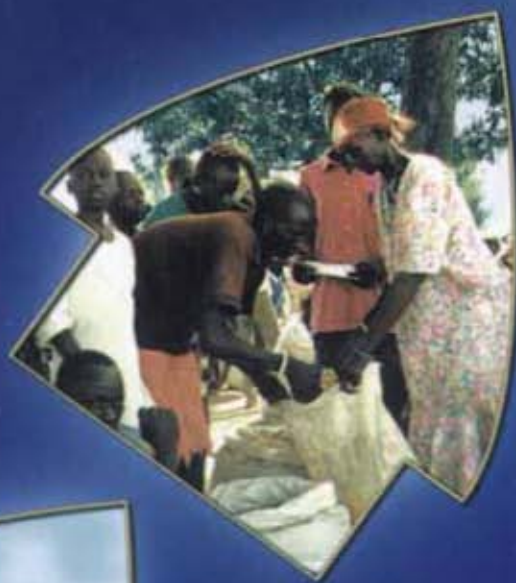


ICRISAT
moving forward
in the service
of the SAT



A Compendium of Speeches
and Presentations by
William D Dar
January-December 2003

ICRISAT

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

2004

First printed in March 2004
Hyderabad, India

Bibliographic Citation:

ICRISAT Moving Forward in the Service of the SAT
A compendium of speeches and presentations by
William D Dar, Director General, ICRISAT, 2004. 106 pp.
Includes a CD-ROM with PowerPoint presentations.

Volume prepared by:

Communication Office
ICRISAT

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William D Dar

Director General, ICRISAT

Biographical Sketch*

William D Dar 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 one of 15 nonprofit, nonpolitical Centers within the umbrella of the Consultative Group on International Agricultural Research (CGIAR).



Dr Dar is a Member of the UN Millennium Task Force on Hunger.

Prior to joining ICRISAT, Dr Dar served as Presidential Advisor for Rural Development, and Secretary of Agriculture in the Philippines (equivalent to Minister of Agriculture). 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). He also served on the managing 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 (UPLB) 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'

**As on January 2003*

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 Most Outstanding Alumnus of BSU. In November 2002, PCARRD honored him with its highest and most prestigious award, the Symbol of Excellence in R&D Management. On April 2003, Dr Dar was conferred the honorary degree of Doctor of Science by the Mariano Marcos State University (MMSU) in Batac, Ilocos Norte, Philippines. On October 2003, the Vietnamese Government honored Dr Dar 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. Just recently the Ilocos Sur Polytechnic State College (ISPSC) High School Class '69 during its reunion awarded him the 'Anahaw Leaf Award' for being the Most Outstanding Alumnus.

Since leading ICRISAT, Dr Dar has intensively advocated for a Grey-to-Green Revolution in the dry tropics of Asia and sub-Saharan Africa 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 2002, ICRISAT led by Dr Dar, won for the third time the King Baudouin Award (the most prestigious in the CGIAR) together with ICARDA for developing new chickpea varieties with higher tolerance to drought and heat, better resistance to pests and diseases that provide stable and profitable yields. ICRISAT and IITA are the only CGIAR Centers that bagged this award three times. In 2003, ICRISAT underwent two external reviews from the CGIAR, acknowledging outstanding science quality and sound 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.

FOREWORD

If I did not know Dr William D Dar any better, I would declare that he has *come of age* as the Director General of the International Crops Research Institute for the Semi-Arid Tropics; but each time one decides that he has reached the pinnacle, Willie Dar shifts the goalposts and continues to grow and metamorphose with the ever-evolving Institute that he leads.



Moving Forward in the Service of the SAT is the fourth compendium of William Dar's speeches and presentations as Director General of ICRISAT. The title is derived from the *Moving Forward* theme used for the Institute in 2003, which highlights the message that ICRISAT has progressed from an Institute that initially worked on increasing seed and food, to one known for improved crop varieties across the semi-arid tropics of the world, to an institution adding value to its earlier successes by joining forces with like-minded partners in improving livelihoods through marketing and good polity in all aspects of agricultural affairs.

I wholeheartedly recommend this compendium as an excellent reference source for what is happening in international agriculture. In the speeches recorded here (on an average of two a month, which in itself is a commendable achievement), the reader will find invaluable facts, reports, advice, and encouragement. I wish you an educative and enjoyable experience.

A handwritten signature in black ink, appearing to read 'Uzo Mokwunye', with a stylized flourish at the end.

Uzo Mokwunye

Chair

ICRISAT Governing Board

Revitalizing Philippine Agriculture and Agricultural Education

Speech delivered at the Western Luzon Agricultural College, 15 January 2003, San Marcelino, Zambales, Philippines

Overview

I am pleased to present this paper on revitalizing Philippine agriculture and agricultural education. By doing this, I revisit a historic part of my career when I was Professor and Vice-President for Research at the Benguet State University.

I profoundly thank President Feliciano Rosete for bringing me to this occasion. Dr Rosete was with me when I visited the Pampanga Agricultural College the other week.



In my presentation, I will focus on the state of Philippine agriculture including a proposed platform, the role and challenges facing agricultural education and the CGIAR and ICRISAT.

Agriculture and the economy

In spite of the growth of the industrial sector, agriculture is still the driving force of the Philippine economy. The agricultural sector continues to be a major source of income and employment, accounting for nearly half of the total labor force and contributing over 20% of our gross domestic product (GDP). When all economic activities related to agro-processing and supply of non-farm agricultural inputs are included, the agricultural sector accounts for about two-thirds of the labor force and 40% of the GDP.

Likewise, agriculture contributes about one-fourth of the country's export earnings. Moreover, agriculture strongly affects the growth of the economy since it is a source of food and raw materials. It is also

the biggest market for non-agricultural inputs and consumer goods and services. Therefore, the attainment of food security and alleviation of poverty requires a rapid, sustainable and equitable development of the agriculture sector.

A proposed platform

To face the foregoing situation, the country must pursue competitive, complementary and compensatory measures on behalf of our farmers. Remember the popular *PEPE* and *PILAR*? We can use this to promote a contemporary platform for Philippine agriculture.



PEPE is an acronym representing the guiding principles of our platform, especially in attaining self-sufficiency in our most important crop, rice. *PILAR* represents the main elements to operationalize our proposed platform. Let me explain:

P = Political will. This must be further strengthened to realize our perennial dream of attaining rice self-sufficiency. The government must have the will to mobilize the needed support and resources at all levels to make this happen.

E = Economic growth. This is the engine for agriculture and rural development. Our rice self-sufficiency and other agriculture programs, guided by a livelihoods framework, should contribute to the creation of wealth and rural employment, which will fuel the growth of our faltering economy.

P = Poverty reduction. This should go hand in hand with economic growth. Most of our poor people are farmers, especially those in the rainfed and upland areas. Hence, the core objective of our agriculture strategy should be to reduce if not eradicate rural poverty.

E = Environmental sustainability and farmer empowerment. These must be pursued together with increased farm productivity and income. We must not compromise the needs of the present with those of our future generations. Likewise, we

must empower our farmers so that they have greater access and control of production, post-production and marketing resources.

For the foregoing to be realized, we must have the following elements:

P = *Policies* that will make agriculture globally competitive, pro-farmer and pro-business must be enacted and implemented. Congress and local governments should be harnessed as our partners in putting the right policies in place to put our agriculture programs on track.

I = *Investments* must be increased significantly to build more small to medium irrigation systems and other rural infrastructures needed to spur agricultural development.

L = *Local government units*, farmers' organizations, the private sector and civil society organizations should be mobilized to help plan and implement our agriculture programs. Let us designate local government officials as the *food security czars* in their respective areas. We must tap the private sector to provide the needed investments for profitable farming. Moreover, let us involve farmers' organizations and civil society organizations in planning, implementing and monitoring our programs.

A = *Agricultural credit* systems appropriate for smallholder agriculture must be designed and implemented. Likewise, we must increase the level of available credit within the reach of small farmers and fisherfolk.

R = *Research, development, extension and education* are the major pillars of a vibrant agriculture industry. We must continuously advocate increased funding to agricultural research, development, extension and education. Due to years of neglect and poor management, our agricultural extension and education system today needs surgical improvements, especially through massive and sustained capacity building.

The role of agricultural education

Given the foregoing platform, improving human capacity for farm productivity is an indispensable requisite for sustainable agricultural development. The country must continuously train a critical mass of dedicated and well-trained cadre to spearhead the agriculture sector.

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The role of agricultural education

Given the foregoing platform, improving human capacity for farm productivity is an indispensable requisite for sustainable agricultural development. The country must continuously train a critical mass of dedicated and well-trained cadre to spearhead the agriculture sector.

In this context, the general role of agricultural education is to provide quality, relevant and effective instruction, research and extension in agriculture. Furthermore, promoting indigenous knowledge and farmer-to-farmer sharing of information is essential for achieving agricultural development.

Thus, agricultural education and training should be conducted not only in schools, colleges and universities, they should also take place in the households, community and farmer groups, and in other venues where exchange of information among farmers, fisherfolk, extensionists and researchers take place.

The challenge

In developing countries like the Philippines, higher education in agriculture is at a crossroads. Financial constraints are severe. At the same time, the demand for quality education has never been greater, especially under the aegis of globalization. However, our educational institutions face several constraints. They are handicapped by a host of constraints like inadequate physical, financial and manpower resources; poor research and extension programs; and inadequate linkages that provide up-to-date knowledge and skills necessary for global competitiveness.

The major challenges confronting agricultural education in the country today are:

1. *Slow rate of professional advancement of faculty.* Inadequate funding for graduate studies continues to delay the professional advancement of a big proportion of agriculture faculty. Institutional policies and bureaucracy also constrain the advancement of young, qualified faculty to senior positions. Thus, good agriculture faculty members leave for greener pastures in the private sector and abroad.
2. *Inadequate funding.* Many Philippine agriculture universities and colleges lack qualified teaching and research staff, as well as adequate facilities and equipment. In some cases where staff members undertake graduate education, they are neither given higher positions commensurate with their acquired degrees, nor the support that enables them to apply their advance degrees.
3. *The agriculture curriculum is not responsive to emerging global trends.* For them to be relevant, agriculture curriculum and course offerings must reflect emerging global trends and

opportunities like biotechnology, bio-safety, IPR science and information and communication technology (ICT). The failure to address these trends has contributed to the declining competitiveness of the agriculture sector.

4. *Academic standards not appropriately and carefully set and maintained.* The unregulated proliferation of agricultural education institutions has produced poor-quality graduates who are ill prepared to handle professional responsibilities.
5. *Inability of many agricultural practitioners and professionals to attend formal courses.* This points to the need for distance education and the application of ICT to provide easier access to agricultural education. More area-based, stakeholder-specific training courses should also be developed to share improved knowledge and skills, based on actual conditions in the regions.
6. *Agriculture graduates do not go into practice.* Agriculture and fisheries are fascinating areas of practice. However, there is a low interest among university graduates to become involved in agricultural enterprises.
7. *Weak information networks.* Active networks and partnerships must be forged for sharing information, knowledge and experiences among various countries, educational institutions and other sectors engaged in agricultural research and development.
8. *Poor teaching methodologies.* Innovative tools and methodologies must be developed to adequately respond to the educational needs of agricultural stakeholders.
9. *Dwindling employment opportunities.* Our agriculture graduates are no longer automatically hired by governments. Likewise, employers in the private sector are demanding students with a different set of knowledge and skills.

The CGIAR and ICRISAT

At this juncture, allow me to say something about the CGIAR and ICRISAT. The CGIAR or Consultative Group on International Agricultural Research is a strategic alliance of 58 members, which includes 22 developing and 21 industrialized countries, four co-sponsors, 16 Centers (including ICRISAT) and many thousands of civil society organizations.

Last year, the CGIAR broke tradition by holding its first annual general meeting outside of Washington by coming to Manila.

Created in 1971, the CGIAR mobilizes cutting-edge agricultural science to catalyze agricultural growth, improve human nutrition and health and protect the environment. Today, more than 8,500 CGIAR scientists and staff are working in over 100 countries. CGIAR research addresses every critical component of the agricultural sector including agro-forestry, biodiversity, food, forage and tree crops, pro-environment farming techniques, fisheries, forestry, livestock, food policies and agricultural research services.

Out of 16 CGIAR Centers, 13 are based in developing countries. The Philippines is lucky to host IRRI, one of our pioneers. The CGIAR is currently undergoing major reforms designed to mobilize science, extend the alliance, streamline governance and maximize impact on issues of global significance.

ICRISAT or the International Crops Research Institute for the Semi-Arid Tropics is a nonprofit, non-political, international organization for science-based agricultural development. ICRISAT's vision is "the improved well-being of the poor of the semi-arid tropics through agricultural research for impact". We are committed to help the poor of the semi-arid tropics through science with a human face and partnership-based research and to increase agricultural productivity and food security, reduce poverty and protect the environment in semi-arid tropic production systems.

Basically, we aim to improve and sustain agricultural productivity in some of the harshest environments, accounting for about two-thirds of the world's cultivable land. We serve more than 800 million people, the poorest of the poor, who live in 42 countries spread in sub-Saharan Africa and Asia.

As I close, 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.

I therefore challenge WELAC to embrace science with a human face as a core value in catalyzing sustainable agricultural development in Central Luzon. In doing this, ICRISAT will be there as your close partner and ally.

Thank you and good day.

Benguet State University: Exponent of Sustainable Development in the Cordilleras

Speech delivered at the Benguet State University, 17 January 2003, Benguet, Philippines

Introduction

First of all, allow me to express how happy I am for being home with you today. Throughout my life, I will always regard BSU as my home.

By coming here, I revisit a historic part of my career when I was Professor and Vice-President for Research in this great institution. For this, I profoundly thank all of you, especially President Cip Consolacion, for bringing me home.



Let me also mention that my mentor and former boss, the first President of BSU, Dr Fortunato A Battad, recently visited ICRISAT as a guest of honor during our 30th anniversary celebration. The other week, we were together again at the Pampanga Agricultural College, the institution he nurtured, which is now steered by his able son.

This year, BSU will be 87 years old. I am happy to note that the University has gone a long, long way to evolve as one of the leading educational institutions in the country today.

The growth of BSU

Aside from this, I am happy to note that BSU has been selected as one of the Centers of Excellence in agricultural education in the country.

From its humble beginnings in 1916 as the Trinidad Experimental Farm Station, BSU has indeed grown to become a major exponent of sustainable development in the Cordilleras.

I also salute the 30 Grade V pupils whom I consider as pioneer products of the University and Mr James A Wright, the first Principal.

Let me also mention the support of three very important people behind the growth of the University:

1. Former Congressman Andres Cosalan who was instrumental in the conversion of the MAC to MSAC in 1970;
2. Former Assemblyman Samuel Dangwa who worked for the conversion of MSAC into a University in 1983; and
3. Former Governor Ben Palispis who strongly supported the elevation of MSAC into BSU.

As your humble alumnus, I feel proud that BSU now has eight colleges, a Graduate School, two academic institutes and four research institutes.

The vision of the Cordilleras

Being an exponent of change, BSU must spearhead the development of the Cordilleras, a region aspiring to be truly autonomous, made up of enlightened and empowered people pursuing sustainable development.

During this century, the Cordilleras positions itself as:

1. A physically integrated region;
2. A paragon of successful poverty alleviation;
3. A watershed cradle and balanced ecosystem model;
4. A major energy generator;
5. An eco-cultural tourist destination;
6. A prime educational center;
7. A food basket; and
8. A light and agri-industry product supplier.

To attain the foregoing, the region aims to attain political stability, sustained economic growth, social and human development, environmental quality and sustainable use of resources and physical integration.

As planned from 2001 to 2004, the region envisions itself as the watershed cradle and ecological zone of Northern Luzon in five growth areas:

1. *Central Cordillera* – the conservation and preservation area which shall be the watershed cradle and eco-tourism destination areas;

2. *Lowland Cordillera Plains* - intensive agricultural cultivation and extensive industrial development covering the lowland areas of Apayao, Kalinga and Abra;
3. *Western Ifugao and Mountain Province* - pasture or grazing for livestock production;
4. *Central Ifugao* - major tourist destination and a major commercial and service center; and
5. *Metro Baguio* - premier commercial trading and educational center, primary tourist destination, temporary regional center consisting of Baguio City and the adjacent towns of La Trinidad, Itogon, Sablan and Tuba.

The challenge

To catalyze sustainable development of the Cordilleras, BSU must respond to the aforementioned* vision through its four functions of instruction, research, extension and production.

To realize this, the University must re-orient its objectives to:

1. Provide good quality education primarily aimed at helping attain the region's development goals;
2. Institute academic, research, extension and production programs that will provide graduates with relevant knowledge and skills needed in the region;
3. Accelerate human resource development programs to further enhance the competence, capacity and competitiveness of faculty and staff;
4. Develop social consciousness among students through instruction, social, civic and cultural activities; and
5. Conduct relevant research, extension and production programs aligned with the development plan of the Cordilleras, especially in the five growth areas.

Hence, aside from the usual advocacy for more budgets, these can be carried out through the following measures:

1. *Enhance policies for the professional advancement of faculty and staff.* Institutional policies must be put in place to motivate young and qualified faculty to stay at BSU. If this is not done, good faculty members will eventually leave for greener pastures in the private sector and abroad.
2. *Update curricula to respond to emerging trends.* For them to be relevant, curricular and course offerings must reflect emerging

trends and opportunities like entrepreneurship, environmental science, biotechnology, bio-safety, IPR science, policy science and information and communication technology. Addressing these trends will enhance the competitiveness of BSU graduates in the labor market.

3. *Upgrade, monitor and maintain academic standards.* Good academic standards produce good quality graduates who are well prepared to handle professional responsibilities.
4. *Strengthen distance education.* This will provide easier and broader access to quality education, especially to poor and unreached communities in the Cordilleras.
5. *Strengthen institutional networks.* Strong and active linkages facilitate up-to-date sharing of information, knowledge and experiences among faculty and staff and with their counterparts, especially in more developed universities here and abroad.
6. *Innovate teaching methods.* Innovative tools and methodologies must be developed to adequately respond to the educational needs of students and other stakeholders.
7. *Facilitate the immediate employment of graduates.* The University must facilitate the immediate employment of its graduates by linking with prospective employers. Holding job fairs with the private sector is a good example.

Opportunities

To be proactive, BSU must fully exploit current opportunities to enhance its capability in catalyzing the development of the Cordilleras.

For instance, the present Medium Term Philippine Development Plan (MTPDP) maps out the modernization and quality improvement of State Universities and Colleges (SUCs) where budget allocation will be based on: (a) quality of program offerings, (b) programs addressing access and equity issues, and (c) thrusts on development priorities.

This gives further impetus in improving the quality of instruction at the University and synchronizing BSU's programs with those of the region.

Moreover, the MTPDP aims to enhance the quality of higher education to meet global standards. This will be done by intensifying ICT applications in the management and modes of instruction of SUCs.

The MTPDP also prioritizes Centers of Excellence in providing institutional development assistance for undergraduate, graduate and research programs. This will be carried out through the National

Agriculture and Fisheries Education System (NAFES) and by strengthening the Higher Education Development Fund. Please note that higher education curricula will also be aligned with the scope and methods of the Professional Board Examinations. Alternative modalities of higher learning like distance education and the Expanded Tertiary Education Equivalency and Accreditation Program (ETEEAP) will also be strengthened.

The CGIAR and ICRISAT

At this juncture, allow me to say something about the CGIAR and ICRISAT. The CGIAR or Consultative Group on International Agricultural Research is a strategic alliance of 58 members, which includes 22 developing and 21 industrialized countries, four co-sponsors, 16 Centers (including ICRISAT) and many thousands of civil society organizations.

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The CGIAR is currently undergoing major reforms designed to mobilize science, extend the alliance, streamline governance and maximize impact on issues of global significance. The innovative Challenge Program initiative, designed to address regional and global issues of global importance, will facilitate collaborative research and help mobilize knowledge, technology and resources.

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As I close, 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.

I therefore challenge BSU to embrace science with a human face as a core value in catalyzing sustainable development for the Cordilleras. In doing this, ICRISAT will be there as your partner and ally.

Thank you and good day.

Role of Chickpea in the Grey to Green Revolution

Inaugural address at the International Chickpea Congress, 20 January 2003, Raipur, Chattisgarh, India

Relevance of the crop in production systems

Globally, chickpea is the third most important pulse crop of the world. It is grown mostly by resource-poor farmers in many developing countries of the world. It is a crop that is environment friendly and sustains soil productivity. The benefits of the crop thus extend beyond the income to the farmers and the farming systems. The area occupied by the



crop is 15% of the total pulse area but in some countries, eg, India and Pakistan, it is the most important pulse crop and the area occupied could well be around 50% of the total pulse area.

It is an important crop for food security, especially in the countries of the semi-arid tropics (SAT) popularly known as the dry tropics, and in the Central and West Asia and North Africa (CWANA) regions. The crop production environment is harsh, risk-prone and fragile. Risks of cultivation are pervasive and greater than in any other production system because the areas are drought prone, soils are poor and land degradation is increasing.

At present, 800 million people are poor and malnourished. Nearly 45% of these live in the dry tropics. About 40 thousand people die each day of malnutrition, one half of them are children. Pulses, in general, are used as complementary crops with cereals but are important constituents of balanced diets. Chickpea is an important crop not only from the perspective of food security but also in terms of nutritional security, as a source of essential proteins and vitamins, eg, Vitamin E.

The heart of the *Grey to Green Revolution*

At the heart of the *Grey to Green Revolution* is 'Research for development'. The focus is on producing technologies that would have positive impact on improving the livelihood and income generating capacity of the resource-poor farmers. Such technologies have an essential element of sustainable agriculture in the environmentally fragile areas of rainfed crop production systems and protect the ecosystem of the highly variable environment.

Technology alone, however efficient, effective or path breaking, would not make the expected impact on development unless accompanied by political commitment, will and the desire to make a difference to the poor with a humane attitude. These are other most crucial elements in the success of a technology that are ingrained in the approaches and implementation of programs at ICRISAT. This is what we call *Science with a human face*.



The challenges

The mission of changing the grey to green in rainfed agriculture is much more daunting than the challenges faced while ushering in the great Green Revolution of the sixties and seventies. The Green Revolution was rooted in increasing productivity by modifying or adapting the environment to suit the crops and its high yielding varieties, by providing additional inputs such as water and fertilizers and management. However, in the *Grey to Green Revolution*, we envisage that the crops or varieties will have to adapt to the harsh and variable climatic conditions. The development of varieties that are tolerant of various biotic (diseases and insect pests) and abiotic

(drought, heat/cold, salinity) stresses are, therefore, expected to be a necessity to achieve the revolution.

The biggest challenge is that by the year 2010 it is expected that the demand for chickpea would escalate from the present 8.2 million t to 11.1 million t. This will have to be accomplished with diminishing resource of land and water for agriculture, because of the increasing demand from other stakeholders of these resources, eg, urbanization, industrialization and other uses. Since chickpea is a crop predominantly used as a complementary or supplementary crop together with cereals in the food habits, its role is generally secondary to cereals. This secondary status of the crop is also reflected in the degraded lands (physical and fertility) and the poor agronomic management of these crops, which is one of the reasons for its low yield.

The opportunities

The challenges posed to this crop are indeed the opportunities to scientists for conducting research for development. For example, the yield gap between on-farm yield (0.8 t per ha) and the maximum realized on experimental stations (2.5 to 3.5 t per ha) and the potential (5 t per ha) shows that a large impact can be made by the application of technology to on-farm situations. In order to generate the impact, the technology has to be tailored to match the farmer's requirements and the local conditions, using farmer-participatory on-farm research.

Compared to other cereals, oilseeds and many other legumes, the chickpea crop has unique characteristics to meet most of its essential requirements from natural resources for its crop growth. It has a very efficient symbiotic nitrogen fixation mechanism, its roots can very efficiently uptake calcium-bound phosphorus (which cereals and oilseeds cannot) and it is also efficient in mobilizing other soil nutrients. These characteristics make the crop less dependent on costly chemical N and P containing fertilizers, and thus amenable to low-input technology and adds to the sustainability of the production systems. Less emphasis on the use of chemical fertilizers in this crop also contributes indirectly to the protection of soil environment through less or no additional input of chemicals to the soil. Also, it is very well recognized that chickpea by virtue of its deep root system is very well adapted to rainfed, drought-prone conditions, under which it is cultivated. These are the free endowments of nature that can be further enhanced through research.

The constraints

A major disadvantage however, is the instability of yield mostly due to diseases that vary with the agroecoregion, eg, ascochyta blight disease in cool temperate and subtropical regions such as the northern parts of India, Pakistan, West Asia North Africa (WANA) region, Australia and north America; and botrytis grey mold in Nepal and Bangladesh and northeastern parts of India. Pod borer and fusarium wilt occur very widely. In cooler chickpea growing areas, excessive crop growth and lodging are also factors in the stability of yield. Factors of crop, soil, climate, disease and insects interact and make the production system very complex and the solution very difficult.



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A major challenge that has remained insurmountable in chickpea is the increasing adaptation of the crop to saline-alkali and acid soil conditions. On many of such lands chickpea has disappeared as a crop.

Networks and multidisciplinary team approach

In order to make an impact of research on development it is essential that a holistic approach to problem solution is adopted. The complex nature of the constraint threatening chickpea production and the many dimensions to it, clearly bring out that no single institution or organization could achieve the objective. Multidisciplinary team efforts are essential. I am aware that such multidisciplinary working groups have been formed and networks are in place to discharge the responsibility effectively. I would wish to emphasize that these should be further strengthened.

Progress made

It is a matter of great pride that chickpea scientists have made remarkable progress in many areas of diagnostic, strategic and applied problem solving research. Many of you present here today are friends and partners of ICRISAT participating actively in effective discharge of its mandate on chickpea in the target agroecoregion. The

CGIAR's King Baudouin Award for the year 2002 for chickpea is recognition of how effectively ICRISAT, ICARDA and the NARS partners have together fulfilled their mission of delivering *Science with a Human Face*. I congratulate you all on this outstanding achievement. Last week, we recognized the contribution of our partners at the Chickpea Scientists Meet held at ICRISAT, Patancheru during 16-17 Jan 2003.

The environments in which chickpeas are grown and the constraints to which it is exposed and the numerous interactions are currently better understood than any time before. This became feasible because of developments in information technology, development of sophisticated technology such as GIS, GPS, crop and climate modeling, and application of these technologies in agricultural research.

Similarly, progress has been made in strategic research in terms of understanding the mechanism and processes that govern tolerance to various types of biotic and abiotic stresses. This has helped in development of effective and efficient methods of screening, which are both rapid and reproducible. A large proportion of the global germplasm collection maintained at ICRISAT (17,258 accessions) has been screened for tolerance to biotic stresses and durable sources of resistance, particularly for diseases, have been identified. These have been used in many programs in the development of disease-resistant varieties.

The progress in developing abiotic stress tolerance varieties of chickpea has been slow, in particular for drought, extremes of temperature (cold and heat) and salinity tolerance. Development of rainout shelters have increased precision of drought research and many components of drought tolerance have been identified which are amenable to manipulation with conventional methods of breeding.

Significant progress has also been made in the application of the biotechnology tools in problem solving. Molecular markers for disease tolerance have been identified in chickpea and work on identification of QTL for root traits is receiving focused attention. These developments show that development of stress-tolerant varieties that are essential for a holistic and integrated management of chickpea would not remain only a vision but a reality in the near future.

For some diseases such as *Ascochyta* blight and *Botrytis* grey mold and *Helicoverpa* pod borer where the levels of genetic resistance are

low, integrated management options have been developed that minimize the threat due to these constraints.

Development of simple methods of rapid advancement of generations by extending day length has made it possible to grow 3 to 4 generations and thereby reduced the generation turnover time.

Future thrusts

1. Chickpea area expansion

It is very well recognized that expanding area under any crop would have the largest impact on production. Since the area in the traditional chickpea growing areas is decreasing, it is important to identify niches for crop area expansion in the prevailing crop production niches, or find opportunities in new evolving cropping systems.

A big opportunity for area expansion is by introduction of chickpea in the fallow lands during the postrainy season, after the harvest of paddy. It is estimated that nearly 14.3 million ha rice fallows are in South Asia alone, and thus this presents a huge opportunity for area expansion under the crop. It has been demonstrated that it is technologically feasible by tailoring varieties to the requirement of the new production system by incorporating resistance to fusarium wilt and shortening the crop duration. In the Barind tract of Bangladesh, nearly 10,000 ha of paddy fallow lands have come under chickpea cultivation.

A major achievement in chickpea improvement is the development of a range of extra-short- and short-duration varieties that has improved adaptation of this crop in various niches of the crop production systems. These new niches have contributed to expansion of area under the crop, despite decreasing trends in the traditional chickpea growing areas, thus contributing to stability of the production systems.

2. Increasing productivity

A major thrust has to be maintained on increasing realization of the available genetic yield potential rather than on further enhancement of the genetic yield potential above the yield ceiling. Increasing the efficiency of nutrients and other natural resources has to receive high priority. In some countries, plant types amenable to mechanical harvest are necessary. It is essential to maintain the competitiveness of the crop in the production systems context.

3. *Improving agronomic management*

Sound technologies, including improved high-yielding varieties, would fail to generate the potential impact in on-farm situations, if these are not accompanied with appropriate agronomic management. A greater awareness needs to be generated on this aspect in particular regarding the non-monetary agronomic management factors.

4. *Biotechnology*

Various biotechnology tools should be harnessed effectively to increase efficiency of crop improvement. These tools/technologies include: (i) in-vitro techniques to facilitate interspecific hybridization to enable introgression of useful genes from wild *Cicer* species; (ii) marker-assisted breeding for complex traits, such as root vigor and root mass to enhance drought tolerance; and (iii) transgenics for incorporating genes from *Bacillus thuringiensis* (Bt Cry 1Ab) or soybean (soybean trypsin inhibitor) for pod borer resistance, or antifungal genes (chitinase, glucanase and polygalacturinase inhibiting protein – PGIP) to manage diseases such as ascochyta blight and botrytis grey mold.

5. *Information and Communication Technology (ICT)*

The Grey to Green Revolution cannot be accomplished without a large helping from the newly emerging ICT – use of distance learning, rural information hubs and the exploitation of bioinformatics in assisting biotechnology. Other technologies such as GIS and GPS can play a vital role in mapping constraint-affected areas and help in targeting interventions to specific areas with location-specific technologies.

6. *Quality, marketing and diversification of use*

Modern consumers are becoming quality conscious. Thus the nutritional quality and organoleptic (taste) quality need increased attention than in the past. A right balance in research on *kabuli* and *desi* types, depending upon the relative demand for these crops and for the specified end-uses need to be addressed by breeding programs.

Uses of chickpea in novel food or snacks need to be investigated and promoted for value addition to the crop. During his speech at the 30th anniversary of ICRISAT, His Excellency, the President of India, Dr Abdul Kalam reiterated that the second green revolution should encompass technologies from soil to consumers, with emphasis on value addition to the produce and market orientation.

The role of chickpea straw and grain in animal feed needs to be re-examined and importance documented and use promoted.

Conclusions

Despite the large and significant progress made in research and development, the task remains far from accomplished because the production and productivity of chickpea remain low.

A large and significant progress has been made in the last two to three decades in chickpea research and development in many national and international agricultural research programs. These efforts have strengthened agriculture, the backbone of economies in many countries of the dry tropics. It has also made an impact on the well-being of the poor living in these areas.

Identification of new niches and tailoring new varieties to fit into those niches should receive high priority. Chickpea scientists today are better equipped to accept the complex challenges of the rainfed, low input production systems with tools of modern science. Going by the past research achievements of the global chickpea research community, I have no reason to doubt that chickpea scientists would meet the new challenge to use chickpea as a model crop in the move towards a 'Grey to Green Revolution'.

IFAD-ICRISAT: Improving Legume Productivity for Poor Farmers in Asia

Opening remarks during the IFAD-ICRISAT meeting, 4 February 2003, ICRISAT, Patancheru, Andhra Pradesh, India



Dr Doug Wholey, IFAD TAG 532 Partners in National Programs in China, India, Nepal and Vietnam, Dr Dyno Keatinge and ICRISAT scientists and staff...

Please allow me to welcome you all to this wonderful campus of the prestigious institute ICRISAT. Many of you have visited this institute earlier. Your each visit brings us happiness because it is a reunion of partners engaged in the common goal of alleviating

poverty among poor farmers in the semi-arid tropics. I am particularly pleased to see Dr Doug Wholey from IFAD, who has been a strong supporter of ICRISAT in the IFAD system. As a matter of fact, Dr Wholey was the main inspiration behind this IFAD TAG 532. I am sure with his presence in the meeting, you would be able to chalk out a good program for 2003. Although the Project started last year, we are able to hold the First Project Steering Committee Meeting only now. I am sure the Committee will provide effective guidance to the Project. From ICRISAT's side, we are fully committed to this Project and value it very highly as it provides us an opportunity to work together with our partners and farmers in a participatory mode. Since farmers are upfront in this Project, it further strengthens our faith in *Science with a Human Face*.

Legumes and cereals are the most important components of agriculture in Asia. However, it was cereals which, being the staple diet, received the most research and development attention in the past due to burgeoning populations in Asia. In the process, the legumes got marginalized. But with increasing realization of their importance not only in human diets but also in soil health, legumes are regaining their respectability. Legume cultivation remains largely

rainfed and productivity is low due to neglect. Legume farmers are generally poor. The scientific improvements in variety and crop management in legumes largely remained confined to the research stations due to various reasons. To capitalize on these past scientific achievements and to translate them into farmer-acceptable and adoptable technologies, the IFAD TAG 532 is very timely and is expected to play a significant role in improving legumes productivity in marginal areas cultivated by poor farmers in Asia. The participation of four major countries of Asia in the Project will ensure the development of technologies that will have spillover effect in other countries also. I am happy to see IFAD Development Project partners and NGOs associated with this Project. This coalition of partners will bring significant synergy in our efforts to address the issue of poverty alleviation through increased legumes productivity in rainfed Asia.

In well-endowed areas, the Green Revolution technologies spread very fast and brought immediate impact on the livelihood of farmers and on national economies. The same journey in rainfed areas is going to be slow and sometimes a little frustrating. However, with perseverance and partnerships with all stakeholders including farmers, we will overcome these difficulties in achieving our aim of increasing legumes productivity in rainfed areas of Asia.

I am told that all arrangements are in place to host you and this meeting. In case we have missed something, please let us know. I look forward to the outcome of this meeting and wish you all a great success in this Project, which has direct relevance to poverty alleviation.

Thank you and have a good day.



Role of Chickpea in the Grey to Green Revolution

Inaugural address at the International Chickpea Congress, 20 January 2003, Raipur, Chattisgarh, India

Relevance of the crop in production systems

Globally, chickpea is the third most important pulse crop of the world. It is grown mostly by resource-poor farmers in many developing countries of the world. It is a crop that is environment friendly and sustains soil productivity. The benefits of the crop thus extend beyond the income to the farmers and the farming systems. The area occupied by the



crop is 15% of the total pulse area but in some countries, eg, India and Pakistan, it is the most important pulse crop and the area occupied could well be around 50% of the total pulse area.

It is an important crop for food security, especially in the countries of the semi-arid tropics (SAT) popularly known as the dry tropics, and in the Central and West Asia and North Africa (CWANA) regions. The crop production environment is harsh, risk-prone and fragile. Risks of cultivation are pervasive and greater than in any other production system because the areas are drought prone, soils are poor and land degradation is increasing.

At present, 800 million people are poor and malnourished. Nearly 45% of these live in the dry tropics. About 40 thousand people die each day of malnutrition, one half of them are children. Pulses, in general, are used as complementary crops with cereals but are important constituents of balanced diets. Chickpea is an important crop not only from the perspective of food security but also in terms of nutritional security, as a source of essential proteins and vitamins, eg, Vitamin E.

At the heart of the *Grey to Green Revolution* is 'Research for development'. The focus is on producing technologies that would have positive impact on improving the livelihood and income generating capacity of the resource-poor farmers. Such technologies have an essential element of sustainable agriculture in the environmentally fragile areas of rainfed crop production systems and protect the ecosystem of the highly variable environment.

Technology alone, however efficient, effective or path breaking, would not make the expected impact on development unless accompanied by political commitment, will and the desire to make a difference to the poor with a humane attitude. These are other most crucial elements in the success of a technology that are ingrained in the approaches and implementation of programs at ICRISAT. This is what we call *Science with a human face*.



The challenges

The mission of changing the grey to green in rainfed agriculture is much more daunting than the challenges faced while ushering in the great Green Revolution of the sixties and seventies. The Green Revolution was rooted in increasing productivity by modifying or adapting the environment to suit the crops and its high yielding varieties, by providing additional inputs such as water and fertilizers and management. However, in the *Grey to Green Revolution*, we envisage that the crops or varieties will have to adapt to the harsh and variable climatic conditions. The development of varieties that are tolerant of various biotic (diseases and insect pests) and abiotic

(drought, heat/cold, salinity) stresses are, therefore, expected to be a necessity to achieve the revolution.

The biggest challenge is that by the year 2010 it is expected that the demand for chickpea would escalate from the present 8.2 million t to 11.1 million t. This will have to be accomplished with diminishing resource of land and water for agriculture, because of the increasing demand from other stakeholders of these resources, eg, urbanization, industrialization and other uses. Since chickpea is a crop predominantly used as a complementary or supplementary crop together with cereals in the food habits, its role is generally secondary to cereals. This secondary status of the crop is also reflected in the degraded lands (physical and fertility) and the poor agronomic management of these crops, which is one of the reasons for its low yield.

The opportunities

The challenges posed to this crop are indeed the opportunities to scientists for conducting research for development. For example, the yield gap between on-farm yield (0.8 t per ha) and the maximum realized on experimental stations (2.5 to 3.5 t per ha) and the potential (5 t per ha) shows that a large impact can be made by the application of technology to on-farm situations. In order to generate the impact, the technology has to be tailored to match the farmer's requirements and the local conditions, using farmer-participatory on-farm research.

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A major disadvantage however, is the instability of yield mostly due to diseases that vary with the agroecoregion, eg, ascochyta blight disease in cool temperate and subtropical regions such as the northern parts of India, Pakistan, West Asia North Africa (WANA) region, Australia and north America; and botrytis grey mold in Nepal and Bangladesh and northeastern parts of India. Pod borer and fusarium wilt occur very widely. In cooler chickpea growing areas, excessive crop



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A Virtual Academy for the Semi-Arid Tropics

Introductory remarks during the roundtable discussion on the establishment of a SAT Virtual Academy, 27 February 2003, ICRISAT, Patancheru, Andhra Pradesh, India



On behalf of ICRISAT, I am honored to welcome you to this roundtable discussion on the establishment of a Virtual Academy for the Semi-Arid Tropics. I am very happy to see one of the original pillars of ICRISAT and my friend, Professor MS Swaminathan.

The common denominator that brings us here today is an ever-worsening problem that affects not only poor rural people but their crops and animals: DROUGHT.

Having focused on crop improvement and watershed management during our 30-year long existence, we find that drought is an ever-recurring problem in the dry tropics. Here in our host state of Andhra Pradesh (AP), rural people are now suffering the consequences of the worst drought and drinking water shortage experienced in recent years.

Last week, AP Governor Surjit Singh Barnala, in his maiden address to the House, spoke on the highly devastating impact of drought and the consequent water and fodder shortage. In his speech, the Governor painted a grim picture, citing that the rainfall deficit was as bad as



32 percent and that the *kharif*-sown area had shrunk by 20 lakh hectares. Moreover, fodder shortage is expected to be 35 lakh tons. Ninety percent of the villages were declared drought-affected and Rs 342 crores released for relief. A Rs 300-crore contingency plan for drinking water supply was also prepared.

Please note that this problem is not only occurring here in Andhra Pradesh, but in most parts of India and Asia, as well as sub-Saharan Africa. In Ethiopia alone, 14 million

people are now suffering the problems brought about by drought.

Internationally, there is widespread acceptance of the pivotal role that information and knowledge can play in drought mitigation and climate management. The UN has even adopted the dictum that 'information is the backbone of drought preparedness.' The Virtual Academy will take the right information to the right people at the right time, using new and conventional communication tools.

From a pilot project on developing an ICT-enabled distance learning module on coping with drought in Addakal village in AP, ICRISAT is fully committed to help India, other parts of Asia and sub-Saharan Africa to mitigate the effects of drought.

We have taken the inspiration from Professor Swaminathan to spearhead the establishment of a Virtual Academy for the Semi-Arid Tropics. With your support, VASAT will be our major channel of sharing timely information and knowledge on drought mitigation and climate management.

I am indeed happy you have accepted my invitation to be here with us today. I am aware of the enormous demands on your time and I thank everyone for your kind presence here. We are particularly grateful that Professor Ram Takwale, well known educator and expert in open university administration, has helped us prepare a feasibility study for VASAT.

I am also happy that Dr Panjab Singh, well known to the CGIAR and to ICRISAT, is here with us today in a new capacity. He is a high-ranking

representative of IGNOU, which is now using frontier technology for mass education, and I am happy to welcome his colleague Professor Kaushik. I am happy that the Vice-Chancellors of the Open Universities in the States of AP and Maharashtra, Professor Prasad and Dr Sabale, are here.

Professor Uma Coomaraswamy, Vice-Chancellor of the Open University of Sri Lanka, has specially come to participate on how we can subsequently expand the University to cover tropical monsoon areas in South Asia. I just came from the Philippines and presented this idea of a Virtual Academy to the Secretary of Agriculture who approved and right away organized a group to operationalize it. I am very happy that the Director of the National Remote Sensing Agency, Dr Navalgund is here, representing the Indian Space Program.

I would like to welcome senior civil servants from the states of AP and Madhya Pradesh. Two of them, Mr Sawhney and Mr Sanjay Singh, are Secretaries of IT, and one of them is the State Relief Commissioner for AP (Mr Roshaiyah). Mr Tucker from the AP Rural Livelihood Project is well known to many of you and to ICRISAT. He is our principal partner in the AP watersheds and livelihoods project. I am very happy that my esteemed colleague, Dr HP Singh from CRIDA is here with us. The CRIDA under his leadership has been a source of support and inspiration to us at ICRISAT.

I am happy to note that Ms Meera Shenoy, well known journalist and social activist is here today and I welcome Dr Prakash from the Karnataka Drought Monitoring Cell, Dr Nagarajan from the Indian



Institute of Technology in Mumbai and Mr Kumaran from Prof Swaminathan's organization. I am particularly happy to note the presence of a senior representative from the ITC, one of the largest agri-business corporations in Asia. Dr Chris Scott of IWMI is also here with us and they will play an active role in this initiative.

I am also grateful for the presence of two colleagues from the FAO Regional Office for Asia and the Pacific, Mr Ti and Mr Satyal. Mr Ti has been guiding ICRISAT and CRIDA in formulating a comprehensive strategy for drought management. We have invited senior officers of the Government of India, Dr K Kasturirangan (ISRO), Dr VS Ramamurthy (DST) and Dr Mangala Rai (ICAR) and Dr Kelkar (IMD) but they could not be present here due to commitments in the current session of Parliament of India. Although not here with us today, the Commonwealth of Learning has also given us tremendous support in this initiative.

We also have with us our senior staff at ICRISAT composed of the members of my Management Group, Global Theme Leaders, Regional Theme Coordinators, scientists and staff of our Information Resource Management Office. I would like to specially mention and recognize Dr Rex Navarro and Dr V Balaji for their untiring efforts to move this initiative forward.

I therefore look forward to our fruitful discussion on the establishment of the SAT Virtual Academy.

Thank you and good morning.



Bridging the Technology Divide @ ICRISAT: A Partnership-based Paradigm of Innovation

Opening remarks during the Colloquium on Bridging the Technology Divide, 18 March 2003, ICRISAT, Patancheru, Andhra Pradesh, India



On behalf of ICRISAT, allow me to welcome you to this very timely colloquium on agri-science alliances and the new architecture of innovation here at ICRISAT. We are very much honored to have the Governor of our host state of Andhra Pradesh, His Excellency Shri Surjit Singh Barnala, as our Chief Guest. The Chair of the ICRISAT Governing Board, Ms Martha B Stone, and our incoming Chair, Professor Uzo Mokunye, are also here with us.

I also thank our sister centers, CIAT, ILRI and ISNAR, for working with us to hold this colloquium. I understand that we have good participation from advanced research institutes, national agricultural research systems, NGOs, donors and the private sector, coming all the way from North and South America, Europe, Africa and Asia.

The main purpose of our activity is to share experiences in building multi-sector alliances and discuss issues with a broad range of stakeholders, specifically on biotechnology.

We will also define a framework and formulate a set of guidelines that will become the basis of developing an action plan for biotechnology within the CGIAR. Thus, this colloquium complements similar activities being carried out at the CGIAR System and the World Bank.

Recent advances in biotechnology hold tremendous opportunities in improving global agriculture and human health. Yet, while humanity has much to gain from the Gene Revolution, we must handle it so well that it will not further widen the disparities between the rich and poor, and among countries in the North and South.

ICRISAT and other public research organizations face the big challenge of ensuring that the poor will benefit from the Gene Revolution. This revolution has radically altered our conventional approach to organizing science and technology. We acknowledge the reality that agricultural innovation brings risks and opportunities, potentially creating winners and losers.

Our task is to ensure that the poor do not become losers in the process.



Hence, we need to re-examine fundamental assumptions about the way we organize science and technology in the context of biotechnology. In the past, we used to believe that:

- Science is divided into various disciplines such as plant breeding, agronomy, social sciences and others.
- Public sector is separate and distinct from the private industry.
- Agricultural research should largely be confined to public institutions.
- Northern countries are more technologically advanced relative to those in the South.
- Agricultural scientists are more knowledgeable than farmers.

We all know that this mindset is no longer valid. Partly, this has happened because of the humanizing role of science and technology in the emerging paradigm of people-centered development accelerated by the Gene and Information Revolutions.



At ICRISAT, we have proactively responded to this changing scenario. Our research programs are no longer done along disciplinary lines. Instead, we conduct global thematic research straddling the development goals of reducing poverty, attaining food security and protecting the environment.

Nevertheless, let me emphasize that our thematic shift does not diminish the importance of disciplinary research at the Institute. We deeply recognize the importance of closely integrating our research efforts.

For example, we are optimizing synergies among genomics with conventional plant breeding, agronomy and natural resource management. Moreover, the private sector is no longer seen by ICRISAT as a separate entity. Three years ago, we started a groundbreaking partnership with a consortium of private seed companies.

Most recently, this has further materialized through the establishment of a Technology Innovation Center (TIC). The TIC is a dedicated facility to manage the Institute's linkages with the private sector. This includes an Agri-business Incubator (ABI) funded by India's Department of Science and Technology. Furthermore, it also includes the Agri-biotech Park of the Genome Valley Science initiative – a brainchild of the Honorable Chief Minister of Andhra Pradesh, Shri Chandra Babu Naidu.

ICRISAT recognizes the strong research capability of the private sector. Thus, we increasingly negotiate access to proprietary technologies that are valuable to our research. In doing this, we are building new skills in the area of intellectual property rights.

In addition, as local private sector research capacity improves, we can sub-contract routine research activities to enable our scientists to do more strategic research.



ICRISAT has long recognized that one of its key roles is to bridge the gap between the technological capabilities of the North with those of the South. Therefore, our capacity building efforts take on an entirely new approach in the light of the Gene and ICT Revolutions.

Along this, I am pleased to reiterate the announcement of our Board Chair yesterday about our move to establish a Virtual Academy for the Semi-Arid Tropics (VASAT). Through non-formal education, the VASAT aims to train and mobilize

vulnerable rural communities and other learners through the integrated use of ICT, open/distance learning and other innovative communication media.

Increasingly, ICRISAT is being asked to assist in establishing bio-safety regimes and other enabling aspects of the policy environment required to harness new science. This approach continues ICRISAT's long tradition of supporting countries in the semi-arid tropics, not just with technology exchange. We also do this through capacity development, which is enduring and founded on partnership and shared learning.

Lastly, on the perceived knowledge gap among scientists and farmers, indigenous knowledge is now accepted in international agricultural research. At ICRISAT, we have been closely working with farmers during the last two decades. By working with farmers, we learn their concrete problems, needs and indigenous practices. It is through this learning process that we tailor our research directions to real human needs.

This is the essence of our credo *Science with a Human Face*.



The role of farmers as custodians of indigenous practices and genetic diversity is made more important in the light of the Gene Revolution. Likewise, besides farmers, consumers' perspectives are also important to science.

Running through all of these contemporary developments is the value of partnership. A partnership-based approach recognizes the perspectives of others, their skills and resources. It is founded on the collective attainment of goals. At ICRISAT, this approach is being pursued through a partnership-based paradigm of innovation. The architecture of this approach is now emerging as demonstrated by the Technology Innovation Center.

ICRISAT is committed to enhance the livelihoods of the poorest of the poor who live in the semi-arid tropics. Hence, we must increasingly balance this goal with those of our partners in the private sector. While we embrace public-private partnership, we must address the following issues and challenges:

1. How do we initiate, evolve and sustain relationships with the private sector and advanced research institutes?
2. How do we ensure public access to propriety technologies and processes?
3. How do we maximize the public good nature of innovations jointly owned with the private sector?
4. How do we negotiate new partnerships that will ensure optimum gain for all stakeholders, especially the poor?
5. How do we constructively deal with issues on the public acceptance of biotechnology, simultaneously promoting new technology and ensuring public safety?
6. How do we reach consensus with private partners on research priorities that address problems of the poor?
7. How do we engage and build capacities in national and international policy processes to harness biotechnology for people-centered development?



We are gathered here today to deliberate on these issues and challenges. At the outset, these may appear formidable. But I am confident that with the vast experience, diversity and wisdom of our group, we will be able to resolve these issues and challenges.

This is an indispensable requisite to our winning the Grey to Green Revolution.

I therefore wish all of you success in your deliberations and that you enjoy your brief stay at ICRISAT.

Thank you and good morning.

BNARS and ICRISAT: Twenty-five Years of Successful Partnership in Enhancing the Livelihoods of the Poor

Opening remarks during the Silver Jubilee celebration of the BNARS-ICRISAT partnership, 23 March 2003, Dhaka, Bangladesh



Distinguished guests, farmers and representatives of various groups, non-governmental organizations, colleagues from the RWC, partners from the donor community, my colleagues from the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), ladies and gentlemen, good morning.

On behalf of ICRISAT, I welcome you to the Silver Jubilee celebrations marking twenty-five years of a long and fruitful Bangladesh national agricultural research system-ICRISAT partnership.

Today, we are gathered here to further strengthen our partnership and capacity building initiatives to face the new challenges of this century. ICRISAT is honored to participate in this meeting held in collaboration with the Bangladesh Agricultural Research Council (BARC) and Bangladesh Agricultural Research Institute (BARI).

Allow me to take this opportunity in sharing major aspects of our cooperation with BARC and BARI. Informal technical collaboration between Bangladesh and ICRISAT started during the late seventies.

Exchange of germplasm and breeding materials was a major activity in the early eighties, along with exchange of scientists and capacity building. Dr CLL Gowda spent six months in 1982 on an FAO consultancy helping BARI establish its Pulses Improvement Program.

Likewise, Dr LJ Reddy spent six months working at BINA, Myamensingh, on groundnut improvement. In 1988, the first high-level ICRISAT mission came here, headed by Dr Michael Goon representing the then Director General Dr LD Swindale. This was followed by the signing of a Memorandum of Understanding (MoU) between ICRISAT and BARC, on behalf of the Bangladesh Ministry of Agriculture on 25 November 1988. During the mid-nineties, Dr Jagdish Kumar worked with CIDA for nearly three years on the Crop Diversification Project (CDP) in Bangladesh.

Today, I am here to enhance and pursue the renewal of the MoU between the Bangladesh Ministry of Agriculture and ICRISAT.

BNARS and ICRISAT have a shared mission of empowering rural families to extricate themselves from the vicious circle of poverty and malnutrition. Along this, let me quote the former Chairman of BARC when he said, "We value ICRISAT's cooperation very much and share the ideals of *Science with a Human face*".

Since then, ICRISAT's top officials and scientists have made countless visits here at Bangladesh. We have developed and implemented collaborative workplans, like the introduction of chickpea and IPM in the Barind in 1991. This was further scaled up from 1998 to 2003. Our research and developmental work became more important after the botrytis gray mold (BGM) disease epidemic in chickpea broke out in 1997-98.

On 6 June 2002, we launched another project called *On-farm chickpea in Bangladesh* funded by UK's Department for International Development (DFID). Concurrently, ICRISAT is involved in another project on *IPM of Chickpea in Bangladesh*, which is funded by ACIAR. Under these



projects, chickpea production and protection technologies have been shared with several thousand farmers in the Barind and in other chickpea growing areas of Bangladesh.

Let me cite this as a model of participatory priority setting, project planning, and implementation for research impact. This was instrumental in our winning our third King Baudouin Award in 2002 together with ICARDA.

Three weeks ago, on 4-7 March 2003, during the Annual Review and workplan meeting of the rice-wheat consortium, we have developed a three-year workplan for 2003-2006. This workplan will provide us opportunities to work with our IARC partners in the rice-wheat consortium of the Indo-Gangetic Plains. In our collaborative work, we aim to expand crop diversification and rehabilitate legumes so that the rice-wheat cropping system becomes more cost effective and sustainable.



More than 100 Bangladeshi scientists and technicians have participated in various training programs at ICRISAT. Germplasm exchange has also been a major activity. ICRISAT has supplied Bangladesh with 3,035 germplasm accessions of all mandate crops. We also shared more than 10,000 breeding and advanced generation lines of chickpea, pigeonpea and groundnut.

Using these materials, Bangladesh scientists have released two groundnut and nine chickpea varieties that have been widely planted or are being accepted by farmers. A recent study indicates that acceptance of new chickpea varieties is 85% in some districts. Improved varieties are giving 55% more yield, and three times more profit than other crops.

Collaboration with regional agricultural research stations through its network with farmers has been encouraging, especially on BGM and pod borers.

Identification of boron deficiency, its association with flower drop including its interaction with BGM and pod borer, and managing these in a holistic manner is a good example of a partnership approach in solving complex problems.

ICRISAT's mission emphasizes that results of research should be shared with stakeholders through appropriate partnerships. Hence, our partners are engaged throughout the project cycle, from brainstorming, planning and fundraising through execution and impact assessment. This approach ensures joint priority setting and commitment to shared outcomes. Moreover, it improves the research skills of national partners and sustains their programs over the long term.

Our work on natural resource management will become more participatory in the coming years. This will enable us to further increase the utilization of NRM technologies by farmers. Similarly, participatory IPM is applying innovative on-farm trial approaches that allow farmers to choose technologies they are interested in and can afford.

I trust that as a result of this new workplan, we will enhance legume production and improve the livelihoods of farmers in Bangladesh. I am also confident that additional benefits will accrue from greater sustainability of production systems into which legumes are grown or expected to expand.

We believe that this focused research and development project on crop diversification could quickly result in greater availability of legumes and reverse the declining trends in area and production under legumes in Bangladesh. We sincerely hope that our partnership will further grow and strengthen collaborative research to provide cost-effective technologies for the agroecosystems of Bangladesh.

As I close, let me say that it is indeed very heartening to realize that we share a common goal of improving the livelihoods of the rural poor, especially the disadvantaged men, women and children of Bangladesh. This ensures that together, we will win the Grey to Green Revolution in the dryland areas of this country and the whole world.

Thank you and good day.

Alleviating Poverty in the Drylands: Integrated Natural Resource Management

Inaugural address during the ADB-ICRISAT NRM workshop, 7 April 2003,
Bangkok, Thailand



Ladies and gentlemen, good morning!

Let me recognize important persons who are here with us now: Dr Prapaisri Pitakpaivan, DDG, Department of Agriculture; Dr Chaiyasit Anecksamphant, DDG, Department of Land Development; Dr Ti TC, Food and Agriculture Organization (Region – Asia Pacific); Mr Raymond ZH Renfro, Representative from the Asian Development Bank; Dr JS Samra, DDG, Indian Council of Agricultural Research; Mr S Ray, Spl. Commissioner, Rural Development, Government of AP; Dr Rego J Aloysius, from the Asia Disaster Preparedness Center, Bangkok; Dr Amado Maglinao, International Water Management Institute; Dr TD Long, Ex-DDG, Vietnam Agricultural Science Institute; Dr Zhong Li, Yunnan Academy of Agricultural Sciences; Dr Yin Dixin from Guizhou Academy of Agricultural Sciences and other partners from China, India, Thailand and Vietnam.

During the late seventies, the Green Revolution initiated a movement that saved the world from hunger and malnutrition. However, the Green Revolution areas are showing yield fatigue and the systems are becoming difficult to sustain. Moreover, the Green Revolution missed the large number of poor people residing in the marginal and mostly rainfed areas. Almost 700 million hectares worldwide are drylands.

These areas are home to about 800 million poor people, the poorest of the poor.

The rainfed areas are also very fragile and prone to degradation. This is because of the poor socioeconomic and technical investments in these areas. Dryland natural



resources, which are the lifeline for millions of poor people, are being strained and degraded continuously. The inherent low fertility, harsh climate and monsoon rains further complicate the issue. The burgeoning population, degradation of the natural resource base and low investments prevent the extrication of the poor out of the vicious circle of poverty.

Along with the land, water resources are also depleting and degrading in the region. It is estimated that by 2025 most developing countries will have severe water scarcity. Agriculture is the main user of water and as rainfed areas constitute 60 to 70% of arable area in most developing countries, there is great scope to improve water use efficiency.

Rainwater, if not managed properly, also causes severe soil erosion and results in very low productivity. Currently the productivity of rainfed agriculture hovers around 1,000 kg per ha and rainwater use efficiency for crop production is around 35 to 45%.

ICRISAT and its partners have developed an innovative participatory consortium model for watershed management. The ADB study has clearly indicated that the investments in rainfed areas are as remunerative as those made in well-endowed areas. However, the investments in rainfed areas have more impact on reducing poverty although it takes some time to realize the benefits.

The ADB-supported ICRISAT project in 1999 through RETA 5812 was carried out in tune with these findings. The hard work of the ICRISAT watershed team resulted in the development of the consortium model and establishment of a number of benchmark watersheds in three countries. The Adarsha Watershed in Kothapally in Andhra Pradesh has

become an appreciated model watershed not only in India but also worldwide as evidenced in BBC's documentary. The CGIAR's Interim Science Council has also considered this case study one of the best examples of the INRM approach, and thousands of farmers and development workers are learning from this watershed.



The hard work of the team led by Dr Wani has earned a place for researchers in the hearts of thousands of poor farmers in India and other countries where this project operated. The watershed team simplified agricultural science where farmers could conduct their experiments and train their peers. The team is now also trying to bring technology to farmers' doorsteps through ICT.

ADB has also recognized the hard work of the watershed team and we all are here now with additional partners from China, FAO and ADPC to scale-up the benefits of this innovative model. The Government of Andhra Pradesh, the Andhra Pradesh Rural Livelihoods Project (APRLP) and Sir Dorabji Tata Trust have also joined the efforts to scale-up the benefits in the states of Andhra Pradesh, Madhya Pradesh and Rajasthan in India along with the ADB.

The ICRISAT consortium team has covered new grounds in the area of ICT by joining hands with the Commonwealth of Learning (COL) to develop distance learning modules for coping with drought. The team has established ICT hubs in the villages, which will serve the purpose of providing information related to watersheds. ICRISAT is trying to take it further through these hubs. That is the strategy this consortium is adopting to scale-up the benefits. This project is developing innovative ways to enhance the participation of the farmers in the watershed activities.

Under the new project along with the APRLP, the team has successfully used knowledge-based activities such as information on soil analysis for entering into the satellite watersheds. The knowledge base, coupled with the experiences of the farmers in the nucleus watersheds, worked very effectively on the minds of thousands of the

farmers from the satellite watersheds. They have come forward to join watershed activities without any subsidies.

So ladies and gentlemen, all of you associated with this project know very well what a powerful approach you are using to solve the most difficult problem of water shortage in rainfed agriculture. We have a very novel mission in front of us all, and we, as a consortium team, will be able to solve the issue of increasing the productivity and incomes of millions of poor people and minimize land degradation in the dry tropics.

ADB's support and your efforts will definitely lead us to the goal of reducing poverty in this harsh climate of the SAT. I congratulate Dr Wani and all the consortium team members for their success and wish them all the best in their new goal to upscale the benefits for thousands of poor farmers in India, Thailand, Vietnam and China. I am confident that through our active partnership, we will win the Green to Grey Revolution in the dry tropics of the world.

I wish you all a very happy and productive stay here in Bangkok.

Thank you and good day.

The New Missionaries

Commencement address during the 2003 graduation ceremony at the Mariano Marcos State University, 11 April 2003, Batac Ilocos Norte, Philippines



Naimbag nga malemyo amin Apo. Maragsakan ken mapadayawanak unay nga umay sumarungkar ditoy nalatak nga probinsiya ti Ilocos Norte, aglalo kadaytoy aldaw nga panagturpos dagiti nalalaing nga agad-adal ditoy MMSU.

Bilang anak ti Ilocos, awatenyo man daytoy naimpapusuan nga kblaaw ko amin kadakayo, aglalo kadigiti agturpos ken kasta met kadagiti nagannak.

Kadagiti agturpos, manipud kadaytoy nga aldaw, surotenyon iti baro nga dalan ti panagbiag. Pasetkayon iti panangipantayo ti agnanayon nga panangpadur-as ti ipatpategtayo nga rehiyon ti Ilocos.

Allow me to express my sincerest thanks and gratitude for this honor that you have bestowed – the degree of Doctor of Science, *honoris causa* – on your humble son today. I will remember and cherish this honor for as long as I live. This honor gives me further encouragement to do more service to the poorest of the poor of the rainfed areas of the developing world.

First of all, let us scan the opportunities and challenges facing us in the Ilocos region. The development of the Ilocos is anchored in the collective vision of achieving a better quality of life and ecological balance through tourism, agro-industrialization and environmental management. This will be supported by information and communication technologies and adequate infrastructure, with an empowered citizenry and responsible political leadership under conditions of social justice, peace, order and security.

From 1999 to 2004, the agriculture of the Ilocos region is expected to grow at an average of 5 to 6% each year. This will be achieved through the adoption and implementation of crop, coastal and marine zonation programs. The promotion of demand-driven and integrated research and development and extension services is also being pursued. During the same period, the industrial sector is expected to grow at an average of 14% every year. Tourism arrivals are also targeted to grow at an average of 8% each year.

As a catalyst of sustainable development, Mariano Marcos State University (MMSU) must be proactive by responding to these challenges and opportunities in the Ilocos region.

In this context, let me congratulate all of you for the impressive achievements of your University through the able leadership of President Saturnino Ocampo Jr. MMSU must be congratulated for its role in producing the manpower needed to catalyze growth and development in the Ilocos region and the nation as a whole. MMSU, being the premier institution of higher learning of the north, must be congratulated for its outstanding and impressive accomplishments in the fields of agriculture, arts and sciences, medicine and pharmacy and engineering and technology.

For instance in school year 2001-2002, MMSU electronics and communications engineering graduates registered a 73% passing, 25% higher than the national score. Likewise, mechanical engineering graduates recorded an 80% passing, 37% higher than the national score. Members of the pharmacy class also registered a 97% rating in the licensure examination for pharmacists, while the national passing was only 61%. The University has had outstanding achievements in research and development. With MMSU's impressive accomplishments as a backdrop, let me now focus my message on you, the graduates of 2003.

All of you are at the crossroads of your life. The completion of your university education starts a new, yet more difficult and challenging phase of your lives. As you do this, let me share some thoughts. When you walk out of the gates of this University, you should not just accept whatever life has in store for you. Instead, you must be in charge of your life, and not allow fate to do it for you.

To be on top of your lives, I challenge you to become *missionaries*. You may be surprised when I use the word *missionaries*. I do not mean that you are missionaries in the religious sense, although some of you may choose a religious vocation. My definition of the word *missionary* is "a person sent on a mission."

As new graduates, all of you must fulfill a mission in your lives. This mission will differ, but each one will be important. This is so because each mission will contribute something meaningful to the development of our province, our country and your own private world.

Indeed, you accepted a mission when you enrolled in a publicly funded educational institution like MMSU. Being such, your education has been subsidized by the taxes from our people. Therefore, as a patriotic Filipino, it is not enough that you simply graduate to obtain a prestigious degree. You must become a missionary for our people. Your mission, in the light of the widespread poverty, hunger, malnutrition and environmental degradation that persists throughout the developing world, is *to do something for our people*.

You are about to become a dedicated group of young professionals, and your mission is to do something to address the pressing challenges of our country, especially our beloved region, the Ilocos.

With you as the new missionaries, we can vigorously move forward to help realize our goals of further improving the growth of agriculture, industry and tourism in the Ilocos through generation and promotion of innovations. This way, we can help reduce poverty, eliminate hunger, malnutrition and protect the environment together with our people.

But you may ask, how do I succeed as a missionary?

Allow me to share my own professional life experiences with you. Like you, I sat and listened to a commencement address in Benguet, not so many years ago! Like you, I sat patiently and listened to the speaker, wondering what was in store for me. But deep inside me,

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 so hard, starting as a government farm management technician. Inspired by my mission, I eventually worked my way to the top, not only in the service of Benguet, my home province of Ilocos Sur, the academe, but the whole country.

Before I knew it, I became Vice President for Research and Development at the Benguet State University. I then moved to the Department of Agriculture as the first Director of the Bureau of Agricultural Research (BAR). From here, I became the fifth Executive Director of PCAARD, the Philippine Council for Agriculture, Forestry and Natural Resources Research and Development. Later on, I became the Acting Philippine Secretary of Agriculture and then Presidential Adviser on Food Security and Rural Development.

During this time, I met and interacted with eminent scientists, development leaders and policy makers from all over the world. Far more than what you get from reading, meeting people from other cultures is very enlightening. Opportunities of travel to foreign places increased. Through these travels, I became exposed to the problems of poor people in places far less fortunate than our country.

Through these experiences, I began to develop a deeper commitment and further strengthened my resolve to pursue my mission in helping the poor.

I realized that I could do something to help solve the global problems of poverty, hunger, malnutrition, environmental degradation, and now, social conflict. These problems also beset our country today.

In time, I came to serve ICRISAT, the International Crops Research Institute for the Semi-Arid Tropics, as its fifth Director General. I am humbled to be the first Asian ever to be appointed to this prestigious position.

ICRISAT serves almost 50 countries of the dry tropics of the world – home to about 800 million people who are the poorest of the poor. Our core business is to improve agriculture in the dry tropics, spearheading a *Grey to Green Revolution*, which is guided by *Science with a Human Face*.

The *Grey to Green Revolution* makes us turn adversities into opportunities for the poor. *Science with a Human Face* means that we

harness science as a means to serve the poor, not an end in itself. Throughout my life, let me emphasize that it was that missionary zeal which drove me to where I am today. I could not have done this alone. I owe all of these to my parents, relatives, mentors, colleagues and my family. At this juncture, let me mention two of my most influential mentors – Dr Santiago R Obien, your former President and Dr Saturnino Ocampo, Jr, your incumbent President.

The big question, then, is: Where do you begin your mission? Contemporary opportunities and challenges are so varied and diverse that pinpointing this may be difficult. Right now, a war is going on, further adding to this difficulty.

Moreover, the ongoing revolutions in biotechnology and information and communication technologies have opened new vistas previously unimaginable. Twenty years ago, no one could have imagined that we would be where we are today.

As I have experienced during the time of my graduation, let me say that the most novel and fulfilling mission is to serve the poor.

Mother Teresa, who as you know lived and worked for the poor in the country where I now reside, India, was a great inspiring soul. Her life is an example of how a person, even small in stature, can achieve great things for the poor. She once said something that I cannot forget: "You don't need to do great things. Just do little things in a great way." Thus, no matter how humble your chosen mission is, as long as it contributes to helping the poor, you are on the right track as a missionary.

The father of India, the late Mahatma Gandhi, once said and I quote: "A small body of determined spirits, fired by an unquenchable faith in their mission, can alter the course of history."

So, with these words, I wish you well, Godspeed and good luck to your new mission in the service of the poor. With God's help, I am confident that all of you can and will be making history.

Sapay koma ta agballigi kayo amin kadaytoy baro a gannuatyo nga mangtulong kadigiti marigrigat nga kailiantayo ditoy Ilocos ken kasta met ditoy pagillian tayo a Pilipinas.

Dios unay ti agngina ken naimbag nga malemyo amin!

Combating Land Degradation Benefits the Poor

Inaugural address at the TATA-ICRISAT Project Review and Planning Workshop, 29 April 2003, CF Bentley Conference Center, ICRISAT, Patancheru, Andhra Pradesh, India



First, let me extend a warm welcome to all of you who have traveled from near and far to attend this second review and planning meeting of the joint Tata-ICRISAT project. I extend a hearty welcome to our good friend, Mr Mukund Gorakshakar, of the Tata Trust, who has traveled overnight from Mumbai and is with us now for the meeting. Our partners from Rajasthan and Madhya Pradesh representing Bharatiya Agro Industries Foundation (BAIF); Jawaharlal Nehru Krishi Vishva Vidyalaya (JNKVV), Indore; Central Research Institute for Dryland Agriculture (CRIDA), National Remote Sensing Agency (NRSA) and ICRISAT scientists and staff are here, and I welcome you all.

Dr Shah from Samaj Pragati Sahayog, a partner in the Dewas Watershed will be arriving tomorrow. I understand that unfortunately Dr HP Singh, Director, CRIDA, could not participate due to his prior commitments. Once again I welcome you all to this Review and Planning meeting to address the issues of improving productivity of rainfed areas in Madhya Pradesh and Rajasthan, which is supported by the Tata Trust.

I am very closely associated with projects that are adopting participatory approaches, building partnerships and addressing the issues of improving the livelihoods of the poor. This project is one of our important watershed projects where a participatory consortium

model of innovative farmers is adopted, and partnerships are built to manage natural resources, mainly water and land, which are the lifeline for millions of poor people.

The world population is estimated to grow by 2.9 billion people over the next 50 years, of which 95% will occur in developing countries. Interestingly, the highest population growth occurs in poverty-stricken regions, composed mostly of rural communities where rainfed agriculture is the predominant



basis for livelihood security. The resource-poor smallholder farmers constitute 70% of the 1.1 billion farmers worldwide and of this, the largest section of resource-poor people live in the tropics.

From a 'water for food' perspective, a global hot spot emerges, namely the drought-prone arid, semi-arid and sub-humid zone where rapid population growth and resource-poor communities coincide with environments subject to serious human-induced land degradation. In the drylands of the developing world, there is an unholy alliance of poverty, hunger and environmental degradation, and such alliance must be broken.

These drylands are of particular concern in terms of their environmental vulnerability. The project we are reviewing today addresses the issues of minimizing the land degradation and increasing the productivity in the poverty-stricken dryland regions of India. I am very happy that the Tata Trust has enabled us to address these forefront issues, for in the end, combating land degradation benefits the poor.

As you know, our mission is to reduce the poverty of millions through the Grey to Green Revolution in the rainfed areas of the tropics through partnership research and protecting the environment. By 2020, it is estimated that India needs to increase its food production to 360 million tons. The untapped potential of rainfed areas will have to be harnessed now to achieve this gigantic target.

The rainfed areas were previously neglected by investors, but now this mistake has been realized as evident from the studies conducted by

the Asian Development Bank and other development investors. I congratulate Mukund who played a very critical role in supporting the long overdue call of rainfed agriculture.

Last week we had an important Development Investor Agency Mission from the International Fund for Agricultural Development (IFAD). We understand that the new country strategy of IFAD for India will be targeting rainfed areas of Madhya Pradesh, Rajasthan and parts of southern India. The Department for International Development (DFID), of the UK and the Asian Development Bank (ADB) have also focused on poverty reduction issues in the rainfed areas. The importance of water management in rainfed areas needs no further highlighting as all around the cry is for efficient water management.

Let us also keep in mind the role of women in water management. Women are key farmers, and for a participatory consortium to be successful and sustainable, it is highly important to recognize the contributions of our women farmers. Let us find means and opportunities to encourage women to bravely demonstrate their experience and wisdom by involving them at the planning stage. For too long women have been exploited for their enduring physical toil, day in and day out in the fields. Remember the saying "The hand that rocks the cradle rules the world". Let us ensure that we do not under-utilize the potential of those hands and minds.

The ICRISAT-led Watershed Management Consortium has put together a good model of building partnerships to find solutions for this critical problem of water management. To address the gigantic task of reaching the target of food production by 2020, as stated by the Honorable President of India Dr Abdul Kalam, we must have new implementation arrangements and build partnerships that include private entrepreneurs, civil society members, research institutions and existing government departments.



President Kalam has also highlighted the role of the Information and Communication Technology, or ICT, for empowerment and education of communities. I am very pleased to note that the watershed team is proactive in employing ICT for empowerment of the rural communities for managing



drought. At ICRISAT Dr Kalam launched the distance learning program module on drought management last December. We also had a Brainstorming Workshop on Drought Management and the state governments in India received the recommendations from this workshop very well. ICRISAT has attached high significance to this project and has increased investments in this region.

For the first time in the history of ICRISAT, we held a Farmers' Day last year at Bhopal, Madhya Pradesh, for the farmers of Rajasthan, Chattisgarh, Madhya Pradesh and Gujarat with our valuable partners, ICAR, BAIF, and the state governments. The event was so successful that the governments of Rajasthan and Chattisgarh requested us to host a Farmers' Day in their states this year. I am happy to inform you that this year we will hold the Farmers' Days in the Bundi district of Rajasthan, and in Raipur in Chattisgarh.

You must be aware that the ICRISAT Watershed Consortium team has secured ADB's support for the second phase of the project on participatory watershed management for improving livelihoods. Rajasthan and Gujarat have been added in the project along with China. Our new IFAD-supported project is also working in Madhya Pradesh and Chattisgarh in India along with other regions and countries. In brief, the region is the heartland of rainfed agriculture in India targeted by this project, and rainfed agriculture is at the heart of ICRISAT's agenda!

This project has capitalized on the valuable experiences of the Watershed Consortium team and has covered strong grounds during the first year of the project, as reviewed during the Steering Committee meeting. You all need to be congratulated for your very good partnership work in this project. This project is quite unique – visionaries of agriculture in India such as Professor Swaminathan and Dr Mangala Rai, the DG of ICAR, are on the Steering Committee, and policymakers such as the Chief Ministers of Madhya Pradesh and

Rajasthan are taking a keen interest in it, and are giving it their support. I hope that in the second year of this project we are able to influence the leaders of the two states to invest in scaling up and scaling out activities so that we can cover more ground as we have done in Andhra Pradesh in a similar initiative.

As stated earlier, we have taken the lead to apply ICT for the benefit of dryland farmers and we are currently laying down the foundations of a Virtual Academy for the Semi Arid Tropics (VASAT) in partnership with the MS Swaminathan Research Foundation. Mukund and those who attended the launching meeting of this project in Bhopal know that Professor Swaminathan proposed a need to establish such an Academy, and we have sincerely acted on the recommendation. This indicates our strong commitment to the mission of improving the livelihoods of the rainfed farmers in the tropics.

I congratulate Mukund and Wani and their teams for their efforts and vision to realize this project. You are doing service with a human face. I am very sure that with such an excellent consortium team this project will be one of the best model development research projects not only for India but also for the other developing countries in the region.

I wish you all the very best for the deliberations and am sure that all of you will raise the project profile to achieve the set goals of this project. In the process, you will be identifying new issues that are critical for achieving the mission, keeping in mind that the partnerships built must be harnessed for the benefit of poor farmers.

My best wishes and support is with you in this mission. Thank you all, and Namaskar.



Managing Common Pool Natural Resources to Improve Livelihood Security

Inaugural address at the launch workshop of the DFID-sponsored project on Natural Resources Management, 8 May 2003, Central Research Institute for Dryland Agriculture (CRIDA), Hyderabad, Andhra Pradesh, India

Dr Margaret Quin, Dr JS Samra, Dr NG Hegde, Dr Gurubachan Singh, Dr HP Singh and Dr KV Subramanyam,

It gives me great pleasure to visit CRIDA, an institute with which ICRISAT has an association for many years. Both our institutions have similar objectives and serve similar goals. We work together in the consortium for watershed development in the dryland areas of India.

Dr HP Singh, by making me the Chief Guest at this function you have given ICRISAT and me a unique privilege. Thank you.



Before speaking about CRIDA and ICRISAT, let me express my pleasure at being present on this occasion along with senior officials from the UK Government's Department for International Development (DFID), the Indian Council for Agricultural Research (ICAR) and the Bharatiya Agro Industries Foundation (BAIF). Our meeting today is significant in that it has representation from the British Government's development cooperation office, the Indian national agricultural research systems and a leading Indian non-governmental organization. ICRISAT works with all of them and we look forward to many more years of happy association.

Both CRIDA and ICRISAT are deeply involved in reducing poverty and improving livelihoods in the dryland areas of India through watershed development. We believe these projects provide the opportunity for improved natural resource management for the rural communities living in areas that receive comparatively less rainfall and over a shorter period.

We believe that research institutions like CRIDA and ICRISAT can make a positive impact through our scientific and technological interventions in these areas. Though CRIDA's mandate is limited to India and ICRISAT's mandate spreads into areas with similar conditions in Africa and Asia, there is an overlap in our mission. This is why we work together for watershed development in Andhra Pradesh, Madhya Pradesh and Rajasthan.

The areas in which CRIDA and ICRISAT work are dry and degraded, suffer frequent droughts and face population pressure. As in the drylands of other developing countries, in these areas of India there is an unholy alliance of poverty, hunger and environmental degradation.

Everybody wants to live with dignity. The resource-poor rural communities in the dryland areas are no different. They want to have greater control over the management of their natural resources. By getting improved benefits from soil, water, vegetation and livestock in their villages, the communities can improve their income and quality of life.

The benefits from watershed projects are two-fold. An improvement in incomes entuses the community to be involved in the activities suggested by the scientists. Further, they understand why the interventions are suggested, and get involved with the



management of the watershed activities. This will allow us to move out of these villages and move into new ones.

It is an indicator to the spirit of partnership with which our institutes work that this DFID-funded project is led by CRIDA and ICRISAT is a partner. CRIDA is also the project leader for the World Bank-funded National Agricultural Technology Project for studying carbon sequestration in agricultural crops. ICRISAT is a partner in this project. In three other projects, ICRISAT is the project leader and CRIDA a project partner. These are: the ADB-funded watershed project being implemented in India, China, Thailand and Vietnam; the Tata Trust-funded watershed project in Madhya Pradesh and Rajasthan; and the Andhra Pradesh Rural Livelihoods Program in Kurnool, Mahboobnagar and Nalgonda districts.

The Kothapally watershed project, developed by ICRISAT with CRIDA's involvement, has become a model for replication not only in India, but also in other parts of Asia. ICRISAT's Governing Board members, who recently visited Kothapally, said that the model could be replicated even in Africa.

A senior representative from the Indian office of the International Fund for Agricultural Development (IFAD) of the UN visited Kothapally a few weeks back. He found the project could be replicated in IFAD's ongoing and future programs.

I understand that the DFID-funded project, which is being launched today, emphasizes natural resource management in the common pool resources for improving the livelihoods of the rural poor. This is an extension of the conventional watershed development projects and tries to include the excluded.

Studies show that the rural poor and landless derive much of their livelihood support from the common pool natural resources like water, grazing lands and forests. Some of the early watershed interventions focused on soil and water conservation. These activities sometimes benefited only those who had farmlands and wells.

The project starting today is an important one since it will take a critical look at the health of the common pool resources in the watersheds. These resources are fast degrading. There are many demands on these dwindling natural resources often leading to tensions between communities. I hope that this project will find long-term solutions by going to the very roots of natural resource management in the common lands.

I want to flag a few issues for you. This project should grow from the shoulders of all that we have learned in the past about natural resources management and watershed development. Many of the activities effectively incorporated into the earlier projects, like integrated pest and disease management, vermicomposting, adding value to agricultural crops and cultivating medicinal plants, can help in providing livelihood to the landless communities and thus include the excluded.

Through an efficient and effective project implementation, we should give the best value for the donor's money. When this project gets on stream there will be two projects that are funded by DFID being implemented with CRIDA and ICRISAT's involvement. The other one is

the APRLP watershed project. For DFID it is an excellent opportunity to find the linkages between these two projects and get the best multiplier effect.

ICRISAT, as always, will bring to the table its expertise from working in similar locations in different parts of Africa and Asia. We can bring to the project fruits of the biotechnological research from our laboratories and research farms. This project can also benefit from our work on linking information and communication technology with rural development.

DFID, ICAR, CRIDA, BAIF and ICRISAT are working together to improve the livelihood of the rural poor in the dryland areas of India. We have made a beginning. We have also reaped a few successes. We, however, have a long way to go since two-thirds of the agricultural land in the country is rainfed. It will be preposterous to think that we can cover all this land. However, if we do our work well, our message will certainly spread. Others will learn from us and take our work forward.

Good day and best wishes to you the participants of this workshop. A job well begun is half done. I hope that by the end of this brainstorming workshop you will have a good plan for the project.

Thank you.

ICRISAT's Roadmap for a Food-secure SAT

Opening remarks during the ICRISAT Global Planning Meeting, 12 June 2003, Patancheru, Andhra Pradesh, India



My dear and esteemed colleagues, good morning.

We are again gathered here today to revisit and map out our institute's global research strategy of improving agriculture to ensure food security, reduce poverty and protect the environment of the semi-arid tropics.

Last year, during our midyear review meeting in Nairobi, I outlined three strategic initiatives to build a strong ICRISAT for a food-secure SAT:

1. *Program mobilization*: strengthening and doing quality research by intensifying the implementation of our six global themes;
2. *Staff mobilization*: teaming up and energizing our human resources; and
3. *Resource mobilization*: enhancing our core financial resources through strategic and social marketing.

Let me reiterate that these initiatives are aimed to proactively respond to the change management process now going on in the CGIAR.

Today, we live in a rapidly changing, hence a very different world. We therefore need to be proactive and must produce the best quality and relevant science to help improve the current situation, especially the livelihood of SAT communities.

We must therefore mobilize the institute to work with our partners in vigorously pursuing our new vision, mission and research strategy. At

the heart of ICRISAT's program mobilization is the consolidation of research operations in the four main regions of Asia, eastern Africa, West Central Africa and southern Africa.



As we have envisioned, the regional hubs will address different research thrusts depending on contemporary needs and priorities of the area. A regional approach to research planning is the fourth of seven core planks in the CGIAR change management strategy.

It is in this context that I would like to view our global research strategy meeting today. As we have started last year, our primary concern is to identify more focused research priorities in the four regions. We will then translate these into impact-oriented operational research projects of regional and global dimensions, driven by and implemented through our six research themes.

I am happy to note that we are now deeply engaged in pursuing our new planning and budgeting cycle. I am very pleased with the collective progress we have made in bringing this to reality during the last 12 months.

During our last work planning meeting, I emphasized the need to further strengthen regional planning at ICRISAT. Henceforth, regional plans will be our road maps in pursuing our new vision, mission and research strategy.

Let me congratulate all of you for the regional research strategies that you completed over the last couple of months. Following our log frame workshop, we are now in the best position to draft log frames supporting the regional plans. With these developments, we can now proudly claim that our research planning process is driven by, and is responsive to local, sub-regional and regional priorities. To top this, we can now show that indeed, science at ICRISAT has a human face and that it is African and Asian!

I am confident that these plans will be able to attract more core resources and special project funds to support our basic strategic research thrusts as well as corresponding downstream research

activities through strategic partnerships, thereby creating more impacts in the lives of the poor people of the SAT.

During the next three days, I understand that you will be working in two groups to perform a complex task. The first group will be tasked to draft an African research strategy and log frame that was requested by the Governing Board during its March meeting. I request you to do this thoroughly and critically since it will be closely examined by the GB during its meeting in September. Likewise, I urge you to underscore our commitment to conduct research that will significantly spur development in Africa.

The second group will be tasked to create an institutional research strategy and log frame based on the four regional plans. It is indeed surprising that until this time, we do not yet have an effective institutional log frame. Hence, its creation is indispensable especially for the next medium term plan. This makes the work of this group very important.

Next week, during the visit of the EPR panel, we will present your work as an example of ICRISAT's new strategic thinking. The job therefore must be finished by Saturday afternoon. I will ask Dyno to hold back the hands of the clock until the job is done!

Before I close, let me reiterate, as I always do, that we must do this planning and log frame exercise in the context of winning the *Grey to Green Revolution* guided by *Science with a Human Face*. Let me also reiterate the importance of our regional plans since they serve as our road maps to serve the poor. Let us do our best, finalize these, present to the Board for approval and look towards their effective and efficient implementation. In doing this, I would like to emphasize that we practice intra- and inter-regional coordination. Within the region, RRs and GTLs must closely coordinate their actions. Moreover, we must also observe close coordination, synchronization and convergence among regions for better science quality.

I therefore wish you a constructive and fruitful three days. Please share your progress with me and I request Dyno to present the highlights of this planning meeting including next steps and timelines during the now scheduled Global Coordination Meeting.

Let's do it!

Thank you and good morning.

Exploring Alternative Uses of Sorghum and Pearl Millet in Asia

Welcome address during the ICRISAT-CFC Workshop on Expert Meeting on Alternative Uses of Sorghum and Pearl Millet in Asia, 1 July 2003, ICRISAT, Patancheru, Andhra Pradesh, India



Guests and colleagues from ICRISAT, good morning. Allow me to welcome all of you to this "Expert Meeting on Alternative Uses of Sorghum and Pearl Millet in Asia."

First of all, I would like to thank the Common Fund for Commodities (CFC) for its financial support and for jointly organizing this workshop with ICRISAT. Thanks also go to the Inter-Governmental Group on Grains (IGGG), FAO, Rome, for its support.

My special thanks are also due to Mr Andrey Kuleshov of CFC and Mr Myles Mielke of FAO for all their wholehearted support to this initiative. I would also like to thank Dr Guy Spielberger, Managing Director, Effem India, for their financial support. Effem India is another new partner of ICRISAT, further broadening our partnership with the private sector.

This is just one aspect of ICRISAT's total research program, which is guided by our new vision: "Improved well-being of the poor of the semi-arid tropics through agricultural research for impact."

To attain this, we are committed with our mission "to help the poor of the semi-arid tropics through *Science with a Human Face* and



partnership-based research and to increase agricultural productivity and food security, reduce poverty and protect the environment in SAT production systems.”

ICRISAT’s vision is guided by the seven planks of the new CGIAR vision and strategy. This is also anchored on our core competencies and thematic comparative advantages, strategic analysis of opportunities in the semi-arid tropics, and potential impacts on the livelihoods of the poor.

In order to pursue our vision and mission, we have mapped out six global research themes, which form the core of our research strategy. These are:

1. Harnessing biotechnology for the poor
2. Crop improvement, management and utilization for food security and health
3. Water, soil and agrodiversity management for ecosystem health
4. Sustainable seed supply systems for productivity
5. Enhancing crop-livestock productivity and systems diversification
6. SAT futures and development pathways

As you can see, we are very much involved in improving crops and managing natural resources. The Global Theme-2 on Crop improvement, management and utilization for food security and health is one of the major themes dealing with our mandate crops. These are sorghum, pearl millet, chickpea, pigeonpea and groundnut. These crops are grown by the poor farmers in the semi-arid tropics (SAT) of the world.

GT-2 has regional projects in Asia and Africa. But for the purpose of this meeting which is focused on Asia, I would like to mention that this theme has two major projects in this region: one dealing with crop improvement and management, and the other dealing with crop utilization including alternative uses and novel foods.

This meeting will focus mainly on alternative utilization strategies, which can open up access to diversified high quality products, novel foods and feed formulations and should ultimately look at market issues.



I am happy to inform you that since January 2003, ICRISAT, along with other partners, has already initiated a DFID-funded project. This is titled "Exploring marketing opportunities through a research industry and users coalition: Sorghum poultry feed". We hope that this Project will lead to the establishment of market links between the sorghum farmer and the poultry feed manufacturer. This is a pilot project to explore the alternative uses of the crop leading to commercialization.

I am very happy to see a wide range of participants from a number of countries from Asia, and also from USA; and a range of partners – research institutions, private sector seed companies, NGOs, feed manufacturers, alcohol and beverage industry, sugar industry, snack and food processors, market specialists, farmer organizations and farmers. I am therefore confident that the results of this meeting will significantly boost our initiatives in alternative uses of sorghum and pearl millet in Asia. But most of all, our work should reach the most marginalized, disadvantaged and hungry.

We must therefore tailor our research efforts to meet real human needs: reducing poverty, hunger, environmental degradation and social inequity. This is the heart of doing *Science with a Human Face*.

You are going to discuss a subject of futuristic importance during the next four days; ICRISAT remains fully committed to this initiative of CFC, which is supported by many other partners.

I wish you all success in this workshop and hope you will enjoy your brief stay at ICRISAT.

Thank you.

Strengthening Public-Private Partnership for Crop Improvement in India

Welcome address during the Workshop on the Evolution of Private Sector Partnerships for Crop Improvement Research at ICRISAT, 15 July 2003, ICRISAT, Patancheru, Andhra Pradesh, India



Ladies and gentleman, good morning! I am most happy to welcome all of you and our special guests: Drs Peter Winter from Germany, Leo Sebastian from the Philippines and KR Chopra from Mahindra Seeds here in India.

In recent years, we have witnessed significant growth in public-private sector partnerships in agricultural research and development. This has made significant strides in addressing the CGIAR's goals of enhancing productivity, reducing poverty and protecting the environment.

Nowadays, partnership-based research is very important because no single organization can address complex developmental issues. Hence, addressing the big challenges of the semi-arid tropics becomes easier when the public and private sector join hands to work on them. This is precisely why partnership-based research remains a hallmark of our research programs at ICRISAT.

The convergence of public and private research in sorghum, pearl millet and pigeonpea hybrid parents at ICRISAT-Patancheru has brought substantial benefits to Indian farmers. Moreover, this partnership has enabled us to enhance our ability in generating a



diverse range of commercially useful breeding materials, parental lines of hybrids and scientific information related to the development of these products. On the other hand, this has also benefited the private sector by making these materials and related information available to them at the right time and in the quantity requested.

I am happy to report that in India, about 4.5 million out of 10 million hectares under sorghum are planted with more than 50 hybrids. The majority of these are from the private sector and 60-80% of these are based on ICRISAT-bred parental lines, or on parental lines developed from germplasm improved by ICRISAT.

Similarly, over 5.5 million out of 10 million hectares of pearl millet area is planted with more than 70 hybrids. Most of these are from the private sector and 70-80% are based on ICRISAT-bred parental lines developed from germplasm improved by ICRISAT.

In 2000, a number of private sector seed companies organized a research consortium for sorghum and pearl millet hybrid parents. I am happy to note that the strength of this consortium has grown over the years. Right now, 14 seed companies are partially funding sorghum and 16 companies are partially funding pearl millet research at ICRISAT. A consortium of funding support for pigeonpea research is also taking root, with two seed companies joining hands and a third having expressed a desire to join.

Building on these successes, ICRISAT has launched a number of initiatives to strengthen strategic alliances with the private sector. Among these are: the Agri-Business Incubator supported by the Department of Science and Technology, and the Agri-Biotech Park

recently nominated as the agri-biotech wing of the Andhra Pradesh science park program, Genome Valley.

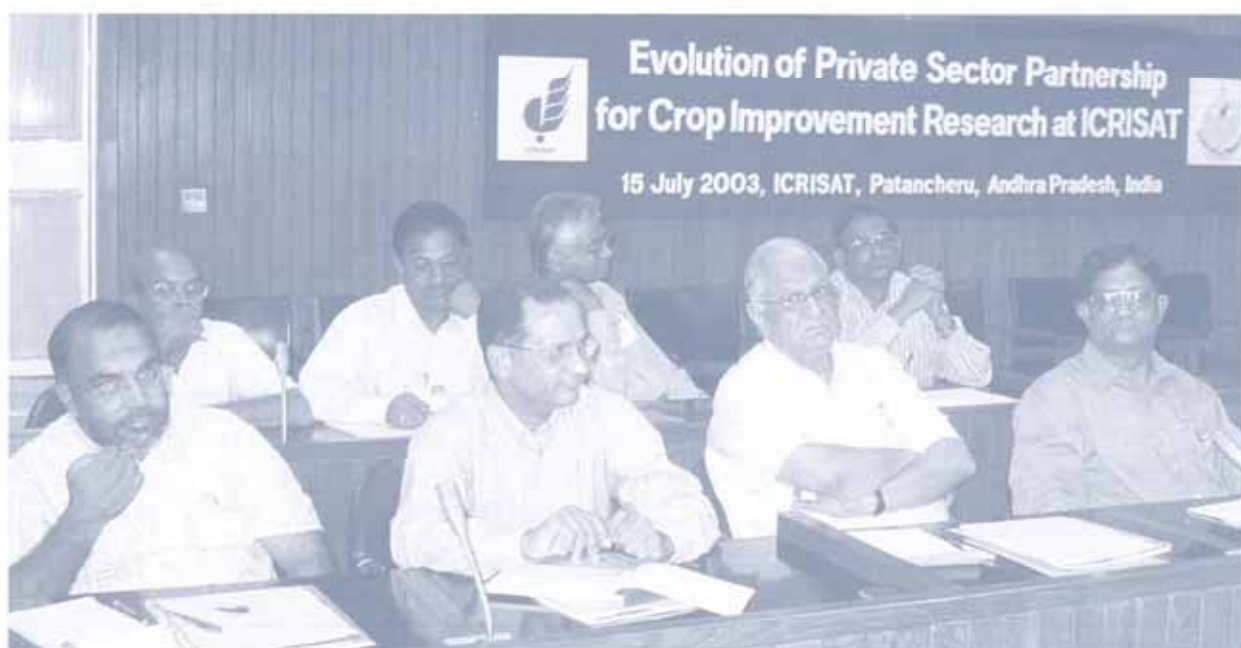
Our private sector partnerships are now coordinated under a single institutional program called the Technology Innovation Center (TIC) and Dr Barry Shapiro will give you more details on this later this morning.

At this stage, I would like to draw your attention to the two main issues you are tasked to discuss in this workshop:

1. The need to further strengthen our research partnership and resource mobilization efforts; and
2. The need to further deliberate our work on biotechnology which is emerging as a powerful tool to enhance the speed, efficiency and precision of our plant breeding efforts. This will be the subject of our workshop on Wednesday, Thursday and Friday.

I am proud to announce that ICRISAT is now recognized as a world leader in molecular breeding. Our location in Hyderabad offers unique opportunities for driving exciting computational advances for plant breeding.

Thus, ICRISAT in India is positioning itself as the *World Dry Tropics Center for Biotechnology and Crop Improvement*. We envision ICRISAT as a global center of excellence for releasing the value encapsulated in germplasm collections, creating, introgressing and evaluating new genetic variation and developing new breeding methodologies.



Our vision for ICRISAT Asia is to provide commercial ventures with full access to ICRISAT's state-of-the-art scientific expertise, infrastructure, equipment and network with the IT and hi-tech communities in Hyderabad. This will evolve into a new paradigm in crop improvement serving our mutual stakeholders – the farmers and consumers of the semi-arid tropics.

With increased funding, we can help you deliver improved breeding products faster and incorporate new value-added traits to differentiate your products in the market. We realize that the speed of product delivery and flexibility of product development to adapt to changing market demands will be a primary factor of your corporate success in the coming years.

We believe that we have the technologies and expertise that will help you become market leaders in the plant breeding business. I personally feel that India can quickly play a significant regional and international role in this business, and we hope that our international networks will help you assume that role.

Before I close, let me reiterate, as I always do, that we must strengthen our partnership in the context of winning the *Grey to Green Revolution* guided by *Science with a Human Face*.

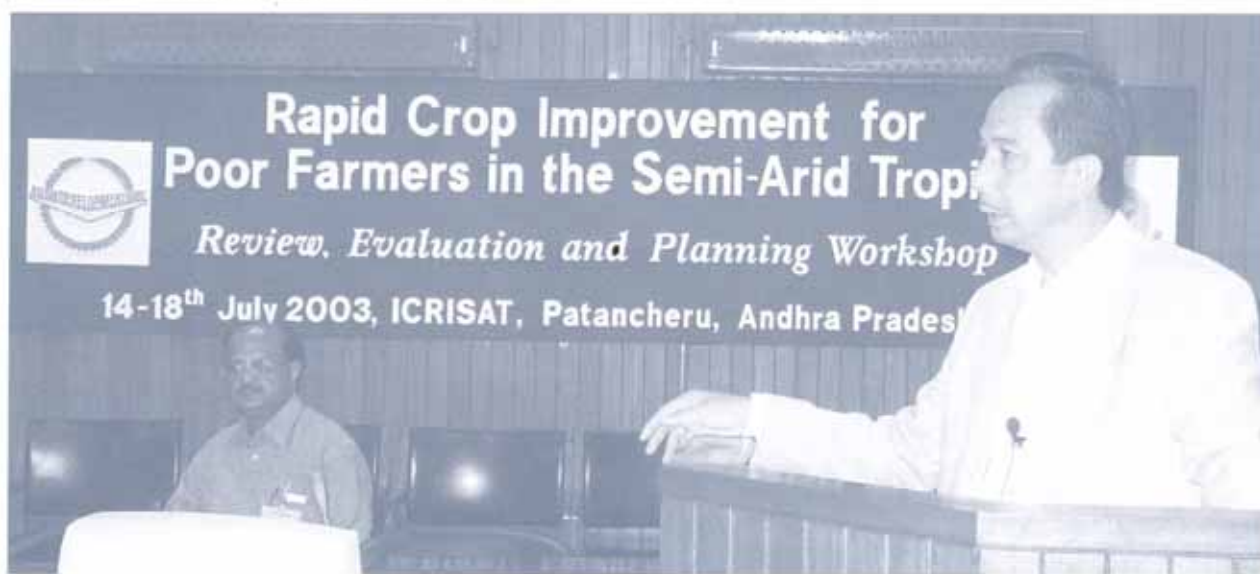
Let me add: *Make us stronger to keep you going stronger.*

Thank you and good morning.



Rapid Crop Improvement for Poor Farmers in the Semi-Arid Tropics of Asia

Welcome remarks at the Workshop on Rapid Crop Improvement for Poor Farmers in the Semi-Arid Tropics of Asia, 16 July 2003, ICRISAT, Patancheru, Andhra Pradesh, India



Ladies and gentlemen, good morning.

Let me welcome you to this very timely review evaluation and planning workshop on rapid crop improvement for poor farmers in the semi-arid tropics of Asia. Indeed, this comes at an opportune time after ICRISAT's biotechnology program has been lauded by our recent External Program Review.

During the last three decades, conventional approaches to crop improvement have had dramatic impacts on crop productivity, particularly for rice, wheat and maize in agro-systems with optimum inputs of fertilizer, pesticides and irrigation. Despite the breakthrough in favorable areas, there is an urgent need to develop sustainable technology options for poor farm families in the semi-arid tropics, where over half a billion of the poorest people in Asia live.

Diversifying cropping systems to enhance the proportion of legumes and coarse grain cereals, which are well adapted to harsh environments, offers an effective solution to this challenge. For example, there is strong evidence that mixed cropping systems in rainfed and dryland areas dramatically reduce malnutrition as compared to rice- and maize-dominated systems.

In addition, legumes can also alleviate the low availability of soil nitrogen and phosphorus. Similarly, coarse grain cereals offer significantly better micronutrient diets than major fine cereals. However, the productivity of these crops generally falls far short of potential yields particularly due to losses caused by an array of pests and diseases.

Recent years have witnessed significant growth in partnership-based research, and the ADB-funded project on Rapid Crop Improvement has been the flagship of our partnership-based activities in genomics. I am delighted to see our scientists wishing to take this one step further in proposing the creation of a Molecular Breeding Community of Practice for Asia. I am confident that this initiative will have great impact in addressing our goals of enhancing farm productivity, reducing poverty and protecting the environment of the dry tropics.

This way, multi-disciplinary and multi-sector teams will re-engineer their respective breeding programs to take full advantage of new tools in molecular biology, germplasm utilization, bio-informatics and biometrics. As a result, plant breeding programs will be able to rapidly generate new varieties in a highly responsive and targeted manner. This will ensure substantial impact on crop productivity and food quality, and in turn enhance livelihoods of the poor across Asia.

This approach will also provide the foundation for addressing more complex challenges such as pyramiding pest and disease resistance genes for enhanced levels and durability of resistance. Moreover, it will also help us develop abiotic stress tolerance against drought, salinity and low soil fertility.



Along this, we are proposing to build the much-needed regional capacity of molecular breeding innovation systems. We will do this by establishing functional links among the wide array of components that are already in place.



We at ICRISAT are genuinely proud to work with you to achieve more impact in farmers' fields through the application of new science tools. Biotechnology is emerging as a very powerful tool that promises to revolutionize the speed, efficiency and precision of plant breeding.

Based on our confidence in the potential of biotechnology, we have invested over one million dollars in establishing a state-of-the-art applied genomics laboratory. This facility has a high throughput DNA marker genotyping and molecular breeding capability. It is currently genotyping around 30,000 plants a month. We expect this to increase to more than one million plants a year in the near future.

Likewise, we have made good progress in marker-assisted breeding for downy mildew resistance in pearl millet using first generation DNA markers. Now with a highly automated facility, we expect to see rapid and dramatic advances in our plant breeding programs. We also hope that parallel progress will occur in your own programs too.

Through the ADB-funded project we have seen you and our own scientists rapidly generating the necessary tools for molecular breeding for an array of pest and disease resistances in sorghum, groundnut and chickpea. Large-scale marker development in groundnut and chickpea is a major advance for the whole community; and it has allowed us to quickly map resistances to various diseases in these crops. In sorghum, rapid progress has been made in mapping resistance to shoot fly and stem borer. This has allowed us to move into marker-accelerated backcross programs well ahead of schedule.

Despite these breakthroughs, we are still eager to improve and do even better. It is notable that our work is highly multidisciplinary, with particular synergistic advantage being gained from our innovative research in biometrics and bio-informatics.

We have three key strategic niches in our seed-based IPG generation activities:

1. Release the value encapsulated in germplasm collections;
2. Create/introgress and evaluate new genetic variation; and
3. Develop new breeding methodologies with advanced genomics and biometrics.

As I mentioned yesterday, our vision for ICRISAT Asia is to provide all our partners and stakeholders with full access to ICRISAT's state-of-the-art scientific expertise, infrastructure, equipment and network with the IT and hi-tech communities in Hyderabad. We need all your help and support for the World Dry Tropics Center for Biotechnology and Crop Improvement based here in Asia to be realized. This dream can only be realized through our collective action. I am confident that you share our excitement at the dawning of this new paradigm of plant breeding.

My final challenge is how to accelerate the generation of products that now would benefit smallholder farmers. Only when these farmers are able to improve their productivity as well as their incomes can we say that biotechnology benefits the poor. This science of biotechnology will work alongside us to win the *Grey to Green Revolution* in the dry areas of Asia!

Thank you and good morning.



Social Analysis in Assessing Gender-related Impacts of Natural Resource Management

Keynote address during the workshop on Social Analysis in Assessing Gender-related Impacts of NRM Options, Focusing on Build-up of Social Capital, 17 July 2003, ICRISAT, Patancheru, Andhra Pradesh, India

Ladies and gentlemen, good morning.

I am very pleased to note that important partners like the FAO-Regional Office for the Asia Pacific, IIT Bombay and the Indian NARS are here with us today.



Poverty arises out of unequal social relations. This results in unequal distribution of resources, claims and responsibilities within society. Gender relations are one such type of social relations. Gender inequality is reproduced, not just in the household, but through a range of institutions, including the international community, the state and the market.

The poor, especially women, are often excluded from the access and ownership of resources. They are forced to depend upon relationships of patronage or dependency for resources. Gender analysis entails looking at how institutions create and reproduce inequalities. Likewise, gender and social analysis looks at smaller social units such as the community, household and family to study relationships and the distribution and control of resources within them.

Thus, the analysis of social diversity and gender provides crucial insight into how poverty is linked to people's position in society. Such analysis shows how factors like ethnicity, geographic location, religious identity or gender themselves form the basis for exclusion from opportunities of all types.

In the past, many development projects have failed because they have not considered the complex social relationships based on gender bias, power and status within communities and households. Social and

gender analysis tells us whether a proposed project contributes to equitable and sustainable development. Due to the foregoing, we at ICRISAT adhere to gender equity in our pursuit of poverty alleviation measures and livelihood opportunities in the semi-arid tropics. Thus, we pay attention to the different ways by which men and women benefit from our technologies.

Gender-related benefits of new technologies differ among diverse cultures of the semi-arid tropics. Our comparative advantage lies in our identification of globally applicable principles and methodologies in gender analysis. We would like to address gender concerns as they relate to three areas: the household, the society and the economy. We would like to do this through social analysis.

Social analysis helps our researchers look beyond 'one-size-fits-all' approaches to problems and prospects. It also takes into account the potential impact of relevant historical, cultural and social factors in designing and implementing new research initiatives. I understand that the primary objective of this workshop is to define dimensions of gender and social analysis. This will then be used to develop a framework and methodology in assessing gender-related impacts of natural resource management technologies.

Findings from a number of studies assessing the impact of agricultural research on poverty show the complex interactions between technologies and the vulnerability of households, their asset base, intervening institutions and livelihood strategies.

However, social dimensions of development are not fully covered by these assessments. One of them is gender, which is a key component of social assessment. Taking women into account is no longer sufficient.

Over the last 25 years, studies on the role of women in agriculture provided a better understanding of the increasingly complex challenges of food production, farm structure and rural development. The 1990s witnessed the emergence of the feminization of agriculture. Recent studies have shown that this social phenomenon has intensified with the rural-to-urban migration of males. It is therefore important to consider women farmers and understand their decisions and constraints. Gender relationships change and we do not always understand how they will respond to the introduction of new technologies. Social capital may be one asset in which gender inequalities are not as pronounced or in which women even hold an advantage.

Acknowledging this provides both substantial challenges for social science research on gender issues in the future and exciting opportunities to understand these complex relationships. From this, there is a need to expand the scope of work on gender especially from a sociological perspective. More work is needed to understand the importance of gender relationships and institutions in fostering sustainable development. Information of this kind will improve the design and development of appropriate technologies, cognizant of the role of women in increasing food production in the semi-arid tropics.

I expect that this workshop will further sharpen our analytical tools to undertake social and gender analysis in the context of natural resource management. Moreover, I am confident that this workshop will be able to assess how far we have come in gender-related work and map out the next steps. I look forward to hearing your outputs and wish you success in all your deliberations.

As I close, let me emphasize that social and gender analysis plays a crucial role in winning the *Grey to Green Revolution* in the dry tropics of the world.

Thank you and good morning.



Role of ICRISAT in Improving Vietnamese Agriculture

Speech at the Vietnam Agricultural Research Institute, 3 October 2003, Hanoi, Vietnam



The International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) is a non-profit, apolitical, international organization for science-based agricultural development. Established in 1972, it is one of the 16 Future Harvest Centers, and is supported by more than 50 governments, foundations and development banks. Our mission is "to help the poor of the semi-arid tropics through *Science with a Human Face* and partnership-based research and to increase agricultural productivity and food security, reduce poverty and protect the environment in SAT production systems." Basically, we aim to improve and sustain agricultural productivity in some of the harshest environments that account for about two-third of the world's cultivable land and serve more than 800 million people in 48 countries, the poorest of the poor, who live in the dry tropics of sub-Saharan Africa and Asia.

Our strategy is to focus on comparative advantage, develop a competitive edge and enhance strategic partnerships. The situation is challenging as this region is heavily populated and pressure on natural resources is very severe. Unless we protect our soil and water resources, they will be degraded and will not be able to support rural livelihoods in the SAT. ICRISAT has a mandate to improve the livelihoods of the millions of poor living in the SAT through increased agricultural productivity and through integrated genetic and natural resource management.

ICRISAT's research and technology exchange program involves activities in Asia, Africa and Latin America. ICRISAT center, Patancheru, India, is responsible for technology exchange involving its mandate in Asia through a network called the Cereal and Legumes Asia Network (CLAN) and Vietnam is an active partner since 1989. The Ministry of Agriculture and Rural Development (MARD) and ICRISAT signed a Memorandum of Understanding in 1989. The main objective of collaboration is to strengthen capacity of Vietnamese researchers in both research and technology transfer in the field of legumes. During the past 15 years of fruitful collaboration, many significant achievements were recorded in several spheres. These are few highlights of our successful collaboration over the years.

A viable mechanism for exchanging germplasm and breeding material was put in place. ICRISAT genebank has so far provided more 3500 germplasm materials containing international trials and nurseries, improved, early and advanced generation breeding lines, male sterile lines, maintainers and restorers. I am happy to note that a significant proportion of breeding material in Vietnam is of ICRISAT origin. Vietnamese and ICRISAT scientists have conducted several germplasm collection trips and collected good number of valuable landraces.

Since groundnut is one of the dominant legume crops in Vietnam, groundnut crop improvement has received high priority. Several promising varieties were identified by the Vietnam Agricultural Research Institute (VASI), National Plant Protection Institute (NIPP) and Oil Plant Institute (OPI) of which, five groundnut cultivars were released by the Government of Vietnam for general cultivation. This has triggered huge productivity gains and increases in cultivated area. The area under groundnut has increased from 160,000 ha to 269,000 ha with 20% productivity and 25% production improvements by 2001. Polythene mulch technique (PFM) introduced as a partnership endeavor proved to be highly profitable to the Vietnamese farming community. PFM, together with improved variety and good agronomy, has increased groundnut pod yields by 86%.

ICRISAT and OPI together developed an Alternative to Coconut Ash (ACA), a good substitute for expensive coconut ash, which is an important constraint to groundnut production in southern Vietnam. ACA reduced input costs by 10-15% and increased groundnut yield by 25% in farmers' fields. IPM studies initiated by NIPP and ICRISAT in groundnut reported a profit of \$100-250 per ha. Insecticide sprays have been reduced from 13-15 to 3-5 in southern Vietnam and from

10 to 5 sprays in northern Vietnam. Similarly, integrated disease management significantly reduced the incidence of damping off and stem and pod rot diseases in groundnut. All these methods are being followed by large number of farmers in southern and northern Vietnam.

Approximately one-third area in Vietnam is rainfed and faces serious natural resource degradation, which threatens sustainable agricultural production. Water is the lifeline of the people living in the SAT regions and unless it is managed, its continuing depletion will endanger the survival of the people living in this region. The main source of water in the SAT is the monsoon rain, which generally occurs as downpours resulting in excess water during the rainy days. Downpours cause severe soil erosion and take away nutrient-rich topsoil along with the runoff, which causes severe damage to natural resources. Subsequently, dry spells follow during the cropping season. The appropriate way to manage these problems is the adoption of integrated participatory watershed management.

Watersheds are not only units for managing rainwater but also are the converging points of various rural activities. The integrated watershed management approach involves participation of all stakeholders in the watershed program. It demands teamwork and effective cooperation. Traditionally watersheds have been viewed as hydrological units to conserve soil and water. However, this view has not benefited farmers. Instead, we must adopt the integrated watershed management approach. Here, all natural resources in the watershed are nurtured properly so that livelihood sources are effectively sustained.

I have personally visited benchmark sites in Vietnam. When you visit Thanh Ha watershed, you will see and experience the happiness of the farmers whose incomes have increased two-fold during the last three years. Now the challenge is for us to translate our success into a broad-based movement of natural resource management. We can do this through the consortium approach adopted in this project. For a better tomorrow, natural resource endowments must be managed and used sustainably. ICRISAT vows to convert "Grey SAT areas into Green". We are committed to achieve this through *Science with a Human Face*. I am sure that we, as a team, will win this fight to help attain a food-secure, prosperous and peaceful world for present and future generations.

While recognizing these achievements, let us remember that they could not have come about without the support of senior research managers and policymakers, who provided wholehearted support for carrying out our work.

In closing, ladies and gentlemen, let me sum up all that I have said in just one single phrase: the power of partnerships. Today is our chance to appreciate the power that our partnerships have shown: what they have achieved, what remains to be done, and to recommit ourselves to the path forward.

This is our chance to offer sincere thanks and appreciation to our partners, especially the Government of Vietnam, its Ministries and Departments; and to all Provincial Administrators with whom we work. We admire and respect your commitment and dedication, and we promise to continue to work shoulder-to-shoulder with you in the same spirit.

For with all that we have achieved – and we know we have helped save millions from hunger today – there are still millions living in quiet desperation. We are winning the battle, but the war is a long and difficult one. Let us then today pledge to re-dedicate our efforts to win the war against poverty, hunger and environmental degradation by working together, doing *Science with a Human Face* to help people “grow their way out of poverty”

Thank you.

A Second Green Revolution

Speech during the 16th anniversary of the Bureau of Agricultural Research, 9 October 2003, Quezon City, Philippines



Ladies and gentlemen, good afternoon. On behalf of the five other former Directors of the Bureau of Agricultural Research (BAR), allow me first to convey our heartfelt thanks for giving each of us a Plaque of Recognition. We will cherish this as a memory of our dedicated service to this organization. Let me also express our warmest greetings to Director William Medrano and the men and women of BAR on the occasion of its 16th anniversary.

Sixteen years ago today, I accepted the challenge to become the first Director of BAR. I did this because I believed in its goal of coordinating agricultural research within the Department of Agriculture (DA) and adapting cutting-edge technology for the benefit of our farmers. This goal is still very relevant – today more than ever.

Today, I am happy to note that Director William Medrano has refocused BAR's activities into a seven-point agenda to fast-track technology utilization for immediate impact to our poor farmers and fisherfolk. BAR must really focus its efforts on enhancing the capabilities of the DA research institutions, particularly the regional integrated agricultural research centers (RIARCs) and outreach stations, as well as working with the agricultural colleges and universities including local government units (LGUs), non-government organizations and private sector to create impacts.

This is very relevant since in spite of intensive efforts and past successes of agricultural research, widespread poverty, chronic hunger, extensive malnutrition, unfair markets and environmental degradation persist worldwide. At the dawn of this century, 1.2 billion people are in poverty, earning less than one dollar a day. More than 800 million people go to bed hungry every day. About 17 million children under the age of five die each year due to malnutrition.

It is now widely recognized that poverty is the major cause of food insecurity. We must significantly reduce or eliminate poverty to improve people's access to food. The poor will only be able to obtain food in the long run if they can afford it. We should therefore create rural jobs through agriculture (this is close to Sec. Lorenzo's heart) and link farmers with markets. With the collapse of the World Trade Organization (WTO) talks in Cancun, we should also institutionalize safety nets and market protection for our farmers and fisherfolk.

There is also emerging evidence that conflict, terrorism, bad governance and environmental degradation also contribute significantly to food insecurity. Here in our country, poverty remains the biggest challenge of governance and agricultural development. According to national income indicators, four out of ten Filipinos residing in the rural areas are in poverty. Most of these rural poor earn their living directly or indirectly from agriculture.

Robert McNamara, a founding father of CGIAR and former World Bank President, warns, "Over the next 50 years, food demand will double as a result of population increases and changes in dietary habits. This demand, combined with decreasing soil fertility and falling water tables, *will create a major crisis.*" We must avert this crisis by waging another Green Revolution throughout Asia and the whole developing world.

Our experiences at the CGIAR serve as a beacon for us to mobilize cutting-edge technology and policy to win this revolution. Over the last 31 years, CGIAR has made a major contribution to poverty reduction and food security in developing countries, and has achieved outstanding rates of return on investment.

As you well know, CGIAR spurred the Green Revolution in Asia in the sixties and seventies. CGIAR-bred crop varieties boosted agricultural production, doubling per capita food availability, increasing rural incomes, improving health and nutrition and conserving the environment. Spearheaded by our dedicated researchers,

extensionists and farmers, propelled by LGUs and the national government, I am confident that we can win another Green Revolution. As we do in the semi-arid tropics, we must turn all our adversities into opportunities.

The tremendous potential of biotechnology and information and communication technology (ICT) can help us attain this. I am pleased to note that the Vatican finally stated its position that "GMOs are not sinful." This gives us impetus to mobilize the great potential of biotechnology and ICTs to revolutionize Philippine agriculture. I really appreciate the leadership and efforts of Secretary Cito Lorenzo in moving forward the science of biotechnology in the country for the benefit of farmers and fisherfolk.

Further, let me appreciate the blessings and the big support of Secretary Cito Lorenzo in institutionalizing the Open Academy for Philippine Agriculture. With him in moving forward this initiative are Dr Santiago R Obien, Dr Leo Sabastian, Dr William Medrano and the rest of the members of this alliance.

Before I close, let me reiterate the commitment of the CGIAR in general and ICRISAT in particular to help modernize Philippine agriculture. By working together, we can win a Second Green Revolution in this country.

But this time, we must do it with a human face. We can only win if we put the Filipino farmer at the center of this revolution.

Maraming salamat at mabuhay kayong lahat!

Breeding of Drought Resistant Peanuts in India and Australia

Welcome and opening remarks during the closing program of the ACIAR-ICRISAT-ICAR project, More efficient breeding of drought resistant peanuts in India and Australia (Extension Phase), 16 October 2003, ICRISAT, Patancheru, Andhra Pradesh, India



Ladies and gentlemen, let me first extend you a very hearty welcome.

We have had the privilege of hosting you on several occasions in the past. We are happy to have you with us again. Over the years, the Australian Centre for International Agricultural Research (ACIAR) and the Indian Council of Agricultural Research (ICAR) have been strong supporters of the CGIAR in general and ICRISAT in particular. We cherish our partnership with these organizations in improving agriculture of the dry tropics, the major source of the livelihoods of the poorest of the poor.

In the dry tropics, water scarcity is the most serious constraint limiting crop production. Water is also becoming scarce not only in the dry tropics but even in irrigated areas. Hence, the harvest and efficient utilization of water has been our major research thrust since the establishment of ICRISAT. In dryland agriculture, we want each drop of water to yield maximum returns in terms of crop productivity.

Most often, early-maturity or short crop duration provides a good escape mechanism from drought. However, this often means some sacrifice in yield. Our breeders generally resort to novel methods in breeding for drought resistance, which take time and generally have low probability of success.

Since 1993, ICRISAT, the Queensland Development of Primary Industries, Australia and ICAR have collaborated in search of an

efficient drought resistance breeding strategy, for groundnut during 1993-1997, our research focused on the selection for water-use efficiency in food legumes (ACIAR project PN 9216). The success of this project led to this initiative on *More efficient breeding of drought resistant peanuts in India and Australia*, again generously supported by ACIAR.

After being extended to carry out further statistical analyses, the second project is also coming to an end. With the successful conclusion of the two projects, we have learned a great deal about plant traits associated with increased water use efficiency and simple surrogate traits. These could be used in place of complex physiological traits that are difficult to measure.

The knowledge we gained would significantly help groundnut breeders worldwide to improve their drought resistance programs. Further, these two projects have showcased excellent teamwork among scientists from the three partner institutions. I am sure the deliberations in this meeting will add value to the accomplishments of the projects. I therefore look forward to the proceedings of this final closing meeting.

Finally, I would like to congratulate all scientists and staff involved in these two projects for their excellent scientific achievements and in pursuing *Science with a Human Face*.

This is another milestone in winning the *Grey to Green Revolution* in the dry tropics!

Thank you and good day.



Winning the Global War Against Hunger

Presented during the seminar on International Alliance against Hunger, 16 October 2003, National Institute of Nutrition, Hyderabad, India

Introduction

I sincerely thank the National Institute of Nutrition of the Indian Council of Medical Research for inviting me to speak on this occasion, commemorating World Food Day. This gives me an excellent opportunity to share the initiatives of ICRISAT and the CGIAR in combating global hunger and malnutrition, especially in the light of the International Alliance against Hunger.



Established in 1972, ICRISAT is one of 16 centers under the umbrella of the Consultative Group for International Agricultural Research (CGIAR). ICRISAT's work is focused in the semi-arid (or dry) tropics of sub-Saharan Africa and Asia, home to more than 800 million people, the poorest of the poor. Marginal environment, unpredictable weather, limited rainfall, degraded soils, and weak physical and social infrastructure characterize the dry tropics. While many parts of the world have made impressive progress towards sustainable development, poverty and food insecurity remain severe and persistent in the dry tropics.

ICRISAT's vision is the improved well-being of the poor people of the semi-arid tropics through agricultural research for impact. To pursue our vision, we are committed to mobilize *Science with a Human Face*. Quoting CGIAR Chair Ian Johnson, "The effective use of science helps to provide solutions for the enormous problems facing the world's poor, including hunger and malnutrition".

The present situation: hunger remains.

More than two decades after the Green Revolution, we face a situation perhaps more complex and challenging than that of the late sixties. Although food production was doubled at a global scale by the Green Revolution during the last two decades, it did not solve the problems of food insecurity, malnutrition and environmental degradation. More importantly, it did not wipe out poverty. It did not create enough jobs to generate the income that enables the poor to buy food.

Today, more than 800 million people throughout the world still suffer the indignity of not having enough food. Of this, 232 million are in India, 200 million in sub-Saharan Africa, 112 million in China, 152 million elsewhere in Asia and the Pacific, 56 million are in Latin America and the Caribbean and 40 million are in North Africa.

The Millennium Development Goal on hunger seeks to cut by half the number of hungry people by 2015. Given the pace of work being undertaken for developing countries, this goal is indeed very formidable. The Food and Agriculture Organization (FAO) defines food security as the "physical and economic access to food by all people at all times." Similarly, nutrition security means the physical and economic access to balanced nutrition and safe drinking water by all people at all times. Since the Green Revolution, access to food by the poor is the most serious challenge to food and nutritional security throughout the world.

We in the CGIAR predict that chronic hunger, widespread malnutrition and pervasive poverty will not be solved, and will even intensify unless scientific efforts are directed toward problems faced by the world's poorest.

The need for an international alliance against hunger

This year's theme for World Food Day, *International Alliance against Hunger* is indeed a good way to build greater momentum to achieve our common goal of fighting hunger.

Hunger is a complicated issue that requires attention and action from all of us. As an alliance, we must work harder to create a policy environment, provide funding and implement programs to finally win the global war against hunger and poverty.

The year 2002 saw many world leaders agreeing to match their commitments with resources and action. Many governments have proclaimed their commitment to reducing hunger. But governments

alone cannot solve the problem. We must have a collective and united action to overcome global hunger and poverty.

I believe that the *International Alliance against Hunger* will bring together the strength of all stakeholders: food producers, consumers, international organizations, agribusiness firms, scientists, academics, donors, policymakers, the private sector, religious groups, civil society organizations and all other committed groups.

The CGIAR's contributions to fighting hunger provides concrete examples of how scientists, in partnership with industrialized and developing countries, are producing new technologies and other solutions to boost crop yields, increase rural incomes and attain food security. For instance, as part of the new Challenge Program of the CGIAR on bio-fortification, the National Institute of Nutrition (NIN) is an important partner of ICRISAT.

The role of ICRISAT in reducing hunger

At ICRISAT, we are doing our share to ensure and sustain household food security in the dry tropics. We do this by pursuing *Science with a Human Face*, harnessing science as a means to serve the poor, not an end in itself. In other words, we tailor our research programs to meet real human needs.

To promote *Science with a Human Face*, we are spearheading a *Grey to Green Revolution* in the dry tropics. You may wonder what the *Grey to Green Revolution* is about... essentially, it is about adapting the farmer's crop to the environment, not the other way around.

The Green Revolution depended on farmers' access to expensive inputs like irrigation water, chemical fertilizers and pesticides. However, the *Grey to Green Revolution* has shown farmers not to be dependent on these expensive inputs. For instance, we harness ample sunshine and dry weather to help control pests and diseases. Likewise, we develop improved varieties of sorghum, millet, chickpea and pigeonpea, which need very little water. These crops are the staple foods for millions of people in the dry tropics.

The *Grey to Green Revolution* is about more than just increasing crop productivity. It is about empowering farmers to use available farm resources, develop their own capacities, and build self-confidence and self-reliance.

ICRISAT recognizes that the effectiveness, efficiency and sustainability of many of its partners are limited by weak institutional capacity.

Hence, capacity building has always been an important concern of ours. Towards this end, we recently launched a *Virtual Academy for the Semi-Arid Tropics (VASAT)*, as an innovative approach of sharing information and knowledge with communities and intermediaries in the dry tropics.

Investments at ICRISAT paid off

Investments in ICRISAT have resulted in over 450 improved varieties released in 170 countries worldwide between 1975 and 2000. These varieties have been adopted extensively in Africa and Asia. Several studies have shown that investments in ICRISAT generate high payoffs. For example: ICP 8863, an improved wilt-resistant variety of pigeonpea gives 57% higher yields, reduces unit costs by 42% and matures slightly earlier in India. Besides productivity gains, investments in ICRISAT have provided significant impact by raising incomes of farmers and reducing their vulnerability to production and marketing risks.

Investments in ICRISAT also enhance the management of natural resources on which poor people depend for their livelihoods, preserve large areas of fragile lands and conserve genetic resources for use by future generations.

Driving forces for food security

Apart from what has been mentioned, let me cite what our sister-center, the International Food Policy Research Institute (IFPRI), considers the nine contemporary driving forces for sustainable food security:

1. *Guiding globalization and trade liberalization.* Without the right policies and institutions at the national and international levels, globalization may either bypass or harm many poor people in both developing and developed countries.
2. *Sweeping technological changes.* Technological advances in molecular biology, energy and information and communication have the potential to help achieve food security for poor people.
3. *Degradation of natural resources and increasing water scarcity.* Degradation of natural resources is rampant in areas with poor soils, irregular rainfall, dense concentrations of population and stagnant agricultural productivity.
4. *Health and nutrition crises.* Malaria, tuberculosis, micronutrient deficiencies, HIV/AIDS and chronic diseases are all compromising food and nutrition security in many developing countries.

5. *Rapid urbanization.* In 2020, many people in the developing world will live in urban areas, where they will make heavy demands to provide jobs, education, health care and food.
6. *The changing face of farming.* The nature of farming is changing rapidly in many developing countries. This is because of an aging farm population, feminization of agriculture, labor shortages and depleted assets resulting from HIV/AIDS.
7. *Continued conflict.* Violent conflicts continue to cause severe human misery in many developing countries, especially in sub-Saharan Africa.
8. *Climate change.* Many scientists and policymakers believe that climate change is leading to more frequent and severe natural disasters.
9. *Changing roles and responsibilities of key actors.* National governments in many developing countries have found themselves playing a new and diminished role in the past couple of decades. Now, local governments, businesses, industry and civil society organizations are undertaking many activities previously performed by national governments.

Conclusion

As I close, let me reiterate that after the Green Revolution, reducing hunger and malnutrition by improving access to food is now the most serious global challenge. This problem can be solved by wiping out the root cause: poverty.

But in order to realize the goal of access to food by all, there must be cooperation from all. I firmly believe that our international alliance against hunger will definitely provide a forum for advocacy and collective action. I therefore challenge the participants in this seminar to join hands and be a part of the *International Alliance against Hunger*. By joining hands, we will win the global war against hunger and poverty.

Let me conclude by quoting my good friend, MS Swaminathan, "Where hunger rules, peace cannot prevail."

Thank you and good day.

The Global Agricultural Open University: A Perspective from ICRISAT

Delivered as a panelist during the parallel session on the Global Agricultural Open University, CGIAR Annual General Meeting, 29 October 2003, Nairobi, Kenya



On behalf of ICRISAT and its stakeholders, let me express my full support to this novel initiative of the CGIAR in establishing a Global Agricultural Open University (GAOU). In this era where there is a strong need for national capacity building amidst funding uncertainty, innovative and cost effective schemes like the GAOU are very relevant.

There are understandable concerns that the CG Open University may duplicate the programs and compete with regional/national educational systems. However, I firmly believe that the GAOU will add significant value to existing open and distance learning programs in agriculture and related fields.

The credo of the CGIAR's ICT-Knowledge Management Program revolving on *communication, collaboration and creativity* faithfully describes the approach of GAOU. First, the GAOU will break communication barriers among CGIAR Centers and stakeholders to fully mobilize science and technology in reducing poverty, attaining food security and protecting the environment.

Second, the GAOU will facilitate inter-Center collaboration to help improve the quality of instruction at regional/national universities especially those in the South. It will work closely with CG Centers, regional/national universities and the Canada-based Commonwealth of Learning (COL) to develop modules, establish a global repository of learning objects and deliver collaborative degree programs.



Third, the GAOU will develop creative mechanisms where our NARS partners and stakeholders can easily access our repository of learning objects and adapt these to their own needs. Through the creative interface of ICTs, the GAOU will be able to share the right information with the right people at the right time anywhere in the world.

Let us recall that the System Review in 1999 underscored the need for the CGIAR to be a leader in harnessing the tremendous potential of ICTs for knowledge sharing. Moreover, let us note that during the last three decades, open and distance learning has emerged as a significant sector in higher education.

Visionaries such as Peter Drucker have pointed out that distance learning will make higher education a mass-based phenomenon in ways of which conventional universities did not conceive.

At this juncture, let me mention that ICRISAT is leading an information, communication and non-formal distance learning coalition called VASAT or the Virtual Academy for the Semi-Arid Tropics. VASAT is focused on sharing appropriate information and knowledge on drought management with farm communities and their intermediaries through the innovative interface of ICTs and distance learning.

Before the GAOU was conceived, we established VASAT together with our sister Centers, IWMI, ILRI and ISNAR, and a number of NARS partners including the Indira Gandhi National Open University in South Asia and the African Virtual University in West and Central Africa. I would also like to acknowledge the strong support of the COL for this initiative.

Let me emphasize that VASAT is an excellent complement to the GAOU. While GAOU puts greater emphasis on postgraduate degree programs for professionals, VASAT focuses on non-degree and information-communication programs for farm communities and their intermediaries.

VASAT and the GAOU will collaborate in developing world-class modules on natural resource management, biotechnology and impact

assessment. We will also establish and share a virtual group of experts to put up a global repository of learning objects on drought, desertification and dryland agriculture with the assistance of COL.

During the last three decades, ICRISAT has been working closely with more than 100 universities in sub-Saharan Africa and Asia. Throughout these years, we worked together to train students, develop programs and strengthen national capacity in agricultural research. In spite of this, we felt a need to innovate further so that we could reach more stakeholders at lesser cost. Hence, VASAT was born.

I am sure that every CG center has a parallel experience. It is therefore timely that we took this association to its next stage of evolution. I envision that the GAOU will differ from the e-learning paradigms of some universities in the late nineties. I would like to see GAOU programs designed with universities in the broader spirit of communication, collaboration and creativity.

A number of successful and sustainable projects harnessing ICTs have shown that people can be empowered through timely information and knowledge. Likewise, a wide variety of training, communication and knowledge exchange functions in the CG System are beginning to take shape. For instance, our ICT-Knowledge Management Program has come up with commendable initiatives to promote a seamless knowledge-sharing scheme within and outside the CGIAR.

With the onset of the Information Revolution, the advantages of forming virtual expert groups have been demonstrated in many ways. Thus, a virtual and minimally structured group of experts cutting across the CGIAR and NARS will certainly leapfrog our knowledge sharing efforts to the Information Age.

The CGIAR must therefore take advantage of this new development by working actively with national partners, investors and local stakeholders. In this light, I congratulate IFPRI and Centers Task Force for the spadework done in conceptualizing the GAOU.

As the global leader in knowledge generation for agriculture, the CGIAR should also be a global catalyst for innovative knowledge sharing. The GAOU is one of the best mechanisms to make this happen. And the right time for us to act is now!

Thank you.

Coordination of Research and Development on Food Legumes in Asia

Presented at the CLAN Steering Committee Meeting, 10 November 2003, ICRISAT, Patancheru, Andhra Pradesh, India

Ladies and Gentlemen, at the outset, let me welcome you all to this CLAN Steering Committee Meeting. This joint activity involving APAARI, AVRDC, ICARDA and ICRISAT is a landmark in inter-center collaboration. It is all the more noteworthy because the regional forum, APAARI, is a partner, making this an inter-institutional collaboration. We are at this stage of working together because of the efforts made by various people in the Asia-Pacific region in the last 20 years. Therefore, I will devote some time to recount the history that has culminated in the four institutions – APAARI, AVRDC, ICARDA and ICRISAT – joining hands to respond positively to the need expressed by the national agricultural research systems (NARS) in the region for regional coordination of R&D on food legumes.



Networks are increasingly becoming important in regional agricultural research as a means of effectively and efficiently using limited staff, facilities and funds to achieve research goals. Networking approaches are being used to avoid duplication of effort, and to engage a critical mass of scientists, at relatively low cost, to address and solve specific problems confronting the network members. Networks also encourage and enhance interaction and exchange of information, knowledge and technology among members.

Realizing that applied agricultural research is location-specific, and to meet the needs of the diverse agroclimatic conditions, ICRISAT has established sub-centers in Africa (in six locations). However, ICRISAT-Patancheru (in India) was also designated as regional center for Asia.

Asia is a large continent, with diverse agroclimatic conditions. Hence ICRISAT scientists developed collaborative research projects in partnership with the Asian NARS to conduct research to assist them in addressing the constraints faced by the farmers in different agroecological zones.

By early 1980s, most Asian countries were self-sufficient in cereal production. Researchers and policy makers realized the need for crop diversification to provide vegetable proteins to the population, and for maintaining soil fertility through crop rotations with legumes. A Consultative Group Meeting was organized at ICRISAT in 1983 to identify the needs and opportunities for collaborative research and development on grain legumes in Asia. Senior scientists/research administrators from nine Asia-Pacific countries (Australia, India, Indonesia, Japan, Malaysia, Nepal, Pakistan, Philippines and Thailand) and seven regional and international programs (ACIAR, ADB, EC, ESCAP-CGPRT Center, FAO, IDRC and Peanut CRSP) participated in the meeting. They endorsed ICRISAT's initiative to form an Asian Grain Legume Program (AGLP) to enhance research and technology exchange involving grain legumes, for the benefit of Asian NARS. At the subsequent Review and Work Plan Meeting held in 1985, the participants drew up a regional plan of action for AGLP. The program was initiated in January 1986, and was later renamed Asian Grain Legumes Network (AGLN) to reflect the collaborative research and development activities through technology exchange.

The Cooperative Cereals Research Network (CCRN) was initiated in 1988 to complement AGLN. Both AGLN and CCRN operated in Asian countries. Subsequently many NARS expressed their preference for a single network dealing with all the ICRISAT mandate crops.



Cereals and Legumes Asia Network

In response to the request from Asian NARS, and to have a single-window for research and technology exchange activities for ICRISAT mandate crops in Asia, a unified Cereals and Legumes Asia Network (CLAN) was formally launched in April 1992. CLAN amalgamated the technology exchange activities in Asia involving sorghum, pearl millet, chickpea, pigeonpea and groundnut.

The overall objective of CLAN is to support, coordinate and facilitate research collaboration and technology exchange involving CLAN priority crops and their resource management among Asian NARS scientists. The ultimate goal is to improve the well-being of the Asian farmers by improving the production and productivity of crops.

Specific objectives of CLAN

- Strengthen linkages and enhance exchange of germplasm, breeding material, information and technology options among members
- Facilitate collaborative research among members to address and solve high priority production constraints giving attention to poverty issues as per needs and priorities of member countries
- Assist in improving the research and extension capability of member countries through human resource development
- Enhance coordination of regional research on sorghum, pearl millet, chickpea, pigeonpea and groundnut
- Contribute to the development of stable and sustainable production systems through a responsive research capability in member countries

Regional Coordination of Food Legumes Research and Development in Asia

Food legumes are often referred to as "orphan crops", because they are considered 'secondary' to the staple cereals. Concern has been expressed at various regional forums on the need to coordinate research and development of these crops. Both IDRC and ACIAR co-sponsored meetings in Bangkok, Thailand, 18-22 Jan and 30 Apr-01 May 1998, for overall coordination of research on food legumes in Asia. The participants at these meetings confirmed the need for such coordination and initiated the concept of a regional network. A proposal for "Food Legume Asian Steering Committee (FLASC)" was put forward at the First Regional Coordination Committee Meeting of the UNDP-FAO/RAS/89/040 project on Food Legumes and Coarse

Grains Network (FLCGNET) held in China during June 1990. The objectives were: (i) to coordinate activities related to food legume research in Asia, (ii) to ensure research backup for improved production of all food legumes, and (iii) to encourage farmer adoption of new technologies to improve food production.

The backup support for these crops was expected to come from the respective IARCs mandated for these crops or from some of the national programs. Participants at that meeting opined that the most appropriate group to carry forward and support the initiative would be APAARI, which is a regional forum consisting of membership of most of the national programs in the Asia-Pacific region.

APAARI and regional networking for legumes

Subsequently, APAARI took the initiative and worked with the FAO-RAP to develop and sustain FLCGNET. Although the scientists involved in FLCGNET agreed to its formation, the governments did not sign the agreement by the due date (31 December 1995), and the network did not take off. However the need for regional coordination of research and development of legumes continued.

The third APAARI Executive Committee Meeting, held 3 February 1996 at New Delhi, India, recommended: "FLCGNET and CLAN should be merged and for the time being, its Secretariat may be provided by ICRISAT". The Committee emphasized that in addition to the CLAN crops, soybean, mungbean and lentil may also be included under the reconstituted CLAN (in collaboration with AVRDC and ICARDA). The





decision was endorsed by the *APAARI Expert Consultation on Research Priority Setting by NARS in the Asia-Pacific Region* held during 25-26 November 1996 at New Delhi, India.

The strongest recommendation for concerted regional effort to facilitate regional research and development of major food legumes was made at the APAARI General Assembly Meeting held at Penang, Malaysia, during 2-4 Dec 2002. The APAARI General Assembly recommended that lentil (ICARDA's mandate) and mungbean (an AVRDC mandate crop) should be included in CLAN. It was suggested that ICRISAT, ICARDA and AVRDC provide the necessary technical and financial backstopping to CLAN. APAARI also indicated its support to the network through financial support for coordination and capacity building in APAARI member countries.

Both AVRDC and ICARDA have indicated this support and commitment to co-facilitate the network. APAARI, AVRDC, ICARDA and ICRISAT have co-sponsored and supported this CLAN Steering Committee Meeting. We are all very happy that the dream of Asian food legume scientists – to make this beginning on regional coordination of R&D in legumes – has come true. I wish the meeting success.

ICRISAT Moving Forward! Entering an Era of Transformation and Renewal

Speech during the 31st Annual Day celebrations, 12 December 2003,
ICRISAT, Patancheru, Andhra Pradesh, India



Guests and colleagues at ICRISAT, good afternoon.

As always, it is a pleasure to be with all of you on this historic day at ICRISAT. This year marked a very important milestone in the life of the Institute. As everyone knows, we underwent two external reviews which acknowledged ICRISAT's outstanding science quality and sound management. As a testimony to our collective achievement, let me again quote Dr Emil Javier, Chair of the interim Science Council who said, "ICRISAT has made laudable improvement in key strategic areas in science, governance and management."

Likewise, Paul Vlek, Chair of our EPR Panel acclaimed: "We strongly recommend that the iSC (now SC) and CGIAR extend full support at this critical moment in ICRISAT's history."

Julie Noolan, Chair of our EMR Panel, has assured donors that "Appropriate and forward looking management processes and systems are in place at ICRISAT."

As a direct complement to these testimonies, let me share the latest breakthroughs we achieved this year, adding feathers to our cap of scientific excellence. In biotechnology, I am happy to report that our work on the world's first transgenic pigeonpea is gaining headway. Our

transgenic lines are now being tested for effectiveness against the legume pod borer, *Helicoverpa armigera*, under field conditions here in Patancheru. Moreover, our transgenic groundnuts are being tested for the second year and three have confirmed resistance to the dreaded peanut clump virus.



In crop improvement, we successfully managed *Helicoverpa* in our experiments here at Patancheru for the fifth year by using low-cost eco-friendly materials. During the rainy season, we turned the severe incidence of red hairy caterpillar in Andhra Pradesh into an opportunity to work on the developmental biology, isolation and multiplication of NPV as an

effective option in integrated pest management.

In Anantapur, Pileru and Mahaboobnagar areas, our scientists are working to share technology in managing aflatoxin contamination under drought conditions.

Our technology of using tolerant varieties together with sound management practices before and after harvest has significantly reduced aflatoxin contamination. This is significant because severe drought in the last two years led to severe loss of income as very little production was achieved.

In watershed management, our team has upscaled activities to 60 locations in India and 8 others in Thailand, Vietnam and China. In on-farm watersheds, our team has successfully demonstrated that yields of rainfed crops can be increased up to 50 to 60% through boron and sulphur amendments. Likewise, yields could even be doubled by amending micronutrients along with the right doses of nitrogen and phosphorus.

In the social sciences, our study conducted for IFPRI further affirms that the Green Revolution strategy must be modified to be made suitable to the semi-arid tropics. You are well aware that the Green Revolution left out the poor people of the semi-arid tropics (SAT).

In view of this, we must therefore give utmost priority to the poor of the SAT through institutional and other innovations through the Green to Green Revolution. Water must be made as the major entry point and catalyst for rural development.

In Africa, emergency relief efforts in Zimbabwe have included small doses of fertilizer for the first time in addition to seed. Impact assessment surveys in Zimbabwe and Tanzania have recently shown that up to 35% of farmers have planted ICRISAT sorghum and pearl millet varieties. In Mali, ICRISAT sorghum and millet varieties are now planted in more than 100,000 hectares.

In West Africa, the ICRISAT team and its partners are testing fertilizer placement with more than 5,000 farmers and 50 civil society organizations extending over Niger, Mali and Burkina Faso. Moreover, utilization of technologies developed through the African Market Garden is now approaching 50% of farmers who have tested them, giving high returns of investment.

Likewise, the Desert Margins Program (DMP) is up and running at full speed. The South African government is releasing funds to allow the DMP team to expand their efforts into the Limpopo basin, complementing our challenge program on water and food.

Let me also congratulate the collective and outstanding efforts of our staff in resource mobilization. Reinforcing our core funds is now one of the big challenges we must face as we enter a new phase in the life of ICRISAT.

Immediately after the external reviews, concerns were raised about the future of ICRISAT, especially the location of our headquarters. Right now, I am happy to report that this has been secured – thanks to the fruitful outcome of our mission during the recent CGIAR Annual General Meeting (AGM) in Nairobi.

As mentioned by our Board Chair, I am happy to report that the outcome of the AGM's discussions on the recommendations by the external reviews mirrored our responses. *Most CGIAR members supported our plan of maintaining our headquarters in India.*

Our proposal to set up a task force to help develop a win-win strategy for sub-Saharan Africa and Asia was also endorsed by the Group. This win-win strategy will further strengthen our commitment to sub-Saharan Africa while responding to the needs of our stakeholders in Asia.

The CGIAR also decided to set up a system-wide Task Force to review inter-Center synergies and institutional alliances starting with sub-Saharan Africa.

Now that the future of our headquarters has been secured, we must vigorously move forward. Henceforth, I enjoin all of you to enter this historic era of transformation and renewal advocated by our external reviews.

Let us move as one to pursue the transformation and renewal of ICRISAT as a premier center of scientific excellence in the 21st century, serving the people of the semi-arid regions in sub-Saharan Africa and Asia.



Moreover, we accept the challenge to urgently develop a win-win strategy of enhancing our impact in sub-Saharan Africa and Asia.

To carry this out, we have mapped out our visionary option for transformation and renewal. In Asia, a Biotech and Crop Improvement (BCI) Center will arise to spearhead an upstream genetic resources and enhancement program.

In sub-Saharan Africa, an Integrated Genetic and Natural Resource Management Center and a Desert Margins Center will take shape to implement a strong and market-driven integrated genetic and natural resource management program. This program will foster dynamic interventions such as market-oriented production and value addition to link smallholder farmers, processors and traders to markets.

Already, here in Asia, we have now as a base in place four flagship initiatives:

1. A Technology Innovation Center (TIC) to accelerate technology exchange and commercialization by linking with private sector firms;

2. A Virtual Academy for the Semi-Arid Tropics (VASAT) to help vulnerable rural families cope better with drought. The emphasis is on creating demand-driven content that which can be easily accessed by rural families and intermediaries;
3. An Agri-Business Incubator (ABI) to accelerate technology exchange by nurturing agriculture-focused commercial enterprises; and
4. An Agri-Science Park (ASP) to provide a facility for the promotion and enhancement of biotechnological products.

These initiatives will also be launched in sub-Saharan Africa.

During the last 31 years, ICRISAT has been very resilient and responsive to the challenges posed by the semi-arid tropics. As we enter an era of transformation and renewal, let us work even harder, commit ourselves and move forward to finally win the *Grey to Green Revolution* in the semi-arid tropics of the world.

Thank you and good day.



About ICRISAT

The International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) is a non-profit, non-political, international organization for science-based agricultural development. ICRISAT conducts research on sorghum, pearl millet, chickpea, pigeonpea and groundnut – crops that support the livelihoods of the poorest of the poor in the semi-arid tropics encompassing 48 countries. ICRISAT also shares information and knowledge through capacity building, publications and ICTs. Established in 1972, it is one of 15 Centers supported by the Consultative Group on International Agricultural Research (CGIAR).

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