest in bio-energy has escalated since oil prices crossed $40 a barrel in mid-2004. Various countries have since been investing

Inaugural speech, meeting to develop a full proposal on Improved livelihoods through collective action and value chain of bio-fuel crops in rainfed areas, 5 June 2007, ICRISAT, Patancheru 502 324, Andhra Pradesh, India.

heavily to make energy clean and competitive in order to increase energy security, reduce dependence on fossil fuels and prevent global warming. As a result, global production of biofuels has doubled in the last five years and will likely double again in the next four years.

Biofuels such as ethanol and biodiesel are examples of technologies that can reduce dependence on oil imports and the environmental impacts of burning fossil fuels, while at the same time address the needs of revitalizing the rural economy.

In consonance with energy consumption trends worldwide, ICRISAT has adopted a pro-poor BioPower Strategy that pursues an integrated, systems-oriented, cohesive global approach to raise incomes and the energy self-reliance of oil importing countries through bio-energy, without compromising food security.

The three main thrusts of ICRISAT's BioPower strategy are increasing rural bio-energy self-reliance and income; alleviating poverty through pro-poor biofuel markets and sharing the wealth of bio-energy knowledge.

Since October 2006, blending petrol with 10% ethanol has become mandatory in all states in India. Simultaneously, there has been increased interest in the utilization of sweet sorghum for ethanol production.

Sweet sorghum research at ICRISAT was initiated in 1982 to identify lines with high stalk-sugar content, and renewed in 2002. ICRISAT's research on sweet sorghum for ethanol production now involves two distinct but simultaneous phases: (1) genetic enhancement of sweet sorghum for quantity and quality of juice for ethanol production and (2) development of cost-effective economy-scale ethanol production technology, requiring industrial expertise.

ICRISAT has formed an Agri-Business Incubator partnership with Rusni Distilleries Pvt Ltd, linking the laboratory, industry, farmer and the market through a public-private partnership initiative.

Juice from sweet sorghum stalks is a viable source of bioethanol. Besides this, sweet sorghum varieties and hybrids produce grain yields of 2 to 2.5 t/ha which can be used for food, feed, fodder and fuel. Thus, the crop ensures not just energy security, livelihood and food security to the dryland farmer, but also a way out of combating global warming.

Sweet sorghum ideally meets the needs of the dryland farmer in several ways. It can withstand stress. It takes about 4 months to grow and its water requirement of 8000 m^3 over 2 crops is four times lower than that of sugarcane, which takes 12–16 months to grow and guzzles 36,000 m^3 of water per crop. The cost of growing one hectare of sweet sorghum (main + ratoon crop in 8 months) is 60% lower than that of growing sugarcane.

Moreover, the presence of reducing sugars in sweet sorghum prevents crystallization and sweet sorghum cultivars have 90% fermentation efficiency.

Further, the stillage from sweet sorghum after the extraction of juice has a higher biological value than the bagasse from sugarcane when used as forage for animals, as it is rich in micronutrients and minerals. It could also be processed as a feed for ruminants. So the question of compromising food and fodder needs of resource-poor farmers does not arise.

In addition, sweet sorghum is amenable to social cooperation mechanisms which can connect the poor to reliable markets.

Sorghum is passing through a transition phase from a mere food and fodder crop to an industrially valued raw material. This increasing shift from food to non-food uses is a blessing in disguise for resource-poor sorghum farmers.

Given all these factors and the need to keep the farmer at the center of our efforts, it is essential that our proposal addresses the following research and technology gaps:

- Identifying high yielding, high sugar/oil containing crops/ cultivars for biofuel production and development of improved cultivars and production technologies for greater production in scientifically identified agroecoregions;
- Establishing farmer-industry linkages for biofuel crops;
- Decentralized value-added biofuel initiatives at the village level as a source of income-generating activities for vulnerable groups and establishing a win-win biofuel model for farmers, private entrepreneurs and the country; and
- Identifying enabling policies and institutions to promote the production, marketing and use of biofuels in India for poor people-centric environment-friendly sustainable development without compromising food, feed and fodder aspects.

I am sure we will together be able to come out with a win-win proposal to benefit the poor farmer in rainfed areas.

Thank you.

Community Watersheds: An Integrating Force for Improving Livelihoods

Ladies and gentlemen, good morning.

Welcome to the TATA-ICAR-ICRISAT Project Consortium Partners' Consultation Workshop being held here today. I would like to extend a warm welcome to Mr Biswanath Sinha, Program Officer, Sir Dorabji Tata Trust, a strong supporter of rainfed farmers as well as to the partners of the consortium. A special welcome to our partners from CRIDA; Maharana Pratap University of Agriculture and Technology, Udaipur; CAZRI; and Jawaharlal Nehru Krishi Vishwa Vidyalaya, Indore, who are strategic research and development allies represented by the Commissioner, Watersheds, Government of Rajasthan; Mr KL Meena; WALMI, Madhya Pradesh; and NGO partners from BAIF, BYPASS and DEEP.

Inaugural address, TATA-ICAR-ICRISAT Project Consortium Partners' Consultation Workshop, 9-10 July 2007, ICRISAT, Patancheru 502 324, Andhra Pradesh, India.

The first phase of the TATA-ICAR-ICRISAT project on 'Combating land degradation and increasing productivity in Madhya Pradesh and Eastern Rajasthan' was unique since it adopted an integrated genetic and natural resource management (IGNRM) approach and consortium method to ensure that interventions have greater impact on the livelihoods of people in the semi-arid tropical areas of two eco-regions.

The project ably demonstrated the success of the Sir Dorabji Tata Trust-funded interventions and the efficacy of a farmer-centric holistic approach combined with scientific backstopping in improving rural livelihoods in the watersheds.

The project, which used soil and water management as entry points, saw farmers' productivity increase by 40-200%. Livestock-based and other income-generating activities ingrained in the approach have benefited small and marginal farmers, the landless and women, culminating in reduced distress migration.

The project succeeded in not only minimizing land degradation by reducing soil erosion, nutrient losses and runoff, but also addressed the issue of building a natural resource base to ensure sustainable and improved livelihoods. Today we call this the community watershed management model.

What has become evident during the last five years when the activities were scaled out from 7 to 60 villages is that the model which the ICRISAT consortium partners developed is upscalable.

During the pilot scaling out, an additional nine districts in Madhya Pradesh and Rajasthan were included for productivity enhancement at the eco-regional level. The importance of applying science for the development of rainfed areas is very much evident in this project, which clearly showed that the soils in these areas are not only thirsty but also hungry and critically deficient in micronutrients, resulting in low rainwater use efficiency and low crop productivity.

Using GIS and remote sensing, we observed that two million ha of land are kept fallow during the rainy season in Madhya Pradesh. This land can be cultivated for two seasons without supplementary irrigation if technologies are made available.

Impact studies in the watersheds have revealed a fall in runoff from 8 to 15% and less soil loss to 1.2-2.3 t/ha resulting in increased water use efficiency. Impact studies in Bundi watershed showed that pumping duration during the postrainy season almost quadrupled and the time required to recharge wells fell from 21 to 16 hours.

I understand that 202 families have invested in diesel pumps, 18 families in electric pumps and 82 families in pipelines for better water use efficiency in two villages of Bundi watershed. In Devas watershed located in the tribal belt of Madhya Pradesh, systems productivity varied from 2.1 to 4.7 t/ha using interventions as against the average productivity of 11 t/ha using normal farmer practices.

Impact assessment studies in Bundi watershed have demonstrated that by adopting an integrated pest management approach, farmers' net incomes increased by 50% for high-value crops like vegetables (green peas).

Livestock improvement as well as availability of quality fodder, health issues and capacity building efforts have paid rich dividends in this project. The external review team highlighted the benefits from this project and has recommended scaling-out at the eco-regional level during the seasonal phase.

How we scale out these benefits at the eco-regional level is the challenge we must meet together during the second phase of the project. Valuable inputs in terms of suitable policies and institutional support from the Governments of Rajasthan and Madhya Pradesh will play a critical role.

I am sure the next two days of discussions among the consortium partners will lead to a very strong strategy for scaling out the benefits and take into account not merely productivity enhancement and environmental issues but also social and institutional development.

We look forward to the strong and critical support from Sir Dorabji Tata Trust during this exercise, and their continued support for scaling up this project at the eco-regional level.

I wish your deliberations great success and look forward to the final recommendations for the new proposal to be submitted to the Trust.

Thank you.

Our Performance, Our Future

Good evening Team ICRISAT!

This day marks a major milestone in the history of ICRISAT's success story. ICRISAT has been rated "Outstanding" by the CGIAR for total excellence 'with regards to quality and relevance of research, institutional and financial health, and stakeholder perception.' In other words, the award belongs to Team ICRISAT!

This thanksgiving celebration we have organized is more than just an expression of gratitude, it is also a celebration of faith, a celebration of team spirit and a drawing together as one people.

Thanksgiving address, 13 July 2007, ICRISAT, Patancheru 502 324, Andhra Pradesh, India.

Tolerance and mutual respect bind us together as a team to enable us to share a common goal towards the empowerment of the poor in the drylands.

When I joined ICRISAT seven and a half years ago, I had promised to serve with a heart. I have committed to be the missionary of the poor. Tied to this promise is the mantra or slogan you are all familiar with and that encapsulates our raison d'etre — *Science with a human face*.

This mantra or slogan we have time and again highlighted reflects the common vision for the institute, the goals to be achieved, the challenges to be overcome, and the set of values shared by all.

That we have come out winners is a reflection of what we are capable of, of the further heights we can scale. I would like to dwell on the factors that may have contributed to this success.

Servant leadership style

Traditional and hierarchical modes of leadership are slowly being replaced by paradigms to simultaneously enhance the personal growth of staff and improve the quality and caring of institutions through a combination of teamwork, personal involvement in decision making and ethical and caring behavior.

You may have often heard me address myself as your servant leader. That's because I see myself as "first among equals". I firmly believe in drawing on the strengths of all of you, allowing everyone to do what you can do well. That is when your personal growth is enhanced; while at the same time the organization flourishes.

Remember, causing change is more important than waiting for change to happen. Everyone here has shared responsibility to be involved and thereby create change. I thank all of you for your commitment and extra mile efforts.

In our journey of innovation and change, our constant companions have been commitment, taking responsibility, skills and shared values. You will recall that much has been done to decentralize and fortify our regional hubs, whose functioning has been streamlined to meet future needs. The Global Themes have also been strengthened.

A compelling vision for the future of the Institute

You may recall that when I joined ICRISAT, I had a larger ambition for the Institute – to transform it into the centre of scientific excellence and relevance of the dryland tropics. Seeing and creating the future of ICRISAT are fundamental.

Innovation, adaptation and evolution have been the hallmarks of our efforts to bring about social change in the semi-arid tropics. Our new vision and strategy to 2015 aims to mobilize science, integrate various disciplines, build innovative partnerships and optimize synergies among various disciplines straddling the research for development continuum. The slogan *Science with a human face* is a means to catalyze our vision.

Our collective pursuit towards new management systems, non-traditional funding mechanisms, linkages with the private sector and civil society organizations, innovative knowledge sharing schemes and strategic communication are paying dividends. We are generating the world's first technologies impacting on the lives of small farmers and poor people in Asia and Sub-Saharan Africa.

Financial stability has been our hallmark. Our reserves, earned incomes and gross revenues have been steadily increasing.

Engaging the right people and developing leaders

Bill Gates has always insisted that his company required the very best minds; understanding the fact that they act as a magnet for other clever people. It is like letting a million flowers bloom. My own experience here has shown that brilliant scientists and managers

respond better to an accessible and benevolent leader than to a traditional boss.

Team ICRISAT is made up of a leader, senior management, competitive scientists, managers and on-the-ground staff. Developing ICRISAT in the last seven and a half years has meant a lot of talent management and recruiting people with the right stuff. Highly effective systems and processes are in place to identify and groom and develop the next generation of leaders and ensure a smooth transition. I have always supported high performance and rewarded it too, all the time motivating, inspiring and communicating to all of you.

Reinventing and innovating continuously

In 1513, Machiavelli wrote, "There is nothing more difficult to plan, more doubtful of success, nor more dangerous to manage than the creation of a new system. For the initiator has the enmity of all who would profit by the preservation of the old system and merely lukewarm defenders in those who would gain by the new one." The "new" leader works to get everybody on board and gets the best out of everyone.

Innovation has become a priority and a way of life in ICRISAT because it has become a central part of our culture. Ideas don't just enter the mainstream by themselves. All of you here in Asia and our esteemed colleagues in Sub-Saharan Africa are the institute's creative human capital, the pioneers of the unbeaten track, the curious, out-of-the-box thinkers who solve big research issues instead of fretting about them.

Daring to do things differently, taking the road less traveled, making new roads and blazing new trails – these are the actions that have brought us laurels today. I have exemplified all these myself, as you have seen in the last seven years.

Value results and relationships

I value results and relationships. In fact relationships are an integral piece of the puzzle called life. In ICRISAT, each person plays a role, and while some are larger than others, all have contributed to success. This has built a strong internal foundation of trust and integrity, which again has served as a valuable tool to help us achieve ICRISAT's goals.

Embody values --Walk the talk

Embracing an adaptive culture is a must if one has to survive today's competitive environment. That is why I engage everyone in the change process, set role expectations in participating in and leading change. There is a need to become the change you would wish to see in the world, as Mahatma Gandhi said. Unless I obtain that commitment and sterling support from all of you to align yourselves to ICRISAT's desired culture, there is little I can achieve.

It's time once again to be DARE - dedicated, accountable, resilient, and energetic. Let us be focused on our core values encapsulated in PURE - partnership and teamwork, urgency and impact, relevance and excellence.

That is why I myself act with zeal as part of TEAM ICRISAT. I too dig in and do actual work. I hope that you all appreciate that I have the vision and the knowledge to get the work done. That is what builds trust in leadership.

I would like all of you to achieve the goals that are important to you as well as the goals that are important to the organization. Building commitment to ICRISAT's goal is important. For this, we must be willing to respond to the needs of our clients – the poor farmers and the external environment.

Challenges the Institute is facing

The biggest challenge the Institute faces is the decline in core funding; I have repeatedly sought your help in shoring up finances.

Let us not forget one more important thing. Since our performance is essentially judged by the impacts our research has on the livelihoods of the poor, let us strive to create more impacts!

ICRISAT's highly competitive team works with frenetic rhythm and emanates a discernible energy. With you by my side, ICRISAT is confident it can continue to turn adversities into opportunities on behalf of the poor of the semi-arid tropics.

Let me reiterate that our future will depend on our performance. Let us again pledge to work harder, for there's no substitute for it.

God bless Team ICRISAT, God bless ICRISAT!

Thank you.

Fuelling the Future with Biodiesel

Honorable Chief Minister Dr Rajasekhar Reddy, officials and members of the Andhra Pradesh Chapter of the Biodiesel Society of India, ladies and gentlemen, good evening.

I would like to thank the organizers for inviting me to address this gathering on the launch of the Andhra Pradesh Chapter of the Biodiesel Society of India. It is indeed an honor to have with us Dr Rajasekhar Reddy, who has continuously demonstrated his leadership in the area of agriculture and rural development in general, and biodiesel production in particular, in the state.

Current energy sources are unable to meet the energy needs of the world's poor, with 2.4 billion people relying on traditional biomass for energy and 1.6 billion not having any access to electricity.

Special address, launch of the Andhra Pradesh Chapter of the Biodiesel Society of India, 14 July 2007, ITC Grand Kakatiya Hotel, Hyderabad, India.

Increasing fuel demand, environmental degradation associated with climate change, declining supply and associated skyrocketing fossil fuel prices, and the need to develop alternative renewable sources of bio-energy have opened up new avenues to find solutions to the complex and interlinked problems of poverty, land and environmental degradation and water scarcity.

Increasing fossil fuel consumption by developing countries like China, India and Brazil and its contribution to increasing the level of greenhouse gases was a point of contention during the G8 discussions on putting a mechanism in place for GHG emission plans by 2012 when the Kyoto protocol expires.

Efforts are on globally to address sustainability issues pertaining to energy. UN-Energy, a collaborative framework of all UN bodies that contributes to energy solutions, born out of the 2002 World Summit on Sustainable Development (WSSD) in Johanesburg, South Africa, identified nine key sustainability issues facing bio-energy development:

- Modern bio-energy can provide energy services for the poor;
- Implications for agro-industrial development and job creation;
- Health and gender implications;
- Implications for the structure of agriculture;
- Implications for food security;
- Implications for government budget;
- Implications for trade, foreign exchange balances and energy security;
- Impacts on biodiversity and natural resource management; and
- Implications for climate change.

Global production of biofuels has doubled in the last five years and is likely to double again in the next four. Argentina, Australia, Canada, China, Colombia, Ecuador, India, Indonesia, Malawi, Malaysia, Mexico, Mozambique, the Phillippines, Senegal, South

Africa, Thailand and Zambia already have pro-biofuel policies in place.

Locally produced bio-energy can provide energy for local agricultural, industrial and household uses, in some instances at less than the cost of fossil fuels.

Developing countries need to ensure that food security, environmental and water security are not compromised while addressing energy security through biodiesel. This is possible by building on the use of biodiesel from non-edible oils which will neither compete with food needs nor use lands used for food production.

Jatropha and Pongamia that are used for biodiesel production, are not cultivated crops. No research has been done on identifying suitable cultivars and agronomic, pest and disease management. However, Jatropha's drought tolerance gives it an edge under low moisture conditions.

Similarly, Pongamia, an N-fixing tree native to India, is an excellent candidate for biodiesel production. It also rehabilitates and greens wastelands. Greater research is required before it can be harnessed for commercial production since information on its water needs, agronomic, disease and pest management, and development of improved cultivars need to be addressed.

I take this opportunity to highlight ICRISAT's experiences with biodiesel crops. We have developed a pro-poor BioPower Strategy which involves the use of low-quality lands to produce Pongamia and Jatropha, and advocates collective action to develop them into biodiesel plantations.

In the process, we need to ensure that poor people who rely on such lands for their food, feed and energy sources are not displaced.

ICRISAT in partnership with the Government of Andhra Pradesh has developed a model in Ranga Reddy district, wherein 300 ha of

common property resources land have been developed into biodiesel plantations using Jatropha and Pongamia and by adopting soil and water conservation measures. The landless dependent on these lands have been grouped under self-help groups (SHGs), with the district administration awarding usufruct rights to the SHGs. Such a model needs to be propagated so that biodiesel plantations on wastelands improve the livelihoods of the poor people.

We also need to look at total energy balance while producing biodiesel. More efficient technologies to produce raw material and for processing need to be introduced. All biofuels cannot be considered environment-friendly unless they are grown and care is taken to consider carbon and energy budgets positively.

Secondly, we also need to look at decentralized energy models that can help rural folk meet their local energy demands. The initiative in tribal Adilabad to extract oil from Pongamia growing in existing forests to generate electricity without esterification needs to be pursued. We must take into account fuel miles while considering centralized biodiesel production.

Among the bottlenecks associated with producing biodiesel is the ratio of male to female Jatropha flowers skewed in favor of the male flower; alternate flowering of Pongamia, pests and diseases, and the lack of improved cultivars with high yield potential.

If we were to compare the biodiesel scenario to a car, the three wheels of policy support, technology and demand are in place. The fourth critical wheel of feedstock is lacking. We need to address this issue.

ICRISAT's people-centric community watershed initiatives have benefited a large number of poor people while increasing productivity from natural resources. That is the way we need to move forward for biodiesel too.

Under the leadership of Dr Rajasekhar Reddy, the State Government has developed a win-win model in which low quality assigned lands of small and marginal farmers are grown to Pongamia plantations to improve livelihoods. ICRISAT's own model in partnership with the Government of Andhra Pradesh needs to be promoted widely to improve livelihoods.

In conclusion, the Andhra Pradesh Chapter of the Biodiesel Society of India needs to take all these issues on board. You need to set an example nationally as well as globally so that biodiesel can be used to help reduce poverty and protect the environment without sacrificing food, fodder and water security. ICRISAT will be willing to join as an active member of this initiative because we want the poor people to benefit from this movement.

Wish you good luck in you endeavors.

Thank you.

High Value Crops and Diversification

Urbanization is gaining momentum across the drylands of Asia and Africa. Urban centers create new markets, and with higher incomes demand more diverse diets. Fruits and vegetables are especially promising because of their high market volumes and value. Their cultivation can multiply farm incomes manifold compared to cereal grain cultivation.

Responding to this opportunity depends on the availability of new technologies to farmers and rural infrastructure, markets and incentive systems. In fact, an FAO/World Bank study has suggested that diversification is the single most important source of poverty reduction for small farmers in South Asia. While it

Paper based on the presentation made at the ASHS Symposium on The role of horticulture in international development: Updates, opportunities and challenges, 17 July 2007, Arizona, USA.

promises higher growth potential to augment incomes, it additionally generates employment, alleviates poverty and improves the sustainability of agricultural systems.

In South Asian countries, the annual domestic demand for high-valued commodities has grown by 3-5% while demand for foodgrains is stagnant. East and Southern Africa have the world's lowest intake of fruits and vegetables with a mean consumption in most countries of less than half the World Health Organization's recommended daily intake. Low fruit and vegetable intake is a main contributor to micronutrient deficiencies and a key risk factor for cardiovascular diseases. Hence they play a strategic role in improving the diets of poor people.

Moreover, smallholder farmers are beset with high transaction costs per unit of output, because of small surpluses, low risk bearing ability, poor access to finance and technology and near inability to implement food safety measures. The advantage of a high labor to land ratio makes growing fruits and vegetables ideal.

Diversification would enable smallholders to reduce the risk of monocropping and move away from reliance on staple cereals,

pulses and starch into high value commodities. This would help them make the transition from subsistence to market-oriented agriculture.

The Consultative Group on International Agricultural Research aims to achieve sustainable food security and reduce poverty in developing countries through scientific research and research-related activities in the fields of agriculture, forestry, fisheries, policy, and environment. Its science advisory organ, the Science Council, identified System Priority 3 which aims to reduce rural poverty through agricultural diversification and emerging opportunities for high value commodities and products, on the grounds that the growth of fruits and vegetables through crop diversification would allow poor farmers the opportunity to derive additional income and increase enterprise stability in the face of natural shocks.

The CGIAR recently embarked on a process of choosing new Challenge Programs (CPs) with the aim of advancing the CGIAR System Priorities. It endorsed high value crops (fruits and vegetables) to be a Challenge Program, and the Alliance of Centers – with their worldclass capabilities in the biological sciences and innovative knowledge sharing in this area – is committed to such a CP to raise incomes of the poor. Among the many partners the Alliance is currently working with are the World Vegetable Center (AVRDC), International Society for Horticultural Science, Centre de coopération internationale en recherche agronomique pour le développement (CIRAD, France), L'Institut national de la recherche agronomique (INRA, France), University of Florida, University of California-Davis, The Technical Centre for Agricultural and Rural Cooperation (CTA) and the Global Horticulture Initiative (GHI).

Ways to leverage the poor out of poverty are being addressed by various centers of the Alliance. Individual center choices in fruits and vegetables are guided by the specific geographic and environmental zones with which they have been mandated.

For instance, Bioversity International is a global player in tropical and temperate fruit and nuts, coconuts, cosmetics and vegetables with an investment of $1.5 million/year that goes into assessing germplasm diversity for high value traits in crops important to the poor and in enhancing value chains for crops or wild species and their products.

In addition to fostering institutional alliances and advocating a non-discriminatory policy for local biodiversity products in developing countries, it brings out technical publications devoted to high value crops, enhances public awareness and is involved in policymaker advocacy in the European Union (EU).

The International Center for Tropical Agriculture (CIAT) deals with tropical fruit, vegetables, biofuels and aromatic plants in Tropical Latin America and generic horticultural whitefly environments, with an investment of $1.0 million/year. Among its initiatives in biotechnology are propagation, regeneration, transformation, gene discovery; participatory selection, identification and characterization of elite materials in addition to integrated pest management and linking supply-demand chains.

The Center for International Forestry Research (CIFOR) conducts research on Cordyceps, a parasitic fungus found in the mountains of Nepal, Birds nest soup, a forest product from Indonesia, and Warburgia bark in Southern Africa. Apart from this, it focuses on building capacities of forest product traders and improving the policy environment for high value forest products.

The International Maize and Wheat Improvement Center (CIMMYT) deals with special trait maize and vegetables in a global environment, spending about $0.2 million/year. Research is conducted on baby corn, sweet corn and green maize. Green maize is eaten parched, baked, roasted or boiled and fills the hunger gap after the dry season in Sub-Saharan Africa. As a high value product, maize fulfils quality protein needs, and vitamin-micronutrient enhanced maize is a good vegetable for poor children.

At the International Potato Center (CIP) which is a global player with an investment of $1.6 million/year, urban and peri-urban horticulture form part of the core research program, with the focus on food safety, occupational health and sustainable management of intensive horticulture systems.

The International Center for Agricultural Research in the Dry Areas (ICARDA) specializes in fruits, nuts, vegetables, oil, medicinal, spice crops and protected agriculture (plastic houses, hydroponics) in the temperate dry areas of Central-West Asia and North Africa and Latin America-Caribbean. This involves an investment of $1.0 million/year. Among its current activities are Pilot projects in West Asia, North Africa, Afghanistan and Pakistan involving a wide range of species of fruit and nut crops, vegetables, herbs and spices, medicinal plants and the domestication of wild species, particularly desert species for drought resistance and combating land degradation with fruit tree plantations.

The World Agroforestry Centre (ICRAF) specializes in tropical fruit tree crops in a global environment, investing about $2 million/year on the same. New fruit species such as Allanblackia and Cola spp. are grown to complement enterprises.

The International Food Policy Research Institute (IFPRI) is a global player which believes that small farmers have an advantage in producing high value crops due to lower opportunity cost and better motivated family labor. Its marketing research on high value crops delves into opportunities to access high-income markets; shifts in consumption from grains to meat, fish, dairy, and fruits/vegetables; the supermarket revolution in developing countries; rising demand for food quality and safety; and evaluating costs and benefits of trade agreements, spending $1.5 million/year.

The International Livestock Research Institute (ILRI) believes that livestock adds value to crops, helps the landless, employs slack family labor and stabilizes incomes in the developing world.

The International Institute of Tropical Agriculture (IITA) conducts research on tropical tree fruit crops and vegetables in the humid and sub-humid tropics of Sub-Saharan Africa, investing $1.5 million/year. Among its innovations are regionalized cocoa research; production and marketing; linking farmers with the supply-demand chain; integrating social and technical interventions; and participatory capacity building. It has successfully trained farmers and extensionists in integrated cocoa production. Farmers cooperatives have been strengthened to provide technical support to farmers; market access, information, confidence, and transparency have improved.

The International Water Management Institute (IWMI) believes that irrigation diversifies cropping patterns towards less water-consuming high value crops, thereby enhancing water productivity and increasing farm income. Dealing with fruits and vegetables in a global environment (urban/peri-urban and waste water in West Africa, South Asia and Southeast Asia), IWMI has invested $1.0 million/year on the same.

Africa Rice Center (WARDA) works with vegetables in the wet lowlands of Sub-Saharan Africa with an investment of $0.25 million/year. Along with AVRDC in West Africa, it deals with sustainable integrated rice-vegetable systems, soil fertility management, integrated pest management and improved water management.

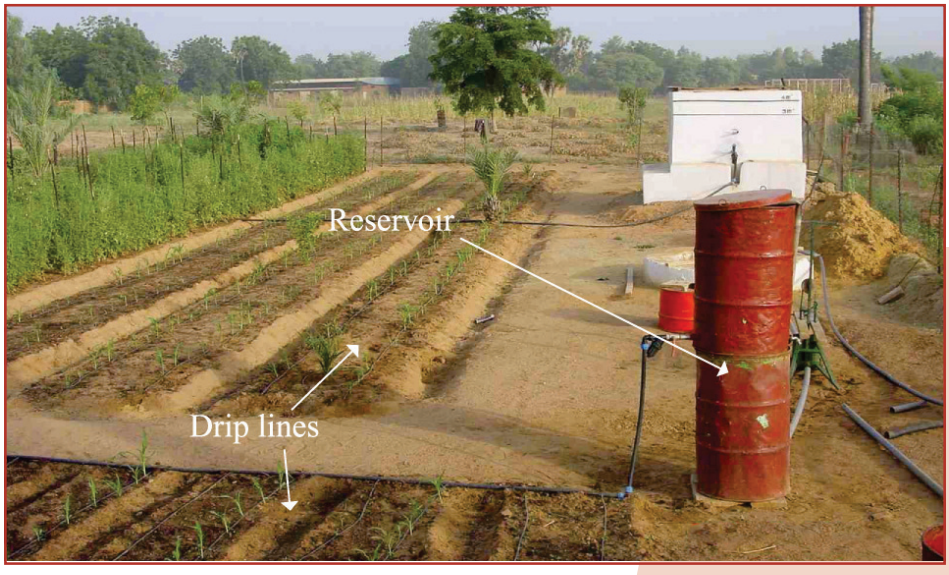
The International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) conducts research in fruits, pulses, legumes, vegetables, biofuels, cosmetic and medicinal crops in the semi-arid tropics of South Asia and Sub-Saharan Africa with an investment of $3 million/year.

Seven years ago, ICRISAT foresaw the potential of diversification and added high value specialty crops (fruit trees, vegetables, fibrous grasses, herbs and medicinal plants) to its repertoire of traditional cereal-based systems.

While the focus of ICRISAT's research in East and Southern Africa is on linking farmers to markets and diversification into legumes, in West and Central Africa the spotlight is on integrating trees and vegetables into cereal systems. In Asia, its community watersheds program has introduced fruits, vegetables, herbs and medicinal plants to improve livelihoods, nutrition and health. Among its mandate crops, fresh green chickpea pods are an important source of income when vegetables are scarce in Ethiopia. In Kenya, Tanzania, Malawi and Mozambique, ICRISAT's early-maturing pigeonpeas capture off-season high prices for green peas consumed as a vegetable.

Coinciding with the CG priority on high value crops, ICRISAT and AVRDC have jointly conducted horticultural activities on high value crops, variety development, regional variety testing, safe production practices and postharvest technology in India, at Bamako (Mali), Niamey (Niger) and Arusha (Tanzania). Another area of joint work includes the integration of data on fruit and vegetable production, consumption and favorable geographical conditions into the CGIAR-GIS data base.

Since current agricultural production systems are not curtailing environmental degradation, there is a need to modify these systems through better utilization of available resources. Furthermore, current models suggest that global climate change



will lead to even drier conditions in the Sahel. Therefore, more drought- and heat-resistant cropping systems with higher water use efficiency than are presently available are required.

Sahelian agro-pastoral systems are low in productivity due to limited rainfall, inherently poor soils and severe human-induced land degradation. Reliance on monocropping of low value crops combined with low yields, crop failures due to droughts and pests, and a high population growth rate are perpetuating both poverty and land degradation.

Vegetables can be extremely profitable when soil fertility and water supplies are improved as in the African Market Garden (AMG) model. Developed by ICRISAT scientists, the innovative AMG uses gravity-based drip irrigation accompanied by high value crops and management techniques. Over the last three years itself, ICRISAT-Niamey has promoted the installation of about 2,000 AMG units across Cape Verde, Senegal, Gambia, Guinea Bissau, Mali, Niger, Burkina Faso and Chad.

The AMG increases tomato yields fivefold, and income is multiplied manifold by adding date palms and other remunerative species. We are selecting varieties of lettuce that will not bolt (flower) too early in the warm tropics; Xina tomatoes that will not drop their flowers because of high night temperatures during the rainy season, when market prices are highest; and high value onions and peppers, along with date palms that can thrive in the climate of the Sahel. This work benefits from close collaboration with AVRDC and GHI and partnership with the University of California at Davis.

Many indigenous fruits and vegetables in Africa have yet to be commercialized, and are at risk of being pushed aside by dominant global species. Domestication of the indigenous leafy vegetable *Senna obtusifolia*, popular for salads and sauces, plays a central role in the food security and nutrition of the poorest farmers in the dry parts of the Sahel. The objective of domestication is to turn the wild species into cultivated crops, thus significantly increasing their supply to the poorest farmers and helping women earn income from their sale.

Many fruit trees mature in the dry season, when other sources of income are few. This increases year-round employment and market value, reducing the need for young men to migrate in search of dry-season work.

Integrating fruit trees with crops and drought-hardy vegetables in Sahelian West Africa is the Sahelian Eco-Farm which stays green long after the rains have ended. High value Pomme du Sahel (*Ziziphus mauritiana*) trees yield fruit, firewood and forage. Ten trees deliver as much value as an entire hectare of millet! The trees thrive because rainwater channeled to them through the bund system continues to be tapped by their deep roots. Improved cowpeas between the trees grow on residual moisture. Leaves of the soil-building *Acacia colei* surround the field. The benefits from diversity are plenty: seeds of *Acacia colei* partially substitute for costly fishmeal in chickenfeed. Roselle (*Hibiscus sabdariffa*) grown on the farm has a large export market as a food colorant and *Andropogon gayanus* grass stems are in wide demand for roofing and mats.

Some very hardy indigenous trees can grow under difficult conditions and can restore the soil over time through their root activity, biomass and nitrogen fixation ability. But they must be profitable in order to motivate people to plant them. For instance, *Acacia senegal*, which produces the commercial product 'gum arabic', is exported globally. ICRISAT is selecting high-yielding trees to be grown by communities in plantations that return a good income while renovating ruined lands. Other promising trees being studied include tamarix (*Tamarix aphylla*), mango, jatropha (*Jatropha curcas*), boscia (*Boscia senegalensis*) and more.

Good quality is rewarded with higher prices, as is evident in the citrus produced in the Air Mountains of Niger which fetches three times the price of that produced in the south of the country; the high-quality onion, tomato and lettuce varieties introduced by ICRISAT and others that attract a 50% price premium in several West African countries; the watermelon added to conventional

maize-maize cropping systems with water harvesting that triples net income in Vietnam; and a single high-quality date palm tree that yields $200 worth of fruit per year in the Sahel. Research can uncover more of such treasure troves.

Abundant availability of fruit and vegetables for consumption in subsistence communities has a substantially greater development impact via nutrition, particularly amongst women and children, and in disadvantaged environments. Tackling hidden hunger, ICRISAT breeds for higher nutrient levels in sorghum and millet. The leafy indigenous Moringa leaves in the Sahel have 50 times higher pro-vitamin A levels than millet grain.

Regulations and standards relating to food safety play a crucial role in determining opportunities of trade with developed countries with stringent standards. Disease and drought-resistant pigeonpeas yield abundantly and are exported to India, providing farmers with a life-saving backup when droughts wreck their maize crops in Eastern and Southern Africa. ICRISAT's small, simple kit that can be used to monitor grains and nuts and improve storage techniques to avoid serious aflatoxin contamination has been used successfully in Malawi by the National Smallholder Farmers' Association of Malawi (NASFAM) to establish exports to the European Union. Last year, NASFAM sold 300 tonnes of groundnuts in SADC and about 60 tonnes to supermarkets in Europe.

Another area where ICRISAT's diversification moves have proved beneficial to the small farmer has been in the area of biofuels. It is contributing to pro-poor BioPower in many ways, such as analyzing bio-energy trends to understand their consequences for the poor; developing biofuel crops and cropping methods that increase incomes and food supplies for the poor; helping the fuel industry work successfully with the poor; helping governments develop pro-poor bio-energy policies; and using bio-energy crops to rehabilitate degraded lands while earning incomes for the poor.

ICRISAT has been promoting the production of bioethanol from sweet sorghum. Sweet sorghum varieties produce lots of sugar in the stem, almost like sugarcane, and the cost of cultivation is much lower (at least in India, where most of our work is done in this area – but rapidly expanding into East Asia, East Africa and eventually we expect into West Africa). So as a result, the production of one liter of bioethanol from sweet sorghum appears to be economically very competitive with the cost of producing one liter from sugarcane juice.

Sweet sorghum has three main pro-poor advantages. It grows in rainfed areas under moderate to low rainfall without irrigation, or with only supplementary irrigation in dry areas. It can be harvested either green (just before flowering) or at grain maturity (little less sugar but compensated by the production of grain), so that both food and fuel can be produced, thus addressing the global concern about food prices being pushed up as grain is diverted to fuel. The net energy balance (energy produced per unit of fossil fuel energy consumed) is as high as for sugarcane, which is much higher than for bioethanol from maize grain, ie approximately 8 vs. 2), so the renewable fuel yield aspect is very positive. Moreover, the stalks of sorghum after crushing are prized for livestock feed and can be used to heat the water needed for fermenting the juice into ethanol.

ICRISAT has partnered with an entrepreneurial bioethanol facility named Rusni Distilleries Ltd. near Hyderabad in a pioneering

venture. The model is a tripartite relationship between the private sector (Rusni), poor farmers and input/services suppliers. The mutual benefits are that farmers benefit from higher net income and assured prices and market, made less risky and more productive by inputs supplied by the other partners; Rusni benefits from assured supply of feedstock at predictable prices; and the link to input and service suppliers provides direct information and innovation flows to and from farmers and the other partners; revenues from the system also flow to sustain the inputs and services.

Coming to biodiesel crops, ICRISAT works with *Pongamia pinnata*, a leguminous tree adapted to wetter wastelands with problem soils; and *Jatropha curcas*, a more drought-tolerant shrub adapted to well-drained wastelands and widely grown as a homestead boundary plant in the Sahel are interesting. Their fruits contain about 35% oil suitable for biodiesel.

ICRISAT is working with poor women united in self-help groups to start Pongamia enterprises in remote tribal areas of Andhra Pradesh, India, and also with India's national research system to identify high-oil varieties as well as better cultivation methods.

ICRISAT is investing in developing hybrid parents and hybrids apart from varieties, their advantage being that their per se productivity for grain and sugar yield is not only high, but also the trade off between sugar yield and grain yield is minimum with hybrids unlike varieties. Additionally, hybrid seed production in itself is a fetching enterprise for small-scale farmers.

Apart from technologies that promote high value crops, it is necessary to ensure information on drought prediction and preparedness to empower vulnerable rural communities to collectively identify problems, articulate their needs and take up informed action.

The Virtual Academy for the Semi-Arid Tropics (VASAT) is a coalition of experts, rural families and their organizations who accept that knowledge is at the core of preparedness. Its innovative mass learning model on drought preparedness (ICT + Open Distance Learning) links rural farm communities with researchers, intermediaries and markets. To date, it has reached 5000 rural households and 30,000 intermediaries in West Africa and South Asia.

Coming to ICRISAT and the Global Open Food and Agriculture University, ICRISAT has been made leader of the Agro-Ecology sector with course material and curriculum being developed in ODL mode. Partner/stakeholder consultations and agreements in South and Southeast Asia have been completed and are beginning in Eastern and Southern Africa.

The major research issues that need to be tackled in high value crops include drought, its prediction and preparedness, soil nutrient deficiencies, integrated pest and disease management, shortages of water and nutrients, overcoming malnutrition, opening up markets and communication and education reaching farmers in real time. These can be achieved by collective efforts, meaning partnerships to give dryland farmers additional options that will multiply their farm incomes. Unless we tackle poverty head-on through higher-value cropping systems suited to the needs and capacities of the poor, there is little chance of their rising out of poverty.

Virtual Inclusion is the Key to Modern Society

Distinguished guests and ladies and gentlemen, good evening!

The last few days have provided a very comprehensive picture of how Information and Communication Technologies have become an integral feature of a competitive economy and an indispensable ingredient of any modern society trying to meet the challenge of this new era.

ICT has tremendous potential to be an engine for economic growth and to deliver innovative applications in government, agriculture,

Valedictory address, e-INDIA 2007, 2 August 2007, New Delhi, India.

commerce, education, health and other spheres. In India, its application in these areas is helping raise new generations of indigenous knowledge producers and consumers.

ICT is characterized by pervasiveness, improvement and innovation spawning, leading to a transformation in the way individuals, businesses and other parts of society work, communicate and interact.

Most of all, ICTs are used to disseminate knowledge, fight diseases, empower people and improve their lives. Their potential to harness and protect natural resources, boost economy and back-up social development needs to be further explored. Worldwide, numerous innovative ICT-focused initiatives seek to modernize countries' educational systems and prepare students to participate in the Information Society.

Whether it is e-governance that mainstreams public policy decisions and provides citizens with easy access to government services or the use of telemedicine to ensure digitized health information in remove villages, the aim is to catalyze positive change and induce development.

ICT access is crucial in bridging the digital divide as a key foundation of rural development. Creating local capacity, stimulating ingenuity and innovation and boosting human skills and performance are critical in connecting rural communities to the global information and communication network.

ICTs are also increasingly playing the role of peacekeepers and disaster managers, raising awareness and suggesting appropriate action. For instance, ICRISAT's efforts in agronomic rehabilitation in tsunami-affected parts of Tamilnadu led to the development of a technology to alleviate salt-affected soils by application of sodium blockers.

The spread of ICTs throughout the world has opened up many new opportunities for marginalized groups. Access promises not only

social and economic development opportunities to citizens, but also helps cultivate the entrepreneurial spirit and skills of disadvantaged people.

For instance, ICRISAT's Virtual Academy for the Semi-Arid Tropics (VASAT), a strategic coalition for information, communication and capacity building, operating in South Asia and West and Central Africa (WCA), links rural farm communities with researchers, intermediaries and markets through an interface of ICT and open and distance learning methods.

While the digital divide keeps getting narrower in terms of mobile subscribers, telephone lines and internet users, the world continues to be separated by major differences and disparities in terms of ICT levels. Also, there are challenges in achieving efficient service delivery, anticipating emerging new technologies and responding to them quickly and anticipating and meeting information and/or transaction needs, etc.

In short, we need to exploit this great integrating force by forging partnerships. Horizontal networking with vertical connectivity can have great impact. Let us join hands to facilitate such a convergence.

Thank you.

Oasis: This is the Beginning

Dear distinguished colleagues, ladies and gentlemen and friends, it is my great pleasure to say a few words to help open this workshop.

First, I'd like to thank CIRAD and IRD for hosting us. It was a major challenge to organize an event like this over the summer to meet the deadline for the pre-proposal, and this could not have been done without a great effort made by CIRAD and IRD staff.

Second, I want to express my sincere gratitude to several donors who stepped forward at short notice to help us bring many of you to this event: Belgian Development Cooperation-DGDC, GFAR and IDRC. CIRAD, IRD, ICRISAT and ICARDA have also contributed funds and staff time.

And third, I would also like to thank all of you, the participants for taking time out of your summer to join us. We know it was very difficult especially for many of our African friends to get visas.

Opening remarks, Oasis pre-proposal workshop, 20-22 August 2007, CIRAD, Montpellier, France.

Thank you for persisting!

It looks to me like we have the seeds of a strong global partnership in this room. Oasis will grow from this strength to blossom and bear fruit.

Strong science can overcome many of the stubborn constraints that still exist in the fight against desertification. But that fight will not succeed if we stick only to our own scientific specialties. We must take an inter-disciplinary, inter-institutional approach based on strong partnerships.

Your presence here shows that Oasis is making great progress in building such partnerships. Five bodies will jointly co-propose Oasis to the CGIAR for Challenge Programme status: our hosts CIRAD and IRD, European DesertNet, The Institute for Environment and Sustainability of the European Commission's Joint Research Centre, ICARDA/ICRISAT (on behalf of the CGIAR Centers) and the Sahel and Sahara Observatory (OSS). We have also received special endorsement from the Global Forum for Agricultural Research (GFAR), the United Nations Convention to Combat Desertification (UNCCD) and from FAO.

ICRISAT and ICARDA are pleased to have been catalysts in this effort. Our centers have mandates to focus on the drylands, so we've engaged with the UN Convention to Combat Desertification from the start. We have tangible projects to show for the effort such as the Desert Margins Program and the Mashreq-Maghreb Program.

But we are here to talk about Oasis. So far, we have a basic concept, and your task this week is to put flesh onto the bones. We need strong strategies in three areas if Oasis is to succeed: science, partnerships and resource mobilization.

The core science strategy of Oasis is to find options that simultaneously 'Build Lives and Save Lands'. We've made this the Oasis motto because it recognizes that livelihoods and land care

are interdependent. We will not succeed at either if we work only on the biophysical side, or only on the policy and institutional side. Each fundamentally affects the other.

Another challenge is to go beyond the field and plot level studies of the past, to the landscape level. This is more complex and challenging, and we need your ideas on how to integrate research findings from different levels of scale.

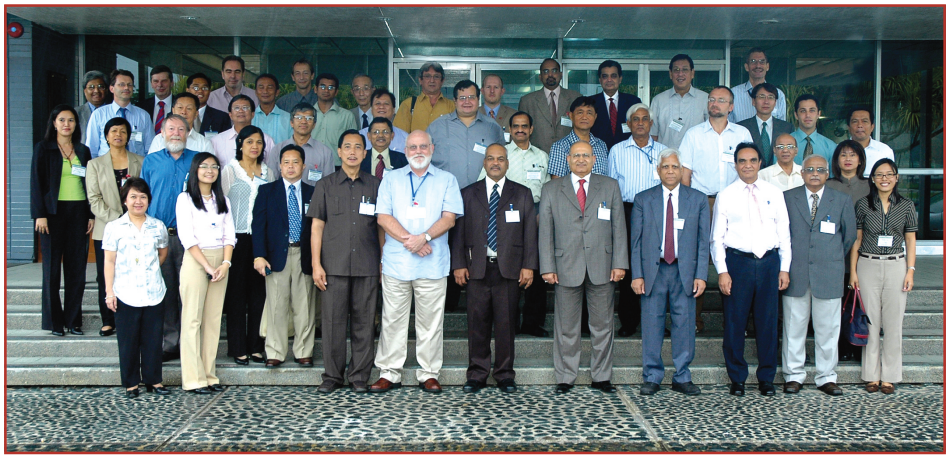
Lastly, I will just flag the need to articulate the linkages between desertification and climate change. Many policy and decisionmakers have been urging this kind of integration and we must explain how we will do it.

In closing, I would urge a new, optimistic approach to sustainable dryland development. Development investors want to bet on winners. We need to highlight the opportunities and solutions, not only the problems and difficulties. A confident, science-based Oasis can cut through the myths and despair and help dryland communities create a much brighter future.

You will show the way.

Thank you.

Biofuels: Power to the Poor



Ladies and gentlemen, good morning. Thank you for this chance to present ICRISAT's perspective on biofuels.

We're all shocked at how gasoline is emptying our pockets of cash these days. We know that nations are now scrambling to replace this foreign-exchange burden with home-grown biofuels.

But some say that the poor are paying the real price. Cereal grain costs are doubling as biofuels compete with them for land. Rising food prices especially hurt the poor and the hungry. And fragile rainforests are being cleared to plant oil palm trees for biodiesel, and sugarcane for bioethanol.

There have been riots in the streets of Latin America and Africa. Environmentalists are up in arms. Journalists and opinion writers are shouting loudly for a freeze on biofuels.

Welcome remarks, Expert Consultation on Biofuels, 27-29 August 2007, International Rice Research Institute (IRRI), Los Baños, Laguna, the Philippines.

Where should we, in the international development community, stand?

At ICRISAT, our view is simple. The biofuels revolution will happen, with or without us. We can stand back and let it take its own course, so nobody can blame us if it goes wrong. Or, we can step forward and do everything in our power to make the biofuels revolution work in favor of the poor, without degrading the environment.

We at ICRISAT have chosen to step forward, through our pro-poor BioPower initiative. The 'Power' in BioPower stands for empowering the poor to benefit from, rather than be marginalized by the biofuel revolution.

But how can we make a difference?

We believe that the biggest threat is that industrial biofuels processors may simply push the poor aside to grow these crops on vast, mechanized bio-energy plantations. It is simpler to do it that way, but it ignores the social and environmental consequences, which could be devastating.

But markets run on profit, not on social consequences. They demand the most efficient production systems possible. Our job, and it is a challenging one, is to help developing countries devise systems, technologies and partnerships that enable the poor to be competitive producers of biofuel feedstocks, and to share in the benefits.

Is this just wishful thinking? We don't think so. In fact, it has been done before.

The biggest cooperative success story in contemporary Indian agriculture is the 'White Revolution' for dairy products. Dairy products, like biofuel crops, are bulky and perishable. One might think it impossible to coordinate their flow on a national scale among millions of farmers. But empowering the poor can work wonders.

The National Dairy Development Board (NDDB) has since 1965 united millions of Indian farmers to make India the world's largest dairy product producer, including diversified products for high value export. Even poor farmers, through their cooperatives, invest a portion of their profits into research, development and marketing, so they can remain competitive and innovative.

In a similar way, bioethanol and biodiesel distilleries can design their processes to work in a coordinated way with the poor, instead of bypassing them. We are involved in a pathbreaking partnership in dryland India to do just that.

The processor is Rusni Distilleries Ltd. Rusni provides seeds, fertilizer, credit, crop management advice and other inputs to thousands of small-scale farmers and buys their crop at a guaranteed price. Farmers have seen their incomes rise significantly. We provide research and technical advice to ensure that the Rusni-farmer partnership keeps abreast of the latest innovations.

Rusni bases its distillery on a uniquely pro-poor crop that we've helped to improve, called sweet sorghum. 'Sweet' varieties of sorghum are genetically special in that they produce sugar-rich stalks just like sugarcane. But they have two major advantages over sugarcane that favor the poor:

- Sweet sorghum produces grain as well as sugar, so that the poor do not have to choose between food and fuel; and
- Sweet sorghum can be grown in the rainfed drylands where the poorest farmers live, because it needs only one-eight as much water as sugarcane per day.

In addition, sweet sorghum has major environmental advantages over maize grain, which is the main feedstock used in the USA; sweet sorghum yields about four times more net energy per unit of energy consumed in the production process. Furthermore, it is not susceptible to aflatoxin, which is a serious hazard with maize grain under the cultivation conditions of the poor.

Following the same pro-poor principles, we are also researching biodiesel production systems and crops that benefit the poor. We focus on two species – *Jatropha curcas* and *Pongamia pinnata* – that can be grown in rainfed wastelands so they do not compete with farmland, and do not require the clearing of rainforests as in the case of oil palm.

We work with the Government of India in projects that grant usufruct rights to the poor, that is, the right to plant and harvest trees on unused wasteland even though they do not own the land. By making these wastelands productive, biodiesel creates an asset base that these poor can use to grow their way out of poverty.

In short, Mr. Chairman, we at ICRISAT see biofuels as a huge opportunity to re-direct some of the massive oil revenues that now go to rich overseas oil barons, to instead benefit the rural poor of developing nations. But the risks are high if we do not act now, and

act forcefully. Perhaps never since the Green Revolution has there been as large a chance for research to make such a huge difference in the lives of the poor.

Will the poor become the beneficiaries, or the casualties of the biofuels revolution? We, here in this room have a major role to play in answering this question, through our choices and our actions. Let us stand clearly and decisively with the poor.

Thank you.

Reforming the Science Body of UNCCD

Dear friends and colleagues,

I would like to express my sincere gratitude to CoP8 and all of you for your show of trust and faith in me by electing me as Chair of the UNCCD Committee on Science and Technology. The Philippine government truly acknowledges this honor.

We all know that we are at a critical juncture for the future of the UNCCD, including for the CST. A major review has taken place. Many bodies provided very thoughtful and analytical inputs to the review. As a result, a new strategic plan drafted by IIWG is on the table for review at this Conference of Parties.

I will not dwell on the formalities of the process here. Instead, I would like to highlight a few key issues that I think most of us are aware of. They deserve our full attention and energy if we are to transform CST into a more effective, results-driven body.

Opening message as Chair of the UNCCD Committee on Science and Technology, 4 September 2007, Madrid, Spain.

Above all, we need a more science-driven, rather than process-driven CST. But the science must be demand-driven, based on open and transparent consultations with as wide a range of stakeholders as possible. This is in keeping with the participatory, people-centered vision of the UNCCD. And I call this Science with a human face.

We need to translate the counsel that our stakeholders give us into clear workplans. We need to produce concrete, valuable results such as top-quality reports and analyses on major desertification and degradation issues, and assistance to other UNCCD bodies on scientific matters.

We also need to take a look at our CST and ask whether we have the quality, capacities, structure and support needed to achieve our task. We can learn from the scientific advisory models of our sister Conventions, while not forgetting the uniquely pro-poor and pro-development aspects of our own CCD. We can debate about the particular types of reform, but we must not shy away from reform itself.

Let us take this fresh opportunity to breathe new intellectual life into our CST by opening our doors to the best brains we can find anywhere in the world, and to those at the grass roots and on the front lines of sustainable dryland development. Let us hear more dialogue, and fewer speeches; more products, not just processes.

Let us begin with a vision of a CST that is globally recognized and respected for its quality of scientific advice. Then, we must develop a road map to reach that vision.

I look forward to working together with you on that vision and road map. As we move along that road, our journey will be made easier by the knowledge that we are helping hundreds of millions of dryland poor by enhancing the role of science in the UNCCD.

Thank you.

ISH: Building for the Future

Mr Helge Gallinger, Principal, International School of Hyderabad, distinguished guests, my dear young friends, parents and ICRISAT staff, good morning!

ISH has truly come a long way since it began operations in Banjara Hills as a small learning facility started with expatriate parents. Today, with more than 200 students on board and a new building, I'm sure you're all enthusiastic to forge ahead.

The International School of Hyderabad has now moved into this campus. Amidst these verdant surroundings, students will have a

Inaugural of the new premises of the International School of Hyderabad, 14 September 2007, ICRISAT, Patancheru 502 324, Andhra Pradesh, India.

great opportunity to see science happening here; in short, apart from your laboratories inside, you'll have a real-life lab to learn from.

ISH is a part of the community with which ICRISAT continues to build the knowledge base and the development of human capital to empower peoples and communities in the developing world. It is like we are living in an eco-village, where human activities are harmlessly integrated into the natural world.

One of the most important aspects of this principle is the ideal of equality between humans and other forms of life, so that humans do not attempt to dominate over nature but rather find their place within it and gain from it too.

This new building has not been made based solely on the pieces of furniture, equipment and space. Addressing the individual and institutional needs of ISH clients, the building has been constructed to ensure an inviting atmosphere that puts students in the proper mindset, in other words, a good learning environment.

The world is moving forward and the school's purpose is to do everything possible to ensure the children will thrive in that future competitive world with the experience they receive today. The future is now.

I would like to make a comparison with ICRISAT here. With global changes taking place in science, ICRISAT is striving to address problems of the dryland farmer with its institutional innovations and scientific breakthroughs and of course, the blending with traditional knowledge.

During the past several years, the environment in which ICRISAT operates has changed significantly.

International agricultural research is seeing the emergence of a new set of institutional arrangements where public-private partnerships are mainstreamed towards a new vision of agriculture and rural development.

We are witnessing a gradual convergence of the public sector's pro-poor development goals and the private sector's commercial interests. We are in sync with global issues of poverty, climate change, desertification, land degradation, drought, loss of biodiversity and fossil fuel depletion.

I'd like to share with you the added responsibility I now hold as Chair of the Committee on Science and Technology (CST) of the United Nations Convention to Combat Desertification, which combines the roles of advocacy, awareness raising and education.

The onus lies on me to transform the CST into a more effective and results-driven body which is globally recognized and respected for its quality of scientific advice.

The bottom line is that our children are ready. We are in the process of nurturing the minds and the hearts for the future. In short, we have an institution to grow, a mission to fulfill, and impacts to achieve.

I am sure that the new premises will inspire you to scale greater heights.

Thank you.

Improving Livelihoods via Feed Production from Sweet Sorghum

Dr Michael Blümmel, Mr Palaniswamy, Dr Heraldo Layaoen, guests and ICRISAT scientists, good morning!

Welcome to the CGIAR System-wide Livestock Program (SLP) Consultation workshop to develop a proposal on "Feed production from sweet sorghum residues after extraction of juice for ethanol".

As you know, ICRISAT attaches highest priority to food and nutritional security, one of the Millennium Development Goals. To achieve this and to improve the livelihoods of smallholders in the dry tropics, we work in watershed mode of crop-livestock systems in which feed improvement for livestock is crucial. Though many farmers depend on livestock to augment their income, fodder is a major limiting factor.

Opening remarks, CGIAR System-wide Livestock Program (SLP) consultation workshop, 17 September 2007, ICRISAT, Patancheru 502 324, Andhra Pradesh , India.

ICRISAT has been working on dual-purpose sorghum (for food and feed) and fodder sorghum (mostly stover) for the last several years. The sugar content in their stalks enables better ratoonability and higher intake of feed by livestock. In fact, one of the outputs of our research has been improved fodder sorghum for sweet stalk and high biomass.

Besides their value as animal feed, sweet sorghum varieties are crucial for ethanol production since the multiple uses of the crop — as food, fodder/feed and fuel — will involve smallholder farmers in the bioenergy revolution. So it's a win-win situation for the farmer whereby he will have greater marketing opportunities for his produce — stalk for juice, grain for food and stillage/bagasse for feed.

I understand that initial results have shown encouraging weight gain in livestock due to bagasse, with the nutritional value of bagasse being almost similar to that of normal stover. In this context, the proposal to use bagasse for feed production goes a long way in meeting the twin objectives of improving livestock and widening market opportunities to improve livelihoods of small farmers.

This project will link and integrate ongoing activities, that is sweet sorghum breeding, distillation of ethanol from sweet sorghum and improving the utilization of sorghum residue as livestock feed. In the process, it will bring together researchers (sorghum breeders, livestock nutritionists and economists), production linkage institutions (Agro-Business Incubator) and entrepreneurs (ethanol distillers and the feed industry) to optimize the whole plant utilization of sweet sorghum for food, biofuel and feed uses in India, the Philippines and Uganda. This ties in well with the CGIAR objective of developing public-private partnerships for the public cause.

While livestock producers will benefit through increased supply of feed, sorghum farmers will profit from the sales of stalks for

ethanol, leaf/stillage residues to livestock producers/markets and grain to food market chains.

Hence the project will improve livelihoods of the livestock and crop mixed farming community and at the same time help sustain the environment.

I am glad to note that the project has the added advantage of the three countries involved already being committed to ethanol production from sweet sorghum and these commitments are implemented by the proposed public-private coalition in all three countries.

I am sure your deliberations will be successful and that you will come up with a winning proposal on the use of bagasse of sweet sorghum for animal feed.

Let us remember that we have an institution to grow, a mission to fulfill, and impacts to achieve.

Thank you and have a good day!

Increasing Legume Productivity for a Wealthier and Healthier People in the Tropics

At the outset, I would like to thank the Bill & Melinda Gates Foundation for funding the Tropical Legumes II project, especially Drs Rob Horsch and David Bergvinson, for their support. I would also like to thank the Government of Tanzania for agreeing to host this meeting, particularly Dr J Haki and S Lyimo. And but for the backing of the Directors General and staff of CIAT, IITA and ICRISAT, which I gratefully acknowledge, the project would not have taken off and shaped up so well.

Inaugural address, Project launch meeting of the Tropical Legume Improvement-II Project, 24-28 September 2007, Arusha, Tanzania.

Grain legumes contribute up to one-third of the dietary protein needs of the human population globally and supplement essential amino acids (like lysine and tryptophane), minerals, fibre and vitamins. A cheaper source of protein than meat and milk products, they are particularly important in developing countries where diets are low in protein derived from animal products.

According to the FAO (2006), 863 million people were undernourished worldwide in 2002–2004, of which 832 million lived in developing countries. South Asia with 299 million undernourished people and Sub-Saharan Africa with 214 million possess a disproportionate share of the world's hungry.

Grain legumes are grown globally on 71.8 million hectares, but the bulk of legumes produced for food are grown in tropical and sub-tropical countries where the majority of the poor and malnourished live. Seventy-six percent of the area planted to legumes worldwide is found in Asia (49.6%) and Africa (26.2%).

Despite its significance to human nutrition, legume consumption in many countries in Sub-Saharan Africa and South Asia is very low due to inadequate availability. For instance, the per capita availability of legumes in India declined from 22 kg per annum in 1950 to 10 kg per annum in 2003. Moreover, the relative price of legumes compared to cereals has risen sharply (due to increased demand and decreased supply), making them less affordable to the poor.

With national policy makers concentrating on achieving self-sufficiency in staple cereals production, legumes have been largely replaced by cereals and other high value crops and have been relegated to marginal lands. Compared to cereals, legume productivity averages around 700 kg/ha in both SSA and SA, compared to wheat (2805 kg/ha), rice (3970 kg/ha) and maize (4610 kg/ha).

Low legume yields are the result of their high susceptibility to pests and diseases and abiotic constraints such as salinity, low soil fertility, heat stress and drought. Global climate change threatens to exacerbate droughts in large parts of the tropics, due to factors such as erratic and inadequate total rainfall, long dry spells and the delayed onset and/or early cessation of rains.

There are serious concerns about declining productivity in high-input cereal-based rice-wheat, rice-rice and maize-wheat cropping systems. Despite increased levels of inputs, yield levels are declining in some cases.

By including legumes in cropping systems, the heavy nitrogen needs of modern intensive cereal-based cropping systems can be at least partially met, and the physical and chemical characteristics of the soil generally improved. Legumes in rotation with cereals not only improve cereal productivity but also economize on nitrogen use. Experiments have shown that chickpea increased the yield of a succeeding rice crop by 1 ton per ha when compared with crop rotation involving wheat. The other positive effects of cereal-legume crop rotations are their ability to reduce weeds, diseases and insect-pests in cereal monocrops.

ICRISAT has developed an academic policy on research and extension that takes into account the prevailing situation in a country. We utilize research results to address burning issues in developing countries. As Bill Gates implied while speaking at Harvard University, the ultimate test of a person or institute's contribution to society is judged by the extent to which efforts have helped reduce the incidence of poverty.

Researchers, farmers, extension agencies and policy markers face the challenge of low and unstable grain legume yields. Most of the legumes continue to be grown with low inputs and on poor and marginal lands. Farmers are either not aware of the improved varieties and production technologies or adoption is hampered by the lack of quality seed. Serious efforts are therefore needed in this direction.

ICRISAT believes it is necessary to reduce the gap between intention and action. The prevalence of research and extension activities in its programs has facilitated widespread impacts of our research. This is what we call the research-for-development paradigm because the complex nature of agriculture is such that solutions cannot be based around a one fix approach. While making decisions we take into account natural resource fragility, community vulnerability, risk profiles, asset resilience, market options and a host of other factors.

Developing improved varieties and production technologies that can provide higher and stable yields is crucial but our responsibilities do not end there. We have to make concerted efforts to raise farmers' awareness of these technologies and remove bottlenecks in their adoption. In short, we have an institution to grow, a mission to fulfill, and impacts to achieve.

The Tropical Legume Improvement II Project is a mega project that involves three CGIAR institutes - (ICRISAT, CIAT and IITA) and NARS, NGOs, and government agencies of eight countries of Sub-Saharan Africa (Ethiopia, Kenya, Malawi, Mozambique, Tanzania, Mali, Niger and Nigeria) and two countries of South Asia (India and Myanmar). The project involves six major legumes – beans, cowpea, chickpea, groundnut, pigeonpea and soybean.

The proposed project aims to (i) exploit the improved germplasm that already exists, by using 'fast track' evaluation and seed

production; (ii) encourage farmer-participatory varietal selection; (iii) develop improved crop cultivars (including hybrids in the case of pigeonpea) by combining conventional plant breeding with modern breeding tools and techniques developed at the participating institutes and by the Tropical Legumes I Project supported by the Bill & Melinda Gates Foundation; and (iv) strengthen national programs' capacity for plant breeding.

Priority-setting, baseline surveys, monitoring and evaluation, policy support and assessment of adoption and impacts will be used to set the context for and support these activities. Earlier studies have shown that adoption of improved varieties of legumes have been hampered by the lack of awareness among farmers of improved varieties and inadequate seed availability.

This project will rectify the situation by using farmer participatory varietal selection to enhance the awareness of farmers and developing a sustainable and effective seed system involving public and private sector seed agencies, seed traders and farming communities. We expect strong linkages with PASS (Program for Africa's Seed Systems) and other related programs to derive synergies in promoting local seed enterprises.

Overall, there will be strong links between the different parts of the project, ie, the targeting of interventions based on biophysical and social parameters; molecular-genetics research; applied research (field breeding and seed delivery systems); and adaptive research (participatory variety selection).

We are confident that this project will contribute to increases in the productivity and production of legumes in Sub-Saharan Africa and South Asia, help reduce food and nutritional insecurity, improve the livelihoods of resource-poor farmers and ensure adequate availability of legumes at affordable prices to poor rural and urban consumers.

Given the number of partners involved in the project, we will recruit a Project Manager who, along with the Objective Coordinators, will be able to deliver the agreed milestones in the projects. All of us have the capacity and willingness to work together to bring the fruits of research to farmers, which reminds me of ICRISAT's mantra of doing *Science with a human face*.

I hope your discussions during these five days will be very fruitful and lead to the development of a sound work plan to achieve the milestones.

Thank you.

ICRISAT and Farmers: Partners in Progress

His Excellency, the Governor of Karnataka, Shri Rameshwar Thakur; Mr A Ramaswamy, Principal Secretary (Agriculture); Dr PG Chengappa, Vice Chancellor, UAS-Bangalore; and Dr JH Kulkarni, Vice Chancellor, UAS-Dharwad; Board of Regents, staff of the University of Agricultural Sciences, and farmers of Karnataka, welcome to this Krishi mela on behalf of ICRISAT.

ICRISAT is devoted to improving the livelihoods of the poorest of the poor in the semi-arid tropics of Asia and Africa with its research on six major crops — sorghum, pearl millet, chickpea, pigeonpea, groundnut and finger millet (*ragi*) — and on natural resource management. Our *mantra* is *Science with a human face*.

We strongly believe that the science we do and its outcomes must be shared to benefit farmers in semi-arid areas. In this Krishi mela,

Chief guest, Krishi mela (Farmers Day), 16 October 2007, UAS-Bangalore, Karnataka, India.

ICRISAT is showcasing its Agri-Science Park (ASP) for public-private partnership in technology commercialization.

ICRISAT has had fruitful R&D collaboration with scientists in UAS-Bangalore, UAS-Dharwad, the University of Mysore and the State Department of Agriculture as well as with NGOs such as MYRADA, AME Foundation, etc. In fact, our ties with the UAS go back to 1978 when the University provided ICRISAT land at the Agricultural College, Dharwad, for research on sorghum improvement.

These ties were strengthened with an MoU between ICRISAT and UAS-Bangalore in 2001. Scientists from both institutions have since been working on drought tolerance mechanisms and have developed and released improved varieties and hybrids of different crops.

Among the varieties adopted by farmers on a large scale is the pigeonpea variety ICP 8863 released by the Karnataka Government as Maruti in 1986, especially in Gulbarga and Bidar. Adoption studies conducted in 1995 revealed that Maruti has over 60% adoption and over 45% yield advantage over the check variety. It was estimated that growing Maruti fetched Karnataka US$ 10 million!

Two years ago, ICP 7035 was released in southern Karnataka with very good farmer adoption. We now have hybrids in pigeonpea (such as ICPH 2671) which will be available to farmers in 2008.

The drought-tolerant groundnut variety ICGV 91114 developed by farmer-participatory research with Anantapur (Andhra Pradesh) farmers has been performing well in farmers' fields in Kolar and Tumkur districts.

ICRISAT has also been partnering with Karnataka's Sujala Watershed Program to harness scientific knowledge for productivity enhancement.

Improved fertility management with balanced use of fertilizers, use of vermicompost and planting of *Gliricidia* trees with improved

crop cultivars have increased crop yields by 116 to 345%, and in many cases doubled yields.

Improved cultivars of *ragi*, maize, sorghum, pigeonpea, chickpea and other crops have increased productivity over farmers' cultivars by 12 to 35% in the case of sorghum, maize and *ragi* and by 140% in the case of groundnut.

Improved management practices with farmers' cultivars increased crop yields by 46 to 74%, yielding additional incomes of Rs 6,000 from finger millet and up to Rs 21,000 from sunflower.

Increased rainwater use efficiency and raising crop productivity with greater fodder availability has led to dairying emerging as an important source of income in the watersheds. I request the farmers gathered here to visit some of the nucleus watersheds so that they can use some of the technologies on their farms.

These are but a few examples of what science can do to help the farming community. We seek your feedback on what more needs to be done or refined to enhance crop productivity so that farmers like you can have improved livelihoods.

Thank you and *namaskara*.

Growing ICRISAT for the Poor

Board Chair Simon Best, honored awardees, distinguished guests and Team ICRISAT, good morning and welcome to our 35th anniversary celebrations!

It is a momentous occasion for Team ICRISAT. The celebrations that begin today confirm ICRISAT's status as the center of scientific excellence. We are here today to honor all those who made this possible — those who have been here as long as the institute itself; those who rose with it and learned to believe in its goals; those who turned adversities into opportunities and those who endured tough times, yet believed that every cloud has a silver lining.

Loyalty Day, 21 November 2007, ICRISAT, Patancheru 502 324, Andhra Pradesh, India.

We are a stronger and more diverse organization in pursuit of the best in science. That is because we have people who swear by the Institute's interests and who have pledged their best efforts to the poorest of the poor, helpless and struggling against the insidious bonds of hunger, poverty and environmental degradation. To the 200 loyalty awardees across our locations, I hold your loyalty in sacred trust.

Looking back on the relevance of our scientific accomplishments and their resounding and wide-ranging impacts, I would say five major catalysts have kindled our science triumphs and impacts.

No organization can do without a clear goal. ICRISAT's clear vision of *improving the lives of the poor in the semi-arid tropics* combined with its mission to *reduce poverty, enhance food and nutritional security and protect the environment thereby helping empower the poor through science with a human face,* have been facilitated by its focused strategy.

Secondly, a carefully nurtured Team ICRISAT, in which each individual is a crucial cog in the wheel of progress, has brought us to a stage where we have been adjudged "Outstanding" among the CGIAR centers for total excellence 'with regard to quality and relevance of research, institutional and financial health, and stakeholder perception'. We have a strong and very supportive Governing Board and the best human capital in Team ICRISAT.

Agriculture faces enormous challenges today. ICRISAT remains a strong votary of strategic public-private-people partnerships to harness synergies for the poor. We have the best of ties with our research partners and collaborators. We have good support from the donor community, including the new-generation of donors and we are collaborating with the best in the business. Our donors and those we serve, the farmers, are happy. Our ties with the host-country are at an all-time high; our research has attracted funds from them like never before.

More importantly, our financial situation is sound. We have had budget surpluses in the last four years, and look forward to another surplus this year. As a natural corollary, staff morale is very high. I can sense the eagerness among staff to achieve greater heights of glory.

A decentralized governance and management system is in place in ICRISAT, helping things along. Our scientific breakthroughs and their impacts in Sub-Saharan Africa and Asia have been our rewards.

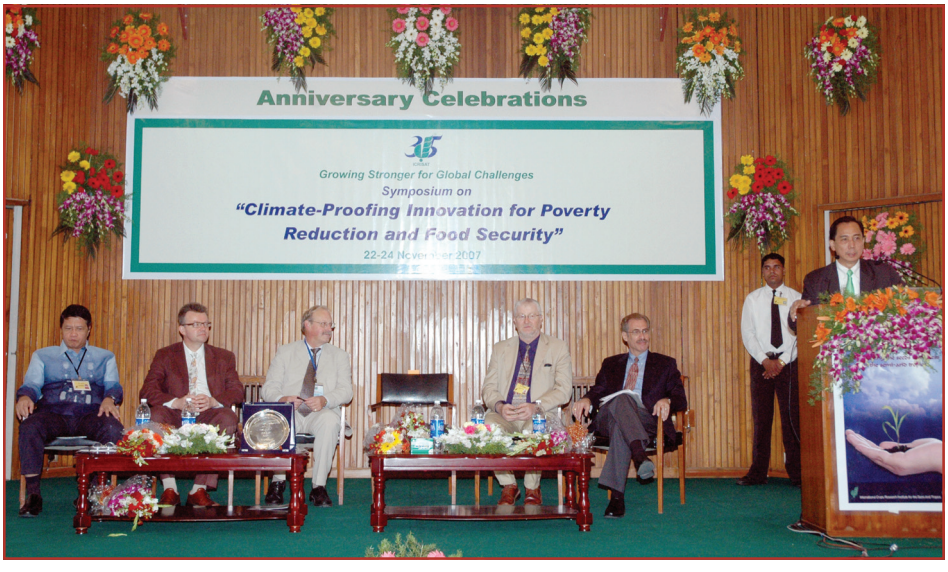
So if we are to thrive in the future and achieve greater glory, loyalty is a foundation we must build on. It is a rock that has preserved us, and a vessel that will carry us into the future.

It takes loyalty and trust for peers to be comfortable around their leader and to foster a work environment that perpetuates the goals of an organization. ICRISAT has proven to be the fertile soil for the seeds of loyalty and productivity to be sown. That's how it has fostered a conducive environment enabling it to root Team ICRISAT in a common goal and agenda.

Today, ICRISAT is riding high on the wave of success. We have major challenges ahead, such as climate change, desertification, land degradation and drought, and I visualize a growing Team ICRISAT getting set to face them with its excellent scientific expertise. Let us fortify ICRISAT, make it strong for the poor. We have an institution to grow, a mission to fulfill, and impacts to achieve. Together, let us forge ahead in this task of growing ICRISAT for the poor!

Thank you.

Growing Stronger for Global Challenges



Dr Martin Parry, Dr Simon Best, Dr Colin Chartres, Dr Dennis Garity, distinguished guests, our honorees, partners and friends, and Team ICRISAT, good morning!

I would like to welcome all of you to ICRISAT's 35th year celebrations and Symposium on "Climate-proofing Innovation for Poverty Reduction and Food Security". ICRISAT has truly come a long way. It has been doing science successfully with pathbreaking achievements to show. Doing science with a human face has paid dividends not just to the poor but to us as well.

This year has been a milestone for us; ICRISAT was adjudged "Outstanding" among the CGIAR centers for total excellence 'with

Annual Day, 22 November 2007, ICRISAT, Patancheru 502 324, Andhra Pradesh, India.

regard to quality and relevance of research, institutional and financial health, and stakeholder perception'.

There are one billion poor people in the world who are vulnerable to climate change, desertification, land degradation, loss of biodiversity, water scarcity and shortage of fossil fuels. India alone accounts for 25.93% of this population and China 16.66%.

The remaining part of Asia and Pacific accounts for 18.30%. In short, Asia is a hub where the poor, undernourished and the vulnerable live. This is followed by Sub-Saharan Africa, which accounts for 23.94% of the one billion.

The poor can be made less vulnerable with greater science and knowledge-based interventions, and more importantly significant donor support from developed and developing countries to support this research.

Business as usual will not help us meet the Millennium Development Goals and much more the goal of reducing poverty by half by 2015. ICRISAT believes that unless the livelihoods and resource base of such vulnerable rural communities are made more resilient, coping with climate change and desertification may be next to impossible.

ICRISAT has been doing this work in 48 countries of the semi-arid tropics of Asia and Africa for the past 35 years. The semi-arid tropics are the most vulnerable ecosystems under the climate change regime.

We have generated and promoted a wealth of technologies and knowledge that have ensured the food and nutritional security of over 560 million poor people. Among them are improved crop varieties, such as our hybrid pigeonpea developed through cytoplasmic male sterility; downy mildew-resistant improved pearl millet hybrid HHB 67 developed through marker assisted breeding; new groundnut variety ICGV 91114; our aflatoxin food testing kit;

and seed aid policies. Improved varieties of ICRISAT crops are now grown in millions of hectares in Asia and Sub-Saharan Africa.

Our natural resource management approaches to include community watershed management are helping farmers devise ways to manage landscapes, soils and crops to store up more and use water and nutrient resources more efficiently.

The Alliance of CGIAR centers is bringing their knowledge together to tackle issues of global importance on land degradation and drought through the Oasis Challenge Program initiative.

Promising new opportunities for mitigating climate change and creating large new markets for agriculture have emerged through the production of sweet sorghum for biofuel. Our crops are very efficient in carbon sequestration.

Our innovations offer stimulating opportunities to use agriculture to promote development – the village-level studies and the Virtual Academy for the Semi-Arid Tropics (VASAT) are making information accessible to the rural poor while the Agri-Science Park (ASP) converges 20 innovations and 60 public-private partnerships. So is the case with our Center of Excellence in Genomics.

We are showing the poor multiple pathways out of poverty by increasing farming system efficiency through crop diversification with high value crops, opening new markets and adding value to farm products.

The catastrophic effects of extreme weather events as revealed by the Intergovernmental Panel on Climate Change (IPCC) threaten to make agriculture riskier, multiplying hunger and poverty.

Our future focus will build on our past work, and look at ways to climate-proof our crops, which already are those that grow in marginal lands, including preparing communities to cope with these vulnerabilities.

I would like to reiterate that ICRISAT is committed to an active role in developing climate change mitigation and coping strategies. I am sure that the symposium will lead to the emergence of novel mitigation and adaptation strategies and make more resilient the resource base upon which the poor depend. The time to act is now! And ICRISAT is ready and has to grow stronger to face these challenges.

Thank you.

Combating Climate Change through Innovative Science

The inconvenient truth that Al Gore reminded us all of, and the reports of the Intergovernmental Panel on Climate Change (IPCC) have riveted global attention towards the catastrophic consequences of climate change.

Some of its pervasive impacts, like rising temperatures that shorten growing seasons and reduce crop productivity, reduced access to water, greater disease potential and heat stress, shifting precipitation and runoff patterns, altered pest and weed patterns, more frequent and furious floods and droughts, and the loss of biodiversity threaten to make agriculture riskier for impoverished and vulnerable dryland farmers in Asia and Africa, multiplying the risk of poverty and hunger.

Symposium on Climate-proofing innovation for poverty reduction and food security, 23 November 2007, ICRISAT, Patancheru 502 324, Andhra Pradesh, India.

ICRISAT addresses these key issues through its Operational Research Strategy on "Managing current climatic uncertainty and adapting to future climate change", the key strategy being sub-optimization for resilience.

ICRISAT follows an Integrated Genetic and Natural Resource Management strategy, or IGNRM. We believe that the whole is much more than the sum of the parts, so we work in a closely interactive way across disciplines. For example, we recognize that drought and heat-tolerant varieties will do much better if they are grown in farming and land-use systems that conserve water both in the root zone of the crop, and in the wells and reservoirs that villagers need for their survival.

Such wells and reservoirs will also help farmers buffer against the expected wild swings in water supply that are expected from climate change, causing floods and droughts. The poor need to save water when there is too much of it, for use later when there is too little.

This IGNRM approach will give farmers higher and more stable productivity over time. They need this livelihood security in order to have confidence in the future, and to invest in it.

Our long-term watershed management experiments have demonstrated the potential. By taking an IGNRM approach that looks at total system needs, we've shown that dryland watersheds in India can produce 5.1 tonnes of grain per hectare a year, supporting 21 persons compared to 1.1 tonnes of grain supporting 4.8 persons under present practices. At the same time, water supplies can last all year round instead of wells going empty in the dry season, forcing villagers to migrate under great hardship.

Hence our future focus will be on IGNRM to prepare communities to cope with these vulnerabilities.

We emphasize the concept of 'resilience'. Climate change is going to shock our traditional systems, and they need to be more resilient so they can quickly bounce back. We are integrating trees

into traditional annual cropping systems to help reduce the impacts of winds and to protect the soils from fierce storms.

ICRISAT is also putting its traditional strong breeding capacities to use. We are adapting our mandate crops – pearl millet, sorghum, chickpea, pigeonpea and groundnut – to cope better with a warmer world, through heat and drought tolerance, resistance to potential new and more severe pest and disease attacks and the migration of dryland crops to areas too marginal for other crops.

To cite a few instances of our successes so far, we have ICCV 2, the world's shortest-duration *kabuli* chickpea variety that matures in 85-90 days escaping terminal drought; groundnut variety ICGV 91114 that is popular in Anantapur district for its ability to withstand drought and pigeonpea hybrid ICPH 2671 which is highly resistant to two major diseases, fusarium wilt and sterility mosaic.

At the same time, we must prepare in case the changes in climate are so strong, that the farmers need to change to different crops that are better suited to the new climate. Some areas now grown to higher-rainfall crops may need our intervention as they dry, in order to bring in dryland cropping systems. The opposite trend may occur in other places.

We are working closely with meteorological organizations to better understand the changes that may lie ahead in particular regions. With the use of weather-driven crop, soil and weather simulation models and spatial weather data generators, we can learn from the past, to plan for the future.

We can also improve economic and social resources, providing safety nets for times of need. Co-learning with farmers and research on how they innovate help build social and knowledge capital, and extend their benefits more widely.

Finally, bioenergy research can also provide significant contributions to the fight against climate change, by reducing global emissions of greenhouse gases into the atmosphere. We are pursuing this through our pro-poor BioPower initiative. We are breeding sweet sorghum which yields about eight times more energy in the form of bioethanol, than is consumed in its production. This net energy gain is five times higher than one can get from maize grain. At the same time, sweet sorghum yields food grain and nutritious stalks for livestock feed.

BioPower is also researching biodiesel crops. The cultivation of non-edible oilseeds jatropha and pongamia on wastelands provides new livelihood opportunities for the poor while producing clean-burning, renewable energy.

We have partnered with a wide range of institutions in many on-going specially funded projects in Africa and Asia in which climate risk management approaches are integral and in which other CGIAR Centers are partners. Adaptation strategies need to be given a serious thought.

We need to be more sharply focused and better coordinated to confront this unavoidable situation. Every center can contribute to the basket of options to upscale and sharpen research strategies towards adaptation. Let us act before it is too late! ICRISAT is poised to take the leap forward!

Thank you.

Harnessing the Power of Legumes for Asia's Poor

Country partners from India, Nepal and Vietnam and ICRISAT scientists, good morning and welcome to the In-country Work Plan and Project Launch meeting of the IFAD Project on "Harnessing the true potential of legumes: Economic and knowledge empowerment of poor rainfed farmers in Asia".

Legumes are laden with nutrients that provide energy, have high commercial potential, and hold great promise for fighting hunger, increasing incomes and improving soil fertility. They enable

Welcome address and Opening remarks, Launch meeting of the, IFAD Project on *Harnessing the true potential of legumes: Economic and knowledge empowerment of poor rainfed farmers in Asia*, 12 December 2007, ICRISAT, Patancheru 502 324, Andhra Pradesh, India.

smallholder farmers to get onto the first rung of the ladder leading out of poverty and nutritional insecurity.

Climate change threatens to make dryland agriculture more and more difficult. Farmers need to produce and adopt more resilient legumes that evade drought, floods, mid-season dry spells, etc. In prioritizing ICRISAT's Crop Adaptation Strategy for Climate Change, we are able to draw heavily on current research products and lessons learned.

For instance, our long-term watershed management experiments have shown that drylands can produce 5.1 t of grain per hectare a year supporting 21 persons as compared to 1.1 t of grain per hectare a year supporting 4.8 persons in the case of farmers' practices. Also, such practices sequestered 330 kg of carbon per hectare a year up to a depth of 120 cm by intercropping sorghum with pigeonpea.

The current IFAD project aims to consolidate and out- and up-scale the gains achieved in IFAD TAG 532-ICRISAT in India (involving groundnut, pigeonpea, chickpea and lentil); Nepal (with pigeonpea, chickpea, groundnut and *Phaseolus* beans) and Vietnam (with groundnut and soyabean), where the activities will focus on tribal and other marginal rainfed areas.

In addition to promoting the informal seed sector and establishing linkages between informal and formal seed sectors, training farmers in seed production, processing and storage methods must enable them to become their own seed producers.

Value addition (such as *'dhal'* making, oil extraction and food products) in legumes at the local level will facilitate product availability to rural consumers at a cheaper price.

The project aims to fulfill these objectives by developing informal seed systems at the village level; supporting the wider adoption of farmer participatory varieties; strengthening the informal seed sector to develop self-reliance and self-sufficiency in seed supply

at the village level; and by knowledge empowerment of farmers in seed production, processing, seed health, storage and marketing. Knowledge empowerment of farmers will ensure long-term sustainability of gains made in the project.

No institution can single-handedly tackle the challenge of crop improvement for several crops across such a broad geographical spread. ICRISAT believes in involving partners — in this case from India, Nepal and Vietnam national research programmes — to ensure new tools and germplasm and varied perspectives, to bring in cutting-edge science, provide reality checks and farmer perspectives and to ensure effectiveness and continuity.

While empowering poor farmers economically is important, knowledge empowerment with training courses on integrated legume production technologies, familiarization with a farmer participatory research and extension approach, 'hands-on' training in making biopesticides and botanicals, sensitizing village school children to integrated legume production technologies and setting up ICT-enabled learning centers will lead to unprecedented confluence of knowledge and opportunities and complete the circle.

I take this opportunity to thank IFAD for reposing their trust in us and for their unstinted support. I am sure that the deliberations during the next two days will lead to work plans that will improve the socio-economic conditions of farmers in terms of sustainable increased productivity, food and nutritional security and improved family well being.

Thank you.

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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