

Leading to serve and empower the poor

Transformational leadership
in agricultural research for development



A commemorative book for
William D. Dar

This commemorative book is published to celebrate Dr William D. Dar's journey as a transformational and servant leader, who took over the reins of the International Crops Research Institute for the Semi-Arid-Tropics (ICRISAT) when it was in a floundering stage, but completely transformed the institute into one of the best international agricultural research for development (AR4D) centers in the world in terms of innovative agricultural research for development programs, impact on smallholder farmers, and financial health and stability. Dr Dar served as Director General of ICRISAT for 15 years, from 2000 to 2014.





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About ICRISAT

ICRISAT is a non-profit, non-political organization that conducts agricultural research for development in Asia and sub-Saharan Africa with a wide array of partners throughout the world. Covering 6.5 million square kilometers of land in 55 countries, the semi-arid tropics have over 2 billion people, and 644 million of these are the poorest of the poor. ICRISAT innovations help the dryland poor move from poverty to prosperity by harnessing markets while managing risks – a strategy called Inclusive Market-Oriented Development (IMOD). ICRISAT is headquartered in Patancheru near Hyderabad, Telangana, India, with two regional hubs and six country offices in sub-Saharan Africa. It is a member of the CGIAR Consortium. www.icrisat.org

CGIAR is a global agriculture research partnership for a food secure future. Its science is carried out by 15 Research Centers who are members of the CGIAR Consortium in collaboration with hundreds of partner organizations. www.cgiar.org

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FOREWORD

There are some who sit back, watch the world turn, and wonder what has happened. There are others who observe the way the world turns, seize opportunities to make the world turn differently, and set out, in a very determined way, to make the planet a better place for its inhabitants. Dr William Dollente Dar is clearly of the latter category.

Willie has made a difference in the lives of some two billion of the world's poorest who live in the dryland tropics. Perhaps it's because of Willie's humble origins and upbringing in a rural farming environment, seeing poverty from birth, which made him acutely aware of the need to bring about change in the world, to do things differently, and to reduce poverty, hunger, and malnutrition. But Willie did not stop there. He worked his way through school and university, and entered a profession which he knew will make the biggest impact towards improving the quality of life in rural areas. Willie embarked on a lengthy career as an agricultural scientist in the Philippines, rising to the highest position in his government.

Never a man to rest on his laurels, never a man contented with the status quo, alarmed by the effects of climate change on agricultural production in the semi-arid tropics, and full of passion and zeal to change the world, Willie took on the daunting challenge of being the Director General of ICRISAT, at a time when the future of the institute was at its bleakest.

In order to overcome poverty, hunger and malnutrition in one of the harshest

physical environments, the dryland tropics, Willie knew that he had to firstly transform ICRISAT. And transform he did! Willie's legacy within ICRISAT is well documented by all the contributors to this book – from finances, to scientific capability, to staff recruitment, to creation of the Center of Excellence in Genomics, to knowledge diffusion, to Inclusive Market-Oriented Development (IMOD). Willie's transformational leadership, his vision, and his ability to move from vision to action are all self-evident when one examines the ICRISAT of today, compared to 15 years ago.

Few institutions have witnessed such transformational change, or have benefitted from such a dynamic and purposeful leader. ICRISAT was fortunate to be guided by Willie, and led by his perseverance to accomplishing its mission, his dedication to its cause, and his rigorous pursuit and oversight of the highest quality science. Willie was a trend setter. He was one of the first Directors General in the CGIAR, to bring the private sector closer to the work of ICRISAT. He was the first to bring an agribusiness incubation hub to a CG center, and he was the driver of the IMOD vision and strategy, which is now a pillar of the ICRISAT research programs.

There is no doubt in my mind that Willie's contributions to ICRISAT have gone well beyond the physical and geographical boundaries of the institution. ICRISAT is today one of the respected flagship centers of the CGIAR Consortium. Because of Willie, I see hope for the impoverished, the hungry,

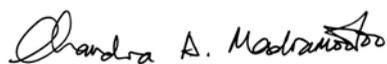
and the forgotten people of the semi-arid tropics. Few in the world have made such a contribution or difference.

It has been a privilege for me to know Willie, to work with him, and to see him in action. He will always stand out in my mind as one of the best science communicators in the world. He always had a message of hope, and he knew how to convey that message whether it be to a farmer, bureaucrat, politician, scientist, or to a common villager. Willie has a heart for the poor and the downtrodden, and this respectful disposition will remain a hallmark of his personality, and exemplifies why he has taken on the mission of improving the life of the worlds' poorest.

Willie's mission is not over. He remains a person of ideas, energy, passion and vitality. While he has completed an

outstanding 15-year term as Director General of ICRISAT, he has much more to contribute in the years ahead. I say, keep watching for the name of Dr William Dollente Dar, because he will continue to transform lives in his future endeavors.

I close by personally thanking Willie for his 15 years of transformational leadership in agricultural research for development, directing ICRISAT. Willie, my dear friend, as a board member, and as Chair of the Board it has been a privilege to work with you. Well done faithful friend and servant leader! May you see your dream for a more food secure and resilient world come true.



Chandra Madramootoo
Chair, ICRISAT Governing Board



The road to transformational and servant leadership

"To lead people, walk behind them." – Lao Tzu





At the dawn of the millennium, the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) witnessed a renaissance. The institution, riddled with serious financial and human resource challenges, rose to the call of the new leadership. Infused with a new verve and a burning optimism, ICRISAT embraced the phrase *Science with a Human Face* from the inaugural speech of its young and energetic Director General, Dr William D. Dar, turning it into both an inspiration and a rallying point for an institutional transformation.

Dr Dar was appointed Director General by the Governing Board in the year 2000. From then on, proactive and strategic thinking became the order of the day. It was the beginning of 15 years of continued exploration of uncommon opportunities for inclusive and sustainable development, while tackling the twin challenges of global

hunger and poverty, and fulfilling a dedication to serve poor communities in the drylands of Asia and sub-Saharan Africa.

Through his strong and transformative leadership and astute governance, Dr Dar has quadrupled the income and investments poured into ICRISAT by development partners, from US\$ 22 million since he took over in 2000 to US\$ 85 million as of 2014.

*His skilled and inspiring leadership strengthened ICRISAT's agricultural research-for-development (AR4D) agenda, generating outstanding economic rates of return to investment of seven highly successful breakthrough innovations (called 'Jewels of ICRISAT'). A 2014 ex-post impact assessment study indicated **a return on investment of US\$70 on average for each dollar invested in AR4D, and an internal rate of return of 35%.***



Science with a Human Face is from Dr William Dar's inaugural address on 10 January 2000.

Turning challenges into opportunities

Like many agricultural research for development (AR4D) institutions in the late 1990s, ICRISAT had been hard-hit by the declining priority of agricultural research and development within international funders and donors, necessitating large budget cuts and morale-sapping staff reductions. Meanwhile, external reviews had advocated the shift of ICRISAT's headquarters to Africa and the rearrangement of the relative priorities of work on crop improvement versus natural resource management despite dwindling funding for both, creating uncertainty among staff and within the host country, India. The CGIAR science advisory bodies were urging ICRISAT to shift towards more basic research, while donor agencies were pleading for the opposite – for more impactful development-related work.

Dr Dar immediately applied his remarkable interpersonal skills to heal these rifts and forge a unified way forward. A man with a gift for transcending cultural boundaries, he

restored strong relations with countries that host ICRISAT in India and Africa. India soon became the fifth largest donor to ICRISAT – the largest of any CGIAR host country. He decentralized decision-making to African regional hub locations.

Capitalizing on diversity in the drylands has been a strong and vital emphasis during Dr Dar's tenure. Recognizing that under rainfed smallholder conditions the farming poor lacked access to high levels of external inputs, Dr Dar guided institutional strategy towards solutions that adapt to and take best advantage of the soil, water, climatic, agro-biodiversity and other assets that were available to the poor. ICRISAT's agenda became more decentralized and regionally-focused; projects were targeted more sharply on solving major crop and system issues.

Donors responded wholeheartedly to the healing and reinvigoration of ICRISAT. The twelve-year decline in ICRISAT's total income reversed dramatically beginning in 2002. ICRISAT's total income quadrupled by 2014 compared to its 2000 low.

This enabled the institute to rebuild its human resources, achieving a 50%

increase in number of scientists over the period. The enlarged capacity and improved morale translated into major acceleration of ICRISAT's AR4D agenda and impacts on food security and poverty reduction.

The main drivers of transformation

Servant leadership was the main ingredient of ICRISAT's transformation when Dr Dar took office. As Robert Greenleaf (1970) aptly said: *"Servant leadership begins with the natural feeling that one wants to serve, first. Then conscious choice brings one to aspire to lead."*

At heart, Dr Dar is a servant first, making a conscious decision to lead in order to serve others better, not to have control over them. At the core, Dr Dar is a transformational leader:

A charismatic, visionary leader committed to transforming the organization by empowering others, by bringing the best out of every team member, and by motivating and challenging teams to perform at levels beyond expectations.

As a transformational leader, Dr Dar was inspirational, a team player, led by examples, and had strength of resolve.



Focusing on opportunities and thinking out of the box made all the difference. Following are the main drivers of ICRISAT's transformation under Dr Dar's leadership.

Institutional change

Institutional change made ICRISAT embrace *Science with a Human Face* as the vehicle for organizational transformation. To pursue this, Dr Dar laid out the process of pursuing staff and institutional innovations, responsive to the rapid changes happening within the global AR4D environment. It was not anymore 'business-as-usual.' Dr Dar led the management team to steer ICRISAT to new heights through a culture of scientific excellence, decentralization, transparency, innovative resource mobilization, knowledge sharing and communication.

Over the course of 15 years, ICRISAT has become more focused on impact and performance, fostering excellence and commitment, and encouraging innovation and risk taking.

Enabling environment

To achieve an enabling environment, Dr Dar reconfigured the workplace so

that staff members are empowered and fully developed to be productive in the organization. Towards this, innovative management policies and procedures were pursued to enable everyone to work in the best conditions across the institute's locations in Asia and sub-Saharan Africa (SSA). Dr Dar was committed to giving high priority in empowering all staff members for greater productivity.

Team-based culture

Dr Dar strongly believes in team-based culture, in working under a collaborative and cooperative spirit. 'Team ICRISAT' was born primarily to serve as a social force for organizational change – to boost

staff morale and enhance organizational effectiveness and efficiency.

At the same time, scientists and staff were encouraged to team up with strategic partners from the public, private and civil society sectors to maintain the quality of ICRISAT's science to benefit the poor. With Dr Dar at the helm, ICRISAT has placed special focus on open communication, participative decision making, and people-public-private partnerships.

Committed service

In tackling the challenges confronting ICRISAT, Dr Dar inspired everyone to embrace a strong commitment to service



– an allegiance to the poorest of the poor of the semi-arid tropics who are its main beneficiaries. ICRISAT is now proud of its highly committed staff and partners, helping the institute to move forward during challenging times.



Nurturing spirit

Dr Dar's nurturing spirit has nourished and sustained the commitment of ICRISAT staff and partners to serve the poor. ICRISAT now devotes substantial resources towards ensuring the well-being of its staff. This is pursued on several fronts: proactive governance; decentralized research management; accessibility and visibility; inclusive and team-based work culture; innovative resource mobilization; communication and knowledge sharing; and strategic public-private-civil society partnerships.

Turning the wheels of change

At the turn of the century in 2001, the theme 'Grey to Green Revolution' was the top agenda under the ICRISAT vision and strategy to 2010. The strategy addressed emerging challenges and issues of the semi-arid tropics, scanned the changing agricultural research environment, and drew up six major global research themes and corresponding deliverables.

The external reviews in 2003 gave a resounding verdict on ICRISAT's quality science and sound management under Dr Dar's initial years at the helm. Its research strategy, especially for sub-Saharan Africa, was further strengthened together with financial and human resources investments. All systems were geared up as ICRISAT began making a financial turnaround.

International agricultural research was seeing the emergence of a new set of institutional arrangements where public-private partnerships were mainstreamed and became an integral part of AR4D. Dr Dar initiated the pursuit of new management systems, strategic linkages with the private sector, innovative knowledge sharing schemes, and improved institutional visibility.

The hearts and minds of Team ICRISAT were engaged under a dynamic leadership. Adaptation, innovation and transformation became requisites for international research organizations to flourish. Dr Dar decided to break away from traditional thinking by exploring new AR4D horizons. Synergies were maximized among research themes to synchronize resources with development goals.

Decentralization soon followed. Dr Dar was confident that decentralizing its management will enable the institute to derive additional positive synergies across locations, optimize research investments, and enable each location to act regionally and produce international public goods (IPGs) with global impact. ICRISAT's management was decentralized from its global headquarters in India, devolving broad powers and authority to its regional hubs in Kenya for Eastern and Southern Africa (ESA) and in Mali for West and Central Africa (WCA).

Financial stability was next. Within a few years under Dr Dar's leadership, the institute's reserves increased, earned incomes went up, and gross revenues have risen through a sound financial management. Financial stability enabled the organization to fulfill its mandate of empowering poor stakeholders.

With it came a series of scientific and development triumphs. With the innovative AR4D programs that Dr Dar introduced, the institute continued to attract much-needed investments into the development of modern, climate-smart and sustainable crop cultivars and technologies of its five mandate crops (pearl millet, chickpea, pigeonpea, groundnut and sorghum) that are farmed by millions of smallholder farm families in the dryland tropics.

Sustainable natural resource management programs have brought prosperity to resource-poor farmers. Centers of scientific excellence for genomics, transgenic and climate change research, and information and communications technology (ICT) innovations for agriculture were established. An inclusive

and technology-based entrepreneurship and agribusiness program through public-private partnerships was institutionalized to bring science-based technologies and products to the market for the benefit of smallholder farmers.

AR4D can address a range of strategic priorities including food sufficiency, poverty alleviation, sustainable resource management, and women's empowerment among others. By the end of 2014, an *ex post* analysis of 7 out of 16 'Jewels of ICRISAT' confirms that from an economic surplus perspective, the following breakthrough innovations yielded exceptionally high return on investments (US\$70 for every dollar invested): (1) Drought tolerant groundnuts in India (Anantapur District), Malawi, and Nigeria; (2) Community-based watershed management in Lucheba, China; (3) Extra-early pearl millet hybrid in northwestern India; (4) Pigeonpea in northern Tanzania; (5) Fusarium wilt-resistant pigeonpea in India; (6) Fertilizer microdosing in Zimbabwe and Niger; and (7) Hybrid Parents Research Consortium (HPRC) on pearl millet and sorghum in India.

Continuing the journey

By 2010, a new CGIAR was emerging, enacting fundamental reforms to bolster strategic planning, investment and action, in the hope of becoming more efficient, more accountable and more open to effective collaboration with partner organizations.

In the same spirit, Dr Dar led ICRISAT in carefully re-examining the institute's own strategic directions. He led the team in the formulation of the ICRISAT Strategic

Plan to 2020. The Plan was the fruit of a year-long effort, challenging everyone to be bold and imaginative and to build on past accomplishments and expertise. ICRISAT's new vision: *A prosperous, food-secure and resilient dryland tropics.*

The new strategic plan's conceptual framework is a more dynamic institutional strategy known as Inclusive Market-Oriented Development (IMOD) which shifted ICRISAT's focus towards enabling poor farmers to harness markets for poverty escape. This concept relies on unleashing the energies of the poor by enabling them with diverse, purposeful, innovative and action-oriented partnerships, more productive and resilient technologies, and supportive policies.

Dr Dar has completely transformed ICRISAT into one of the best international AR4D centers in the world in terms of innovative research for development programs, impact on clientele, and financial health and stability.

After an unprecedented three five-year terms (2000-2014), Dr Dar leaves behind a legacy benefitting millions of farmers in India, Africa, and other dryland countries.

But the journey continues. **Dr William Dollente Dar**, transformational and servant leader, has made a big difference and continues with conviction his mission of helping alleviate the conditions of the poor in this journey to a prosperous and food secure drylands of the world. ■

About William Dollente Dar



William Dollente Dar has achieved outstanding impact as an agricultural research for development (AR4D) leader, guiding crucial periods of renewal in major national, regional and international institutions. Time and again, national and international public AR4D institutions in periods of difficulty have called on him to build teamwork, unify vision and strategy, raise morale, and increase donor support for their food security missions.

Dr Dar was born in Danuman West, Santa Maria, Ilocos Sur, Philippines in 1953. He obtained his Ph.D. in Horticulture from the University of the Philippines Los Baños (UPLB) in 1980. He quickly rose to Professor VI and then Vice-President for Research and Development (R&D) at the Benguet State University (BSU) while catalyzing innovation in fundraising and capacity-building within the inter-institutional Cordillera Integrated Agricultural Development Program. He innovated a novel institutional

development model to get research results off the shelf and into use by spearheading the formation of the BSU Development Foundation, Inc.

His success at BSU led to his appointment as Director of the Bureau of Agricultural Research (BAR) of the Philippines' Department of Agriculture (DA) in 1987. At BAR he successfully coordinated a large array of diverse agencies, field units, and international R&D institutions working under the DA's aegis. He united their research management processes and systematized priority-setting, monitoring and assessment, and project development. One of his achievements was to galvanize the Mt. Pinatubo Research and Development Program to help the devastated region recover from that volcano's cataclysmic eruption in 1991. He also advised the Philippine Senate on GATT negotiation issues, and helped persuade politicians to increase investments in agriculture and fisheries programs.

His legacy of achievement at BAR led to his appointment in 1994 as Executive Director of the Philippine Council for Agriculture, Forestry and Natural Resources Research and Development (PCARRD), the nation's apex agricultural research body. Once again the challenge was to harmonize strategy and increase the collective effectiveness of a wide array of diverse AR4D institutions and agencies at a difficult time when agriculture had dropped to a lower priority for most governments. He harmonized agency agendas; strengthened partnerships with the private sector, NGOs, universities, ministries, AR4D networks, Congress, and international organizations; improved AR4D priority-setting; and increased funding support.

Recognition of Dr Dar's leadership skills extended well beyond the Philippines. While leading PCARRD he also took up the Chairmanship of the Asia-Pacific Association of Agricultural Research Institutions (APAARI), the apex agricultural R4D network for Asia and the Pacific; and served on the Board of Trustees of the International Maize and Wheat Improvement Center (CIMMYT), the Governing Board of the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), the Policy Advisory Council of the Australian Centre for International Agricultural Research (ACIAR), and several other major international bodies.

Dr Dar's revitalization of PCARRD drew the notice of national political leaders, leading to an even higher responsibility – Secretary of the Department of Agriculture (July 1998-May 1999). Yet again he distinguished himself with rapid-fire achievements. He prepared the groundwork for the Agriculture and



Fisheries Modernization Act (Republic Act No. 8435), transforming the DA's strategy to become science and technology-driven. He initiated the *Agriculturang Makamasa* program to put the country on a war footing to recover from the ravages of the 1997-98 El Niño calamity. He empowered local government units, DA regions/institutes and rural communities to participate in bottom-up planning. The country took notice of this change: public approval of the DA reversed from a negative 17-point rating to positive 43 points, as measured by the influential Makati Business Club. The government Office of the Ombudsman measured an 87% drop in graft and corruption, earning DA the rank of one of the least corrupt government agencies. On the basis of this outstanding performance, in 1999 Dr. Dar was appointed as Presidential Advisor on Food Security and Rural Development by the President of the Philippines.

Gaining wide praise for his achievements, Dr Dar was called into the international



arena. In 2000 he became Director General of ICRISAT. His transformational leadership has turned ICRISAT into a forward looking institution. In April 2010, ICRISAT led by Dr Dar won the CGIAR's Science Award for Outstanding Partnership together with the World Vegetable Center (AVRDC), for improving the lives of women and children in West Africa. In 2008, it had won for the fifth time the King Baudouin Award (the most prestigious in the CGIAR) along with eight other Centers.

As Director General of ICRISAT, Dr Dar also responded to the call of Asian countries in 2007 to take up the Chairmanship of the United Nations Convention to Combat Desertification's Committee on Science and Technology. Yet another institution in crisis, he guided the design and implementation of difficult reforms crucial for the survival of the Convention, raising the profile and influence of the scientific community in its political processes.

Throughout his successful career, Dr Dar has received a number of awards and honors, including the Ten Outstanding Young Men (TOYM) of the Philippines, Outstanding Young Scientist of the Year, Crop Science Society of the Philippines' Achievement Award for Research Management, Outstanding Science Administrator given by the Philippines Department of Science and Technology, the 2007 Outstanding Professional of the Year Award in the field of Agriculture by the Professional Regulatory Commission of the Philippines.

In 2009, he was conferred the Father Jose Burgos Award, Ilocos Sur's most prestigious award for his outstanding achievement in the field of agriculture.



Receiving the MS Swaminathan Leadership in Agriculture Award for 2013.

In recognition of his excellent and outstanding contribution to pulses research and development, he was honored with the Indian Society of Pulses Research and Development (ISPRD) Lifetime Achievement Award. In October 2009, the University of the Philippines Los Baños (UPLB) honored him with the Outstanding Alumnus Award. In November 2010, he was conferred the Lifetime Achievement Award by the PCARRD Scholars Association, Inc. (PSAI). In August 2012, he received the BAR Legacy Plaque of Appreciation for his invaluable contributions as the first Director of Philippine's Bureau of Agricultural Research (BAR), setting its directions and bearing as the research and development (R&D) arm of the Department of Agriculture (DA). In June 2013, Dr Dar received the prestigious MS Swaminathan Award for Leadership in Agriculture for the year 2013, instituted

by the Trust for Advancement of Agricultural Sciences (TAAS) of India.

Dr Dar also received the "Excellence in Agricultural Leadership Award" given by the Association of Agricultural Technology in Southeast Asia (AATSEA) in Bangkok, Thailand in November 2013 followed by an award given by the Federation of Asian Biotechnology Association (FABA) in Hyderabad, Andhra Pradesh on "Special Award for Biotechnology and Life Sciences Sector 2014". The latest recognition of his work includes the Lifetime Achievement Award under the Agriculture Leadership Awards 2014 given by Agriculture Today with Dr MS Swaminathan as Chairman of the Awards Committee, and the Special Award given by the Governing Board of ICRISAT for fostering science with a human face and for advancing inclusive market-oriented development (IMOD). ■

Reviving ICRISAT's glory through transformational leadership

CL Laxmipathi Gowda and Surya Kant Sharma (ICRISAT)





Managing change at ICRISAT

“I like challenges, as it also provides opportunities. I know we have a good team at ICRISAT, and with support from everyone I can steer the institute into a complete turnaround.”

These were the words of Dr William D. Dar when asked, during his interview for the position of ICRISAT’s Director General in 1999, why he wanted to take the job, knowing that the institute was in troubled waters.

With a strong focus on building the institution, transformational leadership refers to ways in which the leader becomes a visionary and social architect. A transformational leader engages others in performance beyond expectations, is able to suspend personal goals in favor of organizational goals,

and facilitates others in reaching their fullest potential. Dr Dar fits the definition of a *Transformational Leader* well. He has the ability to perceive opportunities, to engage emotionally with individuals in pursuit of higher goals, to inspire groups of followers, and to develop and articulate a vision— all towards bringing organizational change.

Transformational leadership is not just a set of behaviors or traits of an individual but a process to shape and elevate goals and abilities so as to achieve significant improvements through common interests and cooperative actions, whereby individuals interrelate within the organization as a whole. This type of leadership requires a connection at the emotional level with the subordinates.

When Dr Dar joined ICRISAT in the year 2000, the institute was at its lowest point. ICRISAT had seen

the worst of times: staff morale was low, and staff members had lost trust in the management. They were not only uncertain of their future but were also unsure of the prospects for the institute. Before going ahead with planning and implementing change, Dr Dar's foremost objective was to earn the trust and confidence of the people.

Dr Dar realized that before addressing any issue, the ICRISAT staff needed reassurance in terms of job security as well as future directions for the growth and development of the organization. He had always been a charismatic leader, and the interactions he had with scientists, managers, and staff members at all levels, gave them hope of the future and a dream of resurgence for the institute.

"All of you are among the best in the world... I am confident that you can deliver what the institute needs," he would tell the staff. He understood that the staff at ICRISAT would be looking up to him for the right values and principles to turn the institute around. He gave importance to simple living and high thinking, even forfeiting some of the privileges available to him. With time, the ICRISAT staff completely placed their trust in him, setting aside their self-interests for the good of the whole organization. With his proactive and strategic management thinking, Dr Dar led the staff into recognizing the need for a united effort in rebuilding the institute.

Transformational leadership identifies the change required, creates a vision to guide the change through inspiration, and executes the change with the commitment of the members of the group.

Dr Dar had the vision to clearly see the future, way ahead of others. With good conceptual skills and the ability to think beyond the day to day realities, he looked at the organization from a broad and strategic perspective. On his first day as Director General, while addressing the staff, he expressed his overarching concern on poverty reduction and improving the livelihoods of the poorest in the dryland tropics by enjoining everyone to commit to a new, unifying mantra for institutional transformation – *Science with a Human Face*. This new mantra calls for more focused and pro-poor research for development initiatives, mobilizing science in order to serve the poor, and not science as an end in itself.

Facing challenges with a new vision

With *Science with a Human Face* as the core, Dr Dar led in defining the institute's vision to 2010 as: *"Improved well-being of the poor of the semi-arid tropics through agricultural research for impact."* The mission: to help the poor of the semi-arid tropics through *science with a human face* and partnership-based research, and to increase crop productivity and food security, to reduce poverty, and to protect the environment in semi-arid tropic (SAT) farming systems.

Transformational leadership guided the organization by focusing on action, converting followers to be leaders and leaders to be agents of change. The turnaround of ICRISAT required that all staff be self-managed and self-motivated. Dr Dar identified the right people and created a guiding coalition to steer the institute's transformational change.

This gave way to the concept of “Team ICRISAT.” To inculcate the values of cooperation and team spirit at the institute, Team ICRISAT became a philosophy and the mindset of the people. One of Dr Dar’s early challenges was to ensure that the culture of the organization supported the vision and mission of the institute. That meant that his decisions had to be consistent, and that he displayed ethical and exemplary behavior in emphasizing a code of conduct. He personally interacted with the employees at all levels to drive home the point that the concept of ‘Team ICRISAT’ was not a passing fad, but a genuine belief that the institute would be back on track through teamwork.



Taking the pledge at the launch of the Team ICRISAT movement, 13 February 2002.

Funding was a major issue faced by ICRISAT during Dr Dar’s early years. To increase funding and donor support, it was crucial for ICRISAT to enhance its accessibility and visibility. Getting revenues for the institute was the prime responsibility of the Director General and it depended, to a large extent, on his negotiation and networking skills. Dr Dar knew that fund generation from across

the globe was a herculean task, but not insurmountable.

“Each one of you is a resource mobilizer,” Dr Dar said in enjoining all scientists to the task of generating funds for the institute. Senior management teams were created to liaison with various organizations and donors in different parts of the world to improve the institute’s funding. These senior scientists were given complete autonomy to utilize their personal networks and plan their visits to partner countries and organizations with the objective of procuring research funding for the institute.

When the Crop Improvement Team led by Dr CLL Gowda came with a proposal to seek funds from the private sector seed companies through the Hybrid Parents Research Consortium (HPRC), Dr Dar was quick to approve saying that *“Drops make an ocean”* and *“Small is beautiful”* – referring to the small grants



ICRISAT formalized public-private-people partnership through the HPRC.

that each seed company was paying as membership fee. Through the years, HPRC membership grew and at its height in 2007, the consortium was generating US\$700,000 per year and augmenting the core resources for crop improvement research. Dr Dar believed that unless the end-products of agricultural research reached the farmers, the entire effort would be futile. Thus, under his stewardship ICRISAT started this innovative concept of public-private sector partnership.

Given the momentum achieved in terms of partnership, the relationship at the scientific and administrative levels between ICRISAT and the Indian Council of Agricultural Research (ICAR) dramatically improved. In addition to its long standing collaboration with ICAR, linkages were expanded to include universities, other public institutions, private sector, and foundations in India. These partnership initiatives helped the institute in taking research outputs and impacts to the farmers and in formulating a system wherein farmers were not only given the resources but also the knowledge to implement these new technologies in improving their productivity and livelihoods.

To further strengthen the institute's research for development agenda, scientist-led teams were created at all levels under Dr Dar's leadership to better understand and address various issues affecting the dryland tropics, and become more responsive to the needs of the resource-poor, smallholder farmers. Some of the priority issues tackled by these teams include: poverty alleviation in the drylands, poor soil condition (infertile, drought-stricken, eroded soil), addressing

incorrect farming methods, lack of access to credit, inadequate technology dissemination, poor seed availability, poor harvesting methods, lack of access to markets, poor distribution of the benefits of production, and inadequate private sector participation to make smallholder agriculture a profitable business. These scientists were also empowered to take decisions on various programs to be initiated to achieve the institute's mission. All this was meant to encourage communication at all levels which resulted in increased participation and commitment of the staff.

A culture of innovativeness and openness

Under Dr Dar's watch, ICRISAT staff and partners were mobilized to carry out agricultural research for development tailored to help the poor farmers in the SAT region. A culture of scientific excellence was then institutionalized and nurtured. These efforts improved the morale of the staff and eliminated institutional uncertainty, thereby transforming the institute into a strong, stable organization. It restored people's confidence and optimism in the organization, met the needs and aspirations of the staff, and brought about transparency in decision-making.

Communication is critical to engagement and achievement of goals. However, the systems at ICRISAT before Dr Dar took over were not effective for sharing information across levels, and without the sharing of information vertically and horizontally, the change initiative he had planned would have failed. To address this, the establishment of an institute-wide information platform, or a global

intranet was instituted. An e-Library was also initiated, and five types of learning initiatives were set up – scholarly studies, joint project attachments, specialized skills course, information and communication technology (ICT) enabled learning, and computer-based tutorials. Staff members knew exactly where their responsibilities began and ended. This was done by defining clearly and jointly, the goals, roles, boundaries and values of each staff. By defining boundaries people were aware of their respective areas, and when and where they could act with autonomy. However, even after giving the staff the authority to decide their course of action and take decisions in their area of work, they were monitored by their supervisors and given adequate feedback.

Keeping current with times, ICT was exploited, which permitted faster communication with all stakeholders especially the farmers and also provided solutions to critical issues. In June 2003, the Virtual University for the Semi-Arid Tropics (VUSAT, later renamed as Virtual Academy for the Semi-Arid Tropics or VASAT) was launched by ICRISAT together with the MS Swaminathan Research Foundation. According to Dr Dar:

The Virtual University will take the right information to the right people at the right time using new and conventional communication tools. It will help the central and state governments of India in tackling natural calamities like drought. To mitigate the effects of drought there is an urgent need for sustained information, education and social mobilization effort among the strategic sectors of society, especially among the most vulnerable rural communities.

Dr Dar's communication style had an element of 'cutting through'. He saw himself as a transparent communicator who was willing to take risks. His belief was that open communication builds trust and that open exchange of communication was an important way to solve problems. He garnered respect from others because he was willing to take on the tough issues, to ask questions, and to foster open communications.

The leader as the learner

Dr Dar was a continuous learner, constantly reflecting and looking at disconcerting information as a signal to examine existing paradigms, asking himself questions like: *How do I become more impactful? How do I become a better leader?*

While Dr Dar expected knowledge and expertise to flow from the team, it was clear to him that synergy is what will take the institute to the highest level, beyond that of individual performance, expertise, and outcomes. He emphasized on innovation and scientific excellence, one of the main reasons for the improvement of research outputs by ICRISAT scientists. According to Dr CLL Gowda (ICRISAT Deputy Director General for Research), *"Dr Dar is like a world class chess player, always thinking of the next five or six steps ahead all the time."*

Dr Dar operated like a big-company CEO with a real drive for results. Central to his leadership was the ability to move the organization forward. He would say, *"We can make a difference, and that is the most fun there is."* His leadership approach was founded on cutting

through bureaucratic, historical, and political obstacles to get things done.

Dr Dar was unique in his ability to persevere in getting to the root causes of problems. This was especially important in an organization where history, time, old mindsets, and mergers have a tendency to harbor unquestioned practices that had outlived their usefulness. He was able to push himself and others to ask not only the question 'what' but also 'why'. This helped him to critically reflect on the available choices and solutions and come to a clear and rational conclusion.

For Dr Dar, connecting actions, results, and accountability was the key to organizational performance and in giving others a sense of pride and accomplishment in their work. He believed that 'a strong leader makes a strong team'. He adopted an open exchange with his team and was clear about the value of diversity. He selected people who complemented one another.

Dr Dar's leadership transformed ICRISAT into a forward looking and dynamic institute. The turnaround of the institute was possible because of his effective and human-oriented management, big-picture decisions and innovations, and the positive attitude and high morale

he infused in Team ICRISAT. There were more research outputs and impacts generated by the institute during his 15 years in service both in Asia and in sub-Saharan Africa.

Years of transformative learning experiences in his home country were instrumental in Dr Dar's transformational leadership style. When he took over as ICRISAT's leader – with his informed actions, vision and foresight, commitment to people, and openness to learning – there was no one more ready and able to lead the institute back to its glory. ■



Box story 1: What makes a great leader?

Nigel Poole (ICRISAT Governing Board Chair, 2009-April 2014)



Lady Thatcher once said of a very important colleague “every Prime Minister needs a Willie.” That statement was also true for ICRISAT in 1999 when our Willie (William Dar) arrived as Director General. His achievements in building ICRISAT are covered elsewhere but here I want to express my thoughts on why Willie Dar was so successful.

Great leaders have four characteristics which cannot be taught at some university or business school.

- The first is a mission. Willie’s deeply held mission is to improve the lives of the poor in the semi-arid tropics (SAT) of Asia, India and Africa.
- Next is to have the vision, or rather visions, and to achieve that mission – there is never one simple answer and some will work, others will not.
- Third is the energy to test and develop these visions, the many late night phone calls and e-mails testify to his ability for hard work.

- Finally is the understanding that the mission depends on gaining the contribution of the whole staff (his development of ‘Team ICRISAT’) and of course our partners in the NARS, governments, academia and the CGIAR. Willie has been responsible for recognizing and then nurturing skills in his colleagues and now ICRISAT alumni occupy senior positions around the world. Personally I have found it a great honor to work with so many gifted and motivated people who are making an actual difference to the SAT.

The Director General is one of the key public faces of ICRISAT and his communication to different audiences around the world is the key not only for the transfer of knowledge but also for the financial and moral support the center receives. One of the reasons why Willie is listened to, and is so respected, is that he thinks deeply about the natural and man-made challenges faced by the SAT,

In a progressively warming world, scientific innovations can help improve the livelihoods of millions of poor dryland farmers.

A brewing
'perfect storm'

Climate change
Land degradation
Loss of biodiversity
Food crisis
Energy crisis
Population explosion

best caught in the figure above. Willie shares his thoughts in highly influential talks, blogs, scientific articles and most importantly with the media and hence with the people relying on ICRISAT to find some of the answers and also who pay for our work.

This deep thinking and many discussions with colleagues in Africa and India led to the development of the concept of Inclusive Market-Oriented Development or IMOD which in 2010 became the basis of the ICRISAT Strategic Plan to 2020. The implementation of IMOD meant

some major changes in the way we think and work, and therefore in our structures as well as in assessing the impacts of our research. Some of these changes were of course painful and required much skillful management and leadership from Willie but the success is obvious. IMOD is now being adopted by many centers and other organizations around the world.

Finally I would like to mention another important factor in Willie's success – his wife, Betty, children and grandchildren. On behalf of ICRISAT I would like to thank them. ■



Nurturing science leadership to benefit smallholder farmers of the semi-arid tropics

Rajeev K Varshney and CL Laxmipathi Gowda (ICRISAT)



Dr William Dar and Dr CLL Gowda with CGIAR Fund Council Chair Rachel Kyte at the ICRISAT headquarters' groundnut field demonstration.



With an explosive growth rate, the world population of 7.3 billion in mid-2014 is expected to reach 8.1 billion in 2025, and will further increase to 9.6 billion in 2050. One of today's major global challenges is to ensure food security for this huge population, which means the ability to provide enough food for everyone today and in the future. The world will need to produce about 50% more food to feed the predicted population. This will have to be realized despite that crop production has witnessed significant yield losses in recent years due to increasing water scarcity and the threat of climate change. In meeting this food security goal, ICRISAT's science plays a major role.

In 2000, ICRISAT was at the crossroads when Dr William D. Dar took over the leadership as its

Director General. With declining funding, low staff morale and below par science, he turned the institute around with his utmost commitment and support to ICRISAT scientists and staff, along with his innovative approaches. Leading for 15 years, he steered ICRISAT to new heights through a culture of scientific excellence that is now directly impacting the lives of smallholder farmers in the dryland tropics of Asia and sub-Saharan Africa.

ICRISAT's scientific efforts have become vital in the development and sharing of appropriate technologies with smallholder farmers, such as seed systems, early-maturing and drought-tolerant varieties, microdosing technology and crop diversification for the semi-arid tropic (SAT) regions of the world. Dr Dar advocated the implementation of

participatory technology development engaging progressive farmers in on-farm testing and selection of appropriate technologies that best suit them.

Initiatives for scientific growth and excellence

The past two decades have witnessed a revolution in the area of science. Notably, recent advancements in biotechnology have provided plant breeders the ability to develop new crop varieties at a much faster pace using genome sequencing, and to incorporate disease and stress tolerance genes. Using the potential of biotechnology, huge genetic resources stored in ICRISAT's germplasm collection can now be explored and used for crop improvement. Thus, the new scientific discipline of genomics has emerged and expanded at a rapid pace. Genomics not only involves generation of huge data (genome sequence, marker, and genes), but is also closely linked to bioinformatics and biometrics that handle the analysis of the generated data.

Dr Dar believes that science and technology are vital in ensuring food and nutritional security across the globe. Biotechnology helps the poor and smallholder farmers by developing drought- and other stress-tolerant varieties and by enriching staple foods with nutrition, such as the addition of micronutrients and other essential vitamins.

With his vision and foresight, Dr Dar led ICRISAT into several scientific triumphs. At the onset of his leadership, he reviewed the organization's purpose, goals and priorities, and continuously engaged ICRISAT scientists under his dynamic

leadership. The institute soon blossomed into a center of scientific excellence dedicated to serve poor communities in the dryland tropics. Following are some of the groundbreaking scientific achievements under his leadership.

Freedom to operate

ICRISAT's scientific process was saddled with many layers, with most decision-making confined to limited people. Such a complicated structures often led to delays in meeting, or sometimes failing to meet, research goals. Further, young research scientists were receiving less exposure in dealing with research challenges and slowly losing their confidence and morale.

Under Dr Dar's leadership, ICRISAT experienced decentralization leading to freedom to operate for young researchers, which provided them the ability to conduct their research and development initiatives and come up with new and innovative scientific products relevant to smallholder farmers. Freedom to operate has encouraged young researchers to prepare project proposals and bring funds to implement their innovative ideas to benefit the farmers.

Motivation to young researchers

Motivating young researchers in terms of incentives, recognition through awards and salary increase/promotion based on their performance brought about more dedication and passion in them. Scientists with excellent performances were promoted to higher cadre. These encouraging steps kept scientists motivated, which in turn resulted in



ICRISAT-led global team cracks pigeonpea genome sequence.

them bringing more funds through bilateral projects from different funding agencies across the world. As a result, ICRISAT marched forward in developing ground-breaking technologies along with simultaneous demonstration and dissemination of innovations to the farming communities of Asia and sub-Saharan Africa.

Fuelling private sector money for public research

When Dr Dar joined ICRISAT, the institute was going through a low point, particularly in terms of funding and could hardly sustain its efforts in achieving its research goals. The Hybrid Parents Research Consortia (HPRC) was notably the pioneer in public-private sector partnership at ICRISAT. Through the HPRC, private sector companies infused partial but significant funding support to sorghum, pearl millet and pigeonpea hybrid parent research. Such efforts resulted in the development of several improved parent lines that were used by public and private organizations to develop high-yielding hybrids, thus, benefitting the farmers.

Dr Dar had a positive attitude towards people and institutions that had similar goals and objectives as ICRISAT. Believing in strong partnerships and working

with an open mind to achieve common goals, he was the key in ICRISAT's forging of partnerships with hundreds of institutions, public and private alike, across the world.

Establishment of centers of excellence

Dr Dar was one of the first to recognize the potential of genomics in enhancing the crop productivity of ICRISAT's mandate crops. In order to make plant breeding more efficient and effective using genomics technologies, Dr Dar established the Center of Excellence in Genomics (CEG) in December 2006 with financial support from the Department of Biotechnology (DBT), Government of India.

Since its inception, CEG has been playing a pioneering role in the field of molecular marker discovery, trait mapping and genome sequencing. CEG serves as a platform for modern breeding by integrating genetic, genomic and phenotypic information involving the Breeding, Genomics, Bioinformatics and Biometrics divisions of the institute. The efforts of CEG have converted 'orphan legume crops' into 'genomic resource-rich crops' by developing millions of markers [Simple Sequence Repeats (SSR), Single Nucleotide Polymorphism (SNP), and Diversity Arrays], genes/markers

associated with traits of interest, and also by supporting the Breeding division in deploying markers for breeding using the genomics-assisted breeding approach. In just 5 years, CEG grew from having only 3 to the current 60 young Indian scientists working on genomics research.

As envisioned by Dr Dar, CEG is also actively involved in capacity building of next generation scientists by organizing training courses and contributing towards ICRISAT's goal of moving biotech out of the laboratory to make impacts. CEG also serves as a state-of-the-art genotyping facility providing genotyping services to a range of NARS partners from India and overseas on cost-to-cost basis. With Dr Dar's support and guidance, CEG has become known as a world leader in genomics research.

CEG has led efforts in sequencing the draft genome of chickpea and pigeonpea. Dr Dar has a vision to sequence thousands of accessions/genotypes available in the germplasm collection to

identify useful genes and to bring them into elite varieties by pyramiding all the desired genes. To exploit the treasure available in the institute's germplasm collection, CEG has already completed the re-sequencing of more than 1000 pulse crop variety genomes. Recently, Dr Dar launched an initiative that plans to re-sequence 3000 chickpea accessions from ICRISAT's germplasm collection.

Dr Dar also played a key role in establishing ICRISAT's Platform for Translational Research for Transgenic Crops (PTTC). He believes that *"to meet the present and future food requirement, it is imperative to keep the technological portfolio open to biotechnology and genetic engineering."* He added that *"rigorous regulatory and safety assessment processes hold the key in exploiting the full potential of biotechnology in meeting the world's food security, in view of the public's skepticism on the safety of genetically engineered foods."*



Inauguration of high-throughput sequencing and high performance computational facility to boost genomics for breeding.

PTTC facilitates the translation of existing genetic engineering technologies to the development of transgenic crop varieties. Public-funded research is expected to end the monopoly of multinational seed companies on biotechnology products and to provide sustainable food production, giving farmers access to transgenic seeds, and improving the lives of the poor by making major food crops more productive, nutritious and affordable. PTTC has developed transgenic plants for various constraints like resistance to viruses and fungal pathogens, tolerance to drought and enhancement of beta-carotene or pro-vitamin A in groundnut; pod borer in pigeonpea and chickpea; drought tolerance in chickpea; and enhancement of pro-vitamin A in pigeonpea. These plants are currently in different stages of testing in laboratory and greenhouse conditions.

In addition to CEG and PTTC, ICRISAT also hosts the Center of Excellence on Climate Change Research on Plant Protection (CoE-CCRPP), another partnership with the Department of Science and Technology (DST), Government of India. The CoE-CCRPP strives to understand the effect of climate change variables on the occurrence and distribution of diseases and insect pests in chickpea and pigeonpea across geographical regions, study host x pathogen/pest x environment interactions and the resistance to pests and pathogens in resistant and susceptible cultivars.

The Jewels of ICRISAT

To highlight the key achievements of ICRISAT and provide due recognition to its researchers, Dr Dar along with the Governing Board encouraged the publication of 16 breakthroughs and

innovations called 'The Jewels of ICRISAT,' all having significant impacts on the food security and livelihoods of smallholder farmers in the dryland tropics. Some of these Jewels are presented.

An inexpensive **Aflatoxin testing kit** helps to identify aflatoxin-free groundnut grains to meet international market standards and ensure higher returns for farmers, and provide safer products for consumers. This kit also helps in the conduct of field studies to develop pre- and post-harvest management technologies and discover dietary sources of aflatoxins. This has stimulated interventions that enhance food safety, human health, trade and ultimately farmers' incomes, particularly in groundnut producing countries like Malawi and Nigeria.

Another jewel of ICRISAT is the **groundnut variety ICGV 91114**, which tolerated drought and diseases, has good fodder quality, and replaces varieties grown for more than 60 years, bringing hope to millions of poor farmers. ICGV 91114 is the most popular dual-purpose groundnut cultivated in India today. Despite severe drought conditions in the past 4-5 years affecting seed production and adoption, ICGV 91114 occupied 25,000 ha of the 800,000 ha under groundnut in the district in 2010. The possible economic benefits of wider adoption demonstrate the impact of breeding groundnut for drought tolerance.

Terminal drought is a major yield constraint in chickpea. **Early-maturing chickpea** with improved fusarium wilt resistance, high-yield potential and good seed quality, has greatly increased crop

area and productivity in short-season environments by avoiding terminal drought and heat stress. Adoption of early-maturing chickpea cultivars has led to an increase in area and productivity in short-season environments such as Myanmar and Andhra Pradesh, India. Chickpea production has increased 9-fold over the past 10 years and resulted in a 5-fold increase in area combined with a 2.4-fold increase in yield levels. This jewel has transformed cultivation of chickpea from a subsistence to a market-oriented activity.

Cytoplasmic-nuclear male sterility-based pigeonpea hybrids yield up to 40% more than conventional cultivars. To achieve a breakthrough in pigeonpea yield, ICRISAT along with the Indian Council of Agricultural Research (ICAR), state agricultural universities, government-owned seed corporations and private seed companies developed the first commercial pigeonpea hybrid. Scientists at ICRISAT used cytoplasmic nuclear male-sterility (CMS) system for hybrid breeding technology. In December 2010, ICPH 2671 was officially released by the state of Madhya Pradesh, India. A second hybrid, ICPH 2740, is poised for release by the states of Andhra Pradesh and Maharashtra. These hybrids consistently showed more than 30% yield advantage over standard cultivars in farmers' fields in single and intercropped systems.

With the availability of the **pigeonpea draft genome sequence** in late 2011, pigeonpea became the first 'orphan crop,' the first 'non-industrial crop' and the second food legume with a completed genome sequence. Next generation sequencing technology was used to generate the draft genome

assembly of pigeonpea genotype ICPL 87119 (popularly known as Asha). The availability of pigeonpea genome sequence opened new avenues for pigeonpea improvement. The identification of large-scale SSRs and SNPs spanning the entire genome can help overcome the limitations of insufficient polymorphic markers for genetic mapping and trait identification.

Guinea-race sorghum hybrids are being used to harness the benefits of hybrid vigor with West African farmers, while retaining the adaptation and quality traits of local germplasm. Sorghum varieties belonging to the Guinea-race combine high grain quality with excellent adaptation for major parts of the Sudanian zone of West and Central Africa.

Inter-institutional collaboration involving conventional, participatory and marker-assisted breeding methods were used to develop **extra-early pearl millet hybrid HHB 67-Improved** which has enhanced downy mildew resistance and yield. By 2011, HHB 67 Improved had spread to 875,000 ha, with Rajasthan, India accounting for 768,000 ha (16% of the state's total pearl millet area) and Haryana accounting for 107,000 ha (21% of the state's pearl millet area). The net additional benefits to the farming community from cultivation of HHB 67 Improved, compared to the local landrace varieties in Rajasthan and HHB 67 in Haryana, reached \$13.5 million in 2011 alone.

Sweet sorghum is a smart, multipurpose (food, feed, fodder, fiber and fuel) crop adapted to drought and climate change which provides higher income for farmers. ICRISAT and its partners have

been instrumental in creating awareness of the potential value of sweet sorghum, its cultivation, research needs and use as a feedstock for bio-ethanol production. Many farmers in Cabiao, Candaba and Ilocos Norte, Philippines are cultivating ICRISAT-bred sweet sorghum variety SPV 422 and are reaping benefits by selling stalks and grain, in addition to using the juice to make ethanol and other products (such as hand sanitizer, vinegar, etc.)

High-quality science

Dr Dar has always encouraged researchers to do high-quality research that should have impact on the ground and contribute towards empowering smallholder farmers. Continuing his vision for growth and providing encouragement to the researchers, Dr Dar with strong support from Governing Board constituted several incentives and awards for scientists performing well in their fields. In order to promote scientists to do high quality research, Dr Dar constituted the “Exceptional Scientific Article in a High Impact Journal” award that is given every year to scientists who have published a paper in prestigious, high-impact factor scientific journals.

Contributing to the Global Seed Vault

The loss of biological diversity is currently one of the greatest challenges facing the environment and sustainable development. The diversity of food crops is under constant pressure. The consequence could be an irreversible loss of the opportunity to grow crops adapted to climate change and new plant diseases, and in meeting the needs of an expanding population. Preservation



Medium-term cold storage at the ICRISAT genebank.

of available global genetic diversity is important in providing food security to future generations. In order to store and conserve plant diversity, The Svalbard Global Seed Vault on the Norwegian island of Spitsbergen was established in the permafrost in the mountains of Svalbard. This Seed Vault is designed to store duplicates of seeds from seed collections around the globe. If seeds are lost, such as a result of natural disasters, war or simply a lack of resources, the seed collections may be reestablished using seeds from Svalbard.

In Svalbard, ICRISAT has a huge germplasm collection of its five mandate crops – sorghum, pearl millet, chickpea, pigeonpea and groundnut; and six small millets – finger millet, foxtail millet, little millet, kodo millet, proso millet and barnyard millet. The ICRISAT Genebank stores over 123,000 germplasm accessions assembled from 144 countries. To ensure the safety of conserved germplasm, ICRISAT has already deposited more than 97,800 accessions and committed to store its remaining accessions in the next few years. It was through the leadership of Dr Dar that ICRISAT accessions are now stored and conserved at the Global Seed Vault. ■

Box story 2: William Dar as a transformational leader

An interview with Kanayo F Nwanze (IFAD President)



On William Dar as a transformational leader

I see William (Willie) Dar as a transformational leader who with his agricultural background was always able to relate to the scientists and has supported them in all their endeavors. He was able to understand the government systems in all the countries where ICRISAT has a footprint and was instrumental in partnering with them. He was able to empathize with clients who are primarily small producers and smallholder farmers.

His leadership and management style are such that he engenders confidence and trust among his staff and management colleagues. He is an able leader who facilitates and one who listens because a good leader needs to be a good listener, a motivator, facilitator and catalyst. Willie has all of these characteristics and has applied his style at different levels, and you can see the transformational change that has come about at ICRISAT in the past decade. He has helped in building a robust organization which is the best

among the CGIAR centers. I have had the opportunity of visiting ICRISAT on three occasions since Willie became the Director General, and I have seen first-hand the institute's transformation.

I was at ICRISAT in August 2014 and had an opportunity of visiting the fields at Kothapally and what I saw really impressed me. I remember the whole concept of watershed management when I was at Hyderabad long time ago when this concept was not fully understood yet. The developments that I saw at Kothapally were very impressive, and the discussions I had with the villagers and ICRISAT staff were rewarding and noteworthy. I was also quite impressed with ICRISAT's village level studies, ICT innovations, and the Agribusiness Innovation Platform (AIP).

These impressions conveyed to me that Willie, as a transformational leader, has given a lot to the community. He has provided clear-cut directions to the overall research agenda of the institution, he brings with him a personality which engenders trust and confidence, and

motivates people, empowering them to do their job in the best possible way.

On his contributions to agricultural research and food security in Africa

ICRISAT continuous to maintain activities in several parts of Africa, thanks in part to Willie's vision for the continent. The work in East Africa has grown in spite of problems that ICRISAT encounters regularly. The difficulties ICRISAT had with the Sahelian center in Niamey was very close to my heart, as I opened that center as Head of the Program from 1981-1985. There have been some difficulties in terms of logistics and the environment, but rather than closing it, the center is still being maintained actively.

Then of course ICRISAT has also strengthened the West Africa Regional Program in Bamako. While ICRISAT's program, which is concentrated in the semi-arid tropics, shows the transformational changes that have taken place at the global headquarters in India, one also sees how ICRISAT has continued to maintain its activities in Africa. That is one of the primary reasons why IFAD has continued to support ICRISAT's activities in the continent.

On ICRISAT's Inclusive Market-Oriented Development approach

This is a topic very close to my heart. In the last seven years, I have been campaigning on the centrality of smallholder producers in achieving global food security and the issue here is not simply increasing their production and productivity but their access to the market. For example, this year Tanzanian

farmers have had a bumper harvest of maize and rice. Unfortunately, there are very poor market outlets for the produce. IMOD is a unique approach or platform where small producers can have access to markets. I am speaking about vibrant domestic local markets where farmers can have access, and which will require infrastructure such as roads, and market information. This ICRISAT model of IMOD provides a very strong convergence with IFAD's overall approach to support smallholder farmers particularly along the value chain. So there is a lot of convergence and I would say that for us it is logical for IFAD to remain a partner of ICRISAT in this work. It is in this light that Willie's focus on IMOD is making a lot of difference to smallholder farmers.

On the importance of agri-business initiatives

Willie's thrust in developing the Agribusiness and Innovation Platform (AIP) at ICRISAT has been unique. It has the whole value chain approach and thus is very helpful for the farmers. It is not enough for us to tell the farmers to increase their production and productivity if they do not have access to the markets. Access to markets could mean many things. Value addition to their produce is one such thing. Better storage facilities, better packaging, and better market information, so that their produce are transformed into value added products. like what I saw at AIP. This opens the door for small producers and small agri-business firms to have access to larger companies, and an opportunity to consolidate themselves into agri-business cooperatives.

Basically we go back to the mantra ‘what you eat is what you are’ and ‘what you are is what you eat’. We need to grow more food which we can eat and we need to eat more food produced locally. This is actually a paradox. Africa, specifically sub-Saharan Africa spends US\$35 billion in importing food, food that can be grown in Africa. What we can do instead is use the money to grow food locally and transform them into value added products, bringing the poor along the whole value chains, and getting them out of the poverty trap. This is what AIP has been demonstrating. It will however require government policies and this where I believe ICRISAT comes into help – in the policy formulation dialogue with various governments to support small-scale agri-businesses – produce food locally, create jobs and provide market access for small producers.

On ICT for smallholder farmers

Under Willie’s watch, Information and Communication Technology (ICT) for smallholder farmers has been a unique development. The uniqueness of ICRISAT in adapting ICT and making it user friendly for small producers in remote parts of India was really impressive. IFAD believes that ICT for small producers is a key to prosperity. At IFAD we are supporting the use of mobile technology



to provide smallholder farmers with information on application of fertilizers, purchase of inputs, and access to market. This becomes more significant when the technology is locally adopted for local situations. This is going to be the next revolution and ICRISAT has taken a lead in this area of ICT in agriculture and targeting small producers. This is where Dr Dar and his team have been able to steal the thunder from others.

On ICRISAT’s scientific excellence

When people talk about genomics and biotechnology, they should not limit it to genetically modified organisms. Genomics technology has many applications and I was very fortunate to see what ICRISAT has been doing at its Center of Excellence in Genomics during my recent visit. You have first class international scientists at ICRISAT who are using the genome technology to identify particular genes with desirable traits and characteristics such as plant drought and disease resistance. That way we can advance breeding by several generations in the laboratory itself and in a very limited time span. I was very impressed to see what Willie and the ICRISAT scientists were able to do with their research outputs. I have always argued that biotechnology is a tool and how we use it is very important rather than avoiding the use of this tool/ technology. I believe Willie’s leadership is crucial in showing how science can contribute in enhancing crop productivity, not necessarily restricting it to genetic engineering, and using biotechnology in developing better crop varieties. The level of scientists at ICRISAT’s CEG was for me a most impressive experience during my recent visit there. ■



Resource mobilization and financial health for agricultural research for development

Rajesh Agrawal (ICRISAT)



Mr Bill Gates, co-chair of the Bill & Melinda Gates Foundation, with Dr William Dar. The Gates Foundation is ICRISAT's top donor to date.



In over 40 years, the CGIAR system has shown that with strategic international agricultural research-for-development (AR4D), there is hope of breaking the stubborn grip of poverty, hunger, malnutrition and environmental degradation in the world.

There is evidence, both at the macro-level and through case studies that investment in AR4D contributes to food security and poverty reduction. Findings on the impacts of research by the CGIAR, to which ICRISAT belongs as one of 15 member centers, embodies the world's commitment to this cause. Over the course of nearly 40 years of investment (1971-2011), a growing pipeline of innovations and impacts has been changing lives on a large scale.

Innovative resource mobilization

Dr William D. Dar believes that research must be led by the demands of farmers and that research systems must be linked to extension and markets. A strong investment in AR4D can therefore translate to millions of farmers in Asia and sub-Saharan Africa being lifted out of poverty and food insecurity by research-led agricultural growth.

For over a decade, ICRISAT has been enjoying sound financial health and a strong resource mobilization track record under the dynamic leadership of Dr William D. Dar. One of his key contributions has been in the area of reinvigorating resource mobilization and improving the financial health of the institute.

After an initial process of staff and institutional innovations in 2001, which included staff separations, ICRISAT's reserves were down to about US\$10 million and the gross revenues were only US\$22 million. Responding to this unstable financial situation, Dr Dar paid special attention to energizing Team ICRISAT and requesting the scientists to also become the brand ambassadors of the institute in raising resources. The scientists responded favorably to his call and the resource mobilization engine began moving in the right direction.

Gross revenues of the institute moved from US\$22 million in 2000 to about US\$ 83 million in 2013 (Figure 1). Resources were generated not only for upstream scientific research areas, but also in the area of research for development. Dr Dar had all

along advocated that science should feed into the developmental impacts.

Dr Dar had always believed that a healthy institution should have healthy reserves, as it helps boost the morale of the staff. He encouraged the finance team to think of novel ideas to generate reserves. With the approval of the Governing Board, a treasury management policy was implemented; which helped generate significant resources for the institute. Figure 2 has the details of earned income of the Institute for the period 2000-2013. Treasury income became an important source of resource for the ICRISAT, helping stabilize the reserves and the financial health of the institute.

Growth in treasury income helped in improving the level of reserves for the

Figure 1. Gross revenue, 2000 - 2013

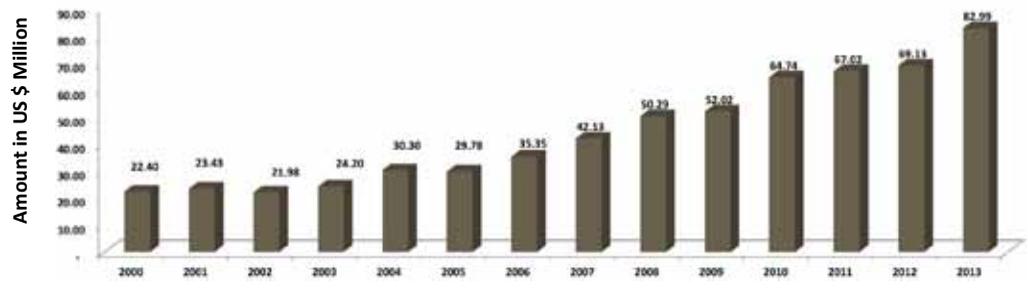
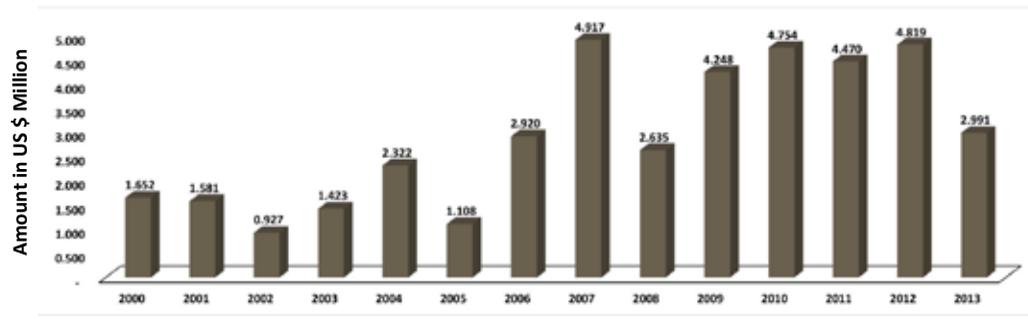


Figure 2. Earned income, 2000 - 2013



institute. Beginning 2002 the reserves have consistently gone up (Figure 3). Strong levels of reserves helped the institute finance critical infrastructural needs, both in Asia and sub-Saharan Africa.

With the current levels of reserves of the institute, ICRISAT has one of the highest levels of reserves in the whole CGIAR system.

Re-engineering internal systems and processes

Dr Dar also laid special emphasis on re-engineering the internal systems and processes of the Institute, placing great

importance on achieving efficiencies and effectiveness in our work.

With his guidance, the institute could achieve significant direct and indirect cost recoveries. Figure 4 has the details of indirect cost recoveries. Full recovery of costs was an important tool to strengthen and stabilize the financial health of the institute. Over the years, the indirect cost recoveries moved from less than US\$1 million to over US\$7 million.

In essence, Dr Dar's leadership through the years has played a critical and pivotal role in the overall turnaround of the institute, particularly its financial turnaround. ■

Figure 3. Reserves, 2000 - 2013

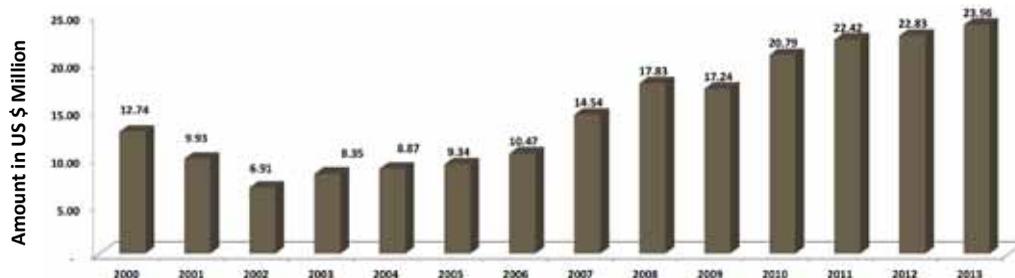
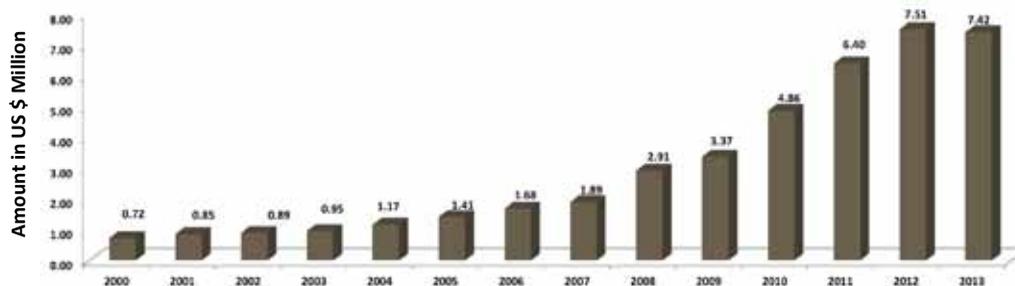


Figure 4. Indirect cost recovery, 2000 - 2013



Box story 3: William Dar: A symbol of excellence

Uzo Mokwunye (ICRISAT Governing Board Chair, 2003-2006)



Dr Leslie D Swindale had served as second Director General of ICRISAT from 1997 until 1991. His long tenure provided ICRISAT with a measure of stability and steady income growth that enabled expansion to Africa and Latin America. After his tenure, ICRISAT went through a troubling and unstable period. Funding declined and the morale of the staff was (to put it mildly) very low. Two Directors General came and went and there was much uncertainty. The Governing Board felt that something drastic and different had to be done. As a member of the Governing Board, Dr William (Willie) Dar was aware of the delicate situation that ICRISAT found itself. The decision of the Board to select Willie as the next Director General of ICRISAT beginning in 2000 was a wise and bold move. By doing this, the Board selected someone who was most capable of building consensus and who would restore stability to the floundering organization.

Uplifting the morale of the staff was Willie's first and primary task. So, he set out to build what he termed as 'Team ICRSAT'. The major challenge was to get buy-in from every member of the staff. By late 2000 when I joined the Board, he had very much succeeded in this difficult task. I believe that he succeeded because he considered

everyone as valuable. The rebranding of ICRISAT as the center that conducts *Science with a Human Face* and his idea of the approach Inclusive Market-Oriented Development (IMOD) are examples of his strategic vision and foresight. Everyone who knew him said that "*Willie is a consummate politician.*" Yes, he is a consummate politician but that is a very rare quality for a leader of a research institute.

The CGIAR conducts, every four years an external program and management review (EPMR) of each of its 15 member centers. The first review that I was involved in recommended that ICRISAT shift its headquarters to sub-Saharan Africa (SSA). It was the opinion of the EPMR team that the impact of ICRISAT was not uniform in the two sub-regions (Asia and sub-Saharan Africa) where it was most active. As the Chair of the Governing Board charged with overseeing the implementation of the recommendations, I felt that the impact was not related to where ICRISAT's headquarters was located. Rather, the impact of ICRISAT should be related to the amount of resources spent on each of the sub-regions where it is performing its work. Willie bought into this philosophy and immediately set out to develop and strengthen the regional hubs in SSA.

Willie recommended to the Board that a new resource allocation formula whereby at least 60% of ICRISAT's annual budget would be used in sub-Saharan Africa (SSA) should be adopted. In addition, the Directors of each of the two hubs in SSA should be granted more autonomy. The Board approved these two measures – which I believe were instrumental in turning the scales around. Progress started showing and more importantly, ICRISAT's clients began noticing.

Willie promoted innovation. There are several examples of this. The development of sweet sorghum is an excellent one. Another is the popularization of pigeonpea and chickpea including the development of hybrid versions of pigeonpea for which ICRISAT won one of its King Baudouin Awards for Excellence in Research. Before his tenure, the village level studies (whereby the village conditions, primarily socio-economic, under which the clients of ICRISAT lived and worked were identified) had started. He encouraged these studies and the outcome has been outstanding. Lessons from these studies helped revive groundnut production in Malawi and a similar scheme to revive the groundnut pyramids in Nigeria has already begun.

He used different methods to build a viable and strong team. He surrounded himself with some remarkable individuals. His management style was based on building consensus. He made the staff feel comfortable and “broke” some of the unwritten rules of the CGIAR by appointing Indian nationals to important positions.

I was elected to chair the Board at the end of my second year. In this capacity I became a member of the Committee of Board Chairs (CBC), and during my first meeting at CBC, the body chose me to be its Chair. Concurrently, Willie

became the Chair of the Committee of Center Directors (CDC). It meant that the fate of the CGIAR for one full year depended on ICRISAT. This was a difficult time for the system as efforts were on hand to make changes in the way CGIAR worked. One major change involved the promotion of collaboration among all centers so that the competition between them would decrease and collaboration would increase. Willie and I guided the centers through this change process by getting them to form an “alliance” which is today known as the CGIAR Consortium. The key was to promote the philosophy of working together especially in sub-Saharan Africa (SSA). In this process, Willie showed his diplomatic prowess.

At the time I assumed Chairmanship of the Board, the annual budget of ICRISAT was under US\$21 million. When I left the Board in 2004, the budget was more than US\$35 million. Willie was anxious to let the Board know that he did not like deficit budgets. By always searching for ways to achieve a surplus at the end of each year, ICRISAT set a high standard for the system. One approach that was adopted was to hire an exceptional and talented finance director. The finance director, Rajesh Agrawal, was an Indian national but he understood clearly how the system and the market worked. He invested wisely and gradually the confidence of donors grew. To add to the money needed by ICRISAT, Willie tirelessly engaged donors in the regions that ICRISAT had the mandate. He got his team in India to develop schemes for each donor showing how the resources given to ICRISAT had been used and what was needed to keep the level of improvement high. New donors such as the Bill & Melinda Gates Foundation took greater interest in what ICRISAT was doing in both Asia and SSA. ■

Inclusive market-oriented development for smallholder farmers

M Srinivas Rao, P Parthasarathy Rao and Ma Cynthia S Bantilan (ICRISAT)





Inclusive Market-Oriented Development or IMOD is an evolutionary market-cum-science-led strategy where smallholder farmers are enabled to increase productivity by bridging the existing large yield gaps through better application of available technologies to produce marketable surpluses. Past agricultural research for development (AR4D) interventions tended to ease poverty marginally, but farmers still could not escape it. A systems perspective needed to be adopted. IMOD is expected to be exactly that – to help the poor move from their current subsistence state, to a more prosperous state. The inclusiveness focus of IMOD means that the poor and other marginalized sectors – particularly women and youth – are included in building solutions, and partnering with and letting them take ownership of the innovations.

Eventually, such market-driven customization and diversification based on customer demand and using limited natural resources more efficiently, in conjunction with value addition, would collectively increase farmers' profits and reduce their dependence on social safety net programs. IMOD is about supporting smallholders to increase production and surpluses that can be stored as food to serve as a buffer in times of hunger or surplus to be sold to markets. This is where interventions are needed – to ensure that farmers get a fair price for their produce. Income from the marketed produce enables farm families to purchase other family necessities, including inputs such as seeds, fertilizer, labor, tools, livestock, insurance and education. This would further raise farm productivity, triggering a series of investments leading to a virtuous cycle of economic growth. As this

is sustained, it creates a self-reinforcing pathway to prosperity.

With IMOD, ICRISAT has continued its pioneering efforts from a farming systems approach to an *integrated livelihood approach* and further graduated to an *“inclusive market-oriented development strategy,”* to fulfill its mission to help improve livelihoods of the rural poor in the semi-arid tropics. The IMOD strategy also calls for developing partnerships with new actors such as government outreach departments, nongovernment organizations (NGOs) and private sectors to achieve its goal through AR4D. This strategy also calls for scaling-up models as economies of scale and collective actions are integral parts of the IMOD strategy.

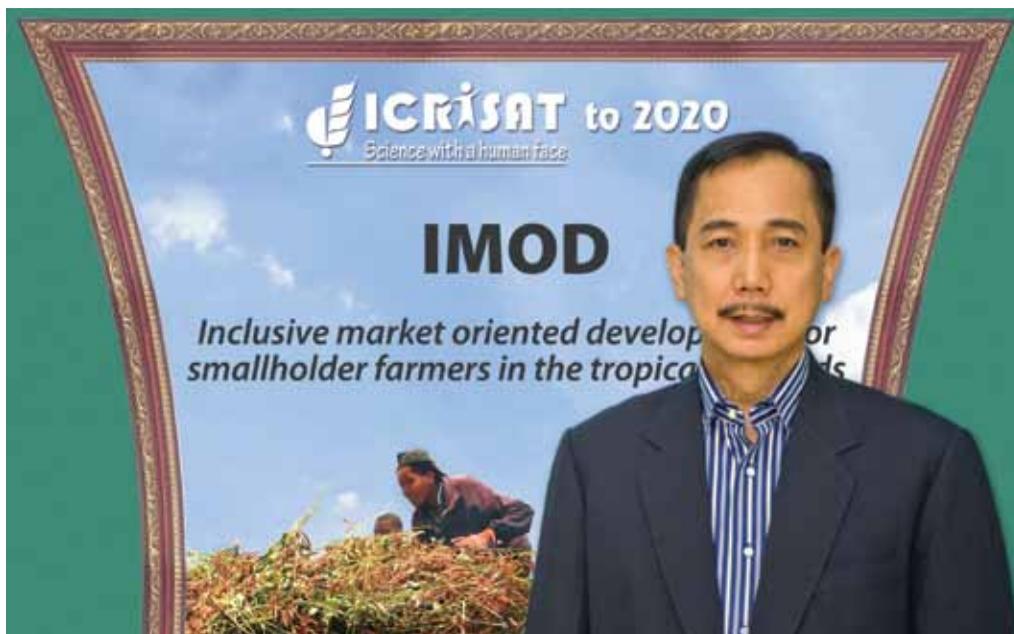
The birth of IMOD

In 2010, Dr William D. Dar and the ICRISAT management initiated a participatory process with its stakeholders representing different groups and regions in developing its Strategic Plan to 2020. The widespread, intense and extensive consultations involved the ICRISAT staff, management and the Governing Board, along with

partners and major stakeholders in Asia and sub-Saharan Africa.

The result was the recognition of the need for market linkages to extricate the highly vulnerable subsistence farmers out of poverty. It was strongly felt that harnessing markets for smallholder farmers combined with AR4D to improve systems for managing risks, would bring them into the mainstream to take part in, and benefit from the overall economic development. An inclusive value chain approach had to be adopted that would benefit smallholder farmers including women farmers and the youth. *It was during these intense consultations that Dr Dar articulated and expounded that ICRISAT’s efforts have to be truly ‘inclusive’ and should be the core of the institute’s vision for 2020.*

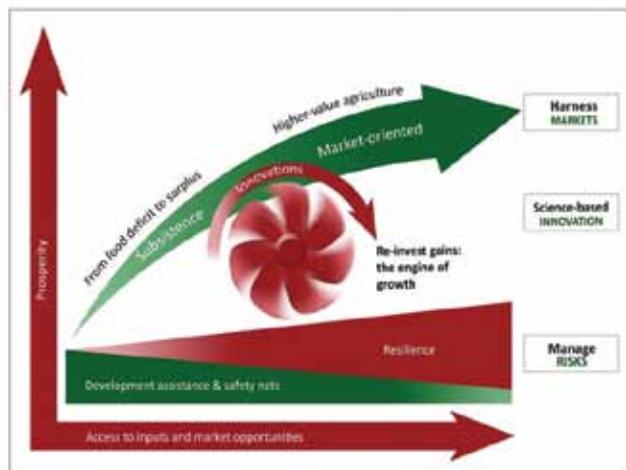
With these insights, the seeds of IMOD were sown. The IMOD strategy was based on the ‘proof of concept’ that by bridging the existing yield gaps, smallholder farmers could produce marketable surplus and by integrating science-led approaches, their resilience could be increased, ensuring prosperity through increased productivity and profits.



However, additional efforts not only in terms of technical innovations but also institutional, policy and social innovations would be needed.

IMOD was also in congruence with the broader World Development Report 2008 which talked about Agriculture for Development and with a policy objective to “improve access to markets and establish efficient value chains.” With this underlying conviction and reinforcement the Inclusive Market-Oriented Development or IMOD framework of the ICRISAT Strategic Plan to 2020 was born.

IMOD is illustrated in the diagram above. The large arrow (in the middle) denotes progress from subsistence agriculture (growing crops only to feed the family – and often falling short of that objective) towards market-oriented agriculture (selling some or all of the farm’s produce for higher income). The wheel represents innovation, which improves the productivity, reliability and sustainability of smallholder farming.



These steady improvements allow a farmer to generate increasing surpluses of food and cash, some of which are reinvested in improving the resilience of the farm, thus reducing the need for social assistance such as emergency food aid (the lower triangular elements of the diagram).

As the diagram depicts, IMOD is a process of *movement along a development pathway* from impoverished subsistence farming to prosperous market-oriented farming. Including the poor and marginalized people also requires new kinds of sustaining and interlocking partnerships.



Prof MS Swaminathan and Dr William Dar launch the Strategic Plan to 2020 with other dignitaries during the 2020 annual day celebration at the headquarters.

IMOD implementation

The ICRISAT Strategic Plan to 2020 identified critical focus areas (CFAs) to be integrated into annual work plans of each scientist in the program. With Dr Dar's guidance and assisted by the Change Management Team, cultural change was also an integral part of the Plan. Covering the mission goal of *helping reduce poverty, hunger, malnutrition and environmental degradation in dryland tropics*, six key development outcomes to contribute directly to IMOD were identified:

1. Food sufficiency
2. Intensification
3. Diversification
4. Resilience
5. Nutrition and health
6. Empower women

When linked with the IMOD diagram, development outcomes 1-3 contribute to progressive stages along the market orientation curve (helping smallholder farm households emerge from subsistence farming to participate in market-oriented agriculture). Development outcome 4 contributes to the risk management platform (helping farmers manage risks by leveraging social assistance into more self-reliant resilience). The other crosscutting development outcomes focus on nutrition/health issues and on women, which contribute to the malnutrition goal of ICRISAT's mission and the inclusiveness objective of IMOD.

IMOD case studies in Asia and sub-Saharan Africa

ICRISAT is the first CGIAR center to make "inclusiveness and value generation by

smallholder farmers through market linkages" as the core of its strategy. While this approach is internalized in all ICRISAT activities, partners will play a key role in scaling out these activities to impact the lives of millions of smallholder farmers in the semi-arid tropics.

The IMOD approach has been demonstrated in various ICRISAT initiatives, some of which are described below:

Microdosing, commodity warrantage, and small seed packs in Africa

Small and targeted fertilizer application in nutrient deficient fields can increase yields of sorghum and pearl millet from 44% to 120%. Eventually crop surpluses stored under inventory warrantage will enable farmers to sell at higher prices at a later date. Just as micro-quantities of fertilizers are more accessible to the poor, so are small-sized packets of improved seed; these are much in demand by the poor and especially by women for their home gardens and field crops, which in turn impact the nutrition of the families. Hundreds of farmer groups are currently testing and adopting this innovation. In a regional project by the Alliance for a Green Revolution in Africa (AGRA), they are targeting 400,000 households by 2014.

Bhoochetana and watershed approach for dryland farmers in India, China, Vietnam and Thailand

In collaboration with state governments and local agencies, ICRISAT is now helping more than 6 million dryland farmer families to boost yields by 30% to 50% by overcoming micronutrient deficiencies through targeted fertilizer application and soil and water management

interventions. In Karnataka state of India, the economic impact in the 2011 monsoon season alone was US\$130 million, returning \$14 for every \$1 invested. Similar impacts were witnessed in the watershed interventions in China and Vietnam; the innovation is now being scaled out to the Philippines.

Pigeonpea development in northern Tanzania

In northern Tanzania, pigeonpea has been traditionally grown at the household level. Fusarium wilt-resistant, seasonally adapted export quality grains have been introduced and are now adopted in 45% of the crop area (doubled in the last 5 years) resulting in an additional 1.3 tons per hectare or 33,000 additional tons and an additional US\$33 million to the farming community. The growing demand from Indian consumers continues to drive pigeonpea global markets.

Agribusiness Innovation Platform

ICRISAT's Agribusiness and Innovation Platform (AIP) is a Public-Private Partnership model that fosters innovative agri-enterprises to bring AR4D innovations of ICRISAT and partners to the marketplace to create IMOD impact. It has supported more than 100 joint ventures and attracted US\$5 million over the past 4 years. In its NutriPlus initiative, it incubates partners that develop, test and market, innovative processed food products from staple grains and legumes that can increase incomes for smallholders. In 2011, ICRISAT launched a South-South Initiative for Indian-African Partnerships in Agriculture Research for Development through its collaboration with the Forum for Agricultural Research in Africa (FARA); it is now mentoring six agri-business and innovation consortia in five African countries.



Former President of India, Dr APJ Abdul Kalam inaugurating the 2nd Global Agri-Business Incubation Conference of the Network of Indian Agri-Business Incubators (NIABI).

Initial successes and key lessons

The experience of the past few years has given insights on the initial drivers for the early impacts of IMOD. Markets have played a critical role and are a strategic entry point for IMOD interventions and so are the reverse value chains linking relevant inputs like seed and fertilizer to smallholder farmers.

Role of markets

In sub-Saharan Africa, markets are not as evolved overall, compared to the government-supported systems and the more organized private sector in South Asia, though inefficiencies and gaps still exist in the latter. However there is enough evidence to show that markets are increasingly driving production of agricultural commodities. Some good examples have been in the groundnut production in Malawi, pigeonpea and sorghum in Tanzania, pearl millet in Niger, chickpea in Ethiopia, to name a few. There is now a growing imperative among some of ICRISAT's key development partners on value chains, which are now supporting better market-linked production (e.g. sorghum for the malting brewery industry). ICRISAT and its partners are working closely with farmer groups, building their capacity on standards for establishing links with value added processors. The situation in sub-Saharan Africa is still evolving with models on public sector investments now evolving and a growing private sector role in agriculture. Innovative models are crucial in developing good farmer linkages and in capturing market share.

Role of partnerships

To achieve scale and impact, it is critical that ICRISAT's partners and stakeholders have similar and aligned objectives. This market-driven, inclusive and systems approach is now being internalized by many of ICRISAT's partners in the national agricultural research and extension systems (NARES), development sector, nongovernment organizations (NGOs), and private sector.

Key lessons

Systems approach. Focus on farmer incomes has provided a better understanding of the full value chain and has kept markets a top priority. This has called for deeper engagement with all stakeholders through a holistic approach and a good look at all key players along the value chain.

Stakeholder engagement. This has been critical in the scaling out of IMOD. Science partners, farmer organizations, development partners, and private companies have all worked in close coordination with ICRISAT for a 'win-win' situation, all as distinct but linked players along the value chain.

Farmer adoption and enthusiasm. Smallholder farmers have expressed enthusiasm about the value chain approach, and have adopted new varieties/technologies as they find them more marketable.

Demonstrable impact. The impacts of some of these interventions are visible even only in just one season, encouraging farmers to adopt technologies and re-invest in their farms.

Constraints

Initial sensitization and uniform understanding of IMOD. This has been addressed through internal and partner communication.

Understanding smallholder farmer value chains and market dynamics across regions as each had a different context. Ongoing process, and recent interventions and training workshops are now capturing some of these.

Creating more impact case studies region-wise, for wider dissemination among partners and policy.

Capacity building of partners. The capacities of partners on systems and market-linked approach must be enhanced.

Business modeling /piloting. Specialized skills are required in developing business models, incubating pilots, developing partnerships, and understanding priorities of the private sector and markets.

Moving forward

With economic liberalization and markets being deregulated, there has been a burgeoning and continuing interest and investment by the private sector in agriculture and agri-business and in developing better value chains to meet market requirements. While ICRISAT is cognizant of the key role of the private sector, it has chosen to strategically combine these market imperatives with the interests and well-being of the small and marginal farmers.

By making IMOD the core of ICRISAT's strategic framework, Dr William D. Dar has demonstrated how science and markets can converge in a 'win-win'



manner to create economic wealth for smallholder farmers and quality produce for the consumers.

ICRISAT will continue to foster not only a faster but also a more equitable agricultural growth. IMOD is that vital link between markets, science and smallholder farmers. ICRISAT has demonstrated that market-based solutions need to have a solid science foundation.

Through IMOD, Dr Dar has called for a widespread change in thinking among all stakeholders, with market as the key driver of economic change in smallholder agriculture in the semi-arid tropics. IMOD has the potential to raise millions of farmers out of endemic poverty.

A few years into the implementation of the strategy, IMOD has now become internalized into the institute's AR4D system. IMOD cuts across all ICRISAT research programs. It has demonstrated that scientific innovations can be sustainable and replicable.

Given the favorable market outlook in the semi-arid tropics, there has never been a better window of opportunity to meet the demands of the food system in the years to come. IMOD is ICRISAT's unique strategic proposition. Along with its AR4D agenda and with private sector investment, IMOD has the potential to become a catalyst of large-scale transformation for smallholder farmers in the semi-arid tropics of Asia and sub-Saharan Africa. ■

Box story 4: An Appreciation of William Dar

Simon Best (ICRISAT Governing Board Chair, 2006-2008)



I had the pleasure of working closely with Willie from early in his tenure as Director General when he had stabilized ICRISAT and prevented the further decline of an institution that had lost almost half of its revenues and capabilities from their peak in the late 1980s. However, the challenges required to refocus and revive ICRISAT that still lay ahead were enormous and Willie has every reason to be very proud of the much larger scale, scientifically and culturally vibrant institution that it has become and of the scale of the resultant impact it now has on improving the food and nutritional security and income generation of the poorest farmers in the semi-arid tropics worldwide and the enhanced well-being of their families.

This has been a team-effort – however, teams need to be built, motivated and led and Willie has demonstrated very unique leadership skills in all three aspects. My recruitment to the Board is an early illustration of Willie’s boldness and imagination as a leader. In asking

the UK’s donor body at the time – the Overseas Development Agency (ODA) – to nominate a Board Member with a private sector background with particular skills in intellectual property management, regulatory and public acceptance of genetically modified organisms (GMOs) and what was at the time, a different culture of governance and administration unfamiliar to most in the CGIAR, Willie broke boundaries – even taboos for some. However, in doing so, he found encouragement and support to broaden ICRISAT’s donor base with private sector foundations, initially the Sehgal Foundation within India and later, one of CGIAR’s first engagements with the Bill & Melinda Gates Foundation, and to mobilize new resources via membership fees from the Indian Private Sector to join pre-commercial breeding consortia structured in a manner fully compatible with ICRISAT’s and the CGIAR’s public-goods orientation and supportive of parallel Indian Public Sector programs. Willie was similarly

bold in recruiting many of his senior administrative staff at Patancheru from private sector backgrounds and business academia. However, in each case finding individuals with the appropriate personal and social values to wholeheartedly commit to ICRISAT's mission whilst 'raising the game' in applying their professional skills to introduce best practices in Human Resources, Finance and other key functions.

Willie has unique skills of another kind which have underpinned the resurgence of ICRISAT and are perhaps now those most critical to being a successful global leader in the modern world. These are best described as diplomatic skills, but in Willie's case these are combined with both the social and commercial entrepreneurial skills and the drive required to "make things happen" and not just to "make things possible." These have allowed him to operate effectively in all of the world's major cultures by demonstrating and building understanding and respect, thereby securing support from both their public and private sectors to deliver results. These skills were fully developed and tested by the challenges Willie faced in balancing the need to cement strong domestic support for ICRISAT in India in a donor environment increasingly insistent

on prioritizing Africa. Dr Dar has been masterful in managing such conflicting dynamics and his success in catalyzing the revival of ICRISAT bears ample testimony to this.

Dr Dar's skills are in short supply and I have every confidence that he will find many new opportunities to leverage these in leadership roles from which he will continue to make major contributions to global development and, in particular, to promote the well-being of the rural poor. ■



Knowledge revolution for the poor in the drylands

Taking science-based knowledge to the fields
for a food secure future

Dileepkumar Guntuku and Rosana P Mula (ICRISAT)





“Millions of smallholder farmers worldwide can improve their crop yields, incomes and resilience if only they had better access to appropriate information and knowledge to help them make informed choices about their farm.”

- William D. Dar

Agricultural extension services played a crucial role in advancing food security during the Green Revolution – agricultural productivity was enhanced through high-yielding varieties, with the extension system providing high-end scientific knowledge and support from research stations to the farmers’ fields. Nowadays, however, traditional extensions systems are fast becoming obsolete, or are inadequate in terms of infrastructure and human resources. For example, there is just one Agricultural Extension

Officer for every 2000 farmers in India and the situation is far worse in some parts of Africa. An average farmer in India receives less than 45 minutes of extension support per year, if the extension officer devotes his/her time fully for extension activities.

Today’s agriculture, unlike during the Green Revolution, has a myriad of challenges such as climate change, land degradation, loss of biodiversity, energy crisis, and rapid population growth. The complexities multiply considering that resources from federal and state agencies in support of traditional extension systems are dwindling. Advances in information and communication technologies (ICT), open data and knowledge solutions which did not exist during the Green Revolution, provide new opportunities to address these pressing global challenges.

Knowledge sharing and innovation

In this modern age, open data and knowledge solutions and innovative ICT-mediated knowledge sharing approaches have become vital components of agricultural research for development (AR4D) initiatives.

Dr William D. Dar saw the extraordinary potential of ICT in bridging the information gap in remote rural regions of Asia and sub-Saharan Africa where ICRISAT has been working. He provided leadership and guidance in establishing a Knowledge Sharing and Innovation (KSI) program at ICRISAT, as a cross-cutting area in converting research results into data, information and education services to satisfy the needs of various stakeholders. These stakeholders include researchers of National Agriculture Research Systems (NARS); faculty and students at academic institutions; extension agents at government extension agencies; nongovernmental organizations (NGOs); donors and funding agencies; and most importantly smallholder farmers and those interested in utilizing ICRISAT's research results to create sustainable forms of agriculture towards contributing to food security.

The Knowledge Sharing and Innovation (KSI) program was formed in 2011 with a view to strengthen the organization and management structure of the earlier Information Resource Management Office (IRMO) and Knowledge Management and Sharing (KMS), with inclusion of novel distance learning and e-learning approaches, and the concept of ICT for Development (ICT4D). In 2012, the Data Management Unit and the Center of Excellence in ICT Innovations

for Agriculture were institutionalized as part of the KSI program.

Serving as the driving force behind KSI's strengthened role, Dr Dar said, *"Our mission is to make smallholder farmers in the drylands prosperous, not just self-sufficient. And that is why we are engaged in promoting an inclusive and technology-based knowledge sharing and innovations program."*

As a cross-cutting area, the KSI program aims at transforming research results into data, information and education services to satisfy the information needs of various stakeholders thereby improving ICRISAT's capability to inform, dialogue with, and serve its stakeholders. KSI executes its activities along three tracks: Knowledge management (KM) for cultural change; KM for enhanced organizational effectiveness; and Innovations in knowledge sharing for impact.

KSI also has five different units and one interdisciplinary platform:

1. Information Systems Unit (ISU) – to sustain ICRISAT's technology edge
2. Data Management Unit (DMU) – to provide access to data to get successful research results
3. Library and Information Services (LIS) – to provide access to research publications
4. Learning systems Unit (LSU) – Capacity building of scientists, students and scholars
5. ICT for Development (ICT4D) – Taking science knowledge to the farmers

Dr Dar's visionary leadership saw the need to have an interdisciplinary platform to bring science, technology and value chain experts on a common platform.

To bring this into reality, a Center of Excellence in ICT Innovations for Agriculture was launched during the 40th anniversary celebration of ICRISAT.

Center of Excellence in ICT Innovations for Agriculture

The Center of Excellence (COE) in ICT innovations for Agriculture aims to integrate science, technology and value chain approaches in designing and developing new affordable ICT technologies, tools, platforms, and methods. The products/deliverables of the COE aim to contribute in enhancing knowledge transfer, extension and capacity building activities. This shall capitalize on a coalition of strategic partnerships from diverse areas to work on specific global issues and problems – ranging from climate change to global food security, enhancing traditional extension and education systems, access to markets and quality inputs, etc. Together with its partners, COE designs and develops open data and knowledge solutions linking scientists, researchers, educators, extension workers, and farmers with other stakeholders in the agriculture sector.

Open Access Repository (OAR) provides an easy interface for researchers, practitioners, or web-connected farmers to use, build on and share research conducted at ICRISAT. Any registered or non-registered user can access the OAR which provides free, immediate, permanent access to the full text of all ICRISAT publications.

ICRISAT is one the very first CGIAR centers that adopted open access policy of its learning resources, as advocated by Dr Dar

who believes that *“Open access benefits the whole world’s science, not just of the western world. It enables the free flow of research information between north and south, east and west, helping research to progress much more effectively.”*

Open Data Repository enables the availability of open data to the global community. *“The open data movement leveraging on data, collaboration, and innovation will definitely accelerate crop improvement for sustainable food production particularly in the marginal environments of Asia and sub-Saharan Africa,”* says Dr Dar.

KSIconnect is a virtual knowledge series platform highlighting the most important research projects and success stories to a global audience in the form of open information and educational video resources, virtual training and learning sessions, and virtual expert-farmer interactions. Talks given by experts from various fields are live-streamed and recorded. Since its launch in July 2012, more than 443 videos have been uploaded with around 20,224 views and 10,300 unique users from more than 166 countries (as of October 2014).

According to Dr Dar, *“KSIconnect is an innovative new platform that uses information and communication technology tools to create a flexible learning environment to enable learning exchanges and knowledge transfer around the globe.”*

AgED Open Courseware Platform offers a research infused curriculum providing life-long learning opportunities to students, faculty members, extension agents, smallholder farmers, etc. through open educational resources – anywhere and



anytime – in a cost effective manner. AgED Open CourseWare is developed using an open source learning management system called Moodle. The platform not only hosts ICRISAT courses but also allows partners to host their own courses. It has become very popular among educators around the world as a tool for creating online dynamic websites for students. As of October 2014, the AgEd Open Courseware has 7 ICRISAT courses, 11 Food and Agriculture (FAO) short courses, 1 Self-Employed Women’s Association (SEWA), India learning module, and more than 6300 learner-participants from around 160 countries.

With AgED Open Courseware, all agricultural stakeholders now have direct access to the research infused curriculum and the latest scientific innovations in agriculture, without ever having to participate in onsite training programs that interrupt their day-to-day activities and travel schedules.

ICT-mediated extension systems for smallholder farmers

For a more food-secure world, smallholder farmers will need to significantly raise their agricultural productivity, be more resilient to shocks, and seize all opportunities to increase their incomes. To do so, farmers need to be able to access and effectively use the right information at the right time. While classic traditional extension system has failed to meet this need, new ICT tools

and devices enable efficient and farmer-friendly ICT-mediated extension that provides real-time advice.

The COE has developed various information systems linking research, extension and markets. For example, the *Krishi Gyan Sagar* and *Krishi Vani* powered by the GreenSIM bring out the best of affordable technologies, knowledge solutions, and information on quality inputs, credit and insurance at the doorsteps of smallholder farmers, anchored on public-private partnership.

Krishi Gyan Sagar is a pull-based ICT mediated extension system, which supports both tablet/smartphone as well as the web. The application for tablet/smartphone consists of various modules providing several personalized information and input delivery services to the farmers. In addition to this, the web-based application helps to generate quick reports, market intelligence, intelligent decision support system, and acts as a proficient monitoring and evaluation (M&E) tool.

Krishi Vani is a push-based, mobile mediated agro-advisory platform that delivers 35 free voice messages per week per farmer in 16 categories (weather, market, crop information, government schemes, nutrition, health, etc.) in regional languages. Through this application, generic advisories are delivered to groups of farmers in a location on the mobile phone owned by them and enabled by the GreenSIM.

More than 40,000 smallholder farmers in 171 villages have benefited from the GreenSIM project in just six months. It also provided an opportunity for rural women and youth to gain additional income as info-entrepreneurs. The project received



Dr William Dar with ICRISAT staff and partners from the Government of Karnataka with the Flame Award 2013.

the Flame Award 2013, given by the Rural Marketing Association of India (RMAI) for showcasing innovative use of technology of the decade.

Dr Dar played a significant role in the success of the project, challenging the KSI team to develop a financially sustainable ICT-mediated extension system and providing the needed guidance to provide solutions in meeting the information needs of smallholder farmers. *“The system successfully demonstrates the holistic approach to improve farm productivity, ensure food and nutrition security, promote sustainability and resilience of farming systems, and directly improve income opportunities of smallholder farmers,”* says Dr Dar.

Next-generation innovations and initiatives

Dr Dar strongly believes in a financially sustainable ‘backbone communication network’ that can be developed with advanced ICT tools anchored on people-public-private partnerships to improve the quality and convenience of information (crop, market, weather and user’s choice) dissemination to smallholder farmers and transparency within the value chains.

With Dr Dar’s guidance and support, two novel next generation innovations and initiatives, the GreenPHABLET powered by the GreenSIM and the One Agriculture-One Science: A Global Education Consortium were launched to bring systematic change and needed reforms to strengthen agricultural extension and education.

GreenPHABLET powered by the GreenSIM is an electronic device integrated with phone and tablet (Phablet) technology, coupled with other required components for use in agriculture data- information-knowledge aggregation and dissemination; it also supports many other uses. The device comes with unique features like water resistance, dustproof, shock proof, break proof, sunlight readability, etc. The GreenPHABLET powered by the Green SIM is an ICT-mediated tool to address the challenges of infrastructure and human resources in extension, creating info-entrepreneurs, and delivering knowledge solutions and quality inputs to the smallholder farmer’s doorsteps through voice advisory services and mobile money.

One Agriculture – One Science (OA-OS) is a common platform to comprehensively



address gaps in agricultural education with the latest advancements in technology and knowledge flow strategies. The One Agriculture – One Science initiative aims to bring various disciplines in agricultural education such as crop, livestock, fisheries, natural resource management, etc. under one roof with strategic partnerships across the globe.

An international partnership across India, Africa and the USA formed the 'One Agriculture-One Science: A Global Education Consortium' initiative aimed at revitalizing global agricultural education, capacity building and technology transfer. This was made possible with the collaboration of ICRISAT and top universities from all the participating continents.

Of the new initiative, Dr Dar opined that *"the task of revitalizing global agricultural education requires all of us to work together in developing an educational and capacity building road map focused on how we can better contribute to global food and nutritional security through a global education consortium for development."*

Nurturing future generation leaders

A staunch believer in nurturing next generation leaders, Dr Dar has been creating opportunities for students in the form of scholarship programs at ICRISAT. He believes that the youth are the pillars of the society and they

can effectively transform the present agricultural scenario by grabbing opportunities provided to them. Through these scholarship programs, they can hone their research skills and contribute towards agricultural development and global food security.

These scholarship programs provide unique opportunity for graduate students to pursue their graduate research work at ICRISAT under the close supervision of ICRISAT scientists in coordination with their faculty committee members at their respective universities. Most of these students are recruited through the Learning Systems Unit of KSI and deployed in various research programs as Research Scholars and Research Fellows. These scholarship programs are competitive in nature. Following are some ICRISAT scholarship programs under the leadership of Dr Dar:

1. J Raghotham Reddy - William D Dar Student Scholarship Program in partnership with the Acharya Jayashankar Agricultural University (formerly Acharya N.G. Ranga Agricultural University or ANGRAU) in Hyderabad, Telangana, India
2. William D Dar - Ben D Ladilad Student Scholarship Program with the Philippines' Benguet State University
3. CV Raman Scholarship providing opportunities for African researchers to conduct collaborative research in science and technology in India

4. USAID Research and Innovation Fellowships to build a sustainable model for knowledge exchange by connecting bright American minds with the key in-country organizations to collaboratively apply science, technology and innovation to complex development challenges.
5. CGIAR Research Programs Student Scholarships

Replicating and up-scaling proven successful experiences

Dr Dar strongly believes in replicating and up scaling impressive gains in productivity found in some parts of the world and make them the norm across developing countries. To bring this idea into reality, Dr Dar with support from the ICRISAT Governing Board launched the ICRISAT South-South Initiative (IS-SI). IS-SI provides a platform for focused and systematic international relationship critical for a more effective and inclusive development cooperation between India and Africa. The key mission of IS-SI is to create better policies, more effective institutions, improved infrastructure, and better access to markets and to higher quality inputs for dryland farmers in South Asia and sub-Saharan Africa.

In Dr Dar's words, *"IS-SI will open more opportunities for increased financial and technical support and enhanced public-private-people partnerships on research for development."*

Launched in March 2011 during the 64th Governing Board meeting, IS-SI was further strengthened, with enhanced partnerships with national and international institutes, round table meetings organized with various

embassies, and exchange visits among scientists and researchers. An execution framework has been developed and approved to further strengthen IS-SI activities.

Visionary leadership on knowledge revolution for the poor

Dr Dar's astute and decisive leadership and guidance enabled KSI make its mark in developing innovative ways and approaches to transform cutting edge research results into data, information and education services to satisfy the information needs of various stakeholders, thereby improving ICRISAT's capability to inform, dialogue with, and serve its stakeholders. Inspired by Dr Dar's support, the KSI team has been working tirelessly to develop expertise in the relatively new fields of ICT4D, e-learning, rural resource information systems, knowledge management and semantic web.

ICRISAT's ICT-enabled information services have been creating para-extension workers out of rural youth and women, with only marginal investment, and showing the world new directions in addressing inadequate infrastructure and human resources challenges being faced by the traditional extension systems.

The KSI program at ICRISAT has successfully demonstrated ways to create a sustainable "backbone communication network" that will improve the quality and convenience of information dissemination and knowledge sharing to various stakeholders, particularly in bringing about knowledge revolution for the poor, smallholder farmers. ■

Box story 5: A leader in science innovation for the people

Robert Bertram (Chief Scientist, Bureau for Food Security, USAID)



What a fantastic tenure Dr William Dar has had at ICRISAT. Like many CGIAR centers, ICRISAT faced major challenges in the 1990s as agricultural budgets in donor agencies were sharply reduced. Fortunately for ICRISAT, Willie arrived and brought his calm and assured vision to rally the center and its supporters and chart a new course. Very quickly, a renewed, stronger center emerged, one that emphasized partnerships both near to home and around the globe. There are so many achievements associated with his leadership that it is hard to choose which of them to mention.

He developed a strong, productive and lasting collaborative relationship with India, ICRISAT's host country. New support from the Indian organizations was in evidence everywhere, but no more so than in the cutting-edge research collaborations using 21st century approaches to age-old problems, like

tolerance to heat and drought, as well as pests and diseases. Willie also took advantage of the center's fortunate location in Hyderabad, India to build new alliances with leading computational partners in bioinformatics and genomics, helping ICRISAT emerge as a global leader. Public-private partnerships grew in one of the most successful business venture incubators linking public research and private start-ups. New investments poured in around legumes, under-invested crops that have emerged so centrally in sustainable systems while also generating income and improving nutrition. In Africa, Willie refocused ICRISAT's strengths, concentrating them and providing a critical mass that made lasting impacts through partnerships with national research centers and other institutions. And he also emphasized that while ICRISAT was about the best of science, it was about science for the people. *Science with a Human Face* became a concept that defined the center's work.

Whether on a farm in Mali or in a meeting room in Washington, Brussels or Nairobi, Willie always conveyed the compelling objective of ICRISAT's work – serving the smallholder farmers and the poor of the semi-arid tropics, some of the poorest regions in the world. But his message was invariably one of hope, that through science and partnerships at all levels, ICRISAT and the broader research for development community could make a real difference. Throughout the CGIAR reform, Willie was always a consensus builder, asserting a positive vision for how centers could work together and with partners of all kinds to generate the solutions that smallholders farm families

need for a better life. Donors looked to him as a voice of reason and progress throughout the reform process. And in turn, when he reached out and made the case for new research capacity and partnerships, development agencies around the world were there, eager to listen and to work together in achieving shared goals.

Now, after many years, Willie should look with great pride on the center that has flourished under his steady guidance, ready to meet the challenges of poverty and food security in the years to come, and more relevant than ever as the world faces climate change and competition for land and water resources. I know I speak for many colleagues from USAID as well as for myself when I say that it has been a great pleasure to be a partner in the transformation he has led. Whether on farmers' fields across Africa where ICRISAT-derived varieties of millet, sorghum and groundnut are reducing risk

and increasing incomes, or in South Asia where chickpea farmers have doubled yields and profits, the fruits of Willie's leadership are there to be seen. His ethos of partnership and collaboration made these gains possible, and have laid a solid foundation for the future. His wise and compassionate vision for the center and for the world has helped millions, and assured the vibrancy of ICRISAT as a leader in innovation for the people. ■



Creating impacts for smallholder farmers

Suhas P Wani (ICRISAT)



With Minister for Agriculture, Government of Karnataka, India, Mr Krishna Byre Gowda.



“Every technology that we have developed must benefit smallholder farmers, and have impacts on the ground. We need to realize that if we cannot have impacts in India where our global headquarters is located, we cannot expect impacts to happen in other developing countries.”

These were the words of Dr William D. Dar, said in his first month in office in the year 2000. His motivational words on the importance of achieving impacts on the ground resonated deeply among researchers and staff, and they committed to develop and introduce new technologies for increasing productivity and profits for smallholder farmers, while ensuring sustainability of natural resources for future generations.

On-farm research agenda was mostly considered as low ranking

science by researchers and research managers. Hence, Dr Dar’s focus on creating impacts inspired and influenced the resolve of many, including myself, in helping farmers in the semi-arid tropics benefit from ICRISAT’s innovations to the best of our ability. We started with the Adarsha watershed in Kothapally village, Andhra Pradesh (now in Telangana state), India. We worked to ensure tangible economic benefits for the smallholder farmers through community participation to achieve the impacts of the interventions in the sustainability of the village.

The clear benefits of the integrated approach for rainwater conservation and its efficient use, along with improved crop cultivars and agronomic management practices, were evident in the two- to three-fold increase in productivity of pigeonpea, maize

and sorghum at the Adarsha watershed. Such tangible economic benefits to the large number of smallholder farmers not only enhanced their participation in the project activities, but also led to the effective dissemination of the innovations through word of mouth with the neighboring villages. The importance of science-led development resulted into demand from surrounding villages for technical assistance in implementing the integrated watershed management project. This was very heartening, as instead of scientists chasing the farmers to adopt the technologies, farmers were requesting ICRISAT and partners to help them with new technologies for increasing their farm productivity. This approach demonstrated the power of science-led development and the importance of achieving impact on the ground in partnership with the farmers.

Partnership with the local government, research organizations and universities was also a key to the success of the project. The consortium of partners started working whole-heartedly for the success of the initiative as they were also enjoying the fruits of the success, the recognition and the goodwill of the farmers.

At every review and planning meeting of the project, Dr Dar would reiterate and emphasize the need for research for impact, equating it with the mantra *Science with a Human Face*. He provided all the needed support for participatory research for development in the farmers' fields and gave scientists the freedom to innovate new institutional mechanisms

as well as new development models to benefit the farmers. Dr Dar not only provided the guidance and the moral support but he also ensured and demonstrated his commitment to achieve impacts at different locations in India as well as in other countries, by engaging with top policymakers to also support research for development initiatives for the benefit of the farmers.

In 2003, the External Program and Management Review (EPMR) panel recommended winding down the Natural Resource Management (NRM) activities in Asia and shifting resources for the strengthening of NRM initiatives in Africa. For Dr Dar, this was a challenge as well as a great opportunity to prove the importance of participatory research for development in Asia that can be applied globally. Demonstrating his full support to our activities, Dr Dar consulted and listened to recommendations – that Asia needed research for impact, and that given the opportunity scientists will be able to mobilize resources to pursue demand-driven research in the area of NRM.

Dr Dar took up the issue to the Governing Board and sought approval for a phased reduction of resources for NRM research in Asia in two to three years. He was confident that by this time, the NRM team in Asia should become self-sufficient by mobilizing resources from bilateral projects. A decade later, NRM research for development expanded and became the flagship project across all ICRISAT locations.



Work on integrated watershed management research started gaining attention and recognition not only within the institute, but also from researchers and policymakers outside. The challenge was to reach millions of smallholder farmers. The Sujala-ICRISAT initiative (in Karnataka, India) in 2003-2006 on increasing productivity of small rainfed agricultural farms was a case in point. The watershed team demonstrated that not only can productivity be increased in a 500-ha watershed area with new technologies, but it can be scaled-up through a number of micro-watersheds. This prompted the Andhra Pradesh Rural Livelihoods Program (APRLP) of the Government of Andhra Pradesh (supported by the Department of International Development or DFID) to work with ICRISAT and partners. The Sujala Watershed Program of the Government of Karnataka supported by World Bank was further expanded in additional project areas in the state.

This evidence-based impact on the ground not only brought learnings and benefits for the farmers and extension workers, but policymakers also came forward to support the participatory research for development approach on large areas. For Karnataka's Department of Agriculture, the approach even served to influence the transformation of the state's extension system. The first opportunity, which was also a challenge, for the institute came in 2009 from the state of Karnataka, where we had to show a 5% increased productivity in rainfed systems annually for four years by adopting a science-led development strategy with full support from the implementing agency (the Department of Agriculture and policymakers in the state).

The mission mode approach project in Karnataka was called *Bhoochetana* (soil rejuvenation), where soil health mapping was used as an entry point for unlocking the potential of rainfed agriculture,

guided by the principles of convergence, consortium, collective action and cooperation. The challenge was enormous but the guidance and support from the ICRISAT management and the dedication of the team enabled us to realize increased crop productivity during the first year in six districts of the state covering 0.2 million ha area by 20-66%. With these results, the implementing agency (Department of Agriculture) as well as the policymakers and the ICRISAT management were more than convinced of the power of science-led development for unlocking the potential of rainfed agriculture.

In 2012, the program expanded by leaps and bounds. *Bhoochetana* has reached 4.3 million farmers covering 3.73 million hectares. For individual farmers, the benefit cost ratio was 2 to 14:1 with gross value of increased productivity reaching Rs. 1267 crores (US\$230 million) in different districts for different crops during the first phase (2009-2012). This mission mode approach of scaling-up made the project a farmer-driven initiative, and the second phase of the project was approved by the Government

of Karnataka. Another systems-based project, called the *Bhoochetana Plus*, was requested by the state government to bring the expertise of eight international CGIAR centers (ICRISAT, IRRI, ILRI, ICARDA, ICRAF, IFPRI, IWMI and AVRDC) to help smallholder farmers. The significant success of the *Bhoochetana* program has convinced policymakers in





With Mr K Chandrashekar Rao, Chief Minister of Telangana, India.

other states of India, as well as in other countries like the Philippines, to adopt the approach to unlock the potential of agriculture.

The vision of Dr Dar in realizing *Science with a Human Face* and in benefiting millions of smallholder farmers has resulted in a new ICRISAT strategy called Inclusive Market-Oriented Development (IMOD) – ensuring increased productivity, profitability, prosperity and sustainability through science-led development and by linking farmers to markets (see details in the previous chapter on IMOD). All

these initiatives have resulted in the need to establish a development center for the scaling-up and scaling-out of research undertaken at ICRISAT to benefit the farmers through on-the-ground impacts. In 2014, the Governing Board of ICRISAT approved the establishment of the ICRISAT Development Center (IDC), aiming to bring smallholder farmers into the mainstream by adopting research for impact strategy with innovation, inclusivity, intensification and integration to benefit smallholder farmers. ■

Creating impacts in Eastern and Southern Africa

Moses Siambi and Said Silim (ICRISAT)





Dr William D Dar joined ICRISAT as the new Director General on 1 January 2000.

This was the period when the interest of development partners in agricultural development had declined. Funding for ICRISAT was down at US\$22 million. Prior to his joining, there had been three staff downsizings (between 1997 and 1999). With uncertainty and low morale, productivity fell and the best people were leaving the institute further weakening its productivity.

The first meeting that Dr Said Silim (then Regional Director, Eastern and Southern Africa) had with Dr Dar remained with him the rest of his stay with ICRISAT. *“Said, I am your Servant Leader, we are in this together and we will turn the institute around. We cannot afford to fail since we are in the semi-arid tropics where the poorest of the poor live and people are looking at*

us for solutions that will improve their lives,” Dr Dar said.

In Eastern and Southern Africa (ESA), ICRISAT had three locations but staff numbers had declined and staff morale was low.

Bulawayo, Zimbabwe had over 12 internationally recruited staff (IRS), but the number had declined to five and most were on special project funds (with the SADC Sorghum and Millet Improvement Program). The facilities at the location also had to be given back to the Zimbabwe government. Lilongwe, Malawi had six IRS but there was none when Dr Dar joined. Nairobi, Kenya which used to have six senior scientists only had three, and most were on special project funds as well.

Dr Dar inherited a management structure which was centralized. Scientists worked as individuals reporting to their Program Leaders at the headquarters in India.

Finance and administration staff reported to their respective Program Directors and there was no cross-location collaboration. In short, the institute appeared to be on a downward slide.

As soon as he joined ICRISAT, Dr Dar consulted and traveled widely, including to Africa. He realized and talked about two things: ICRISAT cannot afford to have further disruptions since staff morale was at its lowest. As such, he retained most of the senior management staff, and engaged the international community, the sub-regional organizations in Africa, the development partners and the national agricultural research systems (NARS) to show that ICRISAT can work closely with partners in the ESA region. He stated clearly that the organization must not only change, but be seen to respond to the concerns of all stakeholders.

Creating impacts

Increased funding for research

The mantra *Science with a Human Face* was embraced by scientists in the ESA region, as they supported new changes which eventually resulted to increased staff morale. Scientists developed their Regional Research Programs which were aligned with the institute's Global Programs but specific to the region and were owned by the NARS and all partners. Dr Dar encouraged staff to use the Regional Research Programs for resource mobilization. Every year the best resource mobilizers in each regional hub were recognized through the Resource Mobilizer Awards.

The approach resulted in more and larger projects being funded. ESA

has the largest concentration of CGIAR centers with two having their headquarters in the region. Large donors with focus in Africa provided large funding. The Bill & Melinda Gates Foundation started supporting two large projects – the HOPE project on Sorghum and Millets and the Tropical Legumes II; the International Fund for Agricultural Development (IFAD) on groundnut, pigeonpea and sorghum; the United States Agency for International Development (USAID) on a number of projects with focus on legumes; Irish Aid on legume seed systems; the Alliance for a Green Revolution in Africa (AGRA) on pigeonpea; Rockefeller Foundation on pigeonpea; the Danish International Development Agency (DANIDA) on pigeonpea; Kellogg Foundation on legumes; the International Development Research Centre (IDRC) on natural resource management; the Food and Agriculture Organization (FAO) of the United Nations, and the Catholic Relief Services, etc.. A number of partner projects were hosted and managed by ICRISAT, one such case is the Association for Strengthening Agricultural Research in Eastern and Central Africa (ASARECA), who requested ICRISAT to manage the Sorghum and Millets Network and the Soil and Water Management Network.

When Dr Dar joined ICRISAT, there was only one ongoing project in ESA which was in its final year and was not going to be renewed – the Sorghum and Millets Improvement Program (SMIP) based in Bulawayo. After 15 years, he leaves behind several ongoing projects worth more than US\$40 million targeting ESA.

Increased staffing

In 2000, the number of IRS in ESA was less than 10; by 2014, the number grew to more than 25, with nationally recruited staff (NRS) at over 100, from 30. He ensured in recruitment that the best scientists and NRS were hired taking into consideration diversity – from biotechnology, breeding, natural resource management, socio-economics, policy, gender, technology exchange to business development.

He always thought ahead in ensuring that there was a succession plan by recruiting young scientists as understudy to those soon to retire, including for the Regional Director of ESA. The approach permitted stability in the region.

Visibility

Dr Dar also addressed the perceived notion that ICRISAT is an India-based institute. He took a number of steps to address

this: first by ensuring that the ICRISAT weekly newsletter, *The Happenings*, would be global in reporting. In ESA, stories of the institute's work, successes, visits by different stakeholders and by partners and donors, field days and meetings, and all other events such as annual days were reported. He encouraged staff in ESA to document success stories and impacts of research. A number of flyers, videos, and briefs specific to ESA and its collaboration with NARS partners and donors were developed, published and circulated.

Research impacts

With improved funding, donor and partner support and trust, plus scientists' commitment and team work, impacts of research are now everywhere in ESA.

Pigeonpea

Pigeonpea (*Cajanus cajan*) is an important grain legume in ESA where



A farewell token presented to Dr William Dar at the ESA regional planning meeting in November 2014.

it is a source of food, cash, firewood, soil fertility improvement and livestock feed. Traditionally, the medium and long duration types are mixed or intercropped with cereals and thus considered a bonus crop. The varieties originally grown were landraces which were low yielding, susceptible to diseases and had mixed grain traits not preferred by the consumers and exporters. The crop was neglected in ESA and no research was being undertaken. Serious effort on pigeonpea improvement was started by ICRISAT in 1992 with generous funding from the African Development Bank (AfDB) and when the project ended in 1998, technologies had been developed but there was no widespread dissemination.

When Dr Dar became the Director General and after nurturing the process of development of Regional Programs and approving them, he took interest in ensuring that resources were provided. Within a short span of 10 years, impacts could be seen everywhere. Concerted efforts in science, partnerships and development revolutionized all this, moving pigeonpea from an orphan crop to an important crop for food and nutritional security, income generation, improving soil fertility, intensification of production systems and agroforestry. Area under the crop has more than doubled, yields have increased, large quantities are being traded, and partners are interested and are funding R&D. Tangible impacts in pigeonpea include:

- A total of 23 varieties released for specific agro-ecologies and cropping systems in Kenya, Malawi, Mozambique, and Tanzania

- Area increased from 450,000 ha in 1992 to 1,100,000 in 2014
- Average yield has increased from 590 kg to 900 kg/ha
- Grain quality has improved and farm gate price increased from USD\$0.17 to 0.75
- Exports have increased 10-folds in Tanzania, Malawi and Mozambique (each exporting more than 120,000 tons)
- Private seed companies in Kenya, Tanzania and Malawi are investing in seed production

In one of his visits to Tanzania, Dr Dar landed and said *“Dar has met Dar at last,”* meaning he had arrived in Dar es Salaam, the commercial capital of Tanzania. He then traveled to Babati and Arumeru, the heartland of pigeonpea and he was surprised to see very high yielding varieties with large pods and grain, and he commented *“I have heard Said and colleagues talking about impacts of pigeonpea but I am amazed the whole landscape in Babati is covered in flowering and podding pigeonpeas that have taken over the land – this is a revolution.”* There and then he decided that the following year the Governing Board Meeting would take place in Arusha, Tanzania. Members of the Governing Board also visited pigeonpea areas in Babati and were highly impressed with what they saw.

Chickpea

In the whole of ESA, the only country with large hectareage and concerted effort on chickpea improvement was Ethiopia. The countries with small

areas or potential to grow chickpea were Kenya and Tanzania. In one of the meetings, after being convinced that chickpea has potential of expansion in Kenya and Tanzania, Dr Dar provided seed money to start research in these two countries. In Tanzania the area under chickpea was about 5,000 ha; the varieties grown were desi type, late in maturing, small seeded and susceptible to Fusarium wilt. In Kenya, the potential was to grow it as a second crop was high. Knowing the constraints and opportunities, very quickly suitable varieties for food, nutrition and income generation were assembled, tested first by ICRISAT in Kenya and the most suitable varieties were provided to the national program. Within a period of 10 years and increased funding from bilateral projects – impacts could be seen everywhere. In both countries more than 10 varieties have been released. In Tanzania, the area has increased from 5,000 ha to over 80,000 ha and the country now exports to Kenya and India.

The ICRISAT collaboration in Ethiopia has been strengthened, and ICRISAT has now stationed a chickpea breeder in the country. Also in Ethiopia, area under chickpea has expanded from under 200,000 to over 240,000 ha, and now the crop is among the top foreign currency earners for the country.

Impacts in Malawi, Mozambique and Zambia

The location in Lilongwe, Malawi is responsible for the breeding of groundnut in eastern and southern Africa. From

2000-2003, the location faced a major crisis as the financial resources to support the activities at the location declined, as was the case with the overall funding situation in the institute. The main project funded by GTZ (German Technical Cooperation) that had supported the breeding program for more than a decade was winding up in late 2003 and no other sources of funding had been identified at this time. Facing imminent closure in 2002, a ‘last ditch’ bridge funding was provided by Dr Dar to sustain the location for as long as possible, while efforts were being made at the country level, regionally and globally to identify new sources of funding.

Groundnut production and Aflatoxin management

In 2003, a new project funded by USAID-Malawi to promote production of groundnuts as an alternative crop to tobacco was initiated in a district called Mchinji, a major production area for groundnuts. The project was funded through the National Smallholder Farmers’ Association of Malawi (NASFAM). This was innovative as it was the first time that ICRISAT had been linked directly to a farmer organization to provide technical backstopping. The project was implemented successfully, providing seed to farmers and exploring the markets for grain through several missions abroad. The major achievements of this project were the increased income from groundnut production resulting from the technical back-stopping and capacity building of the extension and marketing staff of NASFAM; and the development of a system for quality control.



With globalization and trade liberalization, groundnuts produced in Malawi failed to penetrate international markets due to a lack of adherence to quality standards for aflatoxin contamination. With support from ICRISAT, an analytical laboratory was set up and several partners were trained in aflatoxin contamination testing, and post-harvest management procedures that would reduce levels of contamination. This enabled NASFAM to start re-exporting groundnuts to its historical market in the UK and regained Malawi's lost reputation as a producer of high-quality groundnuts.

The initiation of aflatoxin research in Malawi by ICRISAT spurred several other initiatives as it created new interest and awareness in understanding both the health and economic impacts of aflatoxin contamination. A number of institutions and organizations are now actively engaged in research and development related to the risks associated with the consumption of aflatoxin-contaminated foods.

Similar initiatives were started in Zambia and Mozambique with linkages to activities by the CLUSA (Cooperative League of the United States of America) in Chipata (Zambia) and Nampula (Mozambique). An aflatoxin analytical laboratory was established at Posto Agronomica de Nampula (IIAM) and the

capacity of scientists was enhanced. The equipment and trained staff later joined the Catholic University in Nampula and continued to carry out aflatoxin research.

The impact of this has been improved nutrition from consumption of better quality groundnuts and resumption of exports, thus stirring economic development.

Legumes revolution in Malawi

The economy of Malawi is largely dependent on production and export of tobacco or the 'Green Gold' as it is usually referred to, underscoring its importance in agriculture in the country. The quest for other crops that could provide alternative cash income in the face of the declining tobacco prices due to global agitation by the anti-smoking lobbies has been going on for more than a decade. However, starting from 2005, more pragmatic approaches to elevating the role of legumes in the economy started in earnest.

As part of his contribution to this initiative, Dr Dar visited Malawi on two separate occasions and had an audience with the President of Malawi, the late Dr Bingu wa Mutharika. On both visits he held extensive discussions with the President together with Ministers and Officers in the Ministry of Agriculture and Food Security. He donated several

tons of groundnuts and pigeonpea seeds which were later distributed to smallholder farmers in the target districts in the country. The best contribution that these visits made was to convince the President to become a pigeonpea farmer. In the following year he planted about 100 hectares of pigeonpea on his farm at Mitundu. Until his untimely death, the President remained a staunch promoter of pigeonpea and often joked that he was also a 'smallholder' farmer because he grew legumes. The government eventually incorporated legume seed in the Farm Input Subsidy Program that enhanced the adoption of legumes and has positioned Malawi as a major producer of the major food legumes.

Making seed of new varieties available to smallholder farmers

The low adoption of improved varieties of major food grain legumes has often been attributed to the non-availability of seed. This is a result of low investment by seed companies in legume seed production. Since the development of new varieties is a major investment of resources, it is important that smallholder farmers get access to the technologies as soon as they are released. This realization led to the start of a Revolving Seed Fund by ICRISAT in 1998 with annual production of both crops from a number of varieties

averaging about 30 metric tons. Under Dr Dar's leadership the institute greatly enhanced the production of groundnut and pigeonpea basic seed under a Revolving Seed Fund to 300-350 tons annually. There is no doubt that the increased availability of the seed for the Farm Input Subsidy Program in Malawi can be traced back to ICRISAT's Revolving Seed Fund. The basic seed was made available to various seed companies and provided the beginning of a seed industry in legumes beyond Malawi in Kenya, Zambia, Tanzania and Mozambique for both pigeonpea and groundnuts. ■



Creating impacts in Western and Central Africa

Farid Waliyar, Ramadjita Tabo, Hakeem Ajeigbe, and Mahamadou Gandah (ICRISAT)





Just a month after joining ICRISAT as Director General, Dr William D. Dar visited the ICRISAT West African Programs during the Governing Board meeting held in Bamako on February 2000. In one of the Board's sessions focusing on partnership, Dr Dar showed a clear vision for Africa. The main focus of his interventions was on how to increase the impact of ICRISAT research. The session was attended by a number of very important partners and leaders of the National Agricultural Research System (NARS) from Mali, among whom were Dr Adama Traoré and Dr Oumar Niangado. The Governing Board placed a high priority on Africa, as the ICRISAT Africa agenda into the new millennium was discussed during the meeting. At his very

first presentation to the Governing Board, Dr Dar discussed the new ICRISAT Africa agenda focusing on:

1. Enhancing soil fertility and water use;
2. People centered approach;
3. Legumes: Home-grown soil fertility and gender benefits; and
4. Demand and supply bottlenecks.

Impact through market linkages for ICRISAT crops was a major initiative that Dr Dar pursued for the last 15 years, by providing the necessary support and stimulating scientists to undertake research for impact. To achieve this, he encouraged that bilateral projects should be carried out through strategic partnerships with the NARS, nongovernment organizations (NGOs), international agricultural

research centers (IARCs), and the private sector. Joint project development and implementation was also undertaken under his leadership.

We would like to focus on the following technologies with the greatest impacts in West and Central Africa, made possible through the support and guidance of Dr Dar:

- Microdose fertilizer application to improve soil fertility and increase smallholder farmers' income
- Diversification of crops and improved livelihood options for the farmers
- Improved cereals and legumes cultivars to benefit women
- Aflatoxin detection and management in groundnut

Microdose fertilizer application to improve soil fertility and increase smallholder farmers' income

Since Dr Dar joined ICRISAT, he was convinced that management of soil fertility is key to helping farmers increase their production in a sustainable manner and therefore their income.

ICRISAT in partnership with several institutions developed the microdose fertilizer application technology to improve pearl millet and sorghum production in the region. The technology consists of applying a very small quantity (about 2-6 g per hill) of appropriate fertilizer, but at the right time and right place. Placing small quantity of fertilizer close to the plant makes the nutrients readily available for uptake by the plant, which enhances fertilizer use efficiency, thereby improving crop yield. Studies in WCA indicated a 40-120% increase in yield of pearl millet and sorghum using this technology

An accompanying step to this technology was to link farmers to markets. The *warrantage system* or *inventory credit system* enables farmers to store their grain at harvest time rather than selling it at a low price when the supply is plenty, and waiting for more favorable prices a few months later. In the interim, the smallholder farmers (who are members of farmers' organizations), pursue other income generating activities such as sheep fattening, vegetable growing, and extraction of groundnut oil. Farmers are able to obtain credit at relatively lower interest rates in order to satisfy their urgent needs (health, education, social activities). Finally, when selling the grain from the warehouse, farmers have a stronger bargaining power and can take advantage of the commodities' price increase. The main beneficiaries are the individual farmers who can now bypass the middleman. They gain 30% more income through this system.

The fertilizer microdose technology and warrantage system proved to be good but Dr Dar wanted the technology to reach millions of farmers. Therefore, he stimulated initiatives to leverage the necessary funding with the right partners to make sure the technology would reach poor farmers and improve their livelihoods. Based on this, several projects were funded by donors and among them was the AGRA-funded microdose fertilization program in collaboration with NARS in Mali, Burkina Faso and Niger, also in collaboration with a number of NGOs and extension programs.

Although several initiatives were on-going, Dr Dar continued to stimulate other initiatives and communicate the results to donors and the public.

He provided seed money for public awareness and communication campaigns.

The President of the International Fund for Agricultural Development (IFAD) Dr Kanayo Nwanze, giving a keynote speech at the FARA 6th Africa Agriculture Science Week Opening ceremony in Accra in July 2013, said *“We have good results from Fertilizer microdosing technique developed by ICRISAT and its partners, using a bottle cap system so farmers can measure out small, affordable amount of fertilizer.”* This shows clearly that donors are not only aware of the technology but they are convinced of its potential impact.

Diversification of crops and improved livelihood of farmers

As per the ICRISAT Africa agenda, Dr Dar encouraged colleagues in WCA to strengthen crop diversification program. The crop diversification R&D activities started at ICRISAT Niger in the early part of 2000 and focused on technology development. Several technologies were developed, tested and transferred to farmers. Among them, the African Market Garden, Highly Nutrient Fruit Trees, Farmers of the Future, and the Reclamation of Degraded Land programs had major impacts in some of the WCA countries.

The **African Market Garden** is a small home garden where several improved vegetable varieties can be grown under drip irrigation developed for smallholder farmers. The technology uses very small quantity of water stored in an overhead tank. This allows families to have access to fresh food during the dry season and

also participate in the local market which will generate additional income. The AMG technology was adopted by many farmers in Mali, Niger, Burkina Faso, Benin and Ghana. Several donors have supported the scaling up and out of this technology and currently several NGO-led projects are transferring this technology to large groups of farmers.

Under the **High Nutrient Fruit Trees** program, tree species were tested, among which, *Ziziphus mauritiana* (named Sahelian apple in Niger) produces very nutritious and large fruits that are rich in vitamin C, potassium, sodium and magnesium. The adapted varieties can produce within two years of planting and the fruits are available in large quantities. Grafting technique was refined and transferred to farmers and as a result several groups of farmers, mainly women associations, have developed nurseries for grafting improved varieties of *Ziziphus*, as well as Moringa and other important Sahelian trees.

The **Farmers of the Future** is an initiative to engage young students from schools to become trainers for the families. This has been an important event in many villages where school students have been training their parents in grafting techniques, irrigation etc. Dr Dar personally visited some of the farmers of the future villages in Niger and encouraged the families to increase investments in these technologies to diversify their income

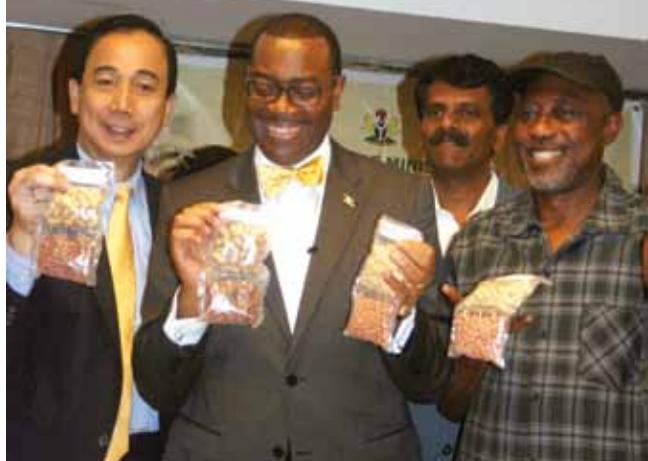
The research on how to restore degraded land provided to women farmers, enabled them to get immediate return from the process of degraded land restoration. The half-moon technology in

a degraded land which involves digging the soil for planting a fast growing tree, and also using the free space by planting annual crops such as *okra*, benefited farmers during the rainy season.

Most of these technologies were promoted through several projects by a number of NGOs in collaboration with ICRISAT and benefited many farmers in several WCA countries

Improved cereals and legumes cultivars to benefit women

For many years, ICRISAT scientists have been developing improved varieties (and hybrids) of pearl millet, sorghum and groundnut in WCA which are grown by the farmers in the region to increase crop productivity and incomes. Dr Dar ensured that ICRISAT's efforts would result in a wide adoption of improved varieties by many farmers. He urged ICRISAT scientists to develop and promote high and stable yielding varieties of sorghum, pearl millet and groundnut that are adapted to the conditions of the farmers, preferred by the end-users, and have multiple uses. The best example of his involvement is the case of sorghum and groundnut projects in Nigeria. He was personally involved in several meetings and discussions with the Government of Nigeria through Dr Akinwumi Adesina, Honorable Minister of Agriculture, to solicit funds for major initiatives in the country. These efforts resulted in the approval and funding of two large projects on boosting sorghum and groundnut production in Nigeria with the main aim of rebuilding the lost groundnut pyramids of the 1970s and making Nigeria self-sufficient in sorghum



Dr William Dar with Nigeria Minister of Agriculture, Dr Akinwumi Adesina, and ICRISAT scientists holding seed packets of improved groundnut varieties.

and groundnut production. An impact of the groundnut project in Nigeria is the adoption of groundnut production for seed, grain and fodder in the dry season.

Aflatoxin detection and management

Aflatoxin research has been on the agenda of the institute for many years with changing research priorities, as this is a much more complex problem than most of the other biotic stresses. Dr Farid Waliyar remembered having discussions with the Director General, Dr William Dar, who was new in the area of aflatoxin, and his many questions which included: *“What is the impact of this technology and how can we promote it? What is the need for more investments? Where should the investment be made?”*

Very quickly some important investments allowed ICRISAT to focus on a few areas, particularly in refining the ELISA test for detection of aflatoxins in groundnut and groundnut byproducts. The ELISA technology existed in the market, but it was too expensive. Therefore, producing our own test kit led to a very significant reduction the cost of testing per sample.

Dr Dar's role was not confined to encouraging us to have the best technologies, but also in guiding the research team in partnering with the private sector and the NARS in technology transfer and adoption. His role in communicating ICRISAT technologies helped in increasing awareness, establishing contacts with new partners, and sensitizing the donor community on the aflatoxin problem.

"We have put another strong weapon in the hands of poor farmers to fight a problem that was making it particularly hard for African agricultural products to get fair treatment in international markets. The test uses what scientists call an enzyme-linked immunosorbent assay or ELISA test to rapidly detect the presence of aflatoxin," said Dr Dar. Today the technology is widely used by NARS, NGOs and many other development agencies to estimate aflatoxin level in groundnuts and other crops such as maize.

Enhanced impacts through IMOD

Dr William Dar has been instrumental in increasing the impact of ICRISAT's

research for development activities in West and Central Africa. His relentless efforts in mobilizing resources to support the work in the region are greatly acknowledged by the ICRISAT staff as well as by key stakeholders and partners.

For the next few years a number of technologies are expected to create significant impacts in addressing poverty reduction and food security concerns of WCA. This will be brought to the next level by the Inclusive Market-Oriented Development (IMOD) approach, towards the realization of Dr Dar's vision of sustainable growth in the drylands. ■



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