

Prof M S Swaminathan

Contributions to Food, Ecological
And
Livelihood Security

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And
Livelihood Security

Statement of earlier nomination for the Nobel Peace Prize

NOMINEE

Dr. M. S. SWAMINATHAN
President, M.S. Swaminathan Research Foundation.
Third Cross Street, Taramani Institutional Area.
Chennai 600 113, India
Tel. 91 44 235 1698/0698. fax 91 44 235 1319
E-mail Msswami@mssrf.res.in

I. OVERVIEW

Dr. M.S. Swaminathan has had a long and distinguished career in developing-world agriculture. Given that Dr. Norman Borlaug was awarded the Nobel Peace Prize thirty years ago for his work on the Green Revolution, I consider Dr. Swaminathan is at least as deserving on agricultural grounds alone.

But his impact is more far reaching than crop plant genetics. Virtually alone among agricultural leaders, he has shown that the challenge of feeding developing countries is closely tied in with a number of other crucial factors, notably poverty, women's roles, and the environment. These further factors broaden agriculture to include concepts of food security, basic human needs and social equity. It is in this larger sense that Dr. Swaminathan is much more than an agricultural pioneer. Indeed he ranks as one of the world's finest exponents of human development in its proper broad sense--a purpose that embraces food supplies but extends way beyond agriculture. If he were to be considered for the Nobel Peace Prize, it should be, first and foremost, because of his endeavours as a pre-eminent humanitarian.

For these reasons, Dr. Swaminathan has done much to promote the cause of peace over a period of fully five decades. Although it has not always been recognized as such, "food security" is a key component of security overall. There is abundant evidence from all three main developing regions and especially from Asia, that hunger breeds economic discord and social strife, leading to political upheaval and often to outright violence. This was acknowledged by the Nobel Peace Prize Committee in 1971 when it selected Dr. Norman Borlaug.

Dr. Swaminathan's international standing has been reflected by a series of front-rank appointments such as the Chairmanship of the Food and Agriculture Organization's Council and of the Board of the Ford Foundation. His reputation has been similarly reflected by international awards such as the World Food Prize, the Tyler Environment Prize, the Blue Planet Prize, the UNEP Environment Prize and the Honda Prize. In India he has been presented with the Ramon Magsaysay Award for Community Leadership, the first time given for serving the cause of women in development; and he has received the first award for women's empowerment from the International Association of Women in Development. His 1980s work in the Philippines led to his being awarded the Golden Heart Award by President Corazon

Aquino, the only such award made during her presidency. Among other forms of recognition are the Padma Shri, Padma Bhusham and Padma Vibhusham Awards, presented by the President of India and ranked as the highest civilian awards in India. He has received 35 honorary doctorate degrees, and he has been elected to eight national academies of science.

II. AGRICULTURE

Dr. Swaminathan is widely recognized as the architect of the original Green Revolution in India. While working at the Indian Agricultural Research Institute during 1954-72, while Director-General of the Indian Council of Agricultural Research during 1972-79, while Principal Secretary of the Ministry of Agriculture 1979-80, and while responsible for Agriculture under the National Planning Commission during 1980-82, he led the way in introducing high-yielding varieties of rice and wheat. He did more than any other individual to stave off major food shortages and famine in India at a time when its population was soaring from 420 million to 710 million people within just 25 years. In fact, India moved from being the country with the largest food deficit to becoming self-sufficient in food.

Swaminathan's work also started the agricultural advances that subsequently spread right across Southern and Southeast Asia. In 1965, rice production in the 18 Asian countries that grew and consumed most of the world's rice was 233 million tonnes; by 1986 that figure had climbed to 432 million tonnes, a rise of 84 percent in just over two decades. He further promoted these advances during his period as Director General of the International Rice Research Institute in the Philippines. It is not going too far to say that as Swaminathan's strategies for agriculture and associated sectors become still more widespread throughout Asia and other developing regions, we may eventually find that he has saved more people from hunger than any other individual.

Little wonder that in 1971 Dr. Norman Borlaug paid tribute while accepting the Nobel Peace Prize: "A great deal of my credit must go to Dr. Swaminathan. Without him, it is quite possible there would not have been a Green Revolution in Asia." Similarly, in 1987 Dr. Javier Perez de Cuellar, then Secretary-General of the United Nations, declared "Dr. Swaminathan is a living legend. His contributions to agricultural science have made an indelible mark on food production in India and elsewhere in the developing world. By any standards, he will go into the annals of history as a world scientist of rare distinction."

III. FOOD SYSTEMS

While pioneering the Green Revolution across tropical Asia, Swaminathan was already seeking to expand it into an Evergreen Revolution. This meant emphasis on the environmental underpinnings of agriculture: soils, water, natural nutrients, biodiversity and climate. In fact, as far back as 1968 Swaminathan was urging the introduction of environmentally sustainable strategies to go alongside the technologies of the Green Revolution. He highlighted the need for three vital contributions: nutrient supplies of organic as well as inorganic kinds; integrated pest management with reduced dependence on synthetic pesticides; and science-based management of

Where hunger rules, peace cannot prevail

M S Swaminathan and a Hunger-Free World

"Sweet Peace, where dost thou dwell?

I humbly crave,

Let me once know.

I sought thee in a secret cave,

And ask'd, if Peace was there,

A hollow wind did seem to answer, No:

Go seek elsewhere.

At length I met a rev'rend good old man:

Whom when for Peace

I did demand, he thus began:

....

"Take of this grain, which in my garden grows,

And grows, for you;

Make bread of it: and that repose

And peace, which ev'rywhere

With so much earnestness you do pursue,

Is only there."

- George Herbert

While awarding the Franklin D. Roosevelt Freedom from Want Medal at Zeeland, Netherlands in May 2000, the Franklin and Eleanor Institute acknowledged Prof Swaminathan's contribution in the following words:

"You have taught nations how to be self-sufficient in their need for food just as you have taught farmers how to develop and enhance the productivity of their land. Your brilliant leadership has established a goal for the new millennium – a hunger free world, an international structure of cooperation among nations, a determination to use the miraculous technology of our times to help those in need."

For over 50 years now, Swaminathan has been waging a relentless struggle against hunger, deprivation and gender inequity. He has been carrying out this mission through the following pathways.

- Ensure adequate **food availability** through attention to improving the productivity, sustainability and profitability of major farming systems.

- Promote food access through increased livelihood opportunities in the farm and non-farm sectors, i.e., promote job-led economic growth.
- Improve the absorption of food in the body through attention to clean drinking water, environmental hygiene and primary health care & education.
- Conserve and enhance the ecological foundations of life such as land, water, forests, biodiversity and the atmosphere.

In all this work, he has promoted community-centred action plans, so that the programmes trigger a self-propelling and self-replicating momentum. In UNDP's Human Development Report of 2001, he explained the principles which led to the widespread impact of his work, an impact which was described in the following words by the Time Magazine in its August 1999 issue where it included **Swaminathan along with Mahatma Gandhi and Rabindranath Tagore (Nobel Laureate in Literature)** as the three most influential Indians among the 20 leading Asians of the 20th Century.

The father of the Green Revolution used his skills in genetic engineering and his powers of persuasion to make famine an unfamiliar word in Asia.

He outlined the three major elements of his strategy for bridging the nutrition divide, which is the most serious form of divide occurring in the world today, in his Plenary Address to the Congress on Right to Food: A Challenge for Peace and Development in the 21st Century" held in Rome in September 2001 (*Annexure A*). He has been an ardent advocate of Food and Development programmes and has been the principal driving force behind the following programmes initiated in India during 2001.

Sampoorn Gramin Rozgar Yojana (Full Rural Employment) – Allocation of 5 million tonnes of wheat and rice by the Government of India.

Grain Banks in tribal areas – 1 million tonnes. His proposals for Food and Urban Waste recycling and composting and Food for Ecological Security of Coastal and Mountain Ecosystems involving the allocation of 4 million tonnes of food grains are likely to be approved soon.

In his foreword to a biography in Tamil on Swaminathan, the President of India wrote:

“Acknowledged as a planetary citizen, Prof Swaminathan is now engaged in mankind's war against poverty, hunger and deprivation”

Swaminathan has been in the forefront of the scientific effort to improve agricultural productivity in **perpetuity**, a phenomenon christened by him as “**ever-green revolution**”

The year 2002 marks the 30th anniversary of the Stockholm Conference on the Human Environment and 10th anniversary of the Rio Earth Summit. Around the world, Swaminathan **has actually demonstrated** how to convert the concept of sustainable development into reality. A recent example is the Iwokrama Rainforest Centre in Guyana, designed by Swaminathan for demonstrating how the world’s unique rainforests can be managed sustainably. He has stressed in his lectures to policy makers in numerous fora that “Where hunger rules, peace cannot prevail”

Pointing out that the famine of food at the level of individuals is more due to a famine of job opportunities, Swaminathan has concentrated on creating opportunities for satisfying self-employment for young women and men. He is the architect of the “**New Deal for the Self-employed**” in India. He promoted the **Biovillage movement** for building the assets of the poor by bringing about a transition from unskilled to skilled work and for adding economic value to the time and labour of women living in poverty. Such women because of multiple burdens on their time are over-worked and under-paid

He has repeatedly stressed that importing food by countries where a majority depend on agriculture for their livelihood will have the same effect as importing unemployment

In his introduction to the Report of the International Commission on Peace and Food, of which he was the Chairman, Swaminathan pointed out “True education is leadership in thought. There are periods in human history when the progress of decades can be accomplished in a few years. We have arrived at one of these great, creative moments. Can the political leadership of all countries seize this moment and convert it into an opportunity for promoting job-led economic growth, rooted in the principles of ecology and equity? Can we make the gender inequity and the coexistence of extreme poverty on the part of a billion children, women, and men, and extreme affluence and unsustainable lifestyles on the part of another billion, an anachronism of the past? Can we foster love of

diversity and pluralism in terms of religion, race, language, colour or political belief? In my view, there are uncommon opportunities now to find the solutions to these basic challenges facing contemporary human society."

In a book written at the end of the last century, he pleaded for public action to end hunger and promote harmony with nature

While awarding the Indira Gandhi Prize for Peace, Disarmament and Development, the International Jury pointed out the Swaminathan's work has led to "ensuring food security to hundreds of millions of citizens in the developing world".

Swaminathan is widely regarded as "the modern day Gandhi", who has revitalised Gandhi's concept of **antyyodaya** (attention to the most deprived) and **sarvodaya** (a win-win situation for all and not winners and losers) in relation to enabling every one to earn their daily bread

While considering him for the 2002 Nobel Peace Prize, the Nobel Peace Prize Committee may like to keep in view the following poem of WH Auden and advice of the Roman Philosopher Seneca.

*"Hunger allows no choice
To the citizen or the police.
We must love one another or die
Defenceless under the night
Our world in stupor lies;
Yet, dotted everywhere,
Ironic points of light
Flash out wherever the Just
Exchange their messages;
May I, composed like them
of Eros and of dust,
Beleaguered by the same
Negation and despair,
Show an affirming flame."*

- W H Auden

*A hungry people listens not to reason nor cares for justice,
nor is bent by any prayers.*

- Roman Philosopher Seneca



सत्यमेव जयते

राष्ट्रपति

भारत गणतंत्र

PRESIDENT
REPUBLIC OF INDIA
MESSAGE

Renowned agriculture scientist, Prof. Swaminathan has been working with dedication since 1947 for the agricultural development of our country by harnessing both traditional and frontier technologies. He has been consistently remaining in the forefront of India's quest for food security on a sustainable basis. I recall that in 1964 the first thing Shri C. Subramaniam did after assuming office as Union Agriculture Minister was to call for a meeting of the agriculture scientists. Prof. M.S. Swaminathan was one of them who attended that very first meeting which launched "green revolution" in our country. Acknowledged world wide for his outstanding scientific work, he has significantly contributed to the practical application of agricultural science for higher yield of food grains and for ecological security. Hailed as a pioneer for converting scientific know-how to field level do-how, his original strategies such as the organization of National Demonstrations in the fields of small farmers, Lab to land and Land to lab programmes, whole village or watershed operational research projects, Krishi Vigyan Kendras and eco-technology centers have helped our nation to avoid the frightening prospects outlined by Malthuse more than two centuries back.

While ensuring accelerated agricultural growth through applications of science and technology Prof. Swaminathan has been relentlessly focusing attention



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PRESIDENT
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on ecological conservation and on gender and social equity. This integrated approach has remained one of the distinguishing aspects of Prof. Swaminathan's original and pathbreaking contributions towards the revolutionary growth of agriculture in our country and indeed the world. He articulated his concerns for ecological security and gender and social equity in 1968 and later continued his mission of giving a gender dimension to our development when he for the first time in the history of Planning in independent India authored a separate Chapter for the Sixth Plan entitled 'Women and Development'. Subsequently he coined the term "ever-green revolution" not only to stress the augmentation of production but also to refashion the whole strategy of "green revolution" to make it pro-environment, pro-women and pro-poor. His approach in pioneering "ever-green revolution" is at the very heart of what is now called the sustainable agriculture.

Acknowledged as a planetary citizen, Prof. Swaminathan is now engaged in mankind's war against poverty, hunger and deprivation. His phenomenal contributions to institution and capacity building in the field of agricultural research and development have been acclaimed by the Governments of China, North and South Korea, Vietnam, Kampuchea, Myanmar, Sri Lanka, Indonesia,

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MONKOMBU SAMBA SWAMINATHAN
UNESCO
in Eastern
राष्ट्रपति
भारत गणराज्य
PRESIDENT
REPUBLIC OF INDIA

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Malaysia, Thailand, the Philippines, Pakistan, Japan, Australia, Egypt, Tanzania, Madagascar, Ghana and Nigeria. In addition, he helped to build the world's largest research center for rainforest management in Guyana. The Time Magazine aptly chose him as one of the topmost influential Asians of the twentieth century. Dr. Swaminathan has the rare distinction of being awarded coveted International Prizes such as World Food Prize, the Honda Award, the Ramon Magsaysay Award, the Indira Gandhi Prize for Peace, Disarmament and Development.

Smt. Indira Gandhi had once said, "A true leader is one who can take the nation forward. If you are able to do so through agriculture, then you are the greatest leader of them all." I am glad that a biography of such a leader is being brought out in Tamil by Kalaignaan Pathipagam. Earlier his biography had been published in Marathi. I congratulate the publishers on their initiative to bring the life and work of a great son of India to the knowledge of the younger generation. The youth of our country are in urgent need of role models and hence such books are of immense value and importance.

Narayanan K.R.
(K.R. NARAYANAN)

November 15, 2001
New Delhi

MONKOMBU SAMBASIVAN SWAMINATHAN

UNESCO-Cousteau Professor
**in Ecotechnology &
Chairman,
M.S. Swaminathan Research Foundation**

CURRICULUM VITAE

I. Born on 7th August 1925 in Tamil Nadu, India

II. Education

- a) B.Sc. from Travancore University in 1944
- b) B.Sc. Agriculture from Coimbatore Agricultural College, Madras University, 1947
- c) Associateship of the Indian Agricultural Research Institute, New Delhi, in Genetics, 1949
- d) UNESCO Fellow in Genetics at the Agricultural University at Wageningen, The Netherlands, during 1949-50
- e) Ph.D. from the School of Agriculture, University of Cambridge, U.K. in 1952
- f) Research Associate in Genetics at the University of Wisconsin USA during 1952-1953

III. Honorary Degrees - D.Sc. from

- 1) The Sardar Patel University, Vallabh Vidyanagar (1970)
- 2) The Andhra Pradesh Agricultural University, Hyderabad (1971)
- 3) The Andhra University, Waltair (1972)
- 4) The Haryana Agricultural University, Hissar (1973)
- 5) Pant University, Pantnagar (1974)
- 6) Jodhpur University, Jodhpur (1975)

- 7) Marathwada Krishi Vidyapeeth, Parbhani (1975)
- 8) Kumaon University, Nainital (1975)
- 9) Burdwan University, Burdwan (1976)
- 10) Agra University, Agra (1978)
- 11) Kerala Agricultural University, Trichur (1978)
- 12) Sri Venkateshwara University, Tirupati (1979)
- 13) University of Agricultural Sciences, Bangalore (1980)
- 14) Banaras Hindu University, Varanasi (1981)
- 15) Technical University of Berlin, Berlin (West) (1981)
- 16) Mahatma Phule Agricultural University, Rahuri (1982)
- 17) Chandrasekhara Azad Agricultural University, Kanpur (1983)
- 18) University of Wisconsin, Madison, Wisconsin, U.S.A (1983)
- 19) Delhi University, Delhi (1984)
- 20) University of the Philippines, Diliman, Quezon City, Philippines (1984)
- 21) Asian Institute of Technology, Bangkok, Thailand (1985): Doctorate of Technology
- 22) University of Mangalore, Mangalore (1986)
- 23) University of Hyderabad, Hyderabad, (1987)
- 24) Agriculture University, Wageningen, The Netherlands (1988)
- 25) Assam Agricultural University, Jorhat, Assam (1988)
- 26) Oregon State University, Corvallis, Oregon State, U.S.A (1988)
- 27) Tamilnadu Agricultural University, Coimbatore (1989)
- 28) Rajasthan Agricultural University, Bikaner (1989)
- 29) Indian Agricultural Research Institute, New Delhi, (1989)
- 30) Pondicherry University, Pondicherry (1989)

- 31) University of Tuscia, Viterbo, Italy (1990)
- 32) North Eastern Hill Univeristy, Shillong (1991)
- 33) University of Bologna, Italy (1992)
- 34) Punjab Agricultural University, Ludhiana (1994)
- 35) Indian Institute of Technology, Madras (1997)
- 36) Hemvati Nandan Bahuguna Garhwal University, Garhwal, UP (1997)
- 37) The Hebrew University of Jerusalem, Israel (1998)
- 38) University of Calcutta, Calcutta (1998)
- 39) Kakatiya University, Andra Pradesh (2000)
- 40) University of Massachusetts, USA (2001)
- 41) Dr Panjabrao Deshmukh Krishi Vidyapeeth, Akola (2001)
- 42) Gujarat Agricultural University, Ahmedabad (2002)
- 43) University of Bonn, Germany (2002)
- 44) Bidhan Chandra Krishi Viswavidyalaya, West Bengal (2003)
- 45) Soka University, Japan (2003)

IV. Professional Profile

A. Positions Held

- a) Teacher, Researcher and research administrator at the Central Rice Research Institute, Cuttack and at the Indian Agricultural Research Institute, New Delhi (1954-72)
- b) Director General, Indian Council of Agricultural Research and Secretary to the Government of India, Department of Agricultural Research and Education (1972-79)
- c) Principal Secretary to the Government of India, Ministry of Agriculture and Irrigation (1979-80)
- d) Acting Deputy Chairman, Planning Commission, Government of India. (April-June, 1980)

- e) Member (Agriculture, Rural Development, Science and Education) Planning Commission, Government of India (June 1980-April 1982)
- f) Director General, International Rice Research Institute (IRRI) Los Banos, Philippines, (April 1982-January 1988)
- g) Chairman, M S Swaminathan Research Foundation (1989 onwards)
- h) UNESCO Chair in Ecotechnology (1994 onwards)

B. Honorary Positions in International Committees/ Organisations

- a) Vice Chairman, Technical Advisory Committee to the Consultative Group on International Agricultural Research (CGIAR) (1971-77)
- b) Vice Chairman, Protein-Calorie Advisory group of United Nations, (1972-77)
- c) Chairman, Committee of the Whole, UN Conference on Desertification, Nairobi (1977)
- d) Chairman, U.N. Advisory Committee on Science and Technology for Development (1980-83)
- e) President, International Federation of Agricultural Research Systems for Development (IFARD) (1976-1983)
- f) President, International Bee Research Association (IBRA) (1978-1990)
- g) Independent Chairman, FAO Council (1981-1985)
- h) Member, Scientific and Technical Advisory Committee, Tropical Diseases Research, World Health Organisation (1983-1985)
- i) Chairman, Governing Board, CAB International (1991-94)
- j) Andrew D. White Professor-at-Large of the Cornell University, United States of America (1989-95)
- k) Trustee of the Ford Foundation (1989-97)
- l) Chairman of the Global Hunger Project (1994-2000)
- m) Founder Chairman of the Trustees of the Iwokrama International Centre for the Sustainable Management of Rainforests, Guyana (1992-99)
- n) Member, China International Council for Sustainable Development (1992-2002)

- o) Chairman, Genetic Resources Policy Committee of the Consultative Group on International Agricultural Research (1994-2002)

C. Honorary Positions in organizations devoted to Nature Conservation and Sustainable Development

- a) Founder Member and later Chairman of the Board of Trustees of the International Council for Research on Agro-forestry (1977-1982)
- b) Founder-Chairman, Society for the Promotion of Wasteland Development, India (1982-86)
- c) Chairman, Advisory Panel on Environment, Forestry and Food Security of the World Commission on Environment and Development (1984-1986)
- d) Trustee, World Resources Institute (1985-1994)
- e) Chairman, Editorial Advisory Panel for the World Resources Report (1986-1998)
- f) Trustee, Better World Society (1986-1992)
- g) Honorary Vice-President, World Wild Life Fund International (1985-1987)
- h) President, International Union for the Conservation of Nature and Natural Resources (1984-1990)
- i) President, International Society for Mangrove Ecosystems (1990-1993)
- j) President, World Wide Fund for Nature-India (1989-1996)

V. Recognition by Scientific Academies

- a) Fellow of the Indian Academy of Sciences (F.A.Sc.) (1957)
- b) Fellow of the Indian National Science Academy (FNA) (1962)
- c) Honorary Fellow of the National Academy of Sciences, India (1976)
- d) General President, Indian Science Congress, Waltair (1976)
- e) Honorary Fellow of the Swedish Seed Association, Sweden (1971)
- f) Fellow of the Royal Society of London (FRS) (1973)
- g) Foreign Associate, National Academy of Sciences of the United States (1977)

- h) Foreign Member, All-Union Academy of Agricultural Science, USSR (1978); Russian Academy of Agricultural Sciences (1992)
- i) Founding Fellow, Third World Academy of Sciences (1983)
- j) President, XV International Congress of Genetics, New Delhi (1983)
- k) Foreign Member, Royal Swedish Academy of Agriculture and Forestry (1983)
- l) Foreign Honorary Member, National Academy of Arts and Sciences, Massachusetts (1984)
- m) Foreign Fellow, National Academy of Sciences of Italy (Accademia Nazionale delle Scienze della Dei XL - 1985)
- n) Fellow of the Royal Society of Arts, London (1985)
- o) Honorary Research Professor of the Chinese Academy of Agricultural Sciences (1987)
- p) Honorary Research Professor in Genetics of the Chinese Academy of Sciences (1987)
- q) Fellow, European Academy of Arts, Sciences and Humanities (1988)
- r) Fellow, Bangladesh Academy of Sciences (1992)
- s) International Member of the American Association for the Advancement of Science (1992)
- t) President, National Academy of Sciences, India (1988-90)
- u) President, National Academy of Agricultural Sciences, India (1991 - 1996)
- v) Corresponding Member, Accademia dei Georgofili, Italy (1994)
- w) Fellow of the Linnean Society of London (1994)
- x) Fellow of the American Association for the Advancement of Science (1994)
- y) Honorary Fellow of the Crop Science Society of America & the American Society of Agronomy (1996)
- z) Vice-President, XVIII International Congress of Genetics, Beijing (1998)
- aa) Honorary Fellow of Association of Aquaculture (1998)
- bb) Fellow, Madras Science Foundation (1999)

- cc) Fellow, Indian Society for Plantation Crops (2000)
- dd) Honorary Member of the World Innovation Foundation (2002)

VI. National Scientific Awards

- a) Shanti Swarup Bhatnagar Award for contributions to Biological Sciences (1961)
- b) Birbal Sahni Medal of the Indian Botanical Society for contributions to Applied Botany (1966)
- c) Silver Jubilee Commemoration Medal of the Indian National Science Academy for contributions to genetics and agricultural research (1971)
- d) Barclay Medal of the Asiatic Society for contributions to genetics (1978)
- e) Moudgil Prize for contributions to standardisation (1978)
- f) Borlaug Award (1979)
- g) Meghnad Saha Medal of the Indian National Science Academy (1981)
- h) Rathindranath Tagore Prize of Visva Bharati University (1981)
- i) R.D. Misra Medal of the Indian Environmental Society (1981)
- j) "Krishi Ratna" Award for serving the farming community by the Bharat Krishak Samaj/World Agriculture Fair Memorial Trust Society (1986)
- k) Dr. J.C. Bose Medal, Bose Institute (1989)
- l) Lal Bahadur Shastri Deshgaurav Samman (1992)
- m) Jawaharlal Nehru Birth Centenary Award of the Indian Science Congress Association (1992)
- n) Charles Darwin International Science and Environment Medal (1993)
- o) Dr. B.P. Pal Medal for unique contributions to agricultural research and development of the National Academy of Agricultural Sciences, India (1997)
- p) V. Gangadharan Award for outstanding contributions to National Development (1997)
- q) B.P. Pal Memorial Award of the Indian Science Congress Association (1998)

- r) Shatabdi Puraskar in the field of Agricultural Sciences of the Indian Science Congress Association (1999)
- s) Prof P N Mehra Memorial Award (1999)
- t) Legend in his Lifetime Award by the World Wilderness Trust (1999)
- u) Asutosh Mookerjee Memorial Award for 1999-2000 by the Indian Science Congress Association
- v) Indira Gandhi Prize for Peace, Disarmament and Development (2000) – for his outstanding contribution, in the domain of plant genetics and ensuring food security to hundreds of millions of citizens in the developing world.
- w) Millennium Alumnus Award by the Tamil Nadu Agricultural University (2000)
- x) Millennium Scientist Award by the Indian Science Congress Association (2001)
- y) Lokmanya Tilak Award by the Tilak Smarak Trust, Pune (2001)

VII. Awards by the President of India

- a) Padma Shri (1967)
- b) Padma Bhushan (1972)
- c) Padma Vibushan (1989)

VIII. International Awards

- a) Mendel Memorial Medal of the Czechoslovak Academy of Sciences for contributions to Plant Genetics (1965)
- b) Ramon Magsaysay Award for Community Leadership (1971) : in recognition of contributions, as "Scientist, educator of both students and farmers, and administrator towards generating a new confidence in India's agricultural capability"
- c) Bennett Commonwealth Prize of the Royal Society of Arts (1984) for contributions to household nutrition security
- d) Bicentenary Medal of the University of Georgia, U.S.A. (1985)
- e) Albert Einstein World Science Award by the World Cultural Council (1986)

- f) Award for serving the cause of Women in Development (1985) : First recipient of the Award instituted by the Association for Women in Development, Washington, D.C., United States, for "outstanding contributions to activities which foster development for women"
- g) First World Food Prize : On October 6, 1987, Dr. Swaminathan received the First World Food Prize at the Smithsonian Institution in Washington D.C. This prize is the foremost international award to recognize, encourage and reward outstanding individual achievement in improving the world food supply. The prize was instituted in 1986 for serving as the "equivalent of a Nobel Prize in the field of food and agriculture"
- h) The Golden Heart Presidential Award : On 10 November 1987, Her Excellency Corazon C. Aquino, President of the Republic of the Philippines, conferred on Dr. Swaminathan the Golden Heart Presidential Award in recognition of his "contribution in resolving a wide range of problems in basic and applied genetics and agricultural research and development in the Philippines, for his accomplishments in the area of agricultural science and research highly beneficial to Philippino farmers and for having expanded considerably IRRI's capacity for upstream research to bring to all the Asian rice farmers the fruits of recent advances in science and technology"
- i) In recognition of Dr. Swaminathan's contributions to the research, training and technology transfer programmes of the International Rice Research Institute (IRRI), the Board of Trustees named the Training and Technology Transfer Building of the Institute as "M.S. Swaminathan Hall". The IRRI Trustees also established a special fund for providing scholarships in the name of Dr. M.S. Swaminathan for candidates who wish to do research in the area of women in rice farming systems. This is in recognition of his services to the cause of women in agriculture
- j) Commandeur of the Order of the Golden Ark of the Netherlands (1990): Appointed to this order to honour special services rendered to the conservation of the flora and fauna in the world
- k) The Tyler Prize for Environmental Achievement : Awarded the 1991 Tyler Prize in recognition of life-long contributions to increasing biological productivity on an ecologically sustainable basis and to promoting the conservation of biological diversity
- l) Honda Prize of the Honda Foundation, Tokyo, Japan in 1991 for outstanding services to the development of eco-technologies in the field of agriculture
- m) Asian Regional Award by the Asian Productivity Organisation (1994) for contributions to the improvement of agricultural productivity in Asia

- n) UNEP - Sasakawa Environment Prize, 1994 for outstanding global contribution to the management and protection of the environment and to conservation and sustainable development
- o) World Academy of Art and Science, 1994 - Special Award for exceptional contributions to global civilisation and leadership in *thought* that leads to *action*
- p) Global Environmental Leadership Award-1995 by the Climate Institute, Washington, DC, USA, for encouraging village level responses to environmental issues
- q) *China* : 1997. "Highest award for International Cooperation on Environment and Development, for outstanding contributions to the lofty cause of environmental protection and development, and for his signal accomplishments in the field of international cooperation"
- r) *France* : 1997. *Ordre du Merite Agricole* created in 1883 to honour persons having rendered services of the highest quality to the cause of agriculture and its development and amelioration
- s) *USA* : 1998. *Henry Shaw Medal* awarded by the Board of Trustees of the *Missouri Botanical Garden* in consideration of important service to humanity through emphasis on sustainability in agriculture
- t) *Sweden / USA* : 1999. *The VOLVO Environment Prize* for his achievements as a plant breeder and administrator which led to dramatic increases in crop yields, his international leadership in agriculture and resource conservation, his deep concern for the poor and disadvantaged, and his continuing research and leadership to ensure that they get the opportunities needed to develop in ways that enhance the natural environment on which they depend.
- u) *France* : 1999. *UNESCO Gandhi Gold Medal* for his outstanding work in extending the benefits of biotechnology to marginalized and poverty-stricken populations in developing countries, and in securing a sound basis for sustainable agricultural, environmental and rural development.
- v) Franklin D Roosevelt Four Freedoms Award by the Franklin and Eleanor Roosevelt Institute (2000) "for brilliant leadership that has established a goal for the new millennium – a hunger free world, an international structure of cooperation among nations, a determination to use the miraculous technology of our times to help those in need; for dynamism and compassion that have given new meaning to Franklin D Roosevelt's commitment to a better world where all nations will understand and strive for Freedom from want".
- w) Planet and Humanity Medal of the International Geographical Union (2000) for significant contribution to environmentally relevant issues.

- x) The Economic Times Awards for Corporate Excellence – Lifetime Achievement (2002) for nurturing a revolution in a highly conservative sector, for laying the foundation for food security, and for using biodiversity for sustainable prosperity.
- y) *Japan*: Toda Award for Peace Achievement, Japan, for contributions to wide-ranging and inter-related concerns as the eradication of poverty, preserving regional ecosystems, promoting technological innovation and research for sustainable agriculture.

IX. Major Scientific Contributions

Has worked in collaboration with colleagues and students on a wide range of problems in basic and applied plant genetics, agricultural research and development and the conservation and enhancement of natural resources over a period of 50 years. Among the more important contributions are:

- a) elucidation of the origin and differentiation of potato species (1952);
- b) Improving the yield potential of *indica* rice through crosses between *indica* and *japonica* varieties (1954);
- c) standardisation of techniques for the induction of polyploidy (i.e., doubling the number of chromosomes) in several economic plants, including tuber-bearing *solanum* species (1950);
- d) accomplishment of difficult crosses in potato species, resulting in alien gene transfer for frost resistance (1953);
- e) elucidation of the factors influencing the induction and recovery of mutations in wheat and rice and elaboration of the relationships between the secondary effects of food irradiation and the assessment of the wholesomeness of irradiated food (1958);
- f) understanding of genetic relationships among wheat species (1960);
- g) identification of the barriers to high yields in wheat and the initiation of the wheat breeding programme involving the "Norin" dwarfing genes obtained from Mexico (1963);
- h) initiation of a rice breeding programme designed to transfer the non-lodging plant type to **basmati** strains (this led ultimately to the release of Pusa Basmati) (1965);
- i) development of the concept of "crop cafeterias", "mid-season corrections in crop-scheduling", risk distribution agronomy and alternative cropping strategies for different weather conditions (1966);

- j) purposeful manipulation of genes in improving the yield, quality and stability of performance of wheat, rice and potato(1949 – 1989);
- k) development of whole village or watershed operational research projects based on principles of ecology and economics and promotion of the concepts of ecological economics and economic or developmental ecology(1972);
- l) development of disaster management strategies based on relief and rehabilitation measures in the most seriously affected (MSA) areas, and improved crop productivity in the most favourable (MFA) areas, and elaboration of the concepts of "drought code" and "good weather code"(1975);
- m) management of the disastrous drought of 1979 as Secretary to the Government of India in the Ministry of Agriculture and Development of a scientific Monsoon Management Strategy(1979);
- n) collection and conservation of plant genetic resources, particularly of potato, rice, wheat and mangrove species (1949 onwards);
- o) development of the National Demonstration, Lab to Land programmes and whole village, watershed operational research projects for the effective field testing and dissemination of research results among small farmer households(1964);
- p) organisation of coastal systems research and biovillages(1990);
- q) organisation of Genetic Resources Centres for Sustainable agriculture and for adaptation to sea level rise(1991);
- r) promotion of a job-led economic growth strategy based on a pro-nature, pro-poor and pro-women orientation to technology development and dissemination(1992);
- s) Organisation of Resource Centres for Farmers' Rights and Ecotechnology(1993);
- t) Organisation of Biovillages and Community Centred natural resources management strategies (1993);
- u) Establishment of computer-aided and internet connected Rural Knowledge Centres (1997);
- v) Organising a Community Gene, Seed and Grain management strategy, involving concurrent attention to conservation, sustainable use and equitable sharing of benefits(1998).

The results of the above research studies and extension efforts have been published in over 500 scientific papers in national and international journals as well as in several books.

X. Contributions to Education and Extension

Over 68 students have done their Ph.D thesis work under the guidance of Dr. Swaminathan. In 1972, he introduced the "Techniracy" concept of imparting training in the latest technical skills entirely through work experience, in order to bypass the problems created by illiteracy and fostered the establishment of a chain of Krishi Vigyan Kendras (Farm Science Centres) for this purpose by the Indian Council of Agricultural Research. He also initiated the Lab to Land Programme and the whole village operational Research Projects, when he was the Director General of ICAR.

XI. During 1980-2002, Dr. Swaminathan chaired the following National Committees set up by the Government of India

- a) Expert Group on programmes for the alleviation of poverty
- b) Task force for the study of eco-development in the Himalayan Region
- c) Task Force for developing an eco-development plan for Goa
- d) Committee for the development of water resources of Western Ghats
- e) Expert Group on perishable agricultural commodities
- f) Study Group on fuel wood requirements
- g) Working Group on control of blindness (1981)
- h) Working Group on control of leprosy (1981)
- i) Chairman, Science Advisory Committee to the Cabinet of India (1980-82)
- j) Chairman, National Biotechnology Board (1981-82)
- k) Member, National Commission on Agriculture (1971-77)
- l) Chairman, Steering Committee for Environment and Forestry of the Planning Commission (1988-89)
- m) Chairman, Core Committee for the preparation of a National Environment Policy, Ministry of Environment and Forests, Government of India (1989-90)
- n) Chairman, High Level Committee for the review of the Central Ground Water Board (1989-90)

- o) Chairman, Expert Group for the preparation of a draft national population policy (1993-94)
- p) Chairman, Government of India Committee for Research on Agricultural Exports in the context of the World Trade Agreement (1994 -97)
- q) Chairman, Government of India Committee on Remedying Regional Imbalances in Agriculture (1996-98)
- r) Chairman, Committee to restructure agricultural education (1996-97)
- s) Chairman, Committee to draft a National Biodiversity Act (1998)
- t) Chairman, Tenth Plan Steering Committee in the area of Agriculture and allied sectors (2000-2001)

XII. Tributes

Dr. N.E. Borlaug

On the occasion of his receiving the Nobel Peace Prize in 1970, Dr. Borlaug wrote, "The green revolution has been a team effort and much of the credit for its spectacular development must go to Indian officials, Organisations, Scientists and farmers. However, to you, Dr. Swaminathan, a great deal of the credit must go for first recognising the potential value of the Mexican dwarfs. Had this not occurred, it is quite possible that there would not have been a green revolution in Asia".

Secretary General of the United Nations

On the occasion of the presentation of the First World Food Prize to Dr. Swaminathan in October 1987, the Secretary General of the United Nations, Mr. Javier Perez de Cuellar wrote, "*Dr. Swaminathan is a living legend. His contributions to Agricultural Science have made an indelible mark on food production in India and elsewhere in the developing world. By any standards, he will go into the annals of history as a world scientist of rare distinction*".

XIII. Present Honorary Positions (2001)

- a) Chairman of the M.S. Swaminathan Research Foundation established with the funds associated with the World Food Prize.
- b) UNESCO-Cousteau Professor in Ecotechnology for Asia

List of Scholars who worked for their Ph.D degree under the guidance of Prof M S Swaminathan

- c) Trustee, Board of Trustees, National Foundation for India
- d) Chairman, Maharashtra Agriculture Commission
- e) Chairman, Kerala Commission WTO Concerns in Agriculture
- f) Chairman, Jharkhand Agriculture Reforms, Research & Development Commission
- g) Vice-Chairman, Tamil Nadu Planning Commission
- h) Chairman, Pugwash Conferences on Science and World Affairs
- i) Chairman, Global Steering Committee for the Fish-for-All Initiative (ICLARM)
- j) Co-Chair, Inter-Academy Council Panel on Technology and Agricultural Productivity in Africa.
- k) Co-Chair, Panel on the elimination of hunger, UN Millennium Goals Task Force.

List of Scholars who worked for their Ph.D degree under the guidance of Prof M S Swaminathan

1. A T Natarajan (1958, Delhi) Cytogenetical studies in some crop plants with special reference to induction of mutations.
2. S Bhaskaran (1959, Delhi) I. Studies on the effects of mutagens on wheat and barley with special reference to the relationship between polyploidy and radiosensitivity. II. Polyploidy and the genesis of the leguminous root nodules.
3. K A Patel (1959, Vallabhbai Vidyapeeth). I. Cytogenetical studies and mutation studies in tobacco. II. Studies on cytogenetical effects of some vegetable and mineral oils.
4. D Jagathesan (1960, Delhi) Studies on the induction of mutations in wheat and cotton.
5. C R Bhatia (1960, Indian Agricultural Research Institute (IARI), New Delhi) Evaluation of utility of radiation induced mutations in wheat breeding.
6. Miss Satya Nirula (1961, IARI) The effects of ultraviolet pre-treatment and some biological factors on the frequency and spectrum of mutations induced by radiations in wheat and sorghum.
7. M C Prabhakara Rao (1962, IARI) A cytogenetical evaluation of the phylogenetic relationships among the hexaploid *Triticum* species.
8. Mrs Kanta Sacher (1962, IARI) Studies on interspecific hybridization in the genus *Corchorus*
9. S K Banerji (1963, IARI) Studies on the maximisation of the induced mutation frequency in wheat.
10. M D Upadhyaya (1963, IARI) Cytogenetical and cytochemical studies in some members of *Triticinae*
11. A K Gupta (1963, IARI) Studies on the induction of polygenic variation in *Brassica campestris*.
12. M P Singh (1965, IARI) Studies on induced mutations and monosomic analysis as applied to problems in wheat breeding.
13. R K Mehta (1965, IARI) Breeding potentialities of tetraploid berseem with special reference to regeneration and seed setting.
14. Miss Puloma A, Desai (1965, IARI) The frequency and spectrum of mutations induced by physical and chemical mutagens in *Triticum durum*

15. R Krishnaswami (1965, IARI) The relationship between response to radiations and nature of polyploidy in some crop plants.
16. J V Goud (1965, IARI) Studies on the frequency and spectrum of viable and micromutations induced by some physical and chemical mutagens in varieties of bread wheat.
17. P S Bhatnagar (1965, IARI) Study of induced polygenic variability in wheat and barley.
18. J K Chandra (1965, IARI) Frequency and types of mutations induced by chemical mutagens and ionizing radiations in wheat.
19. T Srinivas (1966, IARI) Cytogenetic analysis of the Q locus in wheat
20. P C Kesavan (1966, IARI) Indirect effects of radiations and their applied significance.
21. G Varughese (1966, IARI) Induction of mutations in dwarf wheat
22. E A Siddiq (1967, IARI). Induced mutations in relation to the breeding and phylogenetic differentiation of *Oryza Sativa*.
23. O P Govilla (1967, Aligarh) Studies on interspecific incompatibility barriers in the genus *Gossypium*
24. J A Siddique (1968, Aligarh) Interspecific transfer of characters in *Gossypium* and intraspecific differentiation studies in *G. arboreum*.
25. R A Pai (1968, Agra) Effect of radiations on crossing over.
26. M V R Prasad (1968, IARI) Studies on induced mutations in *Triticum* species
27. Virendra Kumar (1968, Delhi) Cytogenetical studies on trans-Himalayan genera of the tribe polygonate of *Liliaceae*
28. R P Sharma (1968, Agra) Genetic studies of the combined effect of physical and chemical mutagens.
29. M P Jha (1969, IARI) Location of genes for rust resistance and dwarfing in the wheat varieties Sonora 64 and Lerma Rojo.
30. M G Joshi (1969, IARI) Genetic affinities and extent of divergence among tetraploid *Triticum* species and their subspecies.
31. H C Bansal (1969, Sardar Patel University) Studies on the induction of mutations with special reference to biochemical traits in chilli and polygenic characters in wheat and barley.

32. Mrs Chanchal Sarin (1969, Rajasthan) Studies of the multi-valent suppressor gene system present on chromosome 5B of *Triticum aestivum*
33. Mrs Rehana Majid (1969, Aligarh) Studies on the induction of mutation in some species of *Lycopersicon*
34. C B Singh (1970, IARI) Studies on sub-specific differentiation of *Oryza sativa*
35. Y S Nerkar (1970, IARI) Studies on induction of mutation in *Lathyrus sativa* with special reference to elimination of neurotoxic principle.
36. N P Mehta (1970, IARI) Studies on breeding of branched ear ideotype in wheat
37. B N Samolo (1971, IARI) Induction of mutations in bread wheat and study of genetics of some induced mutants.
38. S S Rajan (1971, BHU) Cytogenetical studies in linseed.
39. N P Sharma (1971, IARI) Studies on the planned alteration of the spectrum of induced mutations in barley.
40. Dayanad (1971, Agra) Response of some varieties of wheat sown late to different forms of nitrogen, seed treatments and soil covers.
41. S P Sharma (1972, IARI) Studies on genetic improvement and agricultural potential of hexaploid triticales.
42. R P Singh (1972, Agra) Studies on efficiency and economics of fertilizer use for major kharif and rabi crops grown under rainfed conditions.
43. M A E Ismail (1972, IARI) Studies on variability for protein content generated by mutation and recombination breeding in rice.
44. H K Singh (1973, Punjab) Agronomic and economic evaluation of some intensive cropping patterns involving fodder and feed crops
45. K Anand Kumar (1973, IARI) induced variation for protein characteristics in wheat and *sorghum*
46. S Bala Ravi (1973, IARI) starch and protein characteristics of rice in relation of phylogeny.
47. K U Nampoothiri (1973, IARI) Bio-systematic studies in *Cocos nucifera* L
48. R N Swahney (1973, Agra) Genetic analysis of rust resistance and some qualitative characters in wheat.

49. B C Joshi (1973, Agra) Aneuploid analysis of chromosome pairing and resistance to rust in *Triticum*
50. K S Parmer (1974, Sardar Patel University) Studies of problems in producing hybrid rice and mutational rectification of some undesirable traits of three tall popular varieties of rice (*oryza sativa* L)
51. S Chowdhury (1975, Calcutta) Genetic reconstruction of ideotype in *Triticum aestivum* L
52. V P Singh (1976, Agra) Studies on the Genetics of spontaneous and induced dwarf mutations in *oryza sativa* L
53. R D Iyer (1976, Bihar) Production and evaluation of inter-specific hybrids, trisomics and mutants in jute.
54. R K Singh (1976, Bihar) Mutation studies in jute, *Corchorus sp*
55. G N Kar (1977, Bihar) Mutational reconstruction of wheat ideotype.
56. Narendra Gupta (1978, IARI) Induction and isolation of mutations in *Triticum* species
57. K P S Chauhan (1982, Delhi University) Studies on the impact of ageing on viability and cytogenetic behaviour of seed and some crop plants.
58. Bui Ba Bong (1991, IARI, New Delhi) studies on mechanism to enhance hybrid seed production in rice *oryza sativa* L
59. N Subramonian (1995, Madras) Studies on Genetic Diversity in some *Rhizophora* species.
60. P Balakrishna (1995, Osmania University) Genetic, physiological and molecular basis of salt tolerance in *oryza sativa* L and *Porteresia coarctata* Tateoka
61. M Jayanthi (1997, University of Madras) Saving endangered plants : A case study on *Crotalaria longipes* Wight & Arn.
62. C Srinivasa Rao (1998, Osmania University) Studies on Clonal Propagation of some Indian Mangroves and Species Differentiation in the Genus *Rhizophora*.
63. K Narender (1998, Osmania University). Environment Vs. Development of Narmada Valley Project.
64. M Lakshmi (1999, University of Madras) Genetic Diversity in Mangrove species of the Family *Rhizophoraceae*

65. Ajith Anand (1999, University of Madras) Studies on genetic diversity, propagation and rehabilitation of a critically endangered tree species: *Syzygium travancoricum* Gamble
66. S Balaji (2000, Forest Research Institute, Deemed University, Dehra Dun). Impact of Interface Forestry Programme on Biodiversity Status in Selected Forest Areas of Tamil Nadu.
67. Latha Rangan (2001, University of Madras), Studies on Propagation, Genetic Relationship and Characterization of salinity tolerance in *Porteresia coarctata* (Roxb.) Tateoka, wild relative of rice.
68. Radha R (2001, University of Madras), Studies on Conservation, Micropropagation and Characterization of Bioactive Secondary Metabolites in some Medicinal Plants.

M.S. SWAMINATHAN

The father of the Green Revolution used his skills in genetic engineering and his powers of persuasion to make famine an unfamiliar word in Asia

By ANTHONY SPAETH

If you travel by land from any Asian metropolis, it doesn't take long to hit a timeless landscape carpeted with fields of rice, wheat, millet or maize.

Whether you're at the terraced rice paddies of Banaue in northern Luzon or the wheat bowl of central China, farmers tend fields as their ancestors did, harvesting grain for their families and countrymen.

But beneath the soil of those seemingly unaltered tableaux is a high-tech invention that changed not only Asia but the world. The seeds planted today by farmers from Punjab to Pusan are nothing like those used by their ancestors. If they were, the entire continent would either be starving or enslaved to the outside world for food or financing.

That turn of history, one of the truly astonishing transformations of the century, is now known as the Green Revolution. It relied heavily on the work of a diminutive Indian geneticist named Monkombu Sambasivan Swaminathan. As godfather of the Green Revolution, Swaminathan, 74, is modest about his own achievements but forthright about his work's impact on his native land and the planet Earth. "Our history," he says, "changed from that time."

Swaminathan, together with colleagues in India and around the world, managed in

AT HIS RESEARCH FOUNDATION IN MADRAS, INDIA, 1998



DILIP MISHRA—CONTACT PRESS IMAGES FOR LE FIGARO

a few short years to demolish the dire Malthusian worldview that was so prevalent, and pertinent, four decades ago. Asia's populations were growing uncontrollably. None of the largest countries was self-sufficient in food. China lost as many as 30 million people to famine from 1958 to '62 during and after the Great Leap Forward, and postwar India lived a "ship-to-mouth" existence, subsisting on food-grains imported from the U.S. Too many mouths, ever more pregnancies, the same farmers growing the same crops—something had to give.

Instead of tragedy, though, a miracle was born in the mid-'60s at Swaminathan's laboratory in New Delhi—and, a few years later, at the International Rice Research Institute in the Philippines which he later headed. Swaminathan brought into India seeds developed in Mexico by U.S. agricultural guru Norman Borlaug and, after cross-breeding them with local species, created a wheat plant that yielded much more grain than traditional types. Scientists at IRRI accomplished the same miracle for rice. Imminent tragedy turned to a new era of hope for Asia, paving the way for the Asian economic miracle of the 1980s and '90s.

As with all great revolutions, though, the seed was but the starting point. Swaminathan combined all the great components of a revolutionary:

Importing food was like importing unemployment. Seventy percent of our people were employed in agriculture. We were supporting farmers in other countries.

M.S. SWAMINATHAN, on India's food problem before 1970

vision, dedication, energy and follow-through. He was born in what is now the southern Indian state of Tamil Nadu. His physician father was an ardent follower of Mohandas Gandhi, and the young Swaminathan was brought to a rally in which British cloth was burned. (Gandhi exhorted Indians to end their dependence on imported goods.) It was a lesson the boy would never forget. In college, he eschewed more lucrative professions and studied agriculture. "I believed I had to serve the nation," he says from his Madras-based M.S. Swaminathan Research Foundation, which is involved in a range of activities, including ways to hook farmers up to the Internet. He almost became a police officer, but a 1949 fellowship to study genetics in the Netherlands changed his career path. In 1952 he earned his Ph.D from Cambridge University, then crossed the Atlantic on the liner *Queen Elizabeth* to do further studies in Wisconsin. There he turned down a professorship. "I asked myself, why did I study genet-



PARI, NEW DELHI

ics? It was to produce enough food in India. So I came back."

Swaminathan's poor, overpopulated homeland was importing vast amounts of grain. "Importing food was like importing unemployment," he recalls. "Seventy percent of our people were employed in agriculture. We were supporting farmers in other countries." By 1966, Swaminathan was director of the Indian Agricultural Research Institute in New Delhi, spending his time in fields with farmers trying to help improve their productivity. Fertilizers were a dead end: when the wheat plant's pod grew more seeds, its stalk collapsed under the weight. With help from the Rockefeller Foundation, Swaminathan found a cross-bred wheat seed, part-Japanese and part-Mexican, that was both fruitful and staunch. (He would later marry this plant to an Indian variety to produce the golden-colored grain favored by Indians.)

That was the breakthrough in the Green Revolution, but there was a lot more work to be done. Indian farmers, immersed in traditional ways, had to be convinced to grow the new wheat. In 1966, Swaminathan set up 2,000 model farms in villages outside New Delhi to show farmers what his seed could do. Then came the hardest part. He needed the government to help—specifically, to import 18,000 tons of the Mexican seed at a time of fiscal hardship. Swaminathan lobbied then-Prime Minister Lal Bahadur Shastri. "He probably thought nothing could be worse,"

Swaminathan recalls. "Famine was imminent. There was a willingness to take risks." The first harvest with the new seeds was three times greater than the previous year's.

But the revolution was still incomplete. Only Punjab state had the right irrigation for the new technologies, the state-run food collection and distribution networks were notoriously inefficient, and new fertilizers and pesticides were needed, along with credit lines for small farmers. Political leadership was vital to solve that tangle of problems, and Swaminathan found it in Shastri's successor. "Indira Gandhi was a strong nationalist," he recalls. "She wanted an independent foreign policy, and food was a political weapon."

Gandhi bluntly asked him how India could be free of imports and gave Swaminathan a free hand to organize a new agricultural program. Today, India grows some 70 million tons of wheat a year, compared to 12 million tons in the early '60s.

Swaminathan now believes farmers must adopt more eco-friendly methods, and he's using his influence to spread the message. And although populations continue to mushroom, he maintains that still greater harvests are possible. All that's needed, he says, is "inspiration, perspiration and luck." The greatest stroke of luck for hundreds of millions of Asians has been Swaminathan's revolution.

—Reported by Meenakshi Ganguly/Madras

Anthony Spaeth is senior writer for TIME Asia

BHAVE HEART

An early and ardent admirer of Gandhi, Vinoba Bhave renounced the comfort of a middle-class home at age 20 to devote his life to the fight for social justice and equality. Bhave started schools and rural development projects across India, campaigned for the end of untouchability and set up leprosy shelters. But his greatest, most memorable endeavor was in land reform. Even as communist extremists were murdering wealthy landlords and socialists were clamoring for legislation to ensure compulsory land redistribution, Bhave in 1951 came up with the concept of *bhoodan*—the voluntary donation of land. "There is no greater weapon than the faith we place in fellow men," he declared. He did not succeed



in his mission of gathering 20 million hectares of land to give out to the landless, but until his death in 1982, he never lost faith.

Bhave was born in 1895 in the western Indian city of Baroda. At the age of 10, he took a vow to remain celibate and dedicate his life to the country. In 1916, he first read about Gandhi and soon joined him. Bhave was jailed several times by the British for taking part in the freedom movement. His austere lifestyle and extreme self-denial, including near starvation, alarmed even Gandhi, who ordered his disciple to eat. The master was overwhelmed by the devotion of Bhave, whom he loved as a son. "I am not fit to measure your worth," he once told Bhave, because like a real son, the younger man had "surpassed what his father has done." —By Meenakshi Ganguly

WORKING WITH WHEAT SEEDS RESULTED IN HIGHER YIELDS



PARI, NEW DELHI

- BORN Aug. 7, 1925 in Tamil Nadu
- 1952 Graduates from Cambridge with a Ph.D in genetics
- 1966 Uses Mexican seeds in Punjab, which results in vastly increased harvests
- 1967 His team develops high-yield, cross-bred wheat seed that starts Green Revolution across Southeast Asia
- 1974 Chairs U.N. World Food Congress in Rome
- 1987 Wins the World Food Prize in Washington

M S Swaminathan and the Ever-green Revolution

M S Swaminathan started his research on the conservation and sustainable use of plant genetic resources at the Institutes of Plant Breeding and Genetics of the Agricultural University, Wageningen, the Netherlands, in 1949. During 1949-50, he worked with Professors JC Dorst, R Prakken and HJ Toxopeaus on transferring genes for resistance to the golden nematode of potato, which was then a serious threat to the potato crop of the polder lands of Holland. Later, he continued this work at Cambridge, UK and the University of Wisconsin, USA. During the period 1949-54, he produced several novel genetic combinations, some of which led to the breeding of potato varieties like Alaska Frostless, where the frost resistance came from *Solanum acaule*. Swaminathan came to be regarded as a leading authority in the areas of potato genetics, cytogenetics and phylogeny. He was elected as a Vice President of the International Genetics Congress held at The Hague, The Netherlands in 1963. He was invited to deliver the keynote address at the International Potato Congress held at Amsterdam in September 2000.

From 1954 to 1988, Swaminathan's research was primarily around the improvement of the productivity, profitability, sustainability and stability of wheat and rice based farming systems. In 1955 he came to the conclusion that unless the plant architecture was modified, the traditional wheat and rice cultivars will not be able to respond to good soil fertility and irrigation water management. This led him to initiate the semi-dwarf wheat breeding programme based on the Norin 10 gene for dwarfing obtained from Mexico through the kind help of the Nobel Laureate Dr Norman Borlaug. Acknowledging Swaminathan's role in the green revolution, Dr Borlaug wrote as follows in 1970, when he was awarded the Nobel Peace Prize.

The green revolution has been a team effort and much of the credit for its spectacular development must go to Indian officials, organisations, scientists and farmers. However, to you, Dr Swaminathan, a great deal of the credit must go for first recognising the potential value of the Mexican dwarfs. Had this not occurred, it is quite possible that there would not have been a green revolution in Asia.

In January 1968, the very year the term "green revolution" was coined by Dr William Gaud of the United States, Prof Swaminathan in his Presidential address to the Agricultural Sciences Section of the Indian Science Congress, pleaded for the ecological underpinning of agricultural progress in the following words.

Exploitive agriculture offers great possibilities if carried out in a scientific way, but poses great dangers if carried out with only an immediate profit motive. The emerging exploitive farming community in India should become aware of this. Intensive cultivation of land without conservation of soil fertility and soil structure would lead, ultimately, to the springing up of deserts. Irrigation without arrangements for drainage would result in soils getting alkaline or saline. Indiscriminate use of pesticides, fungicides and herbicides could cause adverse changes in biological balance as well as lead to an increase in the incidence of cancer and other diseases, through the toxic residues present in the grains or other edible parts. Unscientific tapping of underground water will lead to the rapid exhaustion of this wonderful capital resource left to us through ages of natural farming. The rapid replacement of numerous locally adapted varieties with one or two high-yielding strains in large contiguous areas would result in the spread of serious diseases capable of wiping out entire crops. Therefore, the initiation of exploitive agriculture without a proper understanding of the various consequences of every one of the changes introduced into traditional agriculture, and without first building up a proper scientific and training base to sustain it, may only lead us, in the long run, into an era of agricultural disaster rather than one of agricultural prosperity.

(From: Proceedings of Indian Science Congress, 1968)

During his tenure as the Director General of the International Rice Research Institute in the Philippines (1982-88), he initiated an International Network on Sustainable Rice Farming and promoted extensive green manure and IPM programmes in several countries in Asia and Africa. He helped to strengthen location specific research, which is vital for sustainable agriculture, by either helping to establishing national rice research institutes or strengthening existing ones. (see Annexure 1).

From 1989 until now, he has been concentrating on the linking of ecological and livelihood security of coastal and tribal communities in India. Using the funds associated with all the prizes he had received, he set up the M S Swaminathan Research Foundation (MSSRF) at Madras (now called Chennai) for this purpose (see attached publication titled a *Social Vision for Science* and a brochure). In technology development, his major emphasis has been on blending traditional technologies with frontier science. In recognition of his role in the development of ecotechnologies through technology blending, UNESCO designated him as UNESCO Chair in Ecotechnology in 1996.

During the last 11 years, Prof Swaminathan has spearheaded a movement for blending traditional wisdom and technologies with frontier science and technology, resulting in ecotechnologies rooted in the principles of ecology, economics, social and gender equity and employment generation. MSSRF's mandate is to impart a pro-nature, pro-poor and pro-women orientation to job-led economic growth in rural and tribal areas. MSSRF under the leadership of Swaminathan has developed methodologies like the establishment of biovillages and rural knowledge centres for spreading the message and methods of ecotechnology and ever-green revolution. MSSRF's work on conservation of coastal biodiversity, particularly mangrove wetlands, through creating an economic stake in conservation of biodiversity resulted in its selection for the Blue Planet Prize in 1966 and the Stockholm Challenge Award in 2001. A significant contribution of MSSRF is the revitalisation of the *in situ* on farm conservation traditions of tribal and rural families and getting an Act passed by the Indian Parliament in 2001 on the Protection of Plant Varieties and Farmers' Rights. This Act, the first draft of which was prepared by Prof Swaminathan, is the first one in the world, which gives concurrent recognition to the rights of breeders and farmers. It introduces a recognition and reward system for fostering community conservation.

National Contributions

Prof Swaminathan's contributions in the following areas in India have been recognised through important national awards, in addition to election to the Fellowship of various scientific academies, and selection for scientific awards.

- Green and ever-green revolution in agriculture;
- Genetic resources conservation and enhancement and establishment of National Bureaus for Plant, Animal and Fish Genetic Resources;
- Community-centred biodiversity conservation;
- Preparation of the National Policies in the fields of environment and population, as well as the Biodiversity Act and the Protection of Plant Varieties and Farmers' Rights Act;

- President of the World Wide Fund for Nature – India (WWF-I) and the establishment in WWF-I of a Conservation Monitoring Centre, an Environmental Law Centre and a Community Biodiversity Conservation Corps;
- Launching a technical literacy movement through Krishi Vigyan Kendras (Farm Science Centres), National Demonstrations and Lab to Land and Land to Lab programmes, for converting research know-how into field level do-how;
- Promoting public understanding of science and fostering a symbiotic social contract between science and society;
- Establishment of a Community-centred Nutrition Security System;
- Education and training;
- Wrote and introduced a chapter on *Environment and Development* for the first time in India's planning history during the VI Five Year Plan period (1980-85).

Global Contributions

Genetic Resources Conservation and Sustainable and Equitable Use

- Played a key role in the establishment of the International Board for Plant Genetic Resources (IBPGR) by the Consultative Group on International Agricultural Research (CGIAR) – see Sir Otto Frankel, *Diversity* (IBPGR has since become the International Plant Genetic Resources Institute - IPGRI). To quote Sir Otto Frankel (*Diversity*, 1989):

“Dr M S Swaminathan, then Director of the Indian Agricultural Research Institute at New Delhi, a member of CGIAR's Technical Committee (TAC), who had been connected with the genetic resources movement from its beginnings, took the initiative to promote TAC and CGIAR support for genetic conservation.”

- Chaired the Keystone International Dialogues on Plant Genetic Resources during the period 1988 to 1991. The Keystone Dialogues helped to develop the consensus needed for the adoption at Rio de Janeiro in 1992 of the Convention on Biological Diversity.

- Was elected President of the International Congress of Genetics held at New Delhi in 1983. He chose the theme, "Genetic Conservation: From Microbes to Man" for his Presidential Address.
- Served as President of the World Conservation Union (IUCN) between 1984 and 1990 and helped to convert IUCN from "an Eurocentric into an Earth Centre" Organisation, to quote Sir Martin Holdgate.
- Helped to establish a FAO Commission on Plant Genetic Resources and draft an International Undertaking on PGR, in the capacity of Independent Chairman of the FAO Council during 1981-85.
- Helped to established an International Society for Mangrove Ecosystem (ISME), with its headquarters at Okinawa, Japan, and served as its Founder-President from 1990-93. Helped to prepare a charter for Mangroves.
- Helped IDRC of Canada to establish the International Council for Research on Agroforestry (ICRAF) at Nairobi and served as Chairman of the Board of Trustees of ICRAF during 1979 to 1983.
- Served as Vice President of World Wildlife Fund – International (WWF) during the period 1984-88 and helped to link conservation with sustainable livelihoods.
- Chaired the Committee of the Whole of the UN Conference on Desertification at Nairobi in 1977.
- Designed and helped to establish the Iwokrama International Centre for Rainforest Management in Guyana and served as the Founder-Chairman of the Board of Trustees from 1992 to 1999. This is the world's largest experiment in the sustainable management of rainforests, covering an area of 400,000 hectares.
- Served as Chairman of the Editorial Advisory Committee of the World Resources Report of the World Resources Institute, Washington for its inception in 1986 until 1999.

- Served as Senior Advisor to the Earth Summit during 1990-92 and is serving as a Member of the Senior Advisory Panel to the Global Environment Facility (GEF).
- Serving as Chairman of the Genetic Resources Policy Committee of the CGIAR, since 1994.
- Currently serving as the Regional Advisor and Chair of the Steering Committee for the UNDP-GEF India-Bangladesh project on Biodiversity Management in the Sunderbans World Heritage Site.

Use of Financial Component of Various Prizes

- In 1971, Prof Swaminathan received the Ramon Magsaysay Award for Community Leadership and donated the money for helping the education of children of migrant labour.
- In 1986, Prof Swaminathan received the Albert Einstein World Science Award and donated the funds to the University of the Philippines at Los Banos, which established a Professorship named "M S Swaminathan Chair for Environment Protection".
- From 1988 onwards, all the funds associated with natural and international awards have gone to the establishment and building of the M S Swaminathan Research Foundation at Madras, India (see *Social Vision for Science*).

**Prof M S Swaminathan,
Father of Economic Ecology and Sustainable Food Security[■]**

Since 1947, Prof Swaminathan has worked tirelessly for ecologically sustainable agricultural renaissance of India and other developing countries through harnessing both traditional and frontier technologies. He has not been just content in advancing the frontiers of science, but has worked passionately for advancing the frontiers of production. His scientific work has been recognised by the leading science academies of the world including the Indian National Science Academy, the Royal Society of London, the US National Academy of Sciences, the Russian and Chinese Academies of Science and several others. Over 40 Universities around the world, including the Agricultural University at Wageningen, have conferred honorary doctorates on him.

In addition to significant contributions in enlarging the scientific know-how related to crop production, he is well known for converting *know-how* into field level *do-how*. His original contributions to technology delivery systems include the organisation of National Demonstrations in the fields of small farmers, Lab to land and Land to lab programmes, whole village or watershed operational research projects and Krishi Vigyan Kendras, which are based on the principle of learning by doing, so that lack of formal literacy does not become a handicap in mastering new technical skills. The Ramon Magsaysay Foundation, while conferring on him the 1971 Community Leadership Award, stated:

In electing Moncompu Sambasivan Swaminathan to receive the 1971 Ramon Magsaysay Award for Community Leadership, the Board of Trustees recognizes his contributions as scientist, educator of both students and farmers, and administrator toward generating a new confidence in India's agricultural capabilities.

In 1968, the year when the term "green revolution" was coined, Prof Swaminathan in his Presidential Address to the Agricultural Sciences Section of the Science Congress stressed the need for integrating the principles of ecology and gender and social equity in technology development and dissemination. He later coined the term "ever-green revolution" to stress that the productivity revolution characteristic of the green revolution,

[■] From a forthcoming biography by Dr RD Iyer

should be environmentally, economically and socially sustainable. In recognition of his pioneering role in fostering sustainable agriculture, he was elected President of the World Conservation Union (IUCN) in 1984.

Prof Swaminathan has taken our planet as a whole as his area of concern, with reference to environment, hunger and deprivation. Thus, his contributions to institution and capacity building in the field of agricultural research and sustainable development have been acknowledged by the Governments of China, North and South Korea, Vietnam, Kampuchea, Burma, Sri Lanka, Indonesia, Malaysia, Thailand, the Philippines, Pakistan, Japan, Australia, Egypt, Tanzania, Madagascar, Ghana and Nigeria. In addition, he helped to build the world's largest research centre for rainforest management in Guyana. The Time Magazine hence aptly chose him as one of the 20 most distinguished Asians of the 20th century.

At the time he was awarded the first World Food Prize in 1987, Mr Javier Perez de Cuellar, the then Secretary General of the United Nations, said:

“Dr Swaminathan is a living legend. His contributions to Agricultural Science have made an indelible mark on food production in India and elsewhere in the developing world. By any standards, he will go into the annals of history as a world scientist of rare distinction.”

While awarding the Franklin D Roosevelt Freedom from Want Medal at Zeeland, Netherlands in May 2000, the Franklin and Eleanor Institute acknowledged Prof Swaminathan's contribution in the following words:

“You have taught nations how to be self-sufficient in their need for food just as you have taught farmers how to develop and enhance the productivity of their land. Your brilliant leadership has established a goal for the new millennium – a hunger free world, an international structure of cooperation among nations, a determination to use the miraculous technology of our times to help those in need.”

His role in bringing about a revolutionary change in India's agricultural destiny was described in the following words by Dr NE Borlaug at the time of his receiving the Nobel Peace Prize in 1970 -

The green revolution has been a team effort and much of the credit for its spectacular development must go to Indian officials, organisations, scientists and farmers. However, to you, Dr Swaminathan, a great deal of the credit must go for first recognising the potential value of the Mexican dwarfs. Had this not occurred, it is quite possible that there would not have been a green revolution in Asia.

And by the TIME Magazine –

The father of the Green Revolution used his skills in genetic engineering and his powers of persuasion to make famine an unfamiliar word in Asia.

While selecting Prof Swaminathan for the UNEP-Sasakawa Environment Prize, the United Nations Environment Programme described him as the “Father of Economic Ecology”. The Indian Environment Society chose the title, “Economic Ecologist of India” for a book on his work published in 1982. This is in recognition of the fact that born in a poor country, Prof Swaminathan realised the need for harmonising the goals of ecology and economics, so that accelerated economic progress can be achieved without ecological harm.

The tribute paid recently by the President of India, Mr KR Narayanan in a foreword to a biography of Swaminathan, is an index of the high esteem in which he is held (see Annexure).

The following citation for the Norman Borlaug Award conferred on him in 1979 captures the essence of his mission in life.

MONKOMBU SAMBASIVAN SWAMINATHAN b. 7 August 1925

servant of agriculture

in profound appreciation of his catalytic role in providing deep insights and inspiring fellow scientists to set goals, share experience in the process of social change and transformation to a society which treats of Man at the centre.

for evolving a strategy for agriculture rooted in science, but tempered by concern for ecology and human values.

for the amplitude of his perceptions which has encouraged community effort directed to a synthesis in the movement of agriculture.

Swaminathan's Fifty Years of Contribution to the Conservation of Plant Genetic Resources and their Sustainable and Equitable Use

- 1949-55 Carried out research on the genetic resources of tuber-bearing *Solanum* species at the Agricultural University, Wageningen, and the University of Cambridge, UK. Assisted the University of Wisconsin and the USDA in establishing an Inter-Regional Potato Introduction Station at Sturgeon Bay, Wisconsin, USA. Developed methods of distant hybridisation, leading to novel and economically valuable genetic combinations
- 1955-72 Built up the wheat and rice germplasm collections at IARI, New Delhi. Helped collect over 7000 rice strains from the north-east region of India (Assam Rice Collection), a veritable mine of valuable genes.
- 1970-80 As Vice-Chairman, Technical Advisory Committee to the CGIAR, Rome, proposed and prepared the project proposal for the establishment of an International Board for Plant Genetic Resources (IBPGR), now called the International Plant Genetic Resources Institute (IPGRI). Sir Otto Frankel, in his history of IBPGR referred to the pivotal role played by Swaminathan in bringing into existence this organization dedicated to the conservation of agro-biodiversity. As Director-General, ICAR, New Delhi, established the National Bureau of Plant, Animal, and Fish Genetic Resources in India. As Principal Secretary in the Ministry of Agriculture, Government of India, transformed the Pre-investment Forest Survey Programme into the Forest Survey of India.
- 1981-85 As Independent Chairman, FAO Council, Rome, played a significant role in getting a Commission on Plant Genetic Resources established in November, 1983. Helped to develop the concept of Farmers' Rights and the text of the International Undertaking on Plant Genetic Resources (IUPGR). As President of the International Congress of Genetics held in 1983 at New Delhi, introduced the focal theme: "Genetic Resources Conservation: Microbes to Man."
- 1982-88 As Director General, IRRI, organised the International Rice Germplasm Centre (IRGC) with an international advisory board. Launched special expeditions to collect wild rices from "hot spot" locations. Organised a one year Associateship of IRRI course in genetic resources conservation.
- 1984-90 As President of the International Union for Conservation of Nature and Natural Resources (IUCN), played a critical role in the development of the draft on the Convention on Biological Diversity (CBD).

Chaired the IUCN General Assembly at San Jose, Costa Rica, where the draft was discussed and finalised. This became the basic document from which the Convention on Biological Diversity adopted at Rio de Janeiro in 1992 was developed.
- 1986-99 Helped to shape the style and content of the World Resources Report of the World Resources Institute, Washington, as the Chairman of its editorial advisory board.

- 1988-91 As Chairman of the International Steering Committee of the Keystone International Dialogue on Plant Genetic Resources, guided the work of this Dialogue at Keystone Centre (1988), Madras (1990), and Uppsala and Oslo (1991). It is widely recognised that Swaminathan's chairmanship of the Keystone Dialogue series was a primary factor in the development of consensus among all the stakeholders in relation to both conservation and sharing of benefits.
- 1988-96 As President, World Wide Fund-India (WWF-I), organised the Indira Gandhi Conservation Monitoring Centre to monitor and chronicle India's biodiversity wealth and a Community Conservation Corps of young professionals to prevent genetic erosion, and established an Environmental Law Centre for promoting legal steps in the area of conservation. Promoted the organisation of the Community Biodiversity Conservation Programme to revitalise the *in situ* on-farm conservation traditions of rural and tribal families.
- 1988-99 As Chairman, Commonwealth Expert Group and Board of Trustees, planned and organised the Iwokrama International Centre for Rainforest Conservation and Development, for the sustainable and equitable management of tropical rainforests in Guyana. This is the world's largest programme in the area of sustainable management of rainforests (the project covers 1 million acres). The late Dr. Cheddi Jagan, then President of Guyana wrote in 1994 that "there would have been no Iwokrama without Swaminathan."
- 1990 Helped to establish an International Society for Mangrove Ecosystems (ISME), with headquarters at Okinawa, Japan and served as its Founder - President during 1990-93. Was instrumental in getting a charter for Mangroves prepared. Established at Pichavaram, Tamil Nadu, a Genetic Resource Centre for Adaptation to Sea Level Rise and helped to organize a network of mangrove genetic resources conservation centers in the Asia-Pacific region.
- 1988-98 Chaired various committees of the Government of India to prepare draft legislations relating to biodiversity (Biodiversity Act) and breeders' and farmers' rights (Protection of Plant Varieties and Farmers' Rights Act), as well as the draft policy statements relating to environment and population.
- 1994 Established a Technical Resource Centre at MSSRF for the implementation of the equity provisions of CBD as well as FAO's Farmers' Rights.
- As Chairman of the Commission on Genetic Diversity of the World Humanity Action Trust, helped to develop a set of policy guidelines for governance of biodiversity-related matters.
- 1994 onwards As Chairman of the Genetic Resources Policy Committee of the CGIAR (GRPC), he continued to play a key role in the development of policies for the management of the *ex situ* collections of IARCs. Convened a meeting on behalf of GRPC to include minor or underutilized crops in the programmes of the IARCs. This led to the initiation of a global programme in 2002 with financial support from IFAD.

- 1999 Introduced the concept of managing biosphere reserves through a trusteeship mode, where all the stakeholders hold such unique biological treasures in trust for future generations. Helped to operationalise this concept in the Gulf of Mannar Biosphere Trust, with financial support from the Global Environment Facility (GEF).
- 2001 Serving as Chairman of the Regional Steering Committee for the India – Bangladesh joint Project on Biodiversity Management in the Sunderbans World Heritage Sites, funded by the UN Foundation and UNDP.

Due to Swaminathan's conviction that institutional structures are vital for operationalising concepts and programmes, the following national and global institutions he helped to design and develop will always stand as evidence of his vision and confidence, expressed in his dictum: " If conservation of natural resources goes wrong, nothing else will have a chance to go right."

National

- National Bureaus of Plant, Animal, and Fish Genetic Resources of ICAR
- National Forest Survey of India
- National Bureau of Soil Survey and Land Use Planning of ICAR
- Genetic Resources Centre for Adaptation to Climate Change and Sea Level Rise

Regional

- India – Bangladesh Cooperative Project for the Conservation of the Sunderbans Mangrove ecosystem

Global

- International Bureau of Plant Genetic Resources (IBPGR) of CGIAR (now IPGRI) at Rome
- Iwokrama International Centre for Rainforest Research and Management, Guyana
- International Society for Mangrove Ecosystems

Sir Otto Frankel

Genetic Resources : The Founding Years (Part III)
Diversity, 1989. 5:2-3, 59-60

For the Record

The Long Road to the International Board

“Dr M S Swaminathan, then Director of the Indian Agricultural Research Institute at New Delhi, a member of CGIAR’s Technical Advisory Committee (TAC), who had been connected with the genetic resources movement from its beginnings, took the initiative to promote TAC and CGIAR support for genetic conservation. Swaminathan obtained TAC approval for a Conference of Experts to be held at Beltsville, USA, March 20-25, 1972.

The report of this conference was considered by TAC, which felt that the proposal needed to be phased in gradually over a period of years. Dr Swaminathan redrafted the programme accordingly. TAC reviewed the proposal drafted by Dr Swaminathan in July-August 1973. In the revised proposal, the Governing Body was to be a Committee or Board with a secretariat based at FAO and a Trust Fund. “This proposal was adopted, thanks to Dr Swaminathan’s continuing effort in sponsoring modifications which made the proposal acceptable to TAC”. TAC recommended the proposal for the approval of CGIAR in 1973. Dr Swaminathan’s title, International Board for Plant Genetic Resources (IBPGR) was accepted by CGIAR in February, 1974 and the first meeting of the IBPGR Board was held in June 1974.

In the Review of Policies and Activities 1974-78 and of Prospects for the Future (IBPGR Secretariat, 1979), **FAO is given the sole credit** for all the initiatives and developments in the ten years from 1965 to 1974, when all those involved know, the momentum came largely from scientists associated with the International Biological Programme. **Another major inaccuracy is “FAO, not Dr Swaminathan, is alleged to have proposed the genetic resources network to TAC”**. Sir Otto Frankel thus expressed his great sorrow that the contributions of the prime mover for the establishment of IBPGR, namely Dr Swaminathan, were ignored in the IBPGR publication. In fact, between 1972 and 1974, Dr Swaminathan worked concurrently for the establishment of the IBPGR at the international level and the National Bureau of Plant Genetic Resources (NBPGR) at the national level.



Toda Award for Peace Achievement

Professor M.S. Swaminathan

For many decades you have made unique and invaluable contributions to deepening and enhancing understanding of plant genetics, contributing immeasurably to the welfare of humankind. In 1988, you established the M.S. Swaminathan Research Foundation; in your capacity as its Chairman, you have exercised outstanding leadership in the field of rural and agricultural development of India. Your efforts have embraced such wide-ranging and interrelated concerns as the eradication of poverty, preserving regional ecosystems, promoting technological innovation, and research for sustainable agriculture. These efforts have always been carried out with a consistent focus on reaching the unreached, empowering women in particular with knowledge, skills and technology.

Moreover, you have served, inter alia, as UNESCO Chair in Ecotechnology, Independent Chairman of the United Nations Food and Agriculture Organization Council, and President of the International Union for the Conservation of Nature and Natural Resources. In these capacities you have worked tirelessly to resolve core global challenges such as food and environmental security. As newly elected President of Pugwash Conferences on Science and World Affairs, you are demonstrating vital leadership toward the abolition of nuclear weapons and in the cause of human security.

Your initiatives to protect the natural environment and to remove the threat of nuclear weapons are a noble endeavour to confront and transform the fundamental crisis of human dignity. In this, they are deeply consonant with the Buddhist humanism of Josei Toda, whose vision of lasting world peace inspires the work of this Institute. It is therefore our privilege to confer on you the Toda Award for Peace Achievement, which was established to commemorate the birth centennial of Josei Toda, in order to extol and transmit your achievements to future generations.

October 26, 2002

Daisaku Ikeda
Founder
Toda Institute for Global Peace and Policy Research



Soka Gakkai

32 Shinano-machi, Shinjuku-ku, Tokyo 160-8583, Japan

October 16, 2002

Professor M.S. Swaminathan
Chairman
M.S. Swaminathan Research Foundation
3rd. Cross Street
Taramani Institutional Area
Chennai 600 113
India

Dear Professor Swaminathan,

I trust this finds you in the best of health and spirits.

Thank you for your letter of October 1 addressed to SGI President Daisaku Ikeda. Dr. Ikeda and senior SGI officials are eagerly looking forward to meeting you and Dr. Geeta Mehta on October 26 and exchange views on and insights into a broad range of issues.

As you may know, the Toda Institute of Global Peace and Policy Research was founded in 1996 by Dr. Ikeda to honour his mentor in life, Josei Toda, the second Soka Gakkai president and ardent pacifist who devoted a lifetime in the service of human welfare and world peace. The Institute has enjoyed a cordial and constructive relationship with many of the world's finest institutions for peace, and is particularly proud of its association with the Pugwash Conferences and its distinguished members.

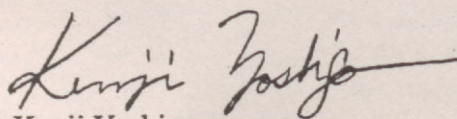
I am therefore pleased to inform you of the Institute's decision to confer upon you its Toda Award for Peace Achievement in recognition of your outstanding accomplishments and selfless service to humanity.

The decision to confer the Award was made on October 11 by the Institute's Board of Directors, which unanimously voted its approval. For your information, the motion came with the strongest recommendation from Dr. Ikeda. The Award has been conferred only twice in the past—the first to former Soviet President Mikhail Gorbachev, and the second to former Philippines President Fidel Ramos.

Please let us know if you should find the Institute's decision agreeable. We would like to propose holding the conferral ceremony on October 26, prior to your meeting with the SGI president.

We thank you for your time and look forward to your reply.

Yours sincerely,



Kenji Yoshigo
Executive Director
Office of International Affairs

also introduced the SGI's music bands and fife-and-drums corps as well as SGI President Daisaku Ikeda's contributions to cultural exchanges founded on Buddhist humanism.

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Sunday, October 27, 2002

- SGI President Ikeda Meets Dr. M. S. Swaminathan, President of Pugwash Conferences and Father of the Green Revolution in India

On October 26, Dr. M. S. Swaminathan, president of the Pugwash Conferences on Science and World Affairs and a distinguished plant geneticist and father of the Green Revolution in India, met with SGI President Daisaku Ikeda at the Seikyo Press building in Shinanomachi, Tokyo. During the meeting, Dr. Swaminathan received the Toda Award for Peace Achievement from the Toda Institute of Global Peace and Policy Research. The award recognized Dr. Swaminathan's contributions to agricultural development, as well as to the advancement of human welfare, eradication of poverty and environmental preservation in India.

Referring to a Buddhist fable and Nichiren's words in which he equated a gift of polished rice to life itself, Mr. Ikeda lauded Dr. Swaminathan's dedication to agricultural development and environmental preservation. Mr. Ikeda and Dr. Swaminathan discussed the issue of over-population of the world, which has crossed the 6.2 billion mark. Dr. Swaminathan stated that, when discussing over-population, securing people's welfare by correcting the imbalance that exists in the distribution of food and wealth, is more crucial than discussing how to increase food production. He also stressed the necessity of reforming "economics for the sake of profit" to the "economics for the sake of human beings." The two also discussed other topics, such as the food crisis in China, Dr. Swaminathan's uncle who edited the complete works of Gandhi, promoting the spirit of non-violence and environmental education, and the spirit and history of Indian independence. Other attendees included Krishen Mehta of the M. S. Swaminathan Research Foundation, Tokyo branch, and his wife, Mrs. Geeta Mehta; Masasuke Nihei, representative director of the Toda Institute; and Institute of Oriental Philosophy Director Yoichi Kawada.

[Dr. M. S. Swaminathan, 77, was named by TIME magazine in 1999 as one of the twenty most influential Asians of the 20th century and one of three from India, the other two being Mahatma Gandhi and Rabindranath Tagore. After graduating in 1952 from Cambridge University, UK, with a Ph.D. in genetics, Dr. Swaminathan and his team developed high-yield, cross-bred wheat seeds in the mid-1960s, that started the "Green Revolution" across South Asia. He spends time with farmers and their fields trying to help improve their yield and he further advocates "ever-green revolution" for sustainable agriculture and food security.]

Dr. Swaminathan was awarded the Ramon Magsaysay Award for Community

Leadership in 1971, the Albert Einstein World Science Award in 1986, the first World Food Prize in 1987 and the Franklin D. Roosevelt Four Freedoms Award in 2000. He has received 43 honorary doctorates, to date, from universities around the world, such as the University of Bologna, Italy, and Oregon State University, USA. In August 2002, Dr. Swaminathan was elected president of Pugwash Conferences on Science and World Affairs and is currently chair of the M. S. Swaminathan Research Foundation in Chennai, India.]

- “Books—Heritage of Humanity” Exhibit Showing in Ginza, Tokyo

From October 27 through November 9 is designated “Reading Week” in Japan. “Books—Heritage of Humanity,” an exhibit introducing valuable books from a variety of ages and cultures, currently showing at the Ginza Matsuzakaya Department Store, Tokyo, is attracting many viewers. Soka Gakkai is the exhibit sponsor, and the National Federal of UNESCO Associations in Japan, the Printing Museum (Tokyo), the Paper Museum (Tokyo), and the Tokyo Bookstore Business Guild and the Tokyo Fuji Art Museum are supporters.

Included in the display are some miniature books known as “gems of learning,” from the collection of the late Isamu Imaida; original handwritten letters, notes and manuscripts penned by Abraham Lincoln, Ludwig van Beethoven, Romain Rolland, Mahatma Gandhi, Albert Einstein, Florence Nightingale and Helen Keller; and also dynamic miniature recreations of scenes and images from beloved classics of the ages, such as *Anne of Green Gables*, *Tale of Three Kingdoms*, and *Eternal City*.

[The exhibit at the Ginza Matsuzakaya Department Store (7th Floor) in Tokyo runs from October 24–30, 2002. The free exhibit will be open every day for the duration of the exhibit from 10:30 a.m. to 7:30 p.m. on October 24, 28, and 29; until 8:00 p.m. on October 25 and 26; until 7:00 p.m. on October 27; and until 5:00 p.m. on October 30, the last day of the exhibit. Latest admittance will be 30 minutes before closing. The exhibit is scheduled to tour Kobe during December.]

- Environment Exhibit to Open in Yokohama City, Kanagawa Prefecture

“Ikitsuzukeru aoi hoshi (“The Blue Earth Lives On,” tentative translation), a photographic exhibit on the environment, opened on October 26, at Red Brick Warehouse No.1, Yokohama City, Kanagawa Prefecture. The exhibit, which focuses on the relationship between humans and nature, as well as explores the earth’s environment from fresh vantage points, presents 192 works by 75 internationally-renowned photographers. The show is a collaborative effort of the Yokohama Arts Foundation, the Hiroshima Prefectural Art Museum and the Tokyo Fuji Art Museum in Hachioji, Tokyo.

[“The Blue Earth Lives On” will show at Red Brick Warehouse No.1, Yokohama City, from October 26 through November 23, 2002. Museum hours are: 11:00 a.m. to 7:00 p.m.; until 8:00 p.m. on Fridays and Saturdays. Admission fee: Adults—800 yen; high school and college students—500 yen; elementary and junior high school students—200 yen.]

- Min-On Sponsors Free School Concert in Kanagawa



UNIVERSITY FOR PEACE
UNIVERSIDAD PARA LA PAZ



24th January 2002

Dr. Geir Lundestad,
Secretary to the Norwegian Nobel Committee,
Director of the Norwegian Nobel Committee,
Oslo,
Norway.

Nobel Peace Prize: Nomination of Dr. Monkombu Swaminathan

Dear Dr. Lundestad,

I wish to congratulate the Committee for the constructive and visionary choice of the United Nations and of its Secretary General Kofi Annan as recipients of the Nobel Peace Prize in 2001. This decision has made a real contribution to peace by strengthening the image, morale and effectiveness of the whole United Nations System.

I am honoured to propose the nomination of Dr. M. S. Swaminathan, President of the M. S. Swaminathan Research Foundation of Chennai, India, as a candidate for the Nobel Peace Prize.

I make this nomination in my capacity as Rector of the University for Peace created in pursuance of United Nations Resolution 35/55 of 5th December 1980 with headquarters in San José, Costa Rica.

I have known Dr. Swaminathan since 1979 in several capacities: first in my capacity as Assistant Secretary General and Executive Director of the United Nations Financing System for Science and Technology for Development, then as coordinator of the China Council for International Cooperation on Environment and Development of which Dr. Swaminathan is a founding Member, and later as a member of the Swaminathan Commission on Food, Employment and Peace.

The unique contribution of Dr. Swaminathan to world peace extends over many fields of human endeavour and many decades. I will not attempt to summarise his contribution here but I enclose some material in support of this nomination.

Dr. Swaminathan is not only a world renowned scientist but he has been remarkably effective in transmuting the results of scientific research into policy decisions at the highest levels of government and of the international system. He has also managed in parallel to maintain a determined and consistent focus on the fundamental problems of the poor, the unemployed, the malnourished and the disadvantaged.

I will briefly outline here only four aspects of his remarkable contribution to world peace:

First, as a world renowned agricultural scientist, Dr. Swaminathan is widely recognised as the father of the "Green Revolution" which proved to be a turning point in improving the condition of hundreds of millions of human beings, not only in India but throughout the world. Abiding hunger and poverty are the breeding ground of conflict: this transformation of agriculture has proved to be a critical contribution to world peace and progress.

The scale of his contribution can be appreciated as follows. He is now continuing his work to transfer the genes which enable some plants to thrive in a salt water environment to plants which are essential as food, such as rice and cereals. Progress has been good and the prospects look promising. Success would open up vast areas to food production which are currently unusable making a further improvement in world food production on a substantial scale.

Second, Dr. Swaminathan has devoted his life to the reduction of poverty through many channels and efforts. In particular, he himself convened and organised a top-level Commission on Peace, Employment and Food. This private Commission undertook to mobilise world opinion to address widening poverty and exclusion through concerted policies aimed at the development of agriculture while stimulating employment in the countryside and thus the purchasing power of the poor. This unique approach was adopted as the basis of policy by the Government of India and may prove to be a seminal concept for national policy as the population of India increases in coming decades.

Third, while acting effectively through scientific research and at the highest levels of policy, Dr. Swaminathan has achieved extraordinary practical results in addressing poverty at the human, grass roots level. In promoting the elimination of poverty, he is also a strong advocate of responsible policies to preserve and rehabilitate the environment and to improve the condition of women. He has established a Research Center and Foundation – which has now achieved a world wide reputation – to focus many practical applications of science and technology to eliminating poverty in the villages of India through employment, education and empowerment. Such approaches, for example through the establishment and support of a network of "biovillages" in southern India, have application throughout India and of course in other countries.

In confronting directly the real and urgent problems of poverty, gender and environmental degradation afflicting hundreds of millions of people, Dr. Swaminathan has demonstrated remarkable leadership in mobilising efforts, both national and international, to resolve many profound social injustices, such as the condition of landless labourers, access to education, the empowerment of women, the prevention of child labor and access to health care. His prestige is such that his leadership on these issues, both in promoting action at the grass roots level and as an advocate at the high policy level is both respected and effective.

Fourth, not content with his remarkable achievements to date, Dr. Swaminathan is now committing his energies to bringing the benefits of modern information and communications technology to improve the living conditions, education and prospects of the poor in villages throughout India. Pilot projects are already in operation as a prelude to the wide dissemination of the approach. Like the Green Revolution, this information revolution offers the hope and prospect of rural employment and progress on a substantial scale to meet the needs and aspirations of a growing population.

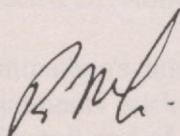
In conclusion, I believe that the consistent efforts of Dr. Swaminathan to promote the abolition of hunger, poverty and injustice have made very real and significant contributions to the prospects for world peace and progress.

I strongly urge his consideration for the award of the Nobel Peace Prize.

This would be a deserved recognition for the remarkable contribution made by Dr. Swaminathan to world peace. It would also be a clear signal from one of the most prestigious institutions in the world which would provide comfort and encouragement to all those who both today and in the future choose to commit their lives in the hard struggle to abolish poverty and injustice as the precondition for world peace in the 21st Century.

I thank you for giving your consideration to this nomination.

Yours sincerely,



R. Martin Lees
Rector of the University for Peace.

Statement of earlier nomination for the Nobel Peace Prize

NOMINEE

Dr. M. S. SWAMINATHAN
President, M.S. Swaminathan Research Foundation,
Third Cross Street, Taramani Institutional Area,
Chennai 600 113, India
Tel. 91 44 235 1698/0698, fax 91 44 235 1319
E-mail Msswami@mssrf.res.in

I. OVERVIEW

Dr. M.S. Swaminathan has had a long and distinguished career in developing-world agriculture. Given that Dr. Norman Borlaug was awarded the Nobel Peace Prize thirty years ago for his work on the Green Revolution, I consider Dr. Swaminathan is at least as deserving on agricultural grounds alone.

But his impact is more far reaching than crop plant genetics. Virtually alone among agricultural leaders, he has shown that the challenge of feeding developing countries is closely tied in with a number of other crucial factors, notably poverty, women's roles, and the environment. These further factors broaden agriculture to include concepts of food security, basic human needs and social equity. It is in this larger sense that Dr. Swaminathan is much more than an agricultural pioneer. Indeed he ranks as one of the world's finest exponents of human development in its proper broad sense--a purpose that embraces food supplies but extends way beyond agriculture. If he were to be considered for the Nobel Peace Prize, it should be, first and foremost, because of his endeavours as a pre-eminent humanitarian.

For these reasons, Dr. Swaminathan has done much to promote the cause of peace over a period of fully five decades. Although it has not always been recognized as such, "food security" is a key component of security overall. There is abundant evidence from all three main developing regions and especially from Asia, that hunger breeds economic discord and social strife, leading to political upheaval and often to outright violence. This was acknowledged by the Nobel Peace Prize Committee in 1971 when it selected Dr. Norman Borlaug.

Dr. Swaminathan's international standing has been reflected by a series of front-rank appointments such as the Chairmanship of the Food and Agriculture Organization's Council and of the Board of the Ford Foundation. His reputation has been similarly reflected by international awards such as the World Food Prize, the Tyler Environment Prize, the Blue Planet Prize, the UNEP Environment Prize and the Honda Prize. In India he has been presented with the Ramon Magsaysay Award for Community Leadership, the first time given for serving the cause of women in development; and he has received the first award for women's empowerment from the International Association of Women in Development. His 1980s work in the Philippines led to his being awarded the Golden Heart Award by President Corazon

Aquino, the only such award made during her presidency. Among other forms of recognition are the Padma Shri, Padma Bhusham and Padma Vibhusham Awards, presented by the President of India and ranked as the highest civilian awards in India. He has received 35 honorary doctorate degrees, and he has been elected to eight national academies of science.

II. AGRICULTURE

Dr. Swaminathan is widely recognized as the architect of the original Green Revolution in India. While working at the Indian Agricultural Research Institute during 1954-72, while Director-General of the Indian Council of Agricultural Research during 1972-79, while Principal Secretary of the Ministry of Agriculture 1979-80, and while responsible for Agriculture under the National Planning Commission during 1980-82, he led the way in introducing high-yielding varieties of rice and wheat. He did more than any other individual to stave off major food shortages and famine in India at a time when its population was soaring from 420 million to 710 million people within just 25 years. In fact, India moved from being the country with the largest food deficit to becoming self-sufficient in food.

Swaminathan's work also started the agricultural advances that subsequently spread right across Southern and Southeast Asia. In 1965, rice production in the 18 Asian countries that grew and consumed most of the world's rice was 233 million tonnes; by 1986 that figure had climbed to 432 million tonnes, a rise of 84 percent in just over two decades. He further promoted these advances during his period as Director General of the International Rice Research Institute in the Philippines. It is not going too far to say that as Swaminathan's strategies for agriculture and associated sectors become still more widespread throughout Asia and other developing regions, we may eventually find that he has saved more people from hunger than any other individual.

Little wonder that in 1971 Dr. Norman Borlaug paid tribute while accepting the Nobel Peace Prize: "A great deal of my credit must go to Dr. Swaminathan. Without him, it is quite possible there would not have been a Green Revolution in Asia." Similarly, in 1987 Dr. Javier Perez de Cuellar, then Secretary-General of the United Nations, declared "Dr. Swaminathan is a living legend. His contributions to agricultural science have made an indelible mark on food production in India and elsewhere in the developing world. By any standards, he will go into the annals of history as a world scientist of rare distinction."

III. FOOD SYSTEMS

While pioneering the Green Revolution across tropical Asia, Swaminathan was already seeking to expand it into an Evergreen Revolution. This meant emphasis on the environmental underpinnings of agriculture: soils, water, natural nutrients, biodiversity and climate. In fact, as far back as 1968 Swaminathan was urging the introduction of environmentally sustainable strategies to go alongside the technologies of the Green Revolution. He highlighted the need for three vital contributions: nutrient supplies of organic as well as inorganic kinds; integrated pest management with reduced dependence on synthetic pesticides; and science-based management of

land and water stocks. In other respects too, he urged that chemical inputs should be complemented and even substituted by biological inputs.

Swaminathan hoped that his overall approach would reduce the risk that intensified agriculture could prove unsustainable because of over-loading of croplands, negligent use of irrigation water, pollutant impacts from widespread applications of synthetic fertilizers and pesticides, and a tendency to foster soil erosion. To cite just one breakthrough: he developed a programme with the Government of Indonesia to tackle crop pests through the strategy of Integrated Pest Management, which not only raised farmers' harvests but reduced their costs, and enabled the Government to phase out 50 synthetic pesticides with their toxic pollutants.

Experience of the past three decades shows how much his prescience was timely, even though it was little heeded at the time. Whereas the Green Revolution was primarily an agriculture based on resources (land, water, chemicals), his expanded approach was based on science and farmers' knowledge. The inherent value of his approach has been amply demonstrated through his precision farming methodologies in many parts of India and other countries of developing Asia. For instance, he has helped Vietnam to become self-sufficient in food, even to become a food exporter; and in Cambodia he has laid the foundations for the country's agricultural re-construction. He has accomplished similar advances in China, Philippines, Indonesia, Myanmar, Bangladesh and Sri Lanka, and further afield in Egypt, Tanzania and Madagascar.

There has been another critical factor at stake, this one extending beyond farms to farmers. The success of the Evergreen Revolution, in Swaminathan's view, would lie with smallscale farmers and their traditional practices. For instance: a wheat crop of six tons per hectare requires 150 kgs. of nitrogenous fertilizer, half of which can be readily supplied by green-manure fertilizer--as is demonstrated by smallscale farmers with their indigenous knowledge. The Evergreen Revolution also depends on other grassroots inputs such as capital assets (meagre though they often are) among rural communities. In turn, this places a premium on relief of poverty; and in turn again, it requires greater attention to women as the main practitioners of agriculture, women also being the majority of the poor. Some 60-80 percent of staple food production in developing countries is supplied primarily by women, yet they receive scant credit for their contributions through crop cultivation and marketing networks.

IV. FARMER SYSTEMS

Whereas many agriculture experts know how to produce more food, Swaminathan tackles the larger question of farmers' poverty. When faced with the challenge of producing twice as much food within the next three decades, agriculture must do better than feed more hungry people, it must feed hungry people more. In order to relieve poverty, Swaminathan has coined the term "eco-technocracy" to indicate that the poor and the illiterate can master the latest technical skills--provided they have a chance to contribute what they already know and are enabled to "learn by doing." In order to launch a national eco-technocracy movement, he has established a Science Centre for Agricultural Technology, followed by a similar grassroots movement in forestry based on a Forest Science Centre to promote "people's forestry."

This movement has been articulated through 350 Farmer Science Centres (Krishi Vigyan Kendras), comprising 30 million farmer families, the bulk of them women. He has further pursued his convictions on this front while serving as Chair of the U.N. Advisory Committee on Science and Technology for Development. In recognition of his contributions, UNESCO has named its Chair in Eco-technology after him.

V. FOOD SECURITY

The above demonstrates how Swaminathan has devised a "whole systems" approach to agriculture--an approach that goes way beyond producing more rice and wheat and serves agriculture embracing crops, livestock, fisheries and forests. In particular he has developed the concept of Food Security, with two key components:

* Every individual shall have physical, economic, social and environmental access to a balanced diet that includes both macro- and micro-nutrients, and also entails safe household water and sanitation, primary health care, environmental hygiene, and education in basic skills.

* Food shall originate from environmentally benign technologies that conserve and enhance the natural-resource base of agriculture.

Thus Swaminathan has expanded agriculture's purview from food production to food security--a major advance indeed.

VI. FURTHER SPECIFIC INITIATIVES

Swaminathan has mounted a series of demonstration projects to pass his farmer-systems message right down to cropfield level. A prime vehicle is the Biovillages Movement in southern India. This strategy seeks to support the economically and socially disadvantaged sections of society, supplying them with the means to escape the poverty trap. He believes the poor are poor because they lack assets such as land, livestock and market skills, their only resource being their labour. Accordingly his approach to poverty has centred on expanding their capacities through building expertise in areas such as agroforestry, carpentry and biogas. These supplementary activities should be an integral part of agriculture systems writ large. The Biovillages have gained so much acclaim that the concept has been adopted by China, where Swaminathan serves as Principal Advisor to the Government.

In similar style, Swaminathan has long been concerned with biodiversity, particularly with regard to its role in the lives of farming communities and the rural poor. These people are more concerned with gross natural product than gross national product. They possess abundant knowledge about native plants, especially wild relatives of food crops, and they are critically placed to ensure their survival--yet they hold next to no rights in these biodiversity resources. As part of his pro-nature campaign, and in parallel with his pro-poor and pro-women campaigns, Swaminathan has developed strategies to reward those rural communities that help to conserve plant genetic resources through their "intellectual property" contributions. It was while he was President of the International Union for Conservation of Nature and Natural Resources during 1984-90 that he became one of the early promoters of a global Convention on Biodiversity, finally achieved at the Rio Earth Summit in 1992.

The prime habitats for biodiversity occur in tropical forests, which links up with Swaminathan's work on "people's forestry." He has put his ideas into practice through the Iwokrama International Rain Forest Centre in Guyana, this being the largest effort in the world to engage in forest exploitation that is demonstrably sustainable in the eyes of both local people and the wider community.

In order to reinforce and expand his conceptual breakthroughs, Swaminathan has established a private Research Foundation in Chennai (formerly Madras). The staff includes 135 scientists, of whom 25 are PhDs and 70 are MScs. This scientific "powerhouse" notwithstanding, its annual budget is only \$400,000. A 35-year-old PhD staffer receives the equivalent of \$2500 per year, by contrast with \$4500 in government or business (both figures based on purchasing power parity rather than international exchange rates). Talented professionals are drawn by the reward of working with Swaminathan and sharing in his pioneering enterprises.

VII. HUMAN DEVELOPMENT

Swaminathan believes that conventional development pathways are unsustainable because of three basic deficiencies: they damage life-support systems of the environment; they foster inadequate forms of economic growth, notably "jobless growth"; and they aggravate both economic and gender inequalities. Too often, they help those who can already help themselves, while marginalizing those who are helpless through no fault of their own. They promote "economic, social and technological apartheid", which in turn serves as a major source of endemic and hidden hunger.

Equally important, the deficiencies can even serve as a source of social disintegration and civil strife. This linkage became a theme of the International Commission on Peace and Food chaired by Swaminathan. The Commission's report, entitled "Uncommon Opportunities: an Agenda for Peace and Equitable Development," stated "Conflicts will become serious if the growing marginalization of the poor is not halted." This assertion was documented by numerous examples from throughout the developing world, in accord with Swaminathan's experiences in countries as diverse as India, China, Philippines, Bangladesh, Egypt, Ethiopia, Nigeria, Sudan, Angola, Mexico and Brazil. Concrete illustrations are to be found in his International Commission's Report.

All this highlights another vital but often overlooked dimension of agriculture in particular and development in general: that failures can lead to violence, while people-focused development can promote peace. It is a mark of Swaminathan's influence that his principles have been adopted by the Government of Tamil Nadu for eliminating poverty-induced hunger through a Hunger-Free Programme across the state of 62 million people, this being the first effort in India to eliminate both hunger and sources of hunger. Within a wider context, the conceptual approach has been taken up by the United Nations Development Programme as a primary ingredient of its campaign for human development.

With particular respect to another poverty problem, unemployment, Swaminathan urges the need for economic growth to be "job led", by contrast with what is becoming a prominent feature of economic growth in many parts of the world,

jobless growth (even as economies grow, their work forces shrink). As early as 1980 and through the Sixth Five-Year Development Plan of India (for which he was a major drafter), he formulated a policy for Production by Masses rather than Mass Production. He has articulated his view through his Biovillages and integrated farming systems with their employment for those lacking assets such as land and livestock. As he has long proclaimed, "Poverty will persist if the human resource is under-valued and land and material resources are over-valued."

VIII. THE HUMANITARIAN CAUSE

It is characteristic of Swaminathan's approach that he opposes a "do good" and patronising attitude to the poor. Example: at the request of the Indian Government in 1982, he converted the Wardha District, where Mahatma Gandhi spent most of his later life, into a "Gandhi District", defining it as a place "where no one is below the poverty line--not because of dole-outs and charity, but because everyone is enabled to earn their daily bread."

When the Indian Government introduced two innovative themes into its 1980-85 Five Year Plan, it asked Swaminathan to write both chapters in question, "Environment and Development" and "Women and Development." For his work on women and gender equity, the International Association of Women in Development in 1984 gave him its first award for supporting women's empowerment--a factor that Swaminathan views as paramount in development processes. In particular, he has engaged in a crusade, notably through the U.N. Nutrition Commission, against malnutrition in pregnant women. This malnutrition results in infants with low birth weight and poor brain development, deficiencies afflicting every third child in India and other countries of Southern Asia. Swaminathan has termed this "the cruellest form of inequity" since the child is deprived even at birth of the chance to lead a full life. Again, he has been a super pioneer in this regard: as early as 1967 he started to warn against the "intellectual dwarfism" that has now overtaken tens of millions of children in Southern Asia.

To further put his pro-women convictions into practice, Swaminathan has established the Asian Network for Women and Rice Farming, which seeks to address gender-specific issues in the production and processing of rice. Notwithstanding their vital role in rice farming, women have traditionally been assigned unskilled work of extreme drudgery. The Network has been instrumental in expanding women's skills, opening up credit systems for them, and generally adding economic value to their work. Swaminathan's breakthrough on this broad front has received tribute from the CGIAR, which plans to establish a worldwide network for the technical empowerment of women in agriculture, based upon Swaminathan's leadership in Asia.

As a measure of his work in fields related to the relief of hunger, Swaminathan has served as Chair of five of India's National Committees: on Poverty Alleviation, Environment, Population, Eco-Development of Mountain Zones, and Eradication of Leprosy and Preventable Blindness. As regards population, he has broached the issue within three contexts: social development, environmental carrying capacity, and individual choice. All these three are in marked contrast to the centralized, target driven, and contraceptive-based practices of earlier population programmes. Within India he has established training modules to enable local communities to develop their own socio-demographic charters. In recognition of his approach to population,

Swaminathan was invited to be a keynote speaker at the International Conference on Population and Development in Cairo in 1994.

As for his Committee on Leprosy, its report marked the beginning of a rapid decline of the disease in India.

A final item. It is entirely like Swaminathan that he was one of the first to publicly criticize India's resumption of nuclear testing. This was a bold and courageous initiative insofar as the country's leaders and the public were solidly behind the tests.

IX. SUMMATION

Swaminathan's contributions have been as productive as they have been pervasive. All of them have been directed at the plight of the hungry and the poor. His five decades of work on several fronts--mostly concerned with agriculture in one respect or another, but reaching far beyond agriculture--have been geared in essence to what one might term "a new development agenda for human well-being and peace"--"peace" in the proper full sense of the word, viz. peace for individuals and peace for communities as well as peace for nations. It is in this broader perspective that his achievements are to be evaluated. During my eight visits to India I have often heard that he is viewed by many as "a modern Gandhi." Indeed it is hard to think of another individual who has done so much to enhance the lifestyles of so many--surely billions--of disadvantaged people.

After thirty years, the Nobel Peace Prize Committee may wish to recognize a second agricultural scientist who is pre-eminent among his peers around the world--and who is much more than an agricultural scientist.

X. REFEREES

H.E. Mr. K.R. Narayanan, President of India, Rashtrapati Bhawan, New Delhi 110001, India

Mrs. Sonia Gandhi, Chairperson, Rajiv Gandhi Foundation, Jawahar Bhawan, Dr. Rajendra Prasad Road, New Delhi 110001, India

Dr. Ashok Khosla, Director, Development Alternatives, B 32 Tara Crescent, Qutab Institutional Area, New Delhi 110016, India

Hon. Dr. Gro Harlem Brundtland, Director General, World Health Organization, Geneva, Switzerland

Hon. Nelson Mandela, President of South Africa, President's Office, Pretoria, South Africa. (President Mandela knows Dr. Swaminathan through the latter's visit to South Africa as Chairman of the Board of the Global Hunger Project.)

Mr. Javier Perez de Cueller, former Secretary General of the United Nations, Lima, Peru

Dr. E. Song Jian, State Councillor and Chairman of the State Science and Technology Commission, 54 Sanlihe Road, Beijing 100862, P.R. China

Mr. Maurice F. Strong, Special Adviser to the Secretary General, The United Nations, New York, NY 10017, U.S.A.

Dr. Jacques Diouf, Director General, Food and Agriculture Organization, Via delle Terme di Caracalla, 00100 Rome, Italy

Dr. Federico Mayor, Director General of UNESCO, 7 Place de Fontenoy, 75700 Paris O7 SP, France

Professor Amartya Sen (recent Nobel Prize Laureate in Economics), Master, Trinity College, University of Cambridge, Cambridge, U.K.

Hon. Ola Ullsten, former Prime Minister of Sweden, and Chairman, World Commission on Forests and Sustainable Development (of which Dr. Swaminathan was a Member), Geneva, Switzerland

Hon. Dr. Wakako Hironaka, former Minister for Environment, and now Member, House of Councillors, Tokyo, Japan

Hon. Bellasario Betancour, former President of Colombia, President's Office, Bogota, Colombia

Hon. Julius Nyerere, former President of Tanzania, President's Office, Dar es Salaam, Tanzania

Hon. Dr. Jose Vargas, Minister for Science and Technology, Government of Brazil, Brasilia, Brazil

Extracts from FELICITATIONS TO DR. M. S. SWAMINATHAN
on his 70th birthday,
published by the National Academy of Agricultural Sciences,
New Delhi, 1995

"Dr. M. S. Swaminathan is a living legend in our time, [with] unparalleled achievements in science and research, and countless awards, prizes, fellowships and honours showered on him by national and international institutions. The Green Revolution which transformed our food-deficit country with 360 million people into a food self-sufficient one with 900 million has earned for him an indelible place in our national history."

His Excellency E. R. Venkataraman, former President of India

"Dr. Swaminathan is the doyen amongst the agricultural scientists who laid the foundations of India's Green Revolution and its present food security. He is undoubtedly one of the foremost agricultural scientists of this century."

Hon. P. V. Narasimha Rao, former Prime Minister of India

"Dr. Swaminathan's contributions to the field of agricultural sciences have had a revolutionary impact on our country's economy."

Hon. Pranab Mukherjee, former Minister of External Affairs, India

"As a scientist and researcher, as a pioneer of the Green Revolution, as an adviser and policy maker, and above all as a leader, you have undertaken great efforts in the relentless struggle to find sustainable ways to achieve man's basic right to food."

Dr. Jacques Diouf, Director General of FAO

"I congratulate you for the many decades you have dedicated to agricultural sciences, contributing greatly to increasing food production to alleviate poverty and human misery. You have made an outstanding contribution to the world, and while preserving our environment you have made people its beneficiary. The people of the world will always be indebted to you, not only for your innovative approaches, your research, and the many books and articles you have written, but for the leadership role you have taken in all areas for the preservation of our planet."

Dr. Norman Borlaug, Nobel Peace Prize Laureate

"Dr. Swaminathan's lifelong work to increase the Earth's food supply has been of great significance to the developing world, to which he has brought nothing less than hope for a better life and hope of a brighter future."

Elizabeth Dowdeswell, former Executive Director of UNEP

DR. M.S. SWAMINATHAN: RECENT ACTIVITIES

The following are some activities undertaken by Dr. M.S. Swaminathan since I first nominated him in January 1999. They demonstrate the exceptional esteem in which he is increasingly held by leaders in many parts of the world.

1. In June 1999 Dr. Swaminathan presented a keynote address to the World Science Conference in Budapest, entitled "Science and Basic Human Needs." The lecture abstract was published as a Guest Editorial in Science journal, this being the leading scientific journal worldwide.
2. In August 1999, Time Magazine listed him as one of the 20 most influential Asians of the 20th century. He was one of three Indians, the other two being Mahatma Gandhi and Dr. Rabindranath Tagore (Nobel Laureate in Literature).
3. In October 1999 Dr. Swaminathan was presented with The Sir Asutosh Mukhanji Medal for Science and Society, being the highest award of the Indian Science Academy.
4. In November 1999 Dr. Swaminathan received the UNESCO Gandhi Gold Medal, "in recognition of his outstanding work in extending the benefits of biotechnology to marginalized and poverty-stricken populations in developing countries, and in securing a sound basis for sustainable agricultural, environmental and rural development."
5. In November 1999 Dr. Swaminathan was awarded the Volvo Environment Prize. This tenth award of the Prize was to recognize "his international leadership in agriculture and resource conservation, his deep concern for the poor and disadvantaged, and his continuing research to ensure that the poor can advance in environmentally sound ways." Previous recipients include Professor Paul Ehrlich, Dr. Peter Raven and Professor Paul Crutzen--all scientists of international eminence.
6. In April 2000 Dr. Swaminathan was presented with the Franklin D. Roosevelt Foundation's Four Freedoms Medal for his "extraordinary work as an agricultural scientist, leading the Green Revolution, and bringing hope to developing nations so that the ages-old scourges of famine and hunger can be ended. [His] brilliant leadership has established a goal for the new millennium--a hunger-free world, an international structure of cooperation among nations, and a determination to use the miraculous technology of our times to help those in need. [His] dynamism and compassion have given new meaning to Franklin Roosevelt's commitment to a better world where all nations will strive for Freedom From Want."

The Four Freedoms Medal was "created to honour individuals and institutions whose work has given special meaning to the four freedoms described by President Roosevelt." Previous recipients have included His Majesty Juan Carlos of Spain; the Dalai Lama; former U.N. Secretary General Peres de Cuellar; the U.N. High Commissioner for Human Rights, Mary Robinson; the U.N. High Commissioner for

Refugees, Sadako Ogata; Dr. Jan Tinbergen, Nobel Prize winner for Economics; and the organization Medicin Sans Frontiers.

7. In August 2000 Dr. Swaminathan received the International Geographical Union's Planet and Humanity Medal in recognition of his role as "one of the greatest scientists and humanists of the second half of the 20th century."

8. In November 2000 Dr. Swaminathan was chosen for the Indira Gandhi Prize for Peace, Disarmament and Development. Previous recipients included Nelson Mandela and Rajiv Gandhi.

9. In January 2001, the Prime Minister of India conferred on him the Millennium Scientist Award of the Indian Science Congress in recognition of his work to relieve hunger.

Professor Norman Myers
Oxford University

Dr. M. S. SWAMINATHAN; RECENT CONTRIBUTIONS

For latest details of Dr. Swaminathan's CV, his awards and honours, and his principal present activities, see "Prof M S Swaminathan and Freedom from Hunger and Harmony with Nature," copy attached.

The major focus of his latest work has been in the field of Food for Peace and Sustainable Development. Since hunger represents the most extreme form of poverty and deprivation, he has concentrated on the goal of a hunger-free India by the year 2007, being the 60th anniversary of India's independence. He has succeeded in generating the political will for this goal, as witness the enclosed article in "The Hindu" newspaper and a copy of his letter to the Prime Minister.

His main strategy is to enable every person to earn his or her daily bread. By contrast with many other food experts, Dr. Swaminathan has long urged that relieving hunger must be allied with relieving poverty. By eliminating social exclusion, both in gender and economic terms, he creates a "win-win" situation.

He has also been highlighting the imperative of enlisting technology to foster social and gender equity as key factors in poverty relief. He believes this is best achieved by adopting Gandhi's "Antyodaya" approach to bridging multiple divides: technological, nutritional, gender and digital among others, and not just in India but worldwide. The Antyodaya concept involves a bottom-up approach starting with the poorest people; Dr. Swaminathan's model has been recognised by the Stockholm Challenge Award in 2001 and by the Motorola Gold Award in 2000. Similarly he has revitalized another of Gandhi's precepts, Sarvodaya, which promotes win-win outcomes for all, rather than winners and losers. He proved the merit of these two strategies way back in 1964 while organising demonstrations with new wheat varieties, resulting in India's wheat revolution of 1968. As a result of his espousal of the two approaches, continuing right up until the present day, he has long been referred to as the Modern Gandhi.

In addition, Dr. Swaminathan continues to promote the Ever-Green Revolution, this being a term first coined by him to emphasize the role of eco-technologies in enhancing crop productivity in perpetuity and hence without associated environmental and social problems.

Professor Norman Myers
Oxford University

Swaminathan to head Pugwash movement

By Our Special Correspondent

AGRA, MARCH 17. Food scientist, M.S. Swaminathan, has been elected to lead the Pugwash Conferences on Science and World Affairs for the next five years. This is the first time an Indian has been chosen to preside over the movement launched nearly five decades ago by Albert Einstein Bertrand Russell.

At the 51st annual session of the movement here, it was announced that Prof. Swaminathan would take charge of the assignment later this year.

The Pugwash movement



won the Nobel peace prize in 1995 for its contributions to promotion of nuclear disarmament. The outgoing president, Michael Atiyah, welcomed the selection. Prof. Swaminathan would help expand the Pugwash agenda in the years ahead to encompass issues relating to health and welfare of the world's people in addition to the traditional Pugwash goals of resolving conflict and eliminating nuclear and other weapons of mass destruction," he said.

Prof. Swaminathan is Unesco-Cousteau Professor in Eco-technology and heads the M.S. Swaminathan Research Foundation.

disputed Ivie's right to rename it.

The controversy highlights problems with duplicate names. Thousands of biological species are thought to share the same names, and a recent paper (J. Alroy, *Proceedings of the National Academy of Sciences*; 10.1073/pnas.062691099; 2002) suggests that this and other taxonomy problems may have led to overestimates of global diversity.

Taste of success in search for oral smallpox drug

Prague Hopes for the development of an easy-to-take smallpox drug were set to receive a boost with the announcement by virologists of a treatment that can be taken orally.

Researchers at the International Conference on Antiviral Research in Prague were expected to reveal this week that hexadecyloxypropyl-cidofovir (HDP-CDV) protects mice against cowpox, a relative of smallpox. The drug also protects cultured human cells against smallpox.

The treatment has not yet been tested for safety in people, but John Huggins of the US Army Medical Research Institute of Infectious Diseases in Fort Detrick, Maryland, says he is optimistic that it will prove to be safe and effective in humans.

Once in the body, HDP-CDV is converted into the drug cidofovir, which is thought to be a safe smallpox treatment but which must be administered by injection.

Crop pioneer to lead non-nuclear family

New Delhi Indian geneticist Monkombu Sambasivan Swaminathan is to lead the Pugwash Conferences on Science and World Affairs, the influential nuclear non-proliferation group that was launched nearly 50 years ago by Albert Einstein and Bertrand Russell.

Swaminathan's work on crop genetics and sustainable agriculture has played an important role in helping to improve India's food supply over the past 40 years. He is currently chairman of the M. S. Swaminathan Research Foundation, a non-profit organization based in Chennai that works to promote sustainable development.

Swaminathan, who is the first Indian to lead Pugwash, was elected as its head last week at the 51st Pugwash Conference in Agra, India. The outgoing president, Michael Atiyah, said that Swaminathan's election would help to expand Pugwash's agenda into areas relating to health and welfare.

Germans up in arms over shotgun technique award



Craig Venter's win drew criticism.

Munich Some German scientists played party-pooper last week after Craig Venter, former president of Maryland-based Celera Genomics, won the prestigious Paul Ehrlich Prize. Venter won the award for developing the 'shotgun' method of mapping genetic sequences and

using it to map the human genome.

Helmut Blöcker of the German Research Centre for Biotechnology in Braunschweig, one of the German Human Genome Project's coordinators, told the German Press Agency that the award was "unjustified". He claims that the shotgun method is flawed and that the sequencing technique used by Venter was not new.

Many biologists feel that the sequencing of the human genome warrants a Nobel prize, but it is unclear whether both the public and the private projects will be so honoured. The Nobel committee will also have to decide how to deal with the rule that stipulates that a maximum of three people can receive the prize.



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**LBSC****OFFICE OF THE EXECUTIVE DIRECTOR**

17 January 2002

Dr. M. S. Swaminathan
M. S. Swaminathan Research Foundation
3rd Cross St., Taramani Institutional Area
Chennai, 600113 India

Dear Dr. Swaminathan:

First of all, the Philippine Council for Agriculture, Forestry and Natural Resources Research and Development (PCARRD) and the Los Baños Science Community (LBSC) would like to extend to you our best wishes for the new year.

Several years ago, you donated a sum of P 100,000 for outstanding research award in agriculture. PCARRD and LBSC have handled the award and have granted it to a number of scientists in Los Baños community using the interest savings from your donation. We have entitled this award as the M. S. Swaminathan Outstanding Research Award.

At this point, we would like to extend our sincere appreciation and gratitude for your contribution to the community.

Beginning 1990, the interest earnings have been used as cash prize for the said award during the National Science Technology Week (NSTW). The conferment of this award has been a continuing highlight of the LBSC-NSTW celebration. Your contribution has contributed significantly to sustain interest of researchers and scientists to pursue excellence in agriculture research. We would like to inform you that the LBSC has been converted into a foundation. It started with 11 members but now involves 22 member agencies in Los Baños.

Changing times have prompted us to increase the cash awards to be at par with those given by other award giving bodies. At present, your trust fund has a total amount of P 140,431.52.

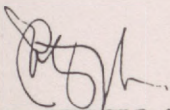
The LBSC Secretariat
PCARRD-DOST, Los Baños, Laguna
Tel. Nos. (049) 536-0014 to 15; 536-0017 to 20;
536-5896 to 99 local 271
FAX: (049) 536-0016; 536-0132

We would therefore like to explore the possibility of increasing the cash prize given every year. This amount as a gesture of concern on the importance of agricultural research and the continuous support to scientific inquiry, will undoubtedly inspire scientists and the members of the LBSCFI.

Attached is the list of recipients of the M.S. Swaminathan Outstanding Research Award.

With my best personal wishes.

Very Truly yours,

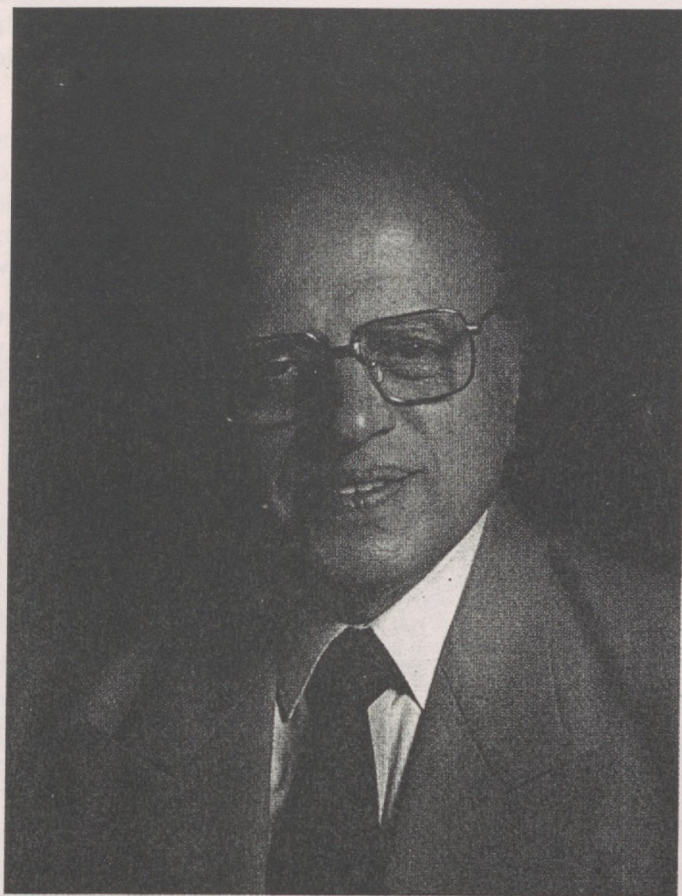


PATRICIO S. FAYLON
Executive Director, PCARRD and
President, LBSCFI

M. S. Swaminathan Outstanding Research Award

<i>Year</i>	<i>Awardee</i>	<i>Agency</i>	<i>Paper Title</i>
1998	S. B. Exconde A. K. Raymundo T. M. Espino	University of the Philippines, Los Baños (UPLB)	Development of Nucleic Acid Based Monoclonal Antibodies for the Detection of the Bacterial Wilt Organism.
1997	L. S. Sebastian R. Ikeda N. Huang T. M. Imbe W. R. Coffman S. R. McCouch	Philippine Rice Research Institute (PHILRICE)	Molecular Mapping of Resistance to Rice Tungro Spherical Virus (RTSV) and Green Leafhopper (GLH)
1996	K.G. Cassman H.C. Gines M.A. Dizon M.I. Samson J.M. Alcantara	International Rice Research Institute (IRRI)	Nitrogen Use Efficiency in Tropical Lowland Rice Systems: Contributions from Indigenous and Applied Nitrogen
1993	A. Rola P. Pingali	International Rice Research Institute (IRRI)	Pesticides, Rice Productivity and Farmer's Health: An Economic Assessment
1992	A.N. Calendacion K.T. Ingrani D.P. Garrity C.B. Adalla	International Rice Research Institute (IRRI) University of the Philippines, Los Baños (UPLB)	Lock-lodging: A New Technology for Ratoon Rice Cropping INPM Extension and Women Project: An Alternative Approach to the Transfer of a Complex Technology
1991	L.E. Padua F. Librero	University of the Philippines, Los Baños (UPLB) University of the Philippines, Los Baños (UPLB)	Biotechnology in the Production of Microbial Insecticide Against Corn Borer <i>Astrinia Furnacalis</i> (Guenee) and Other Important Pests of Corn Synthesis of Selected Development Communication Research in the Philippines: Some Policy Implications for Agricultural Development Program Implementation

<i>Year</i>	<i>Awardee</i>	<i>Agency</i>	<i>Paper Title</i>
1991	L.T. Trung L.P. Palo	University of the Philippines, Los Baños (UPLB)	Milk and Meat Production from Urea treated Rice Straw with Limited Supplementation: The Philippine Experience
1990	I.J. Manguiat D.F. Guinto A.S. Perez A.T. Jalalon	International Rice Research Institute (IRRI)	<i>Sesbania rostrata</i> : An Effective Substitute for Commercial Nitrogen Fertilizers in Corn and Rainfed Rice Production



Dr MS Swaminathan is one of the architects of India's green revolution in the sixties, which transformed the nation from a food scarcity to nation of food surplus and even an exporter. Winner almost all the top prizes in the world, Dr Swaminathan has not rested on its laurels. The MS Swaminathan Research Foundation (MSSRF), which he runs in Chennai for the last decade is a leading institution advocating maintenance of national food security through adoption of modern technologies, including biotechnology on an equitable basis.

As the nation leapfrogs in to the modern technological world, Dr Swaminathan's sane voice has been calling a national consensus on biotechnology. From all public forums, including the latest edition of the Indian Science Congress held in early January, Dr Swaminathan has strongly recommended the need to formulate a National Biotechnology Policy on the lines of the national policies on sensitive areas like space, atomic energy and information technology. Because, national consensus in these sectors have done wonders to make India a leading global player in these areas.

Dr Swaminathan visualizes India making similar strides in biotechnology. As part of the informal nationwide consultation process, Dr Swaminathan recently organized a meeting of over 50 leading experts at the MSSRF in Chennai to discuss the issues confronting the biotechnology sector thread bare.

We present here the Chennai Declaration, prepared under Dr Swaminathan's guidance, which reiterates the urgent need for a National Biotechnology Policy.

'It's time to have a National Biotech Policy'

The country has well defined policies in the fields of atomic energy, space applications and information technology. No further time should be lost in developing a national food and agricultural biotechnology policy through political consensus.

Otherwise India will experience serious genetic divide. A similar policy is also needed in the area of medical biotechnology, which involves ethical issues with reference to both human and animal experiments.

The urgency stems from the fact that the twenty-first century will belong to those who help to advance the frontiers of science and technology in the areas of functional genomics, proteomics, bioinformatics and molecular breeding (ie, genetic modification).

Scientific leap-frogging in both the theoretical and applied aspects of the new genetics will take place mostly in industrialized countries. China is fast becoming a developed country in respect of achieving mastery of techniques relating to genomics and recombinant DNA technology for improving human nutrition and health.

Equally important is to formulate a well-defined implementation plan for the national food and agriculture biotechnology policy. Because any policy without an appropriate and effective implementation framework will have no value.

Therefore, the policy should provide the terms of reference to an autonomous and professional Biotechnology Regulatory and Advancement Commission.

The aim of regulation should be to help in harnessing this powerful technology in a risk free and responsible manner. The Commission should not only develop and enforce a code on "don'ts", but should also propose "dos", which will help to gain benefits without risks. It should build on the Cartagena international protocol on biosafety and introduce a system of regulation and monitoring which inspires public, political and media confidence.

The term, "biotechnology" encompasses a wide range of technologies- both traditional and frontier. For example, the production and use of biofertilizers, biopesticides, vermi-culture, and bioremediation agents are essential for fostering ecologically sustainable farming methods. Bioprocessing and bioprospecting offer new opportunities for skilled jobs and livelihoods. These areas of biotechnology also offer scope for decentralized village level enterprises operated by self-help groups.

Regulation for the responsible advancement of biotechnology for public good should be the motto. The National Biotechnology Regulatory and Advancement Commission, which could be attached to the Ministry of Agriculture for administrative purposes, should be headed by an eminent professional known for objectivity and credibility.

There should be a multi-stakeholder representation on the Commission and its standing Committees, including scientists, concerned government officials, representatives of public and private sector industry, consumer and women's associations, farmers' associations and the mass media. Such a Commission will be effective only if it is created on the basis of consensus among political parties.

The following could be some of the important responsibilities of the Commission

- ❖ Create the expertise and infrastructure needed to undertake a critical and transparent scientific assessment of the food and environmental safety of Genetically Modified (GM) crops.
- ❖ Coordinate the work of the Ministries of Agriculture, Health, Environment and Science and Technology, Department of Biotechnology (DBT) in the area of biosafety assessment.
- ❖ Provide guidelines for research collaboration between public and private sectors in areas such as functional genomics, proteomics and bioinformatics as well for priorities in public investment, as for example research on drought tolerance, water use efficiency and salinity assistance.
- ❖ Assist in fostering linkages among biodiversity-biotechnology biosafety management, conservation of habitats rich in agro-biodiversity should receive special attention
- ❖ Monitor the role of the biotechnology industry in assisting the effective implementations of the Protection of Plant Varieties and Farmers' Rights Act and the Biodiversity Act.
- ❖ Help to upgrade patent offices and develop expertise in dealing with issues connected with the Trade Related Intellectual Property Rights (TRIPS) regime of World Trade Organization (WTO).

- ❖ Promote regional and international biosafety collaboration, particularly among South Asian Association for Regional Co-operation (SAARC) and Association of Southeast Asian Nations (ASEAN) countries.
- ❖ Serve as a single window regulatory and monitoring agency and develop and introduce a time bound regulatory process.
- ❖ Help to create public awareness and understanding on issues relating to biosafety and biotechnology in local languages and vernacular media.
- ❖ The Commission should submit an annual report to parliament on the state of Food and Agricultural Biotechnology in India.

Building National Capacity

To build the national capacity in all areas of risk assessment and biosafety valuation and monitoring, it will be useful to set up a National Research Center for the safe and responsible use of GM crops.

Such a National Research Center could provide the scientific and technical support needed by the proposed National Biotechnology Regulatory and Advancement Commission.

The center should maintain a global database on biosafety assessment procedures and legislation. It should undertake training, capacity building and networking in the field of biosafety evaluation. Ultimately, considerations of human health and environmental safety should be the bottom line in risk assessment.

The policy has to deal with the apprehensions relating to molecular genetics and genetic engineering in many broad categories.

- ▼ Issues relating to science itself, such as its ethical implications and the problems associated with the antibiotic markers used, etc.
- ▼ Issues relating to the control of science such as the probability of the control of global food security falling into the hands of a few transnational corporations.
- ▼ Issues relating to access, such as the implications of IPR for the poor, technologies becoming more

exclusive than inclusive leading to a further expansion of the rich-poor divide in terms of technological empowerment.

- ▼ Issues relating to the environment, such as impact on biodiversity, possibility of "genetic pollution" in the centers of origin and diversity of crop plants emergence of super weeds.

Finally, issues relating to human and animal health and food safety and allergenicity, which are extremely important in the case of food, feed and fodder plants.

Of the above, the ethical issues assume greater importance in medical biotechnology in areas such as human cloning. A disaggregated approach to the study of the above issues will be important for a rigorous analysis of risks and benefits.

If a disaggregated approach is not used to analyze the issues involved, the conclusions arrived at in international meetings will tend to deal with them in a composite manner as will be clear from the following statement made by NGO and civil society organization at the World Food Summit meeting held in Rome in 2002. "GM Organisms represent a threat to family farmers, other food producers, the integrity of genetic resources and human and environmental health. They will affect particularly the rural poor, who cannot afford this costly alternative"

The benefits of molecular breeding techniques like the use of molecular markers and undertaking precision breeding for specific characters through recombinant DNA technology are immense. The work already done in India has revealed the immense potential for breeding new GM varieties possessing tolerance to salinity, drought, some major pests and diseases and improved nutritive quality. A new era of Integrated Mendelian and Molecular Breeding has begun.

This is the only way we can face the challenges of the future, particularly in the context of the growing water scarcity as well as the urgent need to step up productivity in semi-arid and dry farming areas. Denying ourselves the power of the new genetics will be doing great disservice to both resource poor farming families and to the building of a sustainable national food and nutrition security system. Food self-sufficiency is essential for preserving our national sovereignty in foreign policy.

Interview

Photo courtesy
Michele Wambaugh



Ever-Green Revolution with Ecotechnology

Prof. M.S.Swaminathan is well known as the hero of Green Revolution. Now he has given a call for Ever-green revolution for sustainable development and to eradicate hunger. As he is one of the most influential personalities of the world, already there are many takers for his call. And many, including governmental and non-governmental agencies, have already jumped into action in response to his call. In this context, Bioinformatics interviewed him.

Following is the interview with him.

BI: What motivated you to give a call for Ever-green Revolution?

MS: When I had given a call for green revolution in 1968 the ground conditions are so pathetic. Agricultural production was very low in spite of using pesticides, chemicals, and fertilisers very heavily.

Limited arable land and its decreasing area were concerns to us and we felt an urgent need for green revolution to feed the hungry. Today, even though there are surplus food grains in the store the number of hungry people is also growing. On the other hand we have to keep producing at higher levels perpetually. This is possible only through blending traditional and frontier technologies including biotechnology. All these made me to call for the Ever-green revolution.

BI: What are the ways and means to achieve this?

MS: The main aim of the Ever-green revolution is enhance productivity in perpetuity without associated ecological or social harm. I explained the ways and means to achieve this in my book "From Rio de Janeiro to Johannesburg." Hunger can be eradicated by following five dimensional approach. These are: 1. Availability of food, which is a function of production, 2. Access to food, which is related to purchasing power, 3. Absorption of food in the body, which is determined by the availability of safe drinking water, environmental hygiene, primary health care, and primary education, 4. Vulnerability to transient hunger, which is related to natural and man made calamities and disasters, and 5. Sustainability of production, which is influenced by the extent of attention given to the ecological foundations essential for sustained advances in production.

The ways and means to work on these five

dimensions should be chalked out from the key technological developments in the following areas. They are: 1. Genomics- the molecular characterisation of species, 2. Bioinformatics- data banks and data processing for genomic analysis, 3. Transformation- introduction of individual genes conferring potentially



Photo courtesy :
Michele Wambaugh

useful traits into plants, trees, livestock, and fish species, 4. Molecular breeding- identification and evaluation of useful traits by the use of marker-assisted selection, which greatly speeds up traditional breeding processes, 5. Diagnostics- identification of pathogens by molecular characterisation, and 6. Vaccine technology- use of modern immunology to develop recombinant DNA vaccines for improved disease control against lethal diseases of animal and fish. Several large corporations in Europe and the US have made major investments in adapting these technologies to produce new plant varieties of agricultural importance for large scale commercial agriculture. The same technologies have equally important potential applications to achieve the goals

of Ever-green revolution. In order to ensure that the benefits of new technologies reach the unreached, there should be major investments in the public sector.

BI: When you had called for Green Revolution in 1968, there was a need of people and hurry of policy makers. Now there is no hurry or need of such. In this situations will you get same response like that of 1968?

MS: Even though there is a difference in ground realities, sustainability is the need of the hour now. Increase in population and decrease of per capita arable land and irrigation water force us to work for an Ever-green revolution.

BI: What is the difference in background conditions at the time of green revolution and now (Ever-green revolution)?

Dr. M.S. Swaminathan

If we were to present all the awards, achievements and recognition of Dr. M.S. Swaminathan then we will have to place for any other article. But as per our convention we are presenting here some of his achievements, which we can accomodate in this space.

The time magazine ranked prof. M.S. Swaminathan among the twenty most influential asians of the 20th century, along with Mahatma Gandhi and Rabindra Nath Tagore. Dr. Swaminathan has received 44 honorary doctorates from both Indian and foreign universities. He chaired many coveted positions at National and International level the event honorary positions held by him are :

1. Chairman, Board of Trustees, National Foundation for India
2. UNESCO - Cousteau Chair in Ecotechnology for Asia
3. Member, China International Council for Sustainable Development
4. Chairman of the M.S. Swaminathan Research Foundation (MSSRF)
5. Chairman, Ranganathan Centre for Information Studies, Chennai
6. Chairman, Genetics Resources Policy Committee of CGIAR
7. President, Voluntary Health Services, Chennai
8. Chairman, Current Science Association, Bangalore
9. Chairman, Centre for Science and Environment, New Delhi
10. Vice-Chairman, State Planning Commission, Tamil Nadu

11. Chairman, National Institute for Advanced Studies, Bangalore
12. President, Pugwash Conferences on Science and World Affairs.

Some of the Important Awards and Recognition received by Dr. Swaminathan are as follows :

1. Padma Shri, conferred by the President of India (1967)
2. Padma Bhushan, conferred by the President of India (1972)
3. Borlaug-Award, Instituted by Coromandel Fertilizers Ltd. for "evolving a strategy for agriculture rooted in science, but tempered by a concern for ecology and human values" (1979).
4. Meghnad Saha Medal of the Indian National Science Academy (1981).
5. Padma Vibhushan, conferred by the President of India (1989).
6. Jawaharlal Nehru Birth Centenary Award of the Indian Science Congress Association (1992).
7. Indira Gandhi Prize for peace, Disarmament and development, awarded by President K.R. Narayanan (2000).
8. Millennium Award of the Indian Science Congress Association, presented by Prime Minister Vajpayee (2001).
9. Ramon Magsaysay Award for Community Leadership, given in recognition of outstanding contribution as "scientist, educator of both students and farmers, and administrator, towards generating a new confidence in India's agricultural capacity" (1971)

MS: Need and hurry are driving forces for the green revolution of 1968. If we look carefully, the present conditions are also equally serious. Growing rural unemployment will lead to so many social and economic problems. Naxalism is an example for this. Creation of incomes for rural poor is essential. More food, More income, and More Jobs are the requirements today. All these are possible only through production quality and value-addition revolution.

BI: Please tell me about your concept of Community Grain Bank Movement.

MS: I have explained about this in the book "Community Grain Bank- An Instrument for Local Food Security." The co-existence of "mountains of grains

and millions of hungry" is paradoxical. On one hand there are now more than 55 million tonnes of food grain stocks with the government. On the other hand severe drought in several parts of Rajasthan, Gujarat, Madhya Pradesh, and other states is compounding the problems of poverty-induced endemic hunger and drinking water scarcity. Launching an imaginative Community Grain Bank Movement will address this problem. On an average, one tonne of wheat or rice meets the annual food needs of five individuals in our country. Community Grain Banks, each with 200 tonnes of locally acceptable food staples could be established to begin with in "the hunger hot spot" villages. Remote areas, with poor communication as the desert of Rajasthan and hill, tribal and drought

10. First recipient of the World Food Prize, the foremost international award to recognize, encourage, and reward outstanding individual achievement in improving the world food supply, considered the "equivalent of a Nobel Prize in the field of Food and Agriculture" (1987)
11. In recognition of Swaminathan's contributions to the research, training, and technology transfer programmes of the International Rice Research Institute, the Board of Trustees named the Training and Technology Transfer Building of the Institute as the M.S. Swaminathan Hall in 1988. IRRI Trustees also established a special fund for providing scholarships in the name of Dr. M.S. Swaminathan, for candidates who wish to do research in the area of 'Women in Rice Farming Systems.'
12. UNES present all the awards CO Gandhi Gold Medal for his "outstanding work in extending the benefits of biotechnology to marginalized and poverty-stricken populations in developing countries, and in securing a sound basis for sustainable agricultural, environmental, and rural development" (1999).

Contact Information :

Prof. M.S. Swaminathan

M.S. SWAMINATHAN RESEARCH
FOUNDATION

3rd Cross Street, Taramani Industrial
Area, Chennai - 600 113, India
Phone : (O) - (91-44) 2254 2790 / 2254
1229 Fax: 91 44 2254 1319
e-mail : msswami@mssrf.res.in
web : www.mssrf.org



Photo credit: /
Michele Wambaugh

Photo courtesy :
Michele Wambaugh



affected areas, can be given priority in starting the Community Grain bank Movement. About 50,000 Grain banks can be established in two Phases. This movement is: a way to resolve the paradox of the plenty; a way to reduce storage losses and transaction costs.

BI: The nucleus of your Ever-green revolution is organic farming. Organic farmers hate any type of modern technology including biotechnology? How can you bring synergy in these two?

MS: The goals of organic farming and biotechnology are same. Only thing we have to do is to synergise these two to achieve optimum output. The beginning point is organic farming. From this base we have to work to improve the following with the technologies. They are: 1. Soil Health, 2. Water Quality, 3. Plant Health, 4. Post Harvest Technology, 5. Animal Health, and 6. Environment.

BI: Pathways proposed by you for sustainable food security are: 1. Defend gains, 2. Extend gains, and 3. Make new gains. Please elaborate.

MS: Defend gains against biotic and abiotic stresses and climatic change. Extend gains to rainfed and marginal environments. Make new gains through farming systems diversification and value addition. All these can be achieved with modern technology.

BI: Padmasree, Padmabhushan, Padmavibhushan, World Food Prize and many more are token recognitions to your service to the nation and humanity. Sometimes your name was proposed for top constitutional posts. Are you not interested in them?

MS: I am very happy with what I am doing. Working to solve the problem of hunger gives me immense pleasure.

BI: What is your life term goal?

MS: My life term goal is to solve the problem of poverty and to eradicate the hunger. I have given a call for "Count Down August 2007 to Eradicate the Hunger." 2007 is the 60 th year for Independent India. My campaign is to end hunger by that year. Already, our Prime Minister has stated that we should work towards achieving this objective.

BI: What steps should be taken to assess the risks and dangers of Biotechnology?

MS: Scientists are taking enough safety precautions. Even if something goes in an unpredicted way, they have enough capability to control the situation and take remedial measures.

BI: Farmer is the only person who is always with the plants and crops not the scientists. There is a great need to educate them about the pros and cons of Biotech crops. How to do this?

MS: We are starting a "Virtual University for technology and Skill Empowerment for Rural People." Most probably by 5 June, 2003 it will start functioning. It uses 1. Internet, 2. Cable Television, 3. Community Radio, 4. Local Language Media to inform and educate the farmers. Moreover Virtual University also organises direct interaction programmes.

BI: You told about direct interaction. How it is possible?

MS: This programmes disseminates information in an horizontal plane. That means, we will organise Trainers Training programmes. In turn they will go various places and educate the masses. Interaction is possible in this way. Farmer to farmer learning is the most effective method of communication. □

Science and Achieving the Goal of a Hunger-free World

By Prof. M. S. Swaminathan



Professor Swaminathan is widely known as the father of the green revolution, an agricultural renaissance which transformed India from a famine-prone food importer to an agriculturally self-sufficient food exporter. Professor Swaminathan now leads the advocacy for an "ever-green revolution," a vision based on integrated resource management with the aim of improving productivity in perpetuity without associated ecological or social harm.

A plant geneticist by training, holder of the UNESCO Chair in Ecotechnology at the M. S. Swaminathan Research Foundation (MSSRF) and winner of numerous awards, he has recently been elected president of the Pugwash Conferences on Science and World Affairs.

This article is drawn from his Dorothy Hodgkin Memorial Lecture in August 2002.

The Roman philosopher Seneca was convinced that where hunger rules, peace cannot prevail.

In spite of the recognition that food and drinking water constitute the first among the hierarchical needs of human beings, the Food and Agriculture Organization (FAO) reports that the total number of hungry in the world now stands at 815 million, of whom 777 million are in the developing countries, 27 million in the countries in transition from central rule to democratic governance, and 11 million in the industrialized world.

Hunger and Ethics

The United Nations Conference on Food and Agriculture, called on the initiative of U.S. President Roosevelt in 1943, declared its belief that "the goal of freedom from want of food, suitable and adequate for the health and strength of all peoples, can be achieved."

"... the goal of freedom from want of food, suitable and adequate for the health and strength of all peoples, can be achieved."

The World Food Conference, held in Rome in 1974 reiterated Roosevelt's conviction that hunger is inexcusable and called for public action that would ensure that by 1984, "no child, woman or man goes to bed hungry and no one's physical or mental potential is stunted by malnutrition." Yet today hunger is actually increasing in terms of the number of persons affected.

Some 20 countries have adopted constitutions that recognize the right to food as a fundamental right. Most countries are, however, yet to develop an implementation framework which can help convert this right into reality. Countries such as Brazil, Mali, Nepal, South Africa, Senegal and Uganda have started a dialogue on ways of operationalizing the right to food at the national level. An expanding body of national jurisprudence has made the right to food come within the oversight of courts.

In April 2001, for example, a human rights NGO, the People's Union for Civil Liberties, filed a complaint with the Indian Supreme Court, arguing that several federal institutions and local state governments should, inter alia, be held responsible for mass malnutrition



Women make up more than half of the world's agricultural workforce.

among the people living in the states concerned. In one of its interim orders relating to the case, the Supreme Court affirmed that where people are unable to feed themselves adequately, governments have an obligation to provide for them, ensuring, at the very least, that they are not exposed to malnourishment, starvation and other related problems.

Recently journalist Barry Berek of *The New York Times* has documented the sale of children in parts of Afghanistan in exchange for wheat. When confronted by Berek, a father simply said, "I miss my sons, but there was nothing to eat."

Unforgettable human tragedies of this nature are taking place at a time when the markets of both industrialized and developing nations are flooded with grains. At the same time, experience tells us that every calamity provides an opportunity for initiating steps which will help render such tragedies problems of the past.

Tackling Hunger

In 2001, I proposed the establishment of a global grid of Community Food Banks (CFB), to begin with in the "hunger hot spots" of the world, to avoid tragic situations like that described by Berek. Grains could be stored in silos, designed based on the ecology and climate of the area as well as the kinds of staples to be stored. The CFB could be self-sustaining, based on the purchase of local grains and tubers, which serve as lifesaving crops in the region. This will help minimize both transportation and transaction costs and at the same time widen the composition of the food basket.

Today, social realities like peace and security influence the sustainability of food security more than ecological or economic factors. Let the international coalition against terrorism sponsor an international

"Some 20 countries have adopted constitutions that recognize the right to food as a fundamental right."

food bank for community food security, possibly under the auspices of the World Food Program (WFP), so that no one on our planet will hereafter have to sell their children to avoid the pain of hunger.

In many developing countries, hunger is depriving huge numbers of children of the full expression of their innate genetic potential for physical and mental development. For example, 25-50 percent of children born in several

fight maternal and fetal undernutrition, thereby helping to minimize the frequency of children with low birth weights.

The various UN Conferences held during the 1990s have led to global plans of action, which, if implemented, could lead to a better life for all. A review of the recommendations of these international conferences reveals that apart from political, social and gender rights, the goal of poverty eradication should receive the highest priority from both national governments and bilateral and international organizations. Poverty is the root cause of hunger,



The effects of drought. These nomadic people have come in search of pasture but found only wasteland. Here a woman pounds in a mortar the last few grains her family has left.

developing countries are characterized by low birth weight (LBW), caused by maternal and fetal undernutrition and malnutrition. The UN Commission on Nutrition in its recent report (1999) has warned about the serious consequences of LBW both for brain development in the child and the health of the child in later life.

In my view, the WFP, FAO, UNICEF, WHO and UNDP should immediately launch in collaboration with interested national governments a global program to

lack of shelter and access to clean drinking water, illiteracy, ill health and other forms of human deprivation. The pathway to meeting the basic needs of every human being is poverty eradication.

Technology and Empowerment

We have seen in India barely literate farmers acquiring sophisticated electrical and mechanical engineering skills. It should thus be possible to embark upon a dynamic

"Without women's technological and skill empowerment, household nutrition security will continue to remain fragile in poor countries."

program for the technological empowerment of the poor. The major UN organizations should develop a plan of action for mobilizing technology, training, techno-infrastructure and trade for poverty eradication. Trade policies should be formulated in such a manner that they will strengthen and not erode the livelihood security of the women and men living in poverty. Developing countries should ensure that their import and export policies are based on a livelihood impact analysis.

The pervasive poverty we witness today is the most serious indictment of contemporary developmental pathways. The poor are poor because they have no productive assets—no land, no education and no technical skill. They have been bypassed by modern technological advances. Reaching the unreached and including the excluded have to be important components of contemporary science and technology policies and strategies. New information technologies provide a unique opportunity for the knowledge and skill empowerment of the poor. Opportunities exist today for speedily achieving a transition from unskilled to skilled work, which will enable the poor to experience a productive and healthy life.

The Fourth World Conference on Women in Beijing in 1995 found that: "In the past decade, the number of women living in poverty has increased disproportionately to the number of men, particularly in the developing countries. . . . In addition to economic factors, the rigidity of socially ascribed gender roles and women's limited access to power, education, training and productive resources . . . are also responsible. The failure to adequately mainstream a gender perspective in all economic analysis and planning and to address the structural causes of poverty is also a contributing factor." Without women's technological and skill empowerment, household nutrition security will continue to remain fragile in poor countries.

Emerging Scientific Revolutions and an Ecology of Hope

We are now experiencing major revolutions in science and technology, which will influence agriculture and industry in a fundamental manner. The question is how we can mobilize recent advances in science and technology to meet the basic needs of the economically and socially underprivileged sections of the human family.

The past 20 years have seen dramatic advances in our ability to analyze, understand and manipulate DNA molecules. The Human Genome

"How can we mobilize recent advances in science and technology to meet the basic needs of the economically and socially underprivileged sections of the human family?"

agriculture. The same technologies have equally important potential applications for addressing food security in the developing world.

Let me cite one example from the work of MSSRF scientists to illustrate the value of the new tools. As a part of the anticipatory research program to meet the consequences of sea level rise arising from global climate change, genes responsible for conferring the ability to withstand seawater intrusion were identified in

a few mangrove species through molecular mapping. They have been transferred to annual economic plants like rice through recombinant DNA technology.

Public concern relating to genetically modified food, however, stresses the need for effective and transparent mechanisms for assessing the benefits and risks associated with transgenic plants and animals. Broad-based national commissions on genetic modification for sustainable food and health security should be set up.

Project poured substantial resources into the development of new technologies for working with human genes. The same technologies have been applied to the mapping of plant genomes. Thus, new scientific disciplines of genomics and proteomics have emerged and are expanding at a rapid pace.

Several large corporations in Europe and the United States have made major investments in adapting these technologies to produce new plant varieties of agricultural importance for large-scale commercial



consisting of independent professionals, environmentalists, representatives of civil society, farmers' and women's organizations, mass media and the concerned government regulatory authorities. This will help assure both farmers and consumers that risks and benefits have been carefully and objectively assessed.

Knowledge is a continuum. There is much to learn from the past in terms of the ecological and social sustainability of technologies. At the same time, new opportunities for developing technologies which can lead to higher productivity without adverse impact on the natural resources base have opened up. Blending traditional and frontier technologies leads to the birth of ecotechnologies with combined strengths in the areas of economics, ecology, equity, employment and energy.

The Internet, meanwhile, especially in the light of recent enhancements in technology for connectivity in many developing countries, can provide unrestricted low-cost access to information, as well as opportunities for highly interactive distance learning. To make such education opportunities useful in the immediate context, we need to identify topics that are in demand by the rural communities. The MSSRF, for example, is planning the establishment of a Virtual University for Climate Management that will enable rural families and local administrators and policymakers to prepare effective responses to the emerging problem of climate-induced disasters.

The promotion of ecotechnology development and dissemination, the effective adoption of integrated systems of gene and natural resource management, and the effective harnessing of information technologies should become essential elements of the "science and technology for basic human needs" movement.



Mina Ushijima

reducing violence. Unfortunately, even now, far too high a proportion of national GDP is being spent on arms and military equipment as compared to programs designed for poverty eradication and meeting the basic needs of the underprivileged sections of humankind.

We now have a huge stockpile of scientific discoveries and technological innovations. This stockpile is more than adequate to

help all nations provide every adult human being an opportunity for a healthy and productive life and every newborn child a happy future.

A Knowledge Revolution

If technology has been a cause of economic and social inequity in the past, today we have an opportunity to make technology an ally in the movement for social, gender and economic equity. Modern information technology provides this opportunity. However, the technological and skill empowerment of the poor cannot be achieved through programs designed on the basis of a patronizing and top-down approach. The information provided should be demand and need-driven, and the knowledge centers should preferably be managed by women belonging to the socially and economically underprivileged sections of the society. Our aim should be the initiation and spread of a "knowledge revolution" for ending economic and gender inequity.

Scientists of the International Peace Research Institute, Oslo, have studied the causes of armed conflicts during the last 10 years. They found that violent conflicts in most cases could be traced to economic rather than ideological differences. They have hence suggested that investing in agriculture which helps promote food and livelihood security in many nations is an effective strategy for preventing future wars, eradicating poverty, preventing environmental destruction and

Gandhian Principles

Is there then no hope for the future? Mahatma Gandhi showed a path which we should now rediscover. That path was paved with the principles of *antyyodaya* (i.e., attention to the poorest person), *sarvodaya* (a pattern of development where there are no winners and losers, but where there is a win-win situation for all), the trusteeship mode of handling one's intellect and surplus wealth, and nonviolence.

In other words, the formidable power of science and technology can benefit mankind only if we know

"... the formidable power of science and technology can benefit mankind only if we know how to temper it with humanism."

how to temper it with humanism.

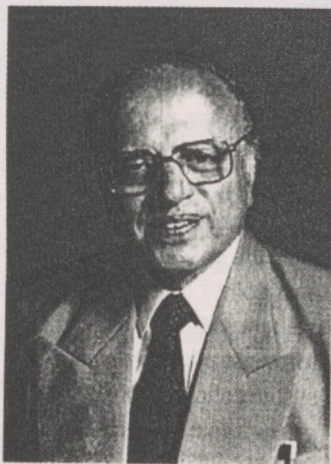
It is the duty of scientific establishments and science

academies to nurture and foster the growth of young men and women research leaders capable of initiating and managing a change in goals and strategies in the coming century.

We now have the capacity to achieve universal freedom from hunger, if we can bring about the requisite fusion of political will and action, professional skill and people power. □

Ecological Security: Backbone of National Food Security

The future of food security depends upon population stabilisation, the conservation and care of arable land, through attention to soil health and replenishment of fertility, and the conservation and careful management of all water sources, so that more crop can be produced per every drop of water.



Prof. M S Swaminathan has been acclaimed by TIME magazine as one of the twenty most influential Asians of the 20th century and one of the only three from India, the other two being Mahatma Gandhi and Rabindranath Tagore.

A plant geneticist by training, Prof. Swaminathan's contributions to the agricultural renaissance of India have led to his being widely referred to as the scientific leader of the green revolution movement. His advocacy of sustainable agriculture leading to an ever-green revolution makes him an acknowledged world leader in the field of sustainable food security. Prof. Swaminathan was awarded the first World Food Prize in 1987, Volvo Environment Prize in 1999, and the Franklin D Roosevelt Four Freedoms Award in 2000. He currently holds the UNESCO Chair in Ecotechnology at the M S Swaminathan Research Foundation in Chennai (Madras), India.

I. Introduction:

Sustained food security will be possible only if farm productivity can be increased in perpetuity without associated ecological or social harm. This will call for the conservation and enhancement of our land, water (inland and marine), forest and biodiversity resources, in addition to the protection of the atmosphere including the ozone layer. There is thus a feed-back relationship between ecological and food security.

II Right to Food:

The Right to Food has been recognised as a fundamental right. Many industrialised countries including the United Kingdom are now shifting their approach from food aid to enabling countries to build sustainable food security systems. This is because of the growing realisation that agriculture is not just a food producing machine, but is the very backbone of the livelihood and ecological security system in most developing countries. Hunger is the extreme manifestation of poverty, since the poor spend over 70% of their daily earnings on food.

In addition to chronic protein-energy malnutrition caused by poverty, two billion people in the developing countries, many of them being women and children, suffer from hidden hunger caused by one or more micronutrient deficiencies, like lack of iron, iodine or Vitamin A.

Ecologically sustainable agriculture, including crop and animal husbandry, fisheries, forestry and agro-processing can help to strengthen the livelihood security system in rural areas.

Household food security in such countries is best defined in terms of person years of jobs or livelihoods, rather than in terms of tons of food grains. A famine of jobs or of purchasing power leads to a famine of food at the level of consumption.

Agricultural progress serves as the best safety net against poverty, hunger and unemployment. Therefore, sustainable agriculture is the foundation for sustainable human security. I coined the term "ever-green revolution" to indicate sustainable advances in farm productivity.

E.O Wilson (2002) has stressed the importance of an ever-green revolution in the following terms. "The problem before us is how to feed billions of new mouths over the next several decades and save the rest of life at the same time, without being trapped in a Faustian bargain that threatens freedom and security. Non one knows the exact solution to this dilemma. The benefit must come from an evergreen revolution. The aim of this new thrust is to lift food production well above the level obtained by the green revolution of the 1960s, using technology and regulatory policy more advanced and even safer than those now in existence".

1. Integrated attention to the Components of Food Security

Food Security has three major dimensions.

Availability of food - a function of production.

Access to food - a function of purchasing power / access to sustainable livelihoods.

Absorption of food in the body - determined by access to safe drinking water and non-food factors like environmental hygiene, primary health care and primary education.

The capacity to support even the existing human and animal populations has been exceeded in many parts of the developing world. Hence, the future of food security depends upon population stabilisation, the conservation and care of arable land, through attention to soil health and replenishment of fertility, and the conservation and careful management of all water sources, so that more crop can be produced per every drop of water.

2. Ownership and Sustainable Use

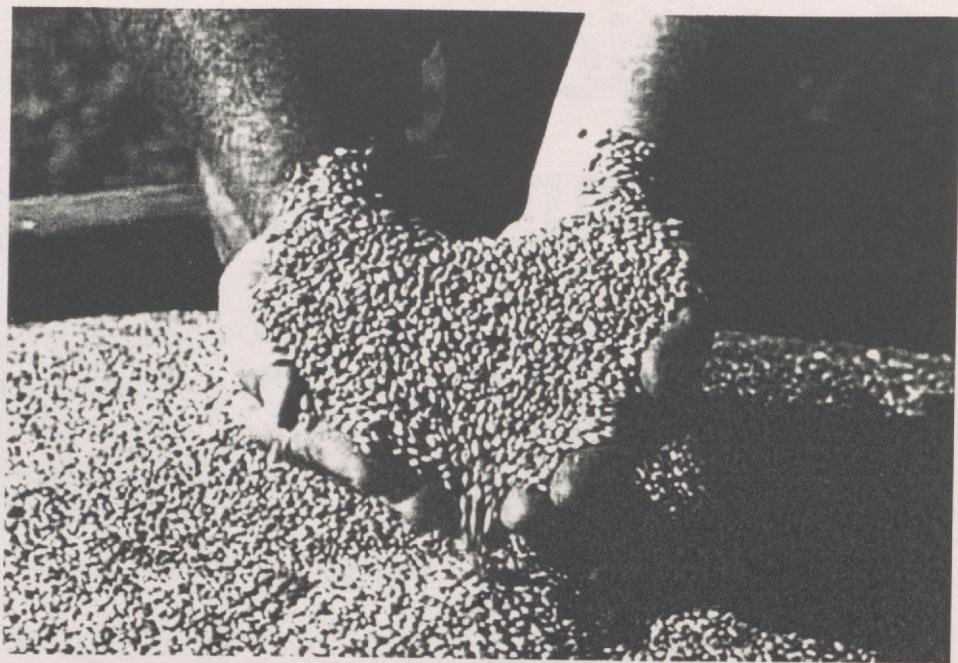
Much of the degraded and desertified land belongs either to resource poor families, or constitutes over used and over-grazed common property.

Ownership pattern of land and water determines the feasibility of introducing integrated and sustainable land and water management systems. Even where land is individually owned, locally acceptable systems of social management may have to be introduced through legislation, education and social mobilisation.

Women's access to land is also important. Water, particularly ground water, should be a social resource and not private property. Creating an economic stake in conservation is vital for ensuring the sustainable use of natural resources.

3. Environmental Refugees

Degradation and diversion of arable land and the depletion and pollution of water resources result in the loss of



rural livelihoods. This triggers the unplanned migration of the rural poor to towns and cities, resulting in the proliferation of urban slums. The rise in the numbers of such environmental refugees threatens peace and security. Norman Myers has chronicled the seriousness of the situation. Hence, there should be a monitoring mechanism for avoiding the loss of rural livelihoods. Development programmes should strengthen the linkages between ecological and livelihood security.

4. Grain y "hot spots", particularly in mountain ecosystems.

Coastal agro-aqua farms (planting of salicornia, mangroves, casuarinas, palms etc. along with coastal agriculture and aquaculture).

Water harvesting, watershed development, wasteland reclamation, and anti-desertification measures. Recycling of solid and liquid wastes and composting.

Agro-forestry and other sustainable land use systems in the fields of resource poor farmers.

The Government of India is now in a position to launch a Food for Sustainable Development and Hunger Elimination. About 20 million tones of

grains would provide nearly 100 million person years of work designed to eliminate poverty-induced endemic hunger and at the same time restore and enhance environmental capital stocks.

The Food for Community Food Banks (CFB) could manage Sustainable Development Initiative at the local level operated by Women's self-help groups. Such CFB's can be designed in a manner that they can address concurrently issues relating to chronic, hidden and transient hunger. The merit of CFB's will be low transaction cost and transparency. They can also help to widen the food security basket, thereby saving what could become "lost crops". Wherever animal husbandry including poultry farming, is important to provide additional income and nutrition to families living in poverty, CFB's can also operate Feed and Fodder Banks.

Conferring the right to food and thereby an opportunity for a productive and healthy life on those who go to bed undernourished now, is the fundamental duty of the State as well as of the well to do sections of the population. Thanks to both the spread of democratic systems of governance at the grass root level and technological advances, we now have a

unique opportunity to foster a Community Centered and Controlled Nutrition Security System. Such decentralized community management will help to improve delivery of entitlements, reduce transaction and transport costs, eliminate corruption and cater to the twin needs of introducing a life-cycle approach to nutrition security, and meeting the challenge of seasonal fluctuations in nutritional status. If women operate such CFB's, this will help to bridge the gender divide in the area of nutrition.

III. Short and long term strategies for sustainable livelihoods.

Both in terms of incidence and absolute numbers, India has the largest number of children, women and men going to bed undernourished in the world. Although the Food Corporation of India has currently over 60 million tones of food grain stocks, and there are numerous safety net measurers of the Government of India for the economically and socially underprivileged sections of the society, the FAO has listed India as one of the countries which has not been able to achieve the targets of the World Food Summit of 1996 in terms of reducing the number of undernourished. This calls for serious introspection of both our strategies for fighting hunger as well as of our ethical commitment to the cause of hunger-free India. The prevalence of endemic hunger should no longer be accepted as unavoidable. The social security systems for the able-bodied poor should include a food component in the form of a National Food Guarantee Scheme on the model of Maharashtra's employment guarantee scheme. The public distribution system should be strengthened and should be designed to reach the unreached. On the basis of ICMR norms, about 158 million persons, belonging to about 32 million households, fall under the category of ultra-poor and need immediate assistance to help them to lead a healthy and productive life. Gram

Sabhas and local bodies best identify them. They can be issued with Food Entitlement Coupons, which should entitle them to be provided with work under the Food Guarantee scheme. The total requirement for such an open ended employment cum food security project may need at the maximum about 10 million tones of food grains per year. Meeting this need is well within our national capacity.

Consumption inequality decreases as income increases. Diversification of diets also happens with increased purchasing power. Unfortunately inequality of income distribution is growing. A job-led economic growth strategy will help to reduce protein-energy malnutrition, and at the same time stimulate farming systems' diversification. A whole life cycle approach should be introduced by providing a horizontal dimension to the numerous on-going vertically structured programmes supported by the Central and State governments as well as by bilateral and multilateral agencies. At the local level, the management of a life-cycle based nutrition security system, beginning with pregnant women and extending up-to old and infirm persons, is best left to the one million elected women members of the Panchayats. Decentralized procurement and decentralized storages will help to minimize transport and transaction costs. Uttar Pradesh, Madhya Pradesh, West Bengal and Tamil Nadu have accepted the principle of a



Collect every drop of water and use it for raising more crop per drop.

decentralized procurement system. The storage can be done through a national grid of Community Food Banks (CFBs) managed by self-help groups. The construction of CFBs can be done at the local level under the food for work programme. CFB's can help to implement these social safety net programmes in an effective and transparent manner. We must end the prevailing mismatch between production and consumption as soon as possible. Short-term problems should not blind us to long-term realities. Population is growing and per capita land and water availability is decreasing. We have to produce more but produce it differently - in a manner that high yields can be obtained in perpetuity without associated ecological or social harm. Farming systems' intensification, diversification and value addition are extremely important to generate the needed on-farm employment. There is also an urgent need for greater attention to the nearly 100 million hectares of rainfed land better dry farm techniques are available. They offer great opportunities

for increasing the production of pulses and oilseeds. Productivity improvement in both irrigated and rainfed areas will help to increase marketable surplus at the household level and thereby the cash income. The gap between potential and actual yields even with the technologies currently available is high in most farming systems. Livestock husbandry and livelihood security tend to be closely correlated in the case of poorer households. There is greater equity in livestock ownership as compared to land. Hence, support services should be organized for small-scale livestock farming families in the form of Fodder and Feed Banks and health care and insurance facilities. With increasing urbanization the demand for animal products will grow. There is an urgent need for spreading quality literacy throughout the Country, which will help to sensitize both producers and consumers on issues relating to food safety. Codex alimentarius standards and sanitary and phytosanitary measures. In addition, there is need for greater research in the field of breeding crop varieties having the quality characteristics needed for food processing and exports. If productivity and quality are improved, farm income will go up substantially. Sustainability of Food security measures should be ensured. PDS at the local level should provide reasonable income to those operating the ration shops. Community Food Banks may receive their initial food supply from government but subsequent replenishment should come from local communities. A wide range of grains and wild foods can be stored in CFBs. This will help to widen the food security basket. Also, the silos can be locally manufactured, thus providing another source of rural employment in the non-farm sector. Further, the silos will help to reduce post-harvest losses considerably. Both private and public sector institutions and companies have the necessary technical capability to launch the CFB movement.

GIS Analysis for Social Studies

The Remote sensing lab at M.S. Swaminathan Research Foundation has been working since 1993 for preparing resources maps by the various departments of the Foundation based on their requirement. RS and GIS technologies are applied as tool for resource mapping activities in the Foundation.

Coastal Wetlands

Mapping and monitoring mangrove extent in Pichavaram and Muthupet wetlands were done digitally using IRS and Landsat remote sensing data. This work was done under the Coastal System Research Project funded by Canada International Development Agency. It was found that there was considerable reduction in mangrove extent from 1986 to 1994 using remote sensing satellite data (LandsatTM and IRS LISS II). Mangrove wetland mapping of Bhitarknika National Park, Orissa was also done under the Project Coastal System Research. IRS 1B LI Remote Sensing data of 1994 was digitally analysed to find the extent of mangroves, degraded area in mangrove forest, wetland, agricultural area and casuarinas in coastline nearby forest.

All these mapping were done using IDRISI a GIS soft ware used for training purposes. With this initiative work, it was proposed to prepare an information system of all mangrove wetlands of east coast of India along with associated natural and socio economic profile of mangrove forest. This work was brought as a part of Coastal Wetlands : Mangrove Conservation and Management Project.

GIS analysis for Social Studies

Analysing the social status of an administration in the tabular form with lengthy fractional numeric values is frustrating to the decision-making authorities. If the same values are given along with the map of the administrative area like district map with socio economic profile map with composition of all parameters with some assigned weightages the result will give a synoptic view of at a glance and will be easily understandable to any one. Based on this, The socio economic parameters of blocks of Dharmapuri district were plotted individually and overlaid together for combined status of blocks in all of the parameters. The parameters selected were poor population, sex ratio, literacy, infant mortality rate, and population below poverty line. Similar study was done for Pennagaram block of Dharmapuri district with village level information. This work was submitted to Government of Tamil Nadu along with study done by Hunger Free are Programme of the Foundation.

Food Insecurity Atlas of Rural India

This project is joint initiative of the M.S.Swaminathan Research Foundation (MSSRF) and United Nations World Food Programme (WFP). Aim of this Assignment is to identify the food insecure states in India both in the short and long term time dimensions and to suggest an action plan for the policy makers to become substantially food secure. GIS is a tool used in this project to detect the food insecure place for Rural India. For this Assignment 16 Indian States have been taken for the study and 19 Indicators are given for the Analysis for each Indicators spatial data has been prepared and finally come out with a Food Insecurity Map of Rural India which represents the food Insecured areas of Rural India. For this project we have relied on different sources of data like Census of India, National Sample Survey Organisation, Sample Registration Survey etc., ■



Prof. M.S. Swaminathan

"The Know-how to Do-how"

How can the Spatial technologies like Remote Sensing and GIS can be used in a country like India for sustainable development?

Both Remote Sensing and GIS are extremely important in order to gather accurate, reliable information. And also dynamic information. Remote Sensing gives you much more dynamic information like what is the situation

Organization of a National Consortium for Sustainable Food Security Indian farmers have shown that they will produce more if there are given opportunities for assured and remunerative marketing. Agriculture is the backbone of India's food, livelihood and ecological security systems. Therefore India's agricultural image within and outside the country needs to be refurbished. At the same time, chronic, hidden and transient hunger should be eliminated as soon as possible. It will be appropriate if NAAS promotes the organization of a National Consortium for Sustainable Food Security consisting of representatives of FCI, CIL, FICCI, ASSOCHAM, NHDB, NDDDB, APEDA, TISCO, Hindustan Lever and appropriate Agricultural Universities

today and also what was it like in the past. You can compare the data. GIS helps you to integrate the whole series of information. For example, we have used GIS in our Hunger Free Zone projects GIS

methodologies to interpose land data, number of characteristics of the place, household structure, number of schools and so on. You can put multiple criteria and get an integrated picture. In fact our rural atlas is also mainly based upon GIS methodology. We have put 19 different parameters together for the maps. So it has become a powerful tool for decision making, planning and we are fortunate

and ICAR Institutes for fostering sustainable food security both in the hunger hot spots of India as well as other countries in Asia and Africa. There is no time to relax, both, on the production and consumption fronts. The stock of 60 millions tones should not lull us into complacency. Concurrent attention to production and consumption is important. Enhancing production through an evergreen revolution is a priority task. However, eliminating widespread endemic hunger is a priority responsibility and ethical obligation. A universal and user-sensitive public distribution system, food guarantee scheme, community food banks and various other food entitlement projects need to be implemented in an integrated manner, so that the goal of

to have the capability of Remote Sensing in this country. With MetSat we should be able to get lot of information on weather conditions. We can prepare different computer simulated models for different weather problems. Drought will come one year or the other. The question is how do you manage it. I think now the space technologies and applications provide greatest strengths to our country for launching sustainable agriculture movement

You have been talking about drought code and weather code. How can that be made possible using these technologies?

Drought code is nothing but long term time sequence of weather data. We have over 130-140 years data of climate

hunger-free India can be achieved. Nutrition status will, however, continue to fall, unless the purchasing power of the poor is increased. Hence, livelihoods for all should be the bottom line of all national development and import and export policies.

IV. Jal Swaraj

Since water will be most limiting factor in the coming years in relation to domestic and agricultural needs as well as for ecosystem maintenance, it would be useful to develop a strategy for a sustainable water security system. The Water Emergency prevailing in the country both due to drought and the unsustainable and inefficient use of most water resources, particularly of ground water, has brought home the urgent

of GIS should be converted

“Once you have the GIS map of an area with critical parameters for livelihoods, agricultural crops – then planning for adverse weather and good weather is possible.”

available to us. Using that one could see the kinds of problems and try to extrapolate. By analyzing the data we can understand whether the monsoon is getting delayed or will it withdraw. You can work out three or four major possibilities of rain fall patterns and then arrive at scenario A or scenario B. This will help the farmer to think of alternative crops.

Then building seed banks and fodder banks. In our Orissa project at kalahandi, koraput, which are always prone to drought we have established different banks teaming the local tribal families. One is a gene bank which maintains their traditional varieties. Then there is water bank. Finally a food bank.

need for launching a Jal Swaraj movement based on the conservation of every drop of water and its sustainable and equitable use for domestic, agricultural and industrial purposes. This was the vision of the late Anil Agarwal, Founder of the Centre for Science and Environment, New Delhi while coining the term “Jal Swaraj”. In 1980, when I was in charge of Agriculture, Rural Development, Irrigation and Science and Technology in the Union Planning Commission, a 5-point strategy was included in the VI Plan (1980-85) for developing a sustainable water security system for the country. Rainwater harvesting and storage in a manner that evapo-transpiration losses are minimized.

Participatory watershed development and

Whenever there is shortage, these respective banks take care of the needs of the farmers.

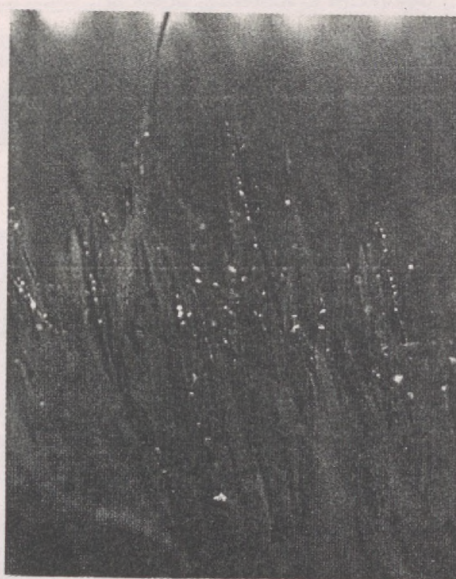
Rajasthan which has a large cattle belt faces severe drought situation almost alternative year and faces severe shortage of fodder. In Punjab 10 million tonnes of straw is burnt as they do not use it for fodder. We need to provide linkages. In areas where there is no feed available these fodder banks should be setup. Especially in all the drought hot spots it is important to develop these banks. That's where GIS data comes into picture. Once you have the GIS map of an area with critical parameters for livelihoods, agricultural crops – then planning for adverse weather and good

management and desilting and renovation of ponds, tanks, lakes and reservoirs. River water sharing and efficient use. Waste water (including sewage water and industrial effluents) treatment and recycling, and Sea water use along the coast for rising mangrove and salicornia plantations together with aquaculture. All the above water source need to be used in a conjunctive manner. Also, in the case of dry farming areas, community conservation of rainwater will happen only if there is equity in water sharing. For this purpose, all farm families should agree to grow only low water requiring but high value crops like pulses and oilseeds. Such a method of water conservation-cum-improved livelihood security can be achieved

weather is possible. How do you maximize the benefits of good weather? For strengthening the ecological foundation for sustainable agriculture. That is planting trees, agro forestry, reclaiming wasteland etc., All these can be done only when there is some moisture in the soil. Drought management code is how to minimize the impact of drought for human beings, crops and animals. So the weather code and drought management code are doable strategies not theoretical strategies. In many laboratories you get very good remote sensing maps. But they are seldom used in the field. So that know how of GIS should be converted into do how at the field level ■

through the organization of Pulses and Oilseeds Villages. In addition to the above immediate measures, steps were proposed in the VI plan for developing a long term plan for linking the major rivers of peninsular India, like Krishna, Godavari, Mahanadi and Cauvery, as well as for the desalination of sea water. Peninsular rivers are under our political control, unlike the Ganges, Indus and Brahmaputra which have international dimensions. The suggestion for linking our major rivers is not new. Dr K.L. Rao is famous for this advocacy of the Ganga-Cauvery tie-up. Various experts have also been writing books and papers from time to time urging steps for linking our major rivers. During the tenure of Bharat Ratna

Morarji Desai as Prime Minister (1977-79), the proposal of Mr. Dastur for constructing "garland canals" in the Himalayas, central and peninsular India attracted his serious attention. He however abandoned the idea when it was pointed out that constructing a canal at a high altitude in the Himalayas was beset with serious ecological, political and national security issues. The revised National Water Policy (April 2002) of the Government of India contains the following statement. "Non-conventional methods for utilization of water such as through inter-basin transfers, artificial recharge of ground water and desalination of brackish or sea water, as well as traditional water conservation practices like rainwater harvesting, including rooftop rainwater harvesting, need to be practiced to further increase the utilizable water resources. Water should be made available to water short areas by transfer from other areas including transfers from one river basin to another, based on a national perspective, after taking into account the requirements of the areas / basins." Thus, inter-basin sharing of waters is an idea whose time has come. The present time is particularly a propitious one, since there is scope now for launching a massive Food and Cloth for Jal Swaraj programme, organized on the model of the Employment Guarantee Scheme of Maharashtra. Based on the financial provision made in the VI Plan for initiating steps for linking the rivers of peninsular India, the Central Water Commission had undertaken detailed studies. Given the necessary political will and consensus, the linking of the rivers of Peninsular India and the equitable and efficient use of this gigantic water grid will help to create a "win-win" situation for all the States involved. If there are winners and losers, there will be only conflict and confrontation, as is happening now. It is high time we move in the direction of rainwater harvesting, watershed development and conjunctive use of



Enhancing production through an evergreen revolution is a priority task.

rain, river, ground, treated sewage and sea water on the hand, and river water linking on the other. China, which has taken a long-term view in the area of building a national water security system, has already made much progress in building the gigantic Three Gorges Dam, for taking the waters of the Yangtzi River to the parched lands of the northern parts of that country. The Three Gorges Dam will confer multiple benefits in the areas of flood control, irrigation, drinking water supply and power generation. Our country unfortunately is one where there is often paralysis by analysis, particularly in vital areas like inter-basin sharing of water. For example, a National Water Policy was adopted in September, 1987. It remained largely on paper. This Policy was reviewed and updated in April 2002. However, implementation structures for converting the policy into reality do not exist. There has been no effort to mobilize the Panchayati Raj institutions for harvesting and sharing water at the

local level. The Centre for Science and Environment and the Akash Ganga Trust have established in Chennai a Rain Centre, which is a single stop information center on all aspects of rainwater harvesting, storage and use. We need such rain centers in every village and town in the country. In each Panchayat and Nagarpalika, atleast 2 women and 2 elected members should be trained as Water Security Managers, capable of looking at water security issues in their totality, namely the consumption of water to meet the needs of human settlements, agriculture, industry and ecosystem maintenance.

While there is discussion and debate relating to the quantitative aspects of water needs, the same interest is not evident with reference to the qualitative aspects of water, with particular reference to domestic consumption. For example, the CPR Environment Education Centre in Chennai has observed the following position in relation to ground water quality in the Chennai area.

Water samples from 25 different locations in Chennai, collected from wells and bore wells were analysed for their potability in the Centre's laboratory. The pH of the samples ranged from 6.50 to 8.81. The Total Dissolved Solids (TDS) exceeded 500 mg/l (the desired limit of TDS in drinking water) in 88% of the samples, and 64% of the samples contained more than 1000 mg/l of TDS. 28% of the samples contained more than 2000 mg/l of TDS, the maximum permissible limit as per IS 10500:1991. 24% of the samples contained high level of iron content. This clearly indicates the sad state of ground water quality in Chennai.

The Ganga Action Plan, after huge investment and many years of work, could not succeed in making the water of this "holy" river potable. This is attributed to non-point pollution, caused by human beings, many of them being pilgrims. The same fate is

true of most of the rivers and tanks revered for their spiritual significance. It is clear that unless water becomes everybody's business, as Anil Agarwal put it, it will remain a source of conflict and contamination. India has enough water resources to fulfill everybody's need. We live in a democracy. Let us designate 2003 as a Water Emergency Year and initiate during the year a Water Literacy Movement which will stimulate State and Central Governments to launch an integrated water security strategy with the following short and medium term action plans. In the short term, emphasis may be given to the following:

- Collect every drop of water and use it for raising more crop per drop.
- Treat all wasted water and use it conjunctively with ground and surface water resources.
- Ensure that drinking water is not polluted.
- Create consciousness of the need to regard holy rivers, reservoirs, lakes and tanks as gifts of God on earth by not polluting them.
- Manage ground and surface water resources in a sustainable and equitable manner through regulation, education and social mobilization.

All the above steps are politically doable and economically affordable. The short-term steps mostly need non-monetary inputs, since they depend upon people's awareness and participation on account of enlightened self-interest. In the medium term, we should initiate action to use conjunctively sea and ground water along with nearly 8000 km shoreline of India for raising plantations of mangroves, salicornia, casuarinas, cashewnut and coconut. Also, agro-aqua farms can be established all along the coast for promoting integrated systems of aquaculture and agro-forestry. Above all, we should not lose even a

day more in fostering political consensus to link all peninsular Indian rivers in the form of a Dakshin Water Grid. When coupled with Prime Minister's National Highways Project, the Dakshin Water Grid will usher in uncommon opportunities for strengthening both food and livelihood security, leading to a hunger and poverty Dakshin. Jal Swaraj will become a reality only if such a movement is built on the foundation of the twin pillars of equity and ethics. For this purpose, all political parties must agree to abide by

the rule of law and respect the findings of institutional structures set up to settle disputes relating to sharing of water, particularly under conditions of scarcity. When Lal Bahadur Shastri coined the slogan "Jai Jawan, Jai Kisan", he wanted us to respect the contributions of every Indian Jawan and Kisan to national security. Since about 75% of our water resources go to agriculture, sharing the joys and sorrows of all Indian farmers in an equitable manner is vital for both agrarian prosperity and sustainable food security ■

Forecast 2003

Growth in Application Areas

Vijay Kumar, Senior GIS Consultant, TATA Consultancy Services

Year 2002 was not a bad year for Geomatic Industry. Industry was able to keep its promise of sustainable growth. As the technology is becoming more open, industries are finding implementation easier and possible. Today GIS is no more restricted with in the research laboratories and mapping organizations. It has come out and spread its wings to almost all the industries and assimilated itself with the core IT solutions. Industries do not look at GIS as a separate map creation tool only, but they want GIS to be integrated with their core business solutions. Today industries like telecom, utilities, city and state agencies, military and defense, agriculture and forestry, and many more are getting increasing ROI from their GIS investments. Use of Satellite Image helped the industry in making the map data available for the applications. Technology openness has offered this field to the many more industries. Fear of implementation failure is slowly going away. Introduction of spatial capabilities in standard RDBMS has opened more vistas and offered

flexibility of integration with other IT applications.

Prospects in 2003

Prediction is always difficult but still one can expect year 2003 promising. Entry of international giants is expected into the GIS market worldwide. Developed countries will find enterprise wide implementation, as the key issue and the thrust of developing countries will still be on data creation. The major challenge for GIS vendors will be - how to tap into the untapped markets where the understanding and use of geographic information may be limited.

While the main providers of GIS platform technology are foreign companies, there is a major opportunity for Indian companies to grow in the industry application area. The number and diversity of the different GIS-based application areas create this opportunity. Large Indian IT companies will find GIS as an integral component in system integration projects worldwide. Data creation and migration will still be the major revenue earner for Indian GIS companies in the year 2003 ■

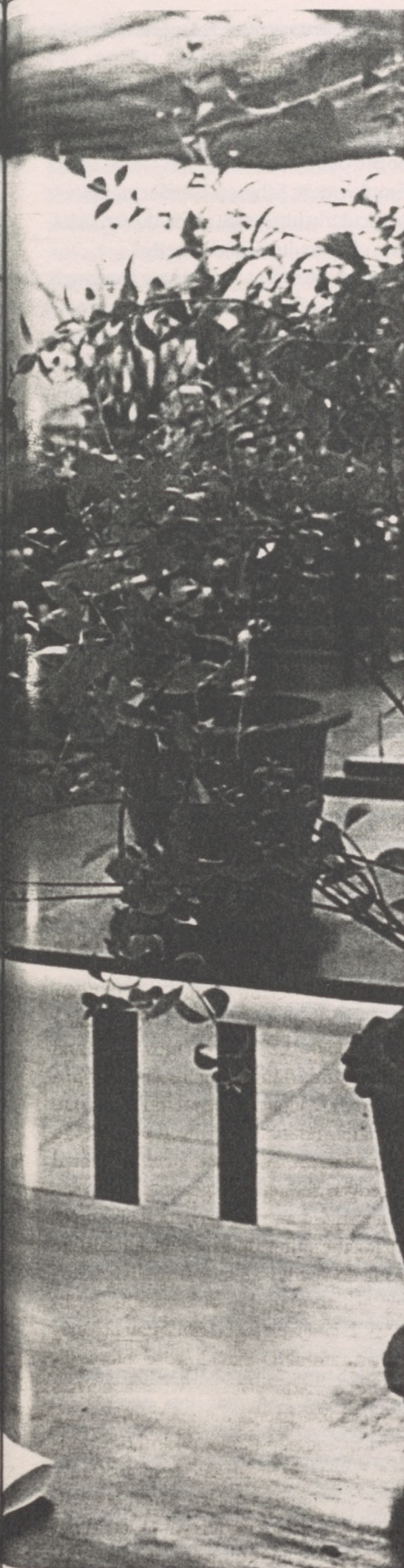
COURTESY OUTLOOK MAGAZINE



The Green Revolutionary

MS SWAMINATHAN ENGINEERED THE GREEN REVOLUTION. NOW HE'S LOOKING AT THE EVER GREEN REVOLUTION

BY PRABHA CHANDRAN



IT'S a unique botanical garden but you'd never guess it looking at the lawns of lush Korean grass fringed with exotic palms. Their beauty is secondary to their efficiency in conserving and recharging ground water levels, explains the scientist. In one corner of the garden is a huge aquaculture tank in which he breeds ornamental fish, changing the lives of hundreds of unskilled villagers. At the entrance is an innocuous looking greenhouse to which he now leads you. There, blooming in potted rows of varying sizes and hues, is his life's work—the genetically modified strains of rice, corn and wheat that he believes will usher in Asia's second green revolution. Soon.

The scientist, who bio-engineered the first big breakthrough in food production, the Green Revolution of 1968, calls his next effort the Ever Green Revolution. These crops, he says, will be ecologically sustainable even in areas where cultivation is impossible today, like swamps and coastal areas submerged by global warming.

As you mull over the exciting implications of his work, he leads you to another building where something equally remarkable is happening in a darkened

vault with freezing temperatures. You are shivering as you walk past rack upon rack of samples of India's vanishing plant life. There are some 1,500 'land races' or varieties of food crops preserved in this cryogenic gene bank that one day may hold the seeds of an extinct bio-diversity. The gene bank also preserves important species that may be required for cross breeding new varieties of food grains one day that will respond to climatic changes of the future. Even as you struggle to absorb the enormity of the work being done here, the scientist takes you upstairs to a communication lab where two researchers from Harvard are watching a group of village women disseminating vital price and weather information from the internet in Tamil to fishermen in Pondicherry.

Welcome to the MS Swaminathan Research Foundation (MSSRF), Chennai, where "everything we do must fulfil three criteria," says the scientist, "it must be pro women, pro poor and pro nature—otherwise we don't do it."

The scientist is none other than Padmashri Monkombu Sambasivan Swaminathan, 77, better known as the Father of the Green Revolution. For 50

years now, MS, as he is fondly called, has devoted his scientific genius to finding ways to empower India's poorest Dalit women and landless labourers. "Scientists must think about meeting basic human needs," he says and if he has one regret today, it is that "we have failed to make a greater impact on the lives of the poor." For if Gandhi was the visionary behind political Independence then MS was the man who gave us economic independence by ensuring India's food security, arguably the second most important event in free India's history. No wonder *Time* magazine honoured them as two of the three most influential Indians of the 20th century, along with Rabindranath Tagore. We enter his Spartan office and it's hard to miss the rows of international awards and honorary doctorates—including the Ramon Magsaysay and the First World Food Prize—for changing this continent, from a famine-stalked the to one with bursting granaries. Those who were born after 1967, the year in which the first harvest of the Green Revolution yielded three times more food grain, will never know the horror of 1947 when three million Indians died in the Bengal famine or the Bihar famine of 1966 or the gruesome human harvest of 30 million starved Chinese in the four years between 1958 and 1962 in China. Today, Asia feeds a third of the world's population and India stocks 60 million tons of surplus grain—yet people starve for economic and other reasons.

"We could give them the seeds but we could not put food in their mouth or money in their pockets," says MS regretfully, "the only way to do that is to change them from unskilled to skilled workers and to increase on and off farm productivity." Over the past decades he has done exactly that, dotting the coast from Kerala to West Bengal with 250 showcase 'bio-villages' where Dalit women and those without land or livestock are being taught new skills for survival. Indeed, he has turned them into barefoot scientists. "We have trained women to make bio-pesticides and bio-fertilisers, and to understand how crop rotation and scientific land and water management can make for precision farming." Some 250,000 fami-

lies have benefited from the Foundation's work so far.

"Women cultivate flowers and mushrooms," says MS, "they have been taught artificial breeding. In Nammakal, the egg capital of India, we have set up community fodder bags using high protein strains of maize, soya and millet. This has not only increased farmers' profitability but also created jobs for landless workers. But all this is only a demonstration, it cannot have mass impact unless it is supported by government policy."

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To be fair, MS has done his share of lobbying at the policy level. His championship of The Protection of Plant Varieties and Farmers Rights Act has already become law. He is now lobbying for the 'Intellectual Property Rights of Tribal Women' a bill that is especially dear to his heart as it seeks to protect "indigenous knowledge of which we have created a vast data bank over the years."

This traditional wisdom—be it grandmother's remedies or conservation techniques—surfaces ubiquitously in all his schemes. For instance, "we have a green kit containing 20 medicinal plants which we grow wherever there is land to provide antidotes to common colds, headaches and other ailments." Ask him why he has made women the main beneficiaries of his work and he says, "If you travel through the rural areas you will see women and children are the worst affected by poverty. They work 18-20 hours a day and are emaciated by the time they are 25 by multiple births and hard labour. It's very sad. I prefer to share knowledge with women. If

you do something for a woman the whole family benefits but if you do something for a man, the reverse is not true. This is also borne out by data from the Maharashtra Employment Scheme. Gender equality is particularly important given the feminization of agriculture, and poverty."

Sometimes the solutions are amazingly simple. "In Chidambaram, I came across a heart-rending sight of emaciated women and I asked what we could do in a place where crops could not grow," recalls MS. "We searched and found huge sewer pipes from an abandoned project. We converted them into tanks for breeding ornamental fish, which we got from a breeder in Himachal and from the Tamil Nadu Fisheries College. The villagers loved it because it was something they could do with very little effort. Now, they are exporting fish to Singapore. There's a solution to every problem."

But it takes genuine concern and some ingenuity to find it. Says a colleague, Professor P C Kesavan, "MS has the greatest concern for humanity coupled with brilliance in applying scientific know-how to society. He is an original thinker whose sole concern is taking technology to the unreachable poor who have been bypassed by all kinds of advances for the last five decades."

Not surprisingly, Gandhiji had a lot to do with his altruism. "My father was a freedom fighter and Gandhiji visited our house a couple of times. I was deeply impressed by the swadeshi movement and the Mahatma." Imbibing his ideals from a father who fought to keep temples open to Harijans and who mobilised villagers to fight malaria, MS also faced personal tragedy at the tender age of 11 when his father passed away. It deepened his empathy for the suffering of others and his life has been spent in alleviating their hardship.

Ask Pannerselvan, a fisherman in Veerampatinam who has lost several colleagues over the years to the treacherous storms and currents in the Bay of Bengal. Not any more. Thanks to an IT experiment launched by MSSRF, he now knows not just when to expect a storm but also fish and crop prices, advice on farming, and access to an online vet and a doctor.

"People discouraged us when we started our internet experiment in 1992. They said there was no electricity to run computers—so we put up solar panels. They said there were no phones—so we asked Motorola to give us wireless connectivity," recalls MS. "We created a hub for downloading internet information which is linked to radiating centres in villages and operated locally, because we wanted people to have a sense of ownership. Women volunteers operate the computers and a wonderful thing has happened: their status and self-esteem has risen tremendously because men must now come to them for vital information on markets and weather conditions. So, the gender divide can be bridged by the digital divide."

Villagers now consult doctors at the Postgraduate Medical Institute in Pondicherry, they email a vet, find the best prices and have increased their earnings by cutting out middle men. They can also apply for loans and grants by accessing a database maintained by the MSSRF of 200 government schemes for those below the poverty line based on age, gender and caste. Some 12 such 'knowledge centres' are being run in a life-transforming experiment by the MSSRF that has attracted eminent scientists from around the world including three visits by the President of the US National Academy of Sciences, Dr Bruce Alberts.

Surely all this must bring some satisfaction but if he was to look back on a single achievement he would like to be remembered for, what would it be, I ask. "Personally, it was creating self-sufficiency in agriculture that has given me the greatest satisfaction," says MS. "No one believed we could do it and experts like Paul Ehrlich were predicting mass scale famine deaths in India in the 70s. Today, the Green Revolution is in trouble even in Punjab where rising salinity, soil degradation and falling water tables have led to unsustainable growth. So, we have to move to the next stage, the Ever Green Revolution which will ensure higher productivity in perpetuity." The solution was to create new, salt-tolerant, strains of rice, wheat and pulses. "We took the Mangrove tree which grows in swamps as our

donor," explains MS, "and we mapped the genome to isolate the gene for salt tolerance. We transferred this gene to rice, mustard, pulses and it is growing beautifully in pots but we have not introduced it to fields yet."

The health-scare surrounding toxic biogenetically engineered foods in the UK last year does not impress him. "The Royal Society carried out a thorough investigation and found there was no basis for the scare," he says. "In life there are

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always genetic combinations, take the six billion humans, we're all genetically recombinant except for identical twins."

True, but nature's role being played selectively by man to create a species with certain desirable traits is scary. It's playing God. He scoffs at such ethical dilemmas as applied to agriculture. "If you can grow five tons of rice instead of one, why shouldn't you? Every second child born in this country is less than 2.5 kg in weight. Nearly 48% per cent of women and children are under normal weight in this country. We have the most austere poverty line in the world," says the man who advised the UN and the Indian government on minimal calorie intake. "It is 2,400 in rural areas and 2,100 in urban areas but man does not live by calories alone. He needs a balanced diet, clothing, shelter, education and health care."

Ask him whether he worries that his life's work may boomerang badly with the introduction of some giant killer weed that could swamp the planet and he dismisses the very idea. "Giant killer weeds

have come by conventional methods. They are called Invasive Alien Species, like the ones that came from Mexico. Similarly, a species from India may become a powerful weed in Mexico. So weeds that come from other parts of the world already exist. Some that move across India to the North East acquire a tremendous capacity to grow even in drought conditions."

You can already see his mind churning at the food possibility in such drought resistance. On a more serious note, though, he has three concerns about genetically modified foods: "The first is environmental safety; second, human safety as in food allergens and third, monopolistic control. A company called Monsanto has raised a lot of fear about who controls food technology. So, the more public and charitable institutes like ours master technology, the more difficult it will be for private companies to control it."

Amazing, but one of the world's greatest scientists has no interest in patenting work that would have made him a billionaire several times over. Instead, he works quietly in his Chennai institute, thinking up ways to enrich the poorest Indian with the fruit of his knowledge. "I was raised in a climate where intellectual property was alien to our culture. Whatever you knew, you imparted to your students. Materialism is the most unfortunate part of today's world. Even the UNDP Human Development Report measures technological progress by the number of patents a country has, which is very wrong. We have done work, which has benefited millions of farmers and we have done it free. We have no patents but does that mean we have no technology?" We have the best scientists but, agrees MS, they are not flourishing in India "because bureaucrats are more interested in promoting themselves for Padma Shris!"

As he walks you out, past the ever green house of tomorrow you can't help but wonder what combination of genes produced this unique individual whose humanism is as deep as his scientific brilliance. At the risk of sounding facetious, you wish we could clone a dozen homo superiori like Swaminathan. ☺

n a winter afternoon in 1967, Prime Minister Indira Gandhi was impressed by what she saw outside a village near Delhi — a huge landscape carpeted with wheat, maize and millet crops. Earlier, little or nothing grew in those fields.

A large crowd of farmers at Kanjhawala village started singing a welcome song. Indira Gandhi — India's most charismatic leader after Mahatma Gandhi and Nehru — was amused because for a change, she realised the villagers were not singing in her honour. Instead, they were singing in honour of the short, bashful man sitting next to her on the makeshift

platform. When the singing had finished, the village *pradhan* (chieftain) approached Gandhi and asked her to put a medal around the neck of India's top agricultural scientist. This scientist has become the Godfather of millions of Indian farmers by transforming the country into a breadbasket with plenty to eat and sell.

GOD IS BREAD

Dr Monkombu Sambasivan Swaminathan believes God is bread, and in a career spanning almost five decades, he has solved his country's chronic food shortages and eased grinding poverty by helping to modernise India's agriculture, which accounts for almost 30 per cent of gross domestic product and nearly 70 per cent of the domestic labour force.

Dr Swaminathan was born on 7 August 1925 in Kumbakonam village in Tamil Nadu state in south India. His father, a surgeon, was credited with helping to eradicate elephantiasis in Tamil Nadu. After graduating from Coimbatore Agricultural College in Tamil Nadu in 1947, Dr Swaminathan earned an Associateship at the Indian Agricultural Research Institute in New Delhi in 1949. Currently, he is chairman of the M.S. Swaminathan Research Foundation (MSSRF), Chennai (Madras), established in 1990 with over US\$1 million prize money he received from the World Food Prize (1987) and other international awards. MSSRF, an autonomous non-profit trust, organises research and training to promote job-led economic growth strategy in rural areas.

Now 75, Dr Swaminathan was the 1999 recipient of the Indira Gandhi Prize, presented in New Delhi recently by President K.R. Narayanan. "His scientific insights have opened new frontiers of success for our nation," President Narayan said in his remarks on the occasion.

M.S. SWAMINATHAN TRANSFORMING INDIA FROM BEGGING BOWL TO BREADBASKET

The Godfather of millions of Indian farmers solved the country's chronic food shortages and eased grinding poverty.

BY AJOY SEN



Dr Swaminathan was chosen for the prize because of his role as the father of India's Green Revolution in the sixties — the second most historic event after India's Independence in 1947.

Dr Swaminathan likes quoting Mahatma Gandhi and Nobel Laureate Rabindranath Tagore, two of his heroes, to explain his own work and philosophy. "Gandhi said in 1944 'God is bread to those who are hungry. The first and the foremost duty of independent India is to ensure that no one goes to bed hungry,'" he observes.

Last year, *TIME* cited Tagore, Gandhi and Dr Swaminathan as being among the 20 "most influential Asians of the 20th century".

What triggered the Green Revolution? Dr Swaminathan explains that he was pained by the remarks of some Malthusian economists in the 1950s regarding the 1945 famine, which killed more than three million people in the then-eastern Bengal province. The economists described India as a hopeless case and commented rudely that only an atomic bomb could ease the country's burgeoning population problem and its growing food shortages.

Dr Swaminathan decided to prove the economists wrong. Within just three years, he achieved a miracle.

CHANGING "SHIP-TO-MOUTH" IMAGE

India had been importing food grain since independence. "My mission was to change India's 'ship-to-mouth image'," he says. How did he achieve this? Dr Swaminathan realised the value of introducing Mexican semi-dwarf wheat seedlings to India to circumvent the problem of tall, native varieties of wheat, which were inclined to break in high winds. As director of New Delhi's Indian Agricultural Research Institute, Dr Swaminathan obtained in 1964 about 100kg of semi-dwarf wheat seeds from US agricultural guru Dr Norman Borlaug. These seeds, along with stepped-up research into wheat, rice and other crops, sowed an agricultural renaissance.

However, Dr Swaminathan had to win a more rudimentary battle. Indians love their *chapattis* with dough made exclusively from traditional amber-coloured wheat. The high-yielding Mexican dwarf wheat was a boon but it was red, a colour most Indians do not like. Dr Swaminathan succeeded in satisfying fussy Indian taste buds when he produced a hybrid Indo-Mexican amber-coloured wheat grain.

Under a path breaking "lab to land" National Demonstration Programme,

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hundreds of demonstration plots across the country were planted with high-yield varieties of wheat and rice between 1964 and 1968. Through practical demonstrations of what these seeds could achieve, Dr Swaminathan bypassed the hurdle of ignorance and illiteracy among Indian farmers and convinced them of the effectiveness of modern agriculture.

"My work mainly has been on two anchor crops, wheat and rice, because they account for almost 80 per cent of the country's food basket and form the foundation of a national food security system — ensuring food for all," he says.

Wheat production in areas where the new seeds were planted jumped from around 12 million tonnes in 1964 to 17 million tonnes in 1968. Over one million acres of land were planted with the high-yielding seeds.

India's total wheat and rice output is currently estimated at over 160 million tonnes, wheat at 75 million tonnes and rice at 85 million tonnes, a hefty rise from 45.6 million tonnes in 1960 and just 18 million tonnes in 1947.

Over 40 million tonnes of food grain is stored in warehouses. One tonne of grain can feed five Indians in a year. Around one million tonnes, mostly scented Basmati rice, are exported. Rats eat almost 10 per cent of food grain. Farmers in their homes and village warehouses for consumption and seeds keep another 10 per cent. The rest is marketed.

In 1971, India officially declared itself self-sufficient in food grain, and US food-aid imports were discontinued.

Dr Swaminathan gives credit to the government for its support. "On the whole, India's Green Revolution has been sustained through technology and public policy," he says. The government purchases food grain from farmers and sells it to the general population at subsidised prices through ration shops.

Is Dr Swaminathan satisfied with the

current food scenario? Although the latest technology is available, the public support policy falters in parts of India, he says, noting that almost 25 per cent of Indians have no money to buy food. He also notes that farmers' lobbies in some rich states dictate public policy. "There are no adequate purchases of crops and poor farmers still depend on village moneylenders (who cheat farmers by charging exorbitant interest rates)," he says.

There are other problems too. Accepting the Indira Gandhi Prize, Dr Swaminathan remarked: "Our agriculture is now at a crossroads. Prime farmland is going out of agriculture all the time and the average size of holdings is becoming smaller each year. The smaller the farm, the greater is the need for marketable surplus so that small farmers can have a reasonable income."

Improved production, though, can bring with it new economic problems. "Markets are also becoming volatile, causing acute distress to small and marginal farmer families," Dr Swaminathan notes, citing the steps taken by the government of Assam, in eastern India, particularly in improving irrigation, which have resulted in a silent revolution in production and productivity of rice. "The price of rice has, however, crashed and farmers will have a hard time in repaying the loans they have taken."

LIFE'S MISSION

He has had the satisfaction of seeing his work bear fruit. Asked for his definition of success he notes that, "You have a vision and if you are able to develop the ingredients for the success of that vision, I will consider it a success. If something goes wrong, I am not discouraged."

His present aim is "to show, through bio-villages and other (projects), the methodology by which agriculture can be an instrument, not only for more food but also for more jobs and income for small farmers. The bottom line is jobs for Indians".

This has been a key source of motivation. "The advice from my mother was most important," Dr Swaminathan recalls, "She used to say 'work hard and never get discouraged. Work without expectations of reward'."

However, the rewards and the awards have been many, but despite that, the appreciation of the Kanjhawala farmers on that winter afternoon in 1947 remains a highlight. "The love the farmers displayed to me on that occasion was the most touching event in my life," says Dr Swaminathan. w

M.S. Swaminathan

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A young Indian scientist was pleading with senior bureaucrats of the agriculture ministry for a grant of Rs 50,000 for organizing 100 demonstrations of new wheat varieties in the fields of small farmers. He said he had experimented with the Mexican variety of dwarf wheat which agriculturist and later Nobel Prize winner Norman Borlaug had experimented with in Mexico. The wheat was developed at the Agriculture Institute at Pusa and he wanted to try it out in the field with farmers. The bureaucrats dissuaded him. 'The Indian farmer is conservative. He won't accept new techniques.' 'It is a waste of money.' Undeterred, the young man went up to C. Subramaniam, minister for food and agriculture, and pleaded, 'Let the farmer decide what is acceptable or not.' The minister agreed.

The Indian farmer eagerly tried it and avidly propagated it. It is he who took it forward. Swaminathan and his colleagues did a superb job ensuring that the new wheat variety reached every nook and corner of India.

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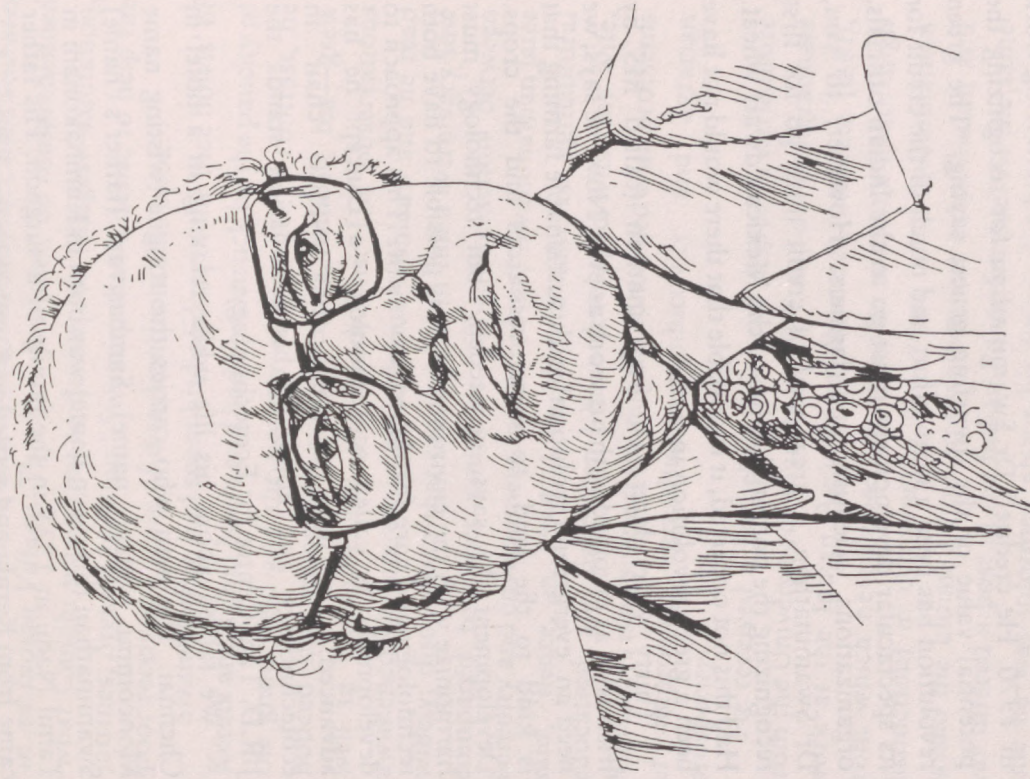


Illustration by Gautam Roy

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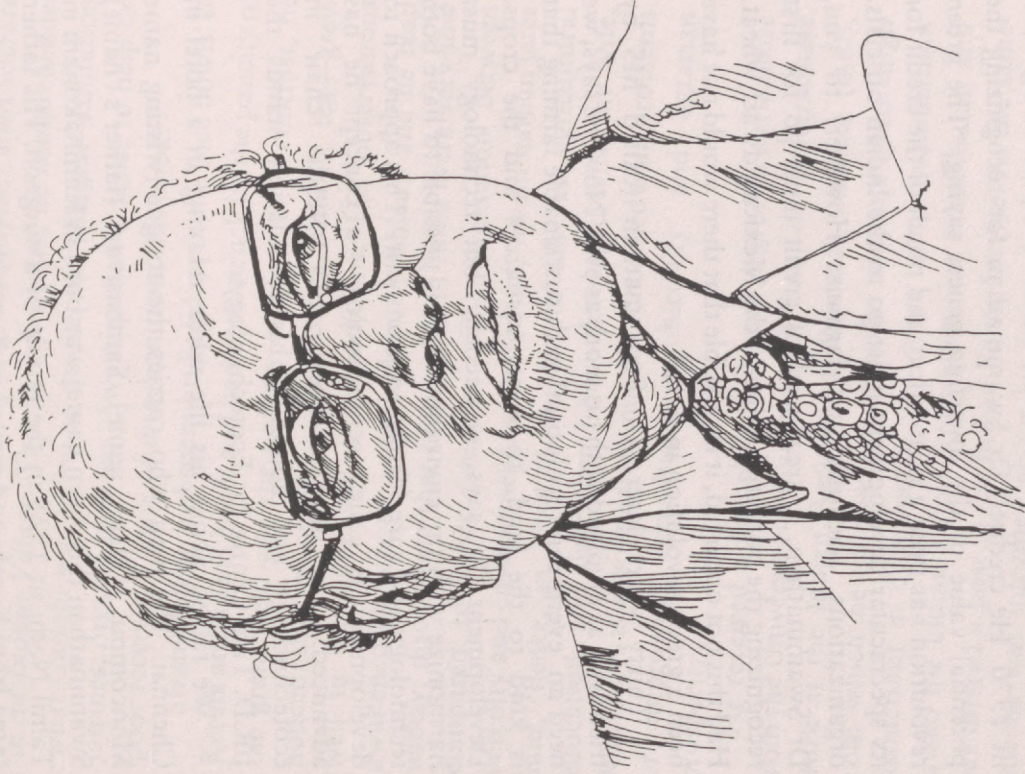


Illustration by Gautam Roy

starvation in India in the 1970s. Instead, a miracle happened. India's wheat production, which stood at 12 million tonnes in 1967, jumped to 20 million tonnes in two years; 24 million tonnes by 1974-75; 44 million tonnes by 1984-85; and 72 million tonnes by 1994-95.

In his book, *A Century of Hope*, Dr Swaminathan looked at the next century. He writes,

It is clear that if children are to be born for happiness in the coming millennium, nature, humanity and technology must work in harmony . . . We need a paradigm shift in our approach to technology development. Natural resource management concerns must be integrated in genetic improvement methodologies. Sir Francis Bacon once said, 'It would be an unsound fancy to expect that things which have never yet been done can be done except by methods which have never been tried.'

Dr Swaminathan is searching for and applying these new methods.

In the late 1960s, it was a team of Indian agricultural scientists, officials and farmers who brought about the miracle of the Green Revolution, but the leadership and the thrust was provided by Swaminathan. Javier Perez de Cuellar, UN secretary-general, said: 'Dr Swaminathan is a living legend. His contribution to agricultural science has made an indelible mark on food production in India and elsewhere in the developing world. By any standards he will go down in history as a world scientist of rare distinction.'

In actual fact, the man who first developed a dwarf wheat using material from Japan was Dr Orville Vogel in

Washington, but it was Dr Borlaug who first developed semi-dwarf wheat varieties, based on the Japanese dwarfing gene.

Dr Borlaug won the Nobel Prize for his pioneering work in 1970. He credited Dr Swaminathan for recognizing the potential value of the dwarfing genes, saying, 'The green revolution has been a team effort and much of the credit for its spectacular development must go to the Indian officials, organizations, scientists and farmers. However, to you, Dr Swaminathan, a great deal of credit must go for first recognizing the potential value of the Mexican dwarf wheat. Had this not occurred, it is possible that there would not have been a green revolution in Asia.'

Thirty years later, Dr Swaminathan (called MS by friends) is as involved with his work as ever. Now, he says, we need an 'evergreen revolution' with sustainable farming that is kind to the land, to water resources and the crops. Development, he says, is needed, 'but technology must harmonize with the environment. It is possible to have both technology and care for the environment.' This approach to development is called ecotechnology—a concept he has advanced. He now occupies the UNESCO chair in ecotechnology and adjoining his foundation stands the J.R.D. Tata Centre for Ecotechnology.

We talked about his life while relaxing in a hotel in Chennai. The man who carries the tongue-twisting name Moncompu (village name) Sambasivan (father's name) Swaminathan (his given name) was born in Kumbakonam in Tamil Nadu in 1925 in the family of a surgeon. His father came from Kerala and settled in Kumbakonam, a town then notorious for filariasis.

'The principles of self-reliance, love towards all and community effort were inculcated in me during the first ten

years of my life. I learnt from my father that the word "impossible" exists mainly in our minds and that given the requisite will and effort, great tasks can be accomplished,' Swaminathan said.

Swaminathan recalls how his father, a follower of Mahatma Gandhi, took the lead in their area in 'burning his foreign clothes', a symbolic act advocated by the Mahatma in support of the swadeshi movement which emphasized the use of Indian rather than foreign-made clothes; and handloom in preference to mill-spun cloth. The purpose of swadeshi was to free India from dependence on foreign imports and to protect village industry. His father also led in opening the temples to 'untouchables'. The higher caste boycotted Swaminathan's father for his courageous stand. His father spearheaded the campaign for eradicating filariasis in Kumbakonam, an area long infected with the dread disease. The sense of service to one's fellowmen was thus ingrained in Swaminathan early in life.

After his father's death, when he was eleven, young Swaminathan was looked after by his uncle, M.K. Narayanaswami, a radiologist. Swaminathan attended the local high school and later the Catholic Little Flower High School in Kumbakonam, from which he passed out when he was fifteen. He went on to get his Bachelor of Science degree in zoology from the University of Travancore (now Kerala University) in 1944. At that point, he decided to take up the study of agriculture.

When I asked him about the deciding factor which made him take up agricultural research—when he was also fond of zoology—he replied, 'The Bengal famine of 1943.' The suffering and deaths left a deep impression on him. 'Did any book influence you profoundly?' I asked him.

'Yes. It was by an ICS official, F.L. Brayne, called *Socrates in an Indian Village*. Though a Britisher, he comprehended what Gandhi was trying to do for our villages—sanitation, latrines, organic farming.' Swaminathan's desire to help the poor received a sense of direction from this book.

Swaminathan had spent his holidays in the 'rice bowls' of Kerala and Tamil Nadu and had been struck by the paucity of the grain yield and the poverty of farmers. In contrast, he noticed that plantation crops—coffee, rubber, tea—grew well in the same soil and conditions. His observations awakened his interest in agricultural problems and he read widely, discovering that crop yields in India were very low compared to other countries. 'The interaction between heredity and environment fascinated me,' Swaminathan later said, 'hence, in 1944, I decided to take to agricultural education, and since then I have developed what my wife, Mina, says is a "single track mind", concerned with problems of improving agricultural productivity and agrarian prosperity.'

He received a Bachelor of Science degree in agriculture from the University of Madras in 1947 and did postgraduate work at the Indian Agricultural Research Institute (IARI), from which he received an associate diploma (with high distinction) in cytogenetics two years later. Swaminathan passed the Indian Administrative Services examination and was offered a post in the Indian Police Service. At the same time he was informed about his being the recipient of a UNESCO fellowship to study abroad. Choosing to pursue his studies from 1949 to 1950, he was a UNESCO Fellow* in the Institute of Genetics at the Agricultural University of

* Almost fifty years later, he was the first recipient of the UNESCO Gandhi Gold Medal for his work on biodiversity in India's villages.

Wageningen in the Netherlands. From there, he proceeded to Cambridge, where he received a Doctorate of Philosophy in 1952 for his thesis, 'Species Differentiation and Nature of Polyploidy in Tuber-Bearing Solanum Species.' It presented an 'entirely fresh concept of the relationships within the tuber-bearing Solanums (potatoes).'

To broaden his experience before returning home, he accepted an appointment as research associate in genetics at the University of Wisconsin in the US, from November 1952 to January 1954. There he continued his work on the potato.

He soon applied his knowledge of potato genetic research to other crops. He received an attractive offer to continue research in the US but declined politely. 'I came to equip myself, not work in a foreign country,' he said.

On his return, he worked at the Indian Agricultural Research Institute and rose to be its director twelve years later. Scores of agricultural scientists qualified during his tenure and they still treat him respectfully as their 'guru'.

From 1972 to 1979 he worked with the Indian Council of Agricultural Research (ICAR) as its director-general. In 1979, when Morarji Desai was prime minister, he summoned Swaminathan and asked him to become secretary, ministry of agriculture. Till then this post had always been occupied by IAS personnel. Surprised, he asked Morarji why he was chosen. 'Because I want an agricultural secretary to know agriculture,' Morarji replied.

In 1980, when Indira Gandhi came to power, she appointed Swaminathan to the Planning Commission. During the Janata rule earlier, when Indira Gandhi was in political wilderness from 1977 to 1980, she would often go to see Vinoba Bhave at Wardha for solace and comfort.

When Indira Gandhi unexpectedly came to power again

and went to see Vinoba, he handed her a slip, 'Make Wardha Jilla into a Gandhi Jilla.' Intrigued, Indira recounted this incident to Swaminathan as she appointed him to the Planning Commission. Vinoba could have meant an area where nobody lived below the poverty line. Swaminathan also presided over Committees for the Eradication of Leprosy and Blindness. But Planning bored him. He was a man of action. In 1981, the chairman of the prestigious International Rice Research Institute of the Philippines came to Delhi and requested Swaminathan to become its director-general. When Swaminathan mentioned the offer to P.C. Alexander, then secretary to Mrs Gandhi, he replied, 'She'll never let you go.' Swaminathan met the prime minister.

'You are indispensable,' she said.

'Because you say so, I'm indispensable, I think I should go, since I believe one must leave when one is wanted.'

Looking back, Swaminathan says, 'Sometimes, words come to us of this nature which make the difference.'

The prime minister thought again. To his surprise, she said slowly, 'Yes, you must leave when you are (still) wanted.'

She repeated sadly but wisely, 'You must leave when you are wanted. You have my blessings.'

After six challenging rich years in the Philippines, Swaminathan returned to India and was awarded the first World Food Prize in 1987 of \$2,00,000. Other honours followed. In 1991 he received the Tyler Prize (for environment, shared), \$1,50,000; in 1992, the Honda Award for Ecotechnology, \$1,50,000; in 1994, the UNEP's Sasakawa Award, \$1,25,000; in 1996, the Blue Planet Award (to his foundation), \$5,00,000; and in 1999, the Volvo Environment Prize, \$1,75,000.

Earlier, he had received the Ramon Magsaysay Award for

Community Leadership (1972); the first award of the International Association of Women in Development (1984); and the Albert Einstein World Science Award (1986).

With his World Food Prize he started the M.S. Swaminathan Research Foundation in Chennai in 1989. Swaminathan's third stage of life began. The purpose of the M.S. Swaminathan Research Foundation is spelt out by him. Swaminathan is a visionary in his thinking and a missionary in his dedication to fulfil his ideas.

'The poor are poor,' says Swaminathan, 'because they have no knowledge or skills. Give them that and you empower them. The only way to abolish poverty is to build the assets of the poor and they will lift themselves from degradation to an honourable existence.' The work of his foundation, with its state-of-the-art research facilities, is implemented in the field by the J.R.D. Tata Centre for Ecotechnology, equipped substantially by funding from the Tata Trusts.

Through the centre's work, Swaminathan has seen downtrodden people who were eking out a miserable existence transform their lives. I asked him from where he found his passion to continue this work. 'Working for the poor gives you inner strength. They are blossoms in the dust but they can become personalities with self-confidence, self-esteem,' he replied.

His dedicated group of scientists are also fieldworkers. When they go to a village, they first survey the prospects. If there is a derelict pond, they improve it and offer facilities for aquaculture. Wherever big pipes are found abandoned in a village, they are sealed and converted into receptacles for cultivating ornamental fish. When women in a village accomplished this, the foundation found the market to

export the fish to Singapore. The women now earn Rs 1,000 to Rs 1,200 per month. In dry areas of Tamil Nadu, millet and pulses were introduced and farmers found a fair living.

Swaminathan who has been heaped with laurels, awards and forty doctorates from universities round the world, is a soft-spoken man of arresting humility and inexhaustible energy. At seventy-four, his travels are frequent and often to far-flung places. He has a kind heart and hates to say 'No' to invitations that descend on him. Even so, his discipline and efficiency is such that his foundation and he constantly notch up achievements to their credit. His spirit of dedication attracts young people to work with him.

Prof. V.N. Chopra, who was director-general of the Indian Council of Agricultural Research, says that when he was a pupil of Prof. Swaminathan, students had to do fieldwork. A certain cotton seed had to be planted at 5.30 a.m. When the boys went to the field, Swaminathan was already there—they planted the seeds and he levelled the earth.

Perhaps the driving force in Swaminathan's life is his concern for the hungry, the poor and the deprived women. He noted women are usually the main producers of food in most Asian countries and yet they are the least fed. He is deeply concerned about the neglect of nutrition for pregnant women and the consequent birth of weak babies. He calls it 'the cruellest act'. One-third of our children are undernourished and underweight. He is concerned about a 'hidden hunger' that comes from poverty in the midst of availability of food. He rejoices when using simple methods, his foundation teaches women to grow high-paid variety of crops and cultivate ornamental fish or prawn. He has broadened his interests and expertise for the protection of

mangroves (India has 60 per cent of the world's variety), and to preserve the unique underwater life of the Gulf of Mannar, a world heritage site.

His foundation building is simply designed with a garden that represents the five elements of nature.

Swaminathan lives in a modest house in Chennai with his wife who is the daughter of a well-known ICS official, Mr Boothalingam. Mina qualified with a tripos in economics and mathematics at Cambridge, but was more interested in working for people than with figures. She went on to specialize in pre-primary education. She felt she needed to awaken the thinking of people—about themselves, their attitudes, their lives. 'Outer change begins with inner change,' she says. She feels that plays can spark off people's imagination and the ability to look inward. Her work of pre-primary education also involves the staging of plays to stimulate people mentally. Their three daughters have inherited their parents' passion to work for social good through different disciplines.

When asked if he ever felt destiny had played a part in his success, Swaminathan replies that the factors that took him forward are 'hard work, some inspiration, luck, destiny'. To these, he adds, 'grace'. He believes, though he is too shy to spell it out, that the divine has blessed his efforts and has made him an instrument of His grace.

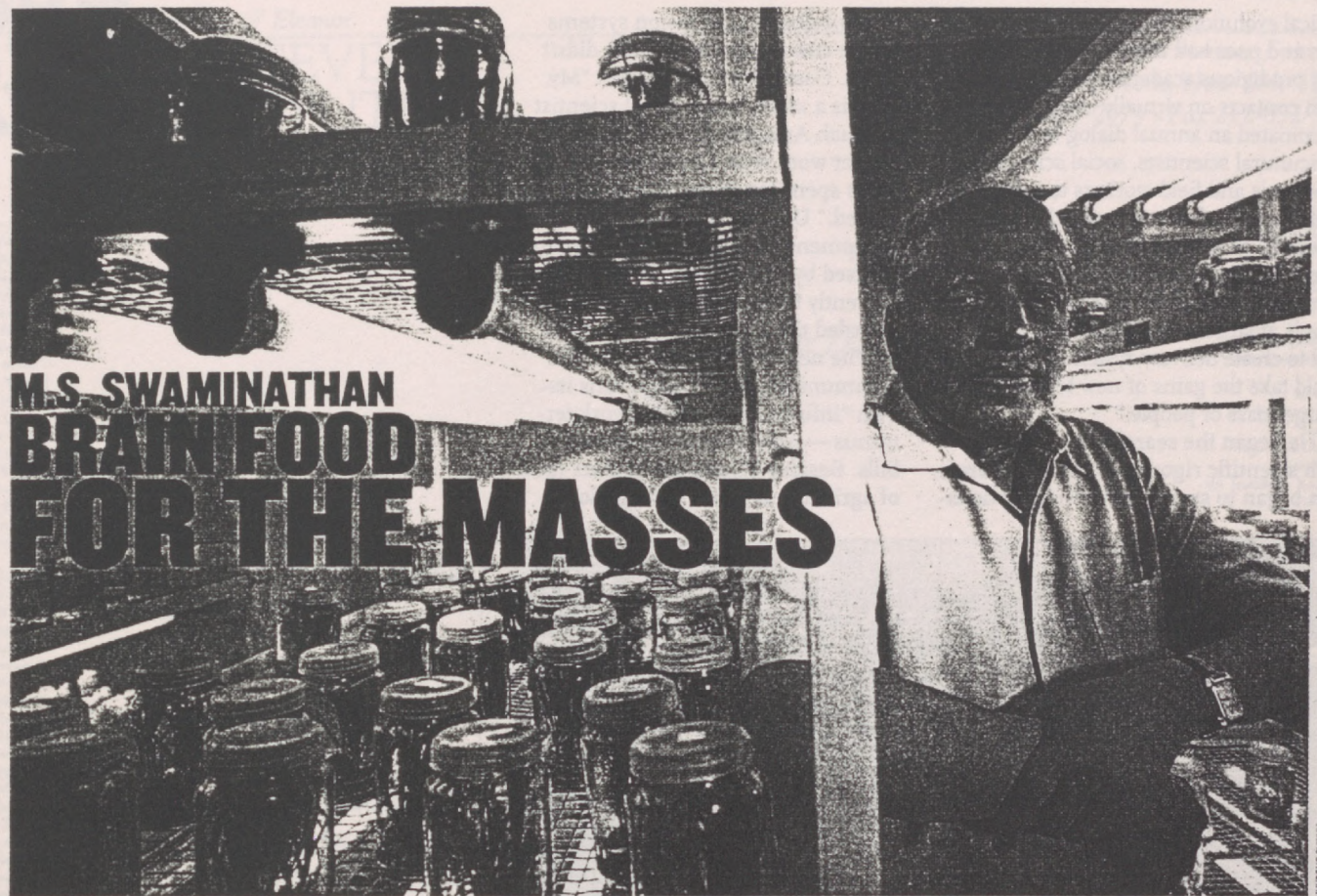
The amazing quality about Swaminathan is that over the years, his interests, expertise and commitment to subjects dear to him have grown and his sympathies have widened. From food production, he has moved to nutrition security. From agricultural development, he has graduated to human development. From an interest in environment, to a concern for the well-being of the malnourished child and the

neglected pregnant woman. And to his interests be brings to bear his well-honed scientific mind, which can zero in and stay on a particular subject and search out an intelligent way to solve a problem.

There are 140 good government schemes for the poor, but they don't reach them, Swaminathan observes. He now wants to use the newly acquired powers of the Panchayati Raj and modern information technology for the upliftment of the people and to empower the weak.

Of all the letters he has received announcing various awards, perhaps no one has been worded as well as that from the chairman of the Roosevelt Institute. Informing Swaminathan of being chosen for the Franklin D. Roosevelt Four Freedoms Medal in 2000, the letter says,

Your extraordinary work as an agricultural scientist, leading the 'green revolution' and bringing hope to the peoples of the developing nations so that the age-old scourge of famine and hunger can be ended, has been particularly noted. You have taught nations how to be self-sufficient in their need for food just as you have taught farmers how to develop and enhance the productivity of their land. Your brilliant leadership has established a goal for the new millennium—a hunger-free world, an international structure of co-operation among nations, a determination to use the miraculous technology of our times to help those in need. Your dynamism and compassion have given new meaning to Franklin Delano Roosevelt's commitment to a better world where all nations will understand and strive for Freedom from Want.



M.S. SWAMINATHAN BRAIN FOOD FOR THE MASSES

The father of a “green revolution” that staved off famine in India 40 years ago has a new cause: delivering information to the underclass by Sanjay Kapoor

Every morning at 4:30, Pannerselvan, a fisherman in the Indian village of Veerampattinam, drags his boat from the high, sandy shoreline to the water, revs up his engine and heads into the restless Bay of Bengal. As he navigates through the tricky currents, he is plagued by doubts. What will the weather be? And what about the waves, will they be high or low? And if a storm blows in, will he ever return? Pannerselvan in the past got answers the hard way. When the seas got angry, he got wet.

But the fishermen of Veerampattinam no longer put themselves in harm's way every time they launch their boats. Three years ago, M.S. Swaminathan, one of India's best-known scientists, chose the village for a pilot project, a demonstration for Delhi government policy wonks that I.T. could change the lives of the poor.

Through his Chennai-based research foundation, Swaminathan established a minimalist communications network linking phoneless Veerampattinam with the city of Pondicherry. The Internet came to town — and with it crop prices, e-mail, and weather forecasts with ocean wave reports courtesy of the U.S. Navy's public website.

Four times a day, a local volunteer checks the Web and broadcasts the information through a village public address system. Every evening as he sits sipping tea at a nearby stall, Pannerselvan can listen and decide whether it is safe to go fishing the next day. “When the computer says that there will be a storm,” he says, “there has always been a storm. We all believe in it.”

Getting people to believe in technology has been a lifelong quest for Swaminathan, holder of a Ph.D in plant genetics from Cambridge University. Now 76,

Swaminathan in the 1960s became known as the father of India's “green revolution” because of his key role in the introduction of high-yielding wheat varieties to the famine-plagued country. To break the resistance of farmers reluctant to switch to unfamiliar seeds, Swaminathan set up thousands of small test plots all over the northern region of the country. Doubters could see with their own eyes that the strange wheat could thrive in their hometowns.

The professor recalls how in the early 1990s he “realized that at every stage of society's technological evolution, the divide between the rich and poor had increased”

Swaminathan says that same grassroots commitment can spread what he calls “pro-poor, pro-nature technology” throughout the region. Sitting in his spartanly furnished office in Chennai, headquarters for the M.S. Swaminathan Research Foundation, the professor recalls how in the early 1990s he “realized that at every stage of society's techno-

ENTERPRISE COVER STORY

logical evolution, the divide between the rich and poor had increased." A charming and prodigious academic collaborator with contacts on virtually every continent, he initiated an annual dialog between agricultural scientists, social scientists, intellectuals and field workers to get them to think about how to "reach the unreached," as he puts it. "All my life as a scientist I was concerned about inventing something that could hold meaning for people at large," he recalls. "But now I had to create delivery systems by which I could take the gains of new technology to a large mass of people."

He began the search for a solution with scientific rigor. In 1997, his foundation began to survey rural India to deter-

and wireless transmission systems where communications lines didn't reach. Costs were minimized. "My boss is a miser," says social scientist Subbiah Arunachalam who does volunteer work with Swaminathan. "He hates spending more than what is required." U.S. telecommunications-equipment giant Motorola was so impressed by the project, which currently takes in nine villages, it awarded the foundation \$200,000.

The network is sustained by the communities. Each village runs its own "info-shop" — the network terminus — and pays the electricity bills. Besides blaring out market rates of agricultural goods through loud-



A WIDER NET Fishermen in Veerampattinam can now access satellite weather information from the Web

mine what kind of information could improve their lot. The results were often enlightening: Women wanted more information on reproductive issues, men wanted to know about government programs. Also clear was that villagers, not distant bureaucrats, had to control the means of acquiring and disseminating information. That might have been a showstopper, but Swaminathan doesn't rely on the government. Most of the funding for his foundation comes from prize money he has been awarded for his scientific achievements. The foundation's seed money was \$200,000, the General Foods World Food Prize he won in 1987.

With the help of committed volunteers, the villages around Pondicherry — beginning with Veerampattinam — began to be brought online starting in 1998. Swaminathan's crew used several technologies: solar panels for electricity

speakers, the info-shops provide e-mail services and employment information. In Embalam village, the info-shop is entirely managed by women who consult the Internet and broadcast current market prices for agricultural products. "Now that [villagers] have access to market rates, middlemen are not able to exploit the farmers or fishermen," says Raja Mohan, the head of the Swaminathan Foundation's I.T. hub in Pondicherry.

The Pondicherry government wants the foundation to extend its network to 208 villages — which to Swaminathan would be a good start. He predicts millions of jobs can be created in rural India as early pioneers spread knowledge to others. "These people," he says, "will teach the masses how 'know how' can become 'do how.'" Swaminathan should count himself among them. ▲



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- Director

December 22, 1999

Dr. M.S. Swaminathan
M.S. Swaminathan Research Institute
Third Cross Street, Taramani Institutional Area
Chennai - 600113
INDIA

Dear Dr. Swaminathan:

The Franklin and Eleanor Roosevelt Institute is honored to inform you that you have been designated as a recipient of the Franklin D. Roosevelt Four Freedoms Medal in 2000. You have been nominated by leaders in both the Netherlands and the United States.

The Trustees of this award believe that you exemplify those objectives which President Roosevelt described in urging Freedom from Want as an essential condition of human liberty. Your extraordinary work as an agricultural scientist, leading the "green revolution" and bringing hope to the peoples of the developing nations so that the age-old scourge of famine and hunger can be ended has been particularly noted. You have taught nations how to be self-sufficient in their need for food just as you have taught farmers how to develop and enhance the productivity of their land. Your brilliant leadership has established a goal for the new millennium - a hunger free world, an international structure of cooperation among nations, a determination to use the miraculous technology of our times to help those in need. Your dynamism and compassion have given new meaning to Franklin Delano Roosevelt's commitment to a better world where all nations will understand and strive for Freedom from Want.

The Franklin Delano Roosevelt Freedom Medal was created to honor individuals and institutions whose work has given special meaning to those freedoms which President Roosevelt described in his memorable speech to the Congress on January 6, 1941:

- Trade W. Lash
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- Raymond A. Lamontagne
- Anne Roosevelt
- Mrs. Franklin D. Roosevelt, Jr.
- Vice Presidents
- Nicholas L. Ludington
- Secretary
- Kirvington R. Winant
- Treasurer

John F. Scan
Executive Director

Dr. M.S. Swaminathan
December 22, 1999
Page Two

"We look forward to a world founded upon four essential human freedoms. The first is freedom of speech and expression - everywhere in the world. The second is freedom of every person to worship God in his own way - everywhere in the world. The third is freedom from want - everywhere in the world. The fourth is freedom from fear - everywhere in the world."

The ceremonies honoring the international laureates will take place in Middelburg, the Netherlands on May 27, 2000. The event, attended by an invited audience of distinguished Europeans and Americans, is organized to reflect the esteem and admiration in which you are held. You are asked only to make a short statement of acceptance after the presentation of the award. A dinner honoring the laureates will be held the evening before the ceremonies at the Roosevelt Study Center in Middelburg. It is expected that Queen Beatrix of the Netherlands will be present at the ceremonies.

Previous recipients of the International Award have included His Majesty, Juan Carlos I of Spain; the Dalai Lama; former U.N. Secretary-General Perez de Cuellar and the U.N. High Commissioner for Human Rights, Mary Robinson. Recipients of the designation for Freedom of Want have included Medicin Sans Frontier; Sadako Ogata, the U.N. High Commissioner for Refugees; and Dr. Jan Tinbergen, Nobel Prize winning economist whose work for the developing world was honored.

We hope that you will be able to accept this award and be with us in the Netherlands on May 27th. Upon receipt of your acceptance, Arend de Ru, Chief-Kabinet van de Commissaris der Koningin in the Netherlands, will be in contact with your office regarding the necessary arrangements.



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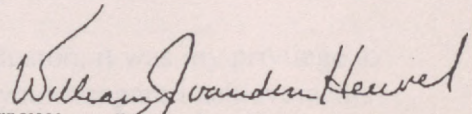
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Dr. M.S. Swaminathan
December 22, 1999
Page Two

We look forward to hearing from you at your earliest opportunity. With respect, we are

Sincerely,


William J. vanden Heuvel
Chairman

Anna Eleanor Roosevelt
President

Arthur M. Schlesinger, Jr.
Honorary Chair

WJvH/jr

cc: His Excellency, Kamalesh Sharma
Permanent Representative of India
to the United Nations



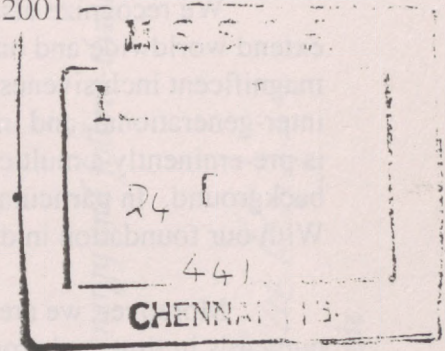
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Office of the Chancellor

100 Morrissey Boulevard
Boston, MA 02125-3393
617.287.6800
Fax: 617.265.7243

February 16, 2001

Dr. M. S. Swaminathan
Office of the UNESCO Cousteau Chair in Ecotechnology &
Chairman, M S Swaminathan Research Foundation
3rd Cross Street, Taramani Institutional Area
Chennai (Madras) 600 113, INDIA



Dear Dr. Swaminathan:

It gives me great pleasure to inform you that the Board of Trustees of the University of Massachusetts voted to offer you the degree of Doctor of Science, to be conferred at the Boston Campus Commencement exercises on Saturday morning, June 2, 2001, at 11:00 a.m.

As Chancellor of the University of Massachusetts Boston, it was my privilege to recommend you for this honorary degree in recognition of your nonpareil achievements as a scientist, global citizen and leader in the application of science to major world problems. Your list of honors is as extensive and deep as that of any other living person and there is perhaps nothing I might say in praise that has not been said before many times over. Yet I do want to speak to the question of why the University of Massachusetts Boston, why do we, particularly, want to honor you, and why might there be benefit, if not to you, then to things you value, in taking time to come here.

At various times in the century just ended, India has held a place of moral leadership in the world. Attempting to bring east and west together, following a path of peaceful change, pursuing economic policies that made genuine attempts to reconcile growth with traditional cultural values—these are examples of that leadership and some of these efforts are of course associated with your name. We would wish that India's role in this regard continue, enhanced, into the 21st century. By recognizing your leadership and India's, we express our hope that India's role on the world stage increase and that India's particular genius for embedding values of the spirit in daily life become more prominent on that stage.

We wish, too, to recognize your efforts for the underprivileged and disenfranchised. As Boston's urban public university, UMass Boston is peopled by non-traditional students, many of them immigrants, from poor families, the first generation in their families to attend college or university. Furthering their economic and social well-being is central to our mission. We share your values in all that you have accomplished for emerging societies and emerging peoples within those societies. By honoring your work we seek to further those values, here, in India and everywhere.

Swaminathan

Page 2

We recognize also the global nature of your achievement. Benefits of your work extend worldwide and have been recognized in countries around the globe. We honor the magnificent inclusiveness of your concerns, by nation, socio-economic group, gender, inter-generational, and including both human and natural environments. UMass Boston is pre-eminently a multicultural university with students of tremendous diversity of background. In particular the number of Asian American students has been growing. With our foundation in diversity, we resonate with your inclusiveness.

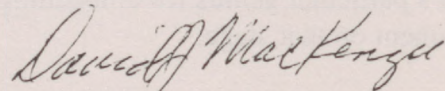
Moreover, we are entered on an era where the impacts of any event easily extend outwards in time and around the globe. With interaction endemic, inclusiveness becomes a bedrock value. Interaction and inclusiveness embody our time in history, this moment and this era. We see your work in this context and value it accordingly. We would value the opportunity to do our modest part in making it better known.

Since it is the policy of the Board of Trustees not to award honorary degrees in absentia, the Trustees, faculty, and students hope that you can be present at the Boston campus on Commencement day. Should your schedule permit, I would also be pleased if you could join us for our traditional Commencement dinner on Friday evening, June 1.

We will of course cover your expenses, including business class air transportation, hotel room and meals, and be of assistance in any other way we can to make your trip here an enjoyable one. Prominent members of the Asian American community in Boston will be honored to greet you, and during your visit my staff will facilitate such interactions, not only with Asian Americans, but also other leaders in Boston. In addition, it goes without saying that Professors Kamal Bawa and Garrison Wilkes would take a most personal pleasure in welcoming you here.

I do hope that you can fit our Commencement celebration into your busy schedule. I look forward to your sharing this most significant day with our students, faculty and other members of the community.

Sincerely,



David J. MacKenzie
Chancellor

Dr. M. S. SWAMINATHAN

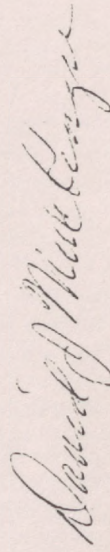
**Doctor of Science
June 2, 2001**

Dr. Swaminathan, your scientific work in creating new varieties of grain has saved the lives of millions of people and improved the food supply for billions. You have been the leader in an agricultural revolution in India and around the globe—as scientist, visionary and government official at the highest levels, helping to transform farming in India.

However, your interests and influence extend far beyond your contributions to global food supply.

You are a world leader in conservation of the environment and natural resources, in alleviating poverty, and in improving the status of women and of young people. You are also a leader in applying both traditional technology and the newest technology in ways that benefit poor people. You are working to expand the Green Revolution in food supply into something even greater, an Evergreen Revolution that extends economic welfare and social recognition to everyone in developing countries.

We honor you for that combination of multiple talents—vision, dedication, energy and follow-through—which has made possible your extraordinary range of achievements.



David J. MacKenzie
Chancellor

Personal Perspectives

M S Swaminathan: A Better Harvest

Tushaar Shah



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Editorial & Administrative Address :

Indian Institute of Management, Bannerghatta Road, Post Box No. 4113, Jayanagar H.O., Bangalore - 560 041.

Telephone : 91 080 6582450

Fax : 91 080 6584050

Email : review@iimb.ernet.in

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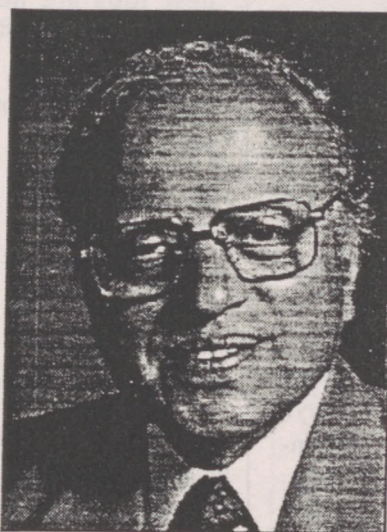
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Personal Perspectives

A Better Harvest

M S Swaminathan in Conversation with Tushaar Shah



MS Swaminathan is Founder-Chairman of the M S Swaminathan Research Foundation. Described by the United Nations Environment Programme as "the Father of Economic Ecology" he has held several advisory posts with international organisations like the UN Science Advisory Committee and the FAO.

A plant geneticist by training, Dr Swaminathan's contributions to the agricultural renaissance of India have led to his being widely regarded as the scientific leader of the green revolution. Among the many honours conferred on him are the Ramon Magsaysay Award for Community Leadership in 1971, the Albert Einstein World Science Award in 1986, the first World Food Prize in 1987 and more recently, the Indira Gandhi International Prize for Peace, Disarmament and Development, 1999.

Dr Swaminathan is a Fellow of many of the leading scientific academies of India and the world, including the Royal Society of London and the U S National Academy of Sciences. He currently holds the UNESCO Chair in Ecotechnology at the M S Swaminathan Research Foundation in Chennai (Madras), India.

Tushaar Shah was formerly Director of the Institute of Rural Management, Anand. He is currently Research Leader — Policy, Institutions and Management Global Programme, at the International Water Management Institute, Colombo, a research centre of the Consultative Group on International Agricultural Research.
t.shah@cgiar.org

TS Over 25 years ago, in your Sardar Patel Memorial Lectures, delivered over the All India Radio, you spoke on 'Our Agriculture Future'. Today, at the dawn of the new millennium, has your prognosis changed?

MSS In 1972, the prices of fossil fuel suddenly shot up and with it there was enormous escalation in fertiliser prices. People were therefore very pessimistic about the future of agriculture in the country, though the Green Revolution had been hailed only a few years before. So in my talk on 'Our Agriculture Future' in 1973 I said that what we needed was an integrated approach: a farming systems approach looking at our land and water resources. I also spoke about the concept of Sarvodaya Agriculture, which is a high synergy society of farmers, managing and caring for natural resources like land and water, through group cooperation and group farming.

In the same year, I also delivered the Coromandel lecture on 'Agriculture in Spaceship Earth', based on Buckminster Fuller's concept of a limited or finite carrying capacity. I felt that what we needed in our country was an economic ecology or 'Do Ecology' as opposed to a 'Don't Ecology'. I warned environmentalists not to be carried away by what was happening in Europe or North America, because for them the struggle was to preserve the very high standard of living they had already achieved. They could afford to keep saying,

don't, don't, don't. For us the struggle is to get some standard of living for a majority of the people. So we need a more positive Do-Ecology, or economic ecology. For example in our JRD Tata Ecotechnology Centre, we are trying to promote aquaculture. You could go to the Supreme Court and get all such efforts stopped. But sixteen million children are born every year. A hundred million new jobs are needed. Where are the livelihood opportunities? Modern industry is not labour absorbing, it is only labour displacing.

So coming back to your question, my prognosis remains unchanged. The basic maladies of Indian agriculture are the same 27 years later. Similarly, the remedies I advocated then were ecologically sustainable and I stand by them. The emphasis is on both social and environmental sustainability, in terms of technology development and dissemination — what we now call Ecotechnology.

TS In recent years, you have been deeply involved with the problems of poverty, livelihoods and employment. Indeed, the earliest initiative of the MSSRF was to create 100 million jobs through an environ-

mentally sustainable programme of rural development. How far has the MSSRF been able to influence large policy framework in this direction? What are its current programmes and priorities?

MSS Agriculture is the mainstay of India's livelihood security system, apart from providing food and nutrition. It's a far different picture from that of the developed countries. The US, for instance, has nine hundred thousand farming families, while we have a hundred and five million farming families. In the US, one hundred thousand

people produce seventy million tones of milk, while in India, eighty million women produce seventy five million tones of milk. This bears out Gandhiji's concept of technology of production by the masses. Indian agriculture has to provide not only more food for the urban population, but more income

Sixteen million children are born every year. A hundred million new jobs are needed. Where are the livelihood opportunities? Modern industry is not labour absorbing, it is only labour displacing.

and more jobs or livelihoods for the rural people. That position has not changed in nearly three decades, in fact the numbers have increased. Although the contribution of agriculture to the GDP has gone down to 29% or so, the onus of employment is still on the agriculture sector. According to the latest plan

document, nearly 65 - 75% of the people have to depend on agriculture for their livelihood. That itself shows the growing rural-urban disparity. So we must look upon agriculture not merely as a method of increasing food production for the urban population, but more importantly for the livelihood security of the poor, particularly of the landless poor and of small and marginal farmers.

Secondly, there is a very strong gender dimension to agriculture planning, what is now generally known as the Feminisation of Poverty. Women play a vital role in agriculture, doing most of the underpaid or unpaid jobs, jobs involving drudgery. And any natural resource degradation affects women more, because fetching water, fodder and fuel is traditionally women's work. These problems require the adoption of a farming systems approach rather than a commodity centred approach to agriculture planning. In other words, we need to concentrate on crop-livestock-fish integration or agro-forestry integration, and the reduction of drudgery.

The third point on my agenda was the need for environmental sustainability in the production process. There I advocate

two different approaches. One is the integrated nutrient supply, organic manures, bio fertilisers, green manures and limited

amount of manure fertilisers.

The second is the social synergy organisation for the conservation of water, land and air. An individual farmer cannot do it. While cooperative societies may be the best form of organisation for the dairy sector, conservation of natural resources requires more cooperation

than a cooperative society.

TS With the advent of globalisation, new institutional arrangements are being created for governing agricultural trade. In India, for instance, there is much concern about Intellectual Property Rights, TRIP and new WTO regulations. There is also concern about the impact of multinational corporations on Indian agriculture. How can India make the most of these changes?

MSS Right now, as a result of the WTO and indiscriminate import of agricultural commodities, our farmers are struggling to defend their home market, forget capturing new markets. Markets abroad have become difficult, have introduced stringent sanitary, phyto sanitary

measures, and so on, while even in the year 2000, our rice farmers are drying their grain on the road. The road and the roof are their only dry areas. Then the rats get a large part of the crop. There is very little infrastructure. How can they compete with the Iowa farmer? I once calculated that an investment in post-harvest technology is one hundred thousand dollars in an Iowa farm; in an Indian farm it is one dollar. Where is the level playing field here?

Our problems are due to poor quality and poorly organised marketing. We have always prided ourselves on being the largest producer of fruits and vegetables, but the fact remains that except for Maharashtra, which has made some investments in grapes and Alfonso mangoes, our marketing is very poor. Our average fruit vendor makes Rs 30 - 40 per day and has to bear the costs of spoilage and rejects. How can s/he survive? Another frequent occurrence is that at the time of harvest the prices crash, and these are all perishable commodities. A primary onion producer may get as little as Rs 16 or 17 per quintal. An average small farmer may bring about 500 quintals to the market; and out of that more than 50 percent is his cost of production. What is the take home pay for them?

When I was Secretary, Agriculture and Rural Development, I introduced the rural godown scheme for both perishable and non-perishable commodities all over the country. The aim was to avoid distress sales and panic

Women play a vital role in agriculture, doing most of the underpaid or unpaid jobs. And any natural resource degradation affects women more, because fetching water, fodder and fuel is traditionally women's work.

purchase, particularly in drought prone areas, give visibility to storage, promote land use planning and reduce spoilage of perishable commodities. Some state governments took an interest, and are now reviving the scheme.

Another handicap is that agriculture in industrialised countries is a technology, capital and subsidy driven enterprise. It is very low labour absorbing and high technology and subsidy absorbing. The fact is that in the United States, Japan and Europe, 97-98% of the people, who are employed in other sectors, subsidise the 2-3% who are agriculturists. In our case, 25-30% are subsidising 70%. The US last year gave \$26 billion of support to farmers, the highest in 15 years. They can continue giving high subsidies, because they have written the text of the WTO and they know the rules of the game. Because the developed countries do the drafting in almost all global negotiations, they play a proactive role, while developing countries play a reactive role. For example if you look at the aggregate measure of support in the WTO you will find things like research exempted. Billions of dollars are going into technology development, which are not

included in any part of the aggregate measure of support to the farmers. In this way they find ways of giving greater support to their farmers. In Switzerland, if you are a farmer,

75% of your money comes from the government. These incentives are offered partly because agriculture is a foreign exchange earner. In the United States it is the number two foreign exchange earner, next to the armament industry. And while only 2 - 3 % are involved in agriculture, another 30 - 35% of the

American population is involved in the secondary sector (processing, business, industrial activity, production of fertilisers, pesticides, and so on) and the tertiary sector (packaging, forwarding, and shipping), which is particularly important in terms of marketing. Therefore the WTO is not a level playing field at all, especially in agriculture.

However, in spite of these handicaps, globalisation should give us an opportunity provided the industrialised countries are honest about their subsidies, because we do have some advantages that we have not exploited. For instance, our exports can find a market in countries which have very limited

arable land. Even if China stabilises its population at 1.4 - 1.5 billion, they will have to import, because the land availability is very low and their yields are already high, 5 tons of rice per hectare. On the other hand, we hardly get 2 tons, so our untapped yield reservoir is high. Even without genetic modification, we can double our total production. But we must improve the rural infrastructure, in terms of milling and so on. And it is vital that we pay more attention to dry land farming.

The increasing import of pulses and oil seeds into this country is an index of the neglect of dry land farming. The most important cash crops of dry land area are pulses, oil seeds and millets. Now when you import a hundred thousand tons of pulses from Australia, which has highly mechanised large farms, our farmers are not going to get a proper price for groundnuts and pulses. This is a political issue, the markets are flooded with oil seeds and pulses, especially at festival time, to earn the blessings of the people.

TS But are you suggesting that we can be competitive in irrigated food grain products even if the West does not withdraw its subsidies?

MSS Even if the West does not withdraw its subsidies we can still be competitive because their wages are very high. To some extent they compensate by using no labour at all in the farm. One couple and their son can manage an Iowa farm of a thousand acres because of their

highly mechanised farming systems. But the relative cost of everything is high there. So if we can improve our water management efficiency in particular (because water management efficiency enhances nutrient use efficiency), and use appropriate varieties, we will get a very high return, reduce the cost of production, and increase the value. But in order to seize these opportunities, we will need a complete restructuring of the extension department in India.

I agree with Dr Kurien when he says the extension must be under the control of the farmers. The development approach of the present extension is a patronage approach. How can you call the farmers 'the beneficiaries'? You and I are the beneficiaries. We should be the 'target group' not the farmer. There is an urgent need for a shift from patronage to genuine partnership in dealing with resource-poor farming families.

TS Coming back to globalisation what has been your thinking on Intellectual Property Rights especially for Indian agriculture?

MSS Indian agriculture has got both a bright side and a flip side. On the bright side we have one of the most dynamic and extensive plant breeding programmes in the world, particularly in the public sector. Even in the international centres most of the top breeders are Indians: Gurdev Kush is a world leader in rice breeding, Sanjay Rajaram from Benaras is number one in wheat breeding. But we must protect our own work. Our out-

dated patent laws have now been revised. And we must bring in a bio-diversity bill. We are the only developing country that is rich in bio-resources as well as bio-technology. We are a mega bio-diversity area and, as with Information Technology, we have tremendous capacity in terms of brilliant young people.

TS I believe it is not good enough for our scientists to get a patent here?

MSS That is one thing in the revised TRIP, if a patent in one country is accepted as a patent in other countries, then you will have the universal patent. The United States is in favour of this because for them it is an advantage if their patents are honoured in India or China. In the Okinawa statement G8 countries have recommended harmonisation of intellectual property rights.

TS Registering patents seems to be a habit in the developed world, but not with our scientists.

MSS They are just not used to it. I myself never

gave any thought to patent rights fifteen years ago. We were working in the area known as the public good research, and the idea of patenting our intellectual property

never even crossed one's mind. It was a different atmosphere altogether. But all that will change now. People like Dr. Mashelkar, head of the Council of Scientific and Industrial Research, have been trying to promote the idea that patent literacy is a must for every scientist in this country.

TS What are the opportunities and threats arising from the recent breakthroughs in genetic engineering? Are there opportunities for increasing the productivity of dry land farming through this route? What are the implications for our agriculture future?

MSS There have been a number of technological changes in

the last 27 years, for example, many varieties of hybrid rice are being produced. Genetic modification has become the technology of the future. So much so that the private sector, which was never much involved in research or production of food crops like wheat and rice, is now finding these very attractive.

Now the wheat

and rice revolutions in Punjab have altered the concept of cash and food crops. Now, these food crops, and not sugarcane or tobacco, are the major cash crops.

How can you call the farmers 'the beneficiaries'? You and I are the beneficiaries. There is an urgent need for a shift from patronage to genuine partnership in dealing with resource-poor farming families.

Genetic engineering has been coming over a period of time from 1953 when Crick and Watson identified the double helix structure of DNA. From that time onwards people have been wanting to map the human genome. They wanted to manipulate and bring in genes from totally unrelated species, what is known as parasexual or crossing the sexual barriers. When I was an active breeder the maximum I could do was to bring genes from breeds which would cross with each other. I could do tissue culture, but essentially with breeds which were sexually compatible. Now we can move genes across sexual barriers. For example in our own centre here, some of my young colleagues, Ajay Parida and his group, have identified the genes for seawater tolerance in mangroves, which as you know, grow in estuaries, and have transferred it to mustard, tobacco and now rice. When I got my PhD in genetics in 1952 from Cambridge, I wouldn't have dreamt that it would be possible to transfer genes from a tree to an annual crop.

India has a great opportunity in genetic modification. What we need is a risk-benefit analysis methodology by which one can identify what the risks are. The only risk I see is there could be some allergens. After all I am taking a gene from mangrove and putting it into rice or mustard. It is possible our stomachs are not used to that protein. So you could have an allergic reaction. Another problem may be that the markers used are

antibiotics. If the human system gets a lot of these then it may not respond to antibiotics when you need them. So there are some genuine human health concerns. Environment concerns, such as the possibility of some new weed proliferating, are more remote possibilities.

To my mind, there are two serious questions concerning genetic engineering. One is the food safety concern, which has to be studied in greater detail; and the other is the ethical question. The question of ethics more closely involves the human side, like cloning. There is a whole series of issues on ethics, and that is why UNESCO has a universal declaration on the human genome and human

rights. So I would say at the moment we should develop our capacity to the full. Because in a way what has happened over the millennia is some kind of genetic engineering — whether it is animals, birds, or pollination of plants across great distances from other plants — this is why you can see so

much variability in nature, so much mutation and recombination. What is new is that you can do it much more precisely. In breeding I have to make a cross and grow thousands of seedlings, hoping that I will get the combination that I need.

Today I need not hope for the combination, I can make that combination at the molecular level. For example, if I want the genes for brown plant hopper resistance or stem borer resistance, now I don't take the whole thing, I take only that piece of DNA and transfer it. So there is a great deal of precision in what you are doing now.

What is important is to discuss it with the public, and establish a more transparent, credible method of risk and benefit analysis. For instance, in England they had the bovine spongiform encephalopathy (BSE) or mad cow disease, and the public found that the scientists had not been honest with

them. The mad cow disease was swept under the carpet and then there was another problem with chicken in Belgium. The American public is also suspicious of corporates because the tobacco companies suppressed vital data for a long time, until they were punished. So they feel that multinationals

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will be self-serving, that they won't put all their cards on the table. So you must have a mechanism by which the public is assured that the risk-benefit analysis procedure is above board, that it is done in an

objective way with the public good in mind and not their own personal agenda. Fortunately the scientists are also going back to the drawing board, re-examining their methods and trying to foresee and plug all possible dangers or risks. We must have a national commission on genetic modification for food security. And we must ensure that this commission has very broad multi-stakeholder participation: representatives of non-governmental organisations, women's organisations, consumer forums, media representatives, the experts concerned and the government regulation authorities. So you will have openness, transparency and credibility. And of course there must be labelling for some time. The Americans were very much against labelling because they thought consumers would be put off by the genetically modified (GM) label. But the consumers have every right to know what they are eating. So we should label GM food until consumers have the confidence that it is like any other food. This may take another five years, until then the companies also must be patient, they must try to educate the public. So we must have a multi pronged strategy: labelling of GM food in the market, transparent mechanism of risk-benefit analysis, and orienting our research agenda in such a way that the genuine concerns of food allergy and food safety are addressed carefully. If you do that, then India can convert its rich bio-resources into economic wealth through biotechnology.

One of the projects funded by

the Rockefeller foundation in Switzerland and Germany has created Golden Rice, rich in vitamin A or beta-carotene. They transferred the genes for high vitamin A from a species totally unrelated to rice. So a young child who cannot eat much rice, will get his requirement of vitamin A from just a few spoons of rice, and problems arising from lack of vitamin A, like night blindness, can be immediately controlled. Similarly, Professor Ashish Dutta and his colleagues in the Jawaharlal Nehru University at Delhi have transferred genes from amaranths or saag, which are very rich in certain kinds of amino acids and proteins, to potatoes, creating highly nutritive potatoes. So all this work is going on, which can open up completely new vistas in terms of quantity, quality, and resistance to both biotic and abiotic stresses.

TS You've accomplished so much, in your years at the Indian Council of Agricultural Research (ICAR), with the Government of India, at the International Rice Research Institute (IRRI) and at the MSSRF; as a scientist and as an institution builder. What were your priorities

when you set up MSSRF?

MSS Early in 1988 I left IRRI so that I could set up an institution of my own before I was too old. Although I felt that this country did not need any more institutions — there are so

We must have a multi pronged strategy: labelling of GM food in the market, transparent mechanism of risk-benefit analysis, and orienting our research agenda in such a way that the genuine concerns of food allergy and food safety are addressed carefully.

many institutions and universities for agriculture — I noticed a gap. I had become deeply interested in coastal agriculture, and I found that although different departments (forestry, fisheries, tourism, and so on) were doing something, there was no real organised effort to look in an integrated way at

natural resources management along the coastal areas. So I wanted to develop a Coastal Systems Research (CSR) methodology. And the government of Tamil Nadu was very willing to give us this land, in the Taramani institutional area.

Then the question was what kind of research priorities: one was CSR, which is an adaptation of the farming systems research methodology. Except you look at the land surface and the sea surface in an integrated way. Coastal aqua culture, capture fisheries, culture fisheries, coastal-forestry, agro-forestry and coastal agriculture: all of these needed to be studied intensively.

I was also deeply interested in the issue of climate change, which I felt was inevitable. Because, whatever one may say, the industrial countries are not going to shift to sustainable life styles. Their fossil fuel consumption will continue to be high. We could endlessly argue about who is the greatest polluter, but the sufferers will always be the poor. On the one hand, the poor nations, and on the other, the poor in all nations. Arguments about who is responsible for global warming do not help the poor. I thought we should do anticipatory research. So the theme of my lecture at the 1989 Global Climate Conference in Geneva was mitigational anticipatory measures to meet the challenges of climate change and sea level rise. The Japanese government felt that it was such an important area of research that they provided half a million dollars to fund the project. So in 1990 we started this work on coastal biodiversity and biotechnology, conservation of mangrove forests round the coast, creating an awareness of the importance of mangroves, transferring the salinity tolerance genes from the mangrove to annual plants and so on. Later on we extended this work to the Gulf of Mannar area, adjoining Sri Lanka, which was once upon a time very rich in biodiversity though the dugongs and the sea grass beds are all disappearing now. So efforts are underway to save the Gulf of Mannar.

Another area in which I was always interested is the blending of traditional technologies

and frontier science. I also wanted to do more work on how to introduce ethics and equity in benefit sharing, in the use of genetic resources. I was then independent Chairman of the FAO governing council. So at the same time we set up an international commission on plant genetic resources and developed the concepts of farmers' rights, rights of conservers, the contributions of traditional conservation, traditional wisdom, traditional knowledge and so on.

The fourth area we chose was called reaching the unreached, that is largely how to reach children and women. This programme, run by my wife Mina, works in the areas of gender discrimination, gender justice, female foeticide, nutrition of children, mobilising theatre, traditional tools, and so on. We also helped the UN Commission on Nutrition to develop their report on child malnutrition.

One of our aims, when we established this centre ten years ago, was to get the best in modern science to those who have been by-passed by science and technology. So we took up four areas in technology: Biotechnology, Information Technology, Space Technology (particularly GIS Mapping, Natural Re-

source Survey Mapping and so on) and Renewable Energy (particularly biomass, biogas and solar). A fifth area that emerged was Management Technology; it was defined as putting all the pieces together in a proper way so that there was synergy among them, and also blending traditional wisdom and traditional knowledge with modern science.

We have also set up knowledge centres to disseminate information. One such centre is Veerampatinam, a coastal fishing village in Pondicherry. All the fishermen go out to sea in catamarans, so the monsoon is a very worrying time for them. Now there is data from the US Navy that gives you the size of

the wave in each area, each beach — 1000 metres from the coast, 2000 metres from the coast and so on. So they download it in the morning from the Internet, and broadcast it on loudspeakers all over the village. Everybody is excited because they never thought that it would be possible to know ac-

I was always interested in the blending of traditional technologies and frontier science. I also wanted to do more work on how to introduce ethics and equity in benefit sharing, in the use of genetic resources.

curately what the condition of the sea would be — not the Indian Ocean, but their own stretch of sea — before they got into their catamarans. So modern information technology is very powerful, provided the

users control it. And this information is driven by demand, not by supply.

Our programme in Informatics, (modern information technology) has been an adventure, a new form of social synergy between scientists and men and women who are economically and socially underprivileged, many of whom live in rural areas. At the same time it has provided opportunities for our young men and women to express their creativity.

In recent years, the UNDP has adopted our slogan, which is that sustainable human development must be pro-environment, pro-poor, pro-woman and pro-employment. So we have had a wide impact on the world's thinking.

TS That is probably why *Time* magazine acclaimed you as one of the 20 most influential Asians of the 20th century.

MSS I had the privilege of travelling widely in Asia when I was in IRRI, to develop the rice institutes in a number of countries; in Burma, Vietnam, Cambodia, North Korea and of course, the National Rice Institute of China, where I received an award from the Chinese government for significant contributions to the country. What I have been impressed with is, wherever you go, the rural people are extraordinarily receptive to ideas. The picture of the Asian farmer as fatalistic and impervious to new ideas, is a myth created by the Western world. Take our computer work in the villages of Pondicherry:

women who are barely literate take to technology like fish to water. And therefore it is important for all developing countries to adopt the American slogan of 'land of opportunity'.

TS Finally, could you provide some insights into your early life, inspiration and philosophy?

MSS My father, who was a medical doctor, died in 1936 when I was only eleven. He was a Gandhian; Mahatma Gandhi stayed in our house to my memory at least twice when I was a young boy. We used to go and sit near him, and I have a vivid memory of how, if you were wearing a bangle or a chain, he would take it away, saying he needed it for a better cause. My mother had told us in advance not to object, but to give him whatever he asked for!

We were brought up in the tradition of simple living and high idealism. At first, I wanted to go in for a medical career. But in 1942, when I was studying in the Science College in Trivandrum, the great Bengal famine took place, and the Quit India Movement started. We thought of abstaining from classes in protest, but our Vice Chancellor convinced us that in order to serve independent In-

dia one day, we must equip ourselves. The Bengal famine convinced me that I must go into agriculture. I was particularly fascinated by the few lectures on genetics in my BSc, and decided I would take up genetics and breed new varieties of crops. So I did a second BSc in Agriculture from the Agriculture College at Coimbatore and then went on to Delhi to the Indian Agricultural Research In-

In recent years, the UNDP has adopted our slogan, which is that sustainable human development must be pro-environment, pro-poor, pro-woman and pro-employment. So we have had a wide impact on the world's thinking.

stitute to study genetics and plant breeding. Then I got a UNESCO Netherlands Government Fellowship to continue my studies in genetics in Holland. After I had completed my PhD in genetics from Cambridge in 1952, I got a post-doctoral appointment in the University of Wisconsin.

Early in 1954, I had to take a decision because Wisconsin offered me the position of assistant professor in the Department of Genetics where I was working. I reminded myself that I had come to specialise in genetics to help my country, turned down the offer and came back to India. I had no job in India; for three months I was just sitting at home. Then fortunately one day I happened to meet my old professor, Dr N Parthasarathy, who was working at the Central Rice Research Institute in Cuttack, who

offered me a temporary job transferring genes for fertiliser response from Japonica to Indica, and that is how I went to Cuttack in 1954. After that, of course, one of my applications to the UPSC bore fruit and I was selected for the post of cytogeneticist in the IARI, where I went on to become Director. This was followed by a series of government posts, including Director General ICAR, Secretary for Agriculture, Deputy Chairman of the Planning Commission, and so on. I was fortunate to share a good rapport with both the Prime Ministers I was privileged to work with, Indira Gandhi and Morarji Desai, who was a great man. He had a tremendous capacity to be straight. When he became Prime Minister, people told him I was Indira Gandhi's man. He replied, "Yes, but today I am the Prime Minister of India, and he is my man." That kind of support helps you achieve many things. Often people ask me how I achieved so much. I got many things done in the face of bureaucratic opposition, only with the support of the Prime Minister and visionary ministers like Mr C Subramaniam.

In 1980, I was appointed Acting Deputy Chairman of the Planning Commission. Although I was reluctant to go to the Planning Commission, it was an interesting experience and I enjoyed it. But it was a difficult task, involving a lot of bargaining and negotiations with the state governments. I found then that converting confrontation to cooperation was the best way of handling it. Instead of calling the state secretaries to Delhi as was the usual custom, I made a point of visiting the states myself. This gesture itself changed the complexion of the negotiations, and I developed a very cordial relationship with several of the Chief Ministers.

IRRI was another very interesting period in my life. So many things have happened over the years that were not a part of my plans, but I have enjoyed every one of them. The post of Director General, IRRI, was offered to me out of the blue in 1982. Though I had no plans to move out of Delhi, I was tempted because my whole philosophy is that of a field man really; I like to walk around the fields, in villages. Like many other agriculture scientists my

strength has always been a very close relationship with farmers. I always feel I must learn from them, and that attitude has helped me in my life. I realised I was tired of morning-to-night meetings and reports at Yojana Bhawan. This was the time to get out of it. I also felt that though I had studied in England, Holland and America, like many of us I had had very little contact with our neighbours. I wanted to learn a little more about Asia. I decided to accept the offer. Of course, it was more difficult to persuade Indira Gandhi to accept my resignation.

"Swaminathan," she told me, "You are indispensable; how can I let you go?"

So I answered, "I believe one must leave when one is wanted, not when one is not wanted."

She was very struck by that. Then all that she said was, you have my blessings. She was a very kind and generous person, whatever her faults; and she respected your professionalism if you had the courage to present your views firmly but respectfully. And so I went back to the green fields once again.

Reprint 00407



इन्दिरा गांधी पुरस्कार
Indira Gandhi Prize

प्रशस्ति

The Citation

19 नवम्बर 2000

19 November 2000

*The International Jury of the
Indira Gandhi Memorial Trust
herewith awards
The 1999 Indira Gandhi Prize
for Peace, Disarmament and Development
to
Prof. M.S. Swaminathan,
eminent agriculture scientist
Chairman, M.S.S. Research Foundation,
for his outstanding contribution
in the domain of plant genetics
and
ensuring food security
to hundreds of millions of citizens
in the developing world.*

*Given by
President of India
Shri K.R. Narayanan
on Sunday, 19 November 2000
in New Delhi.*

इन्दिरा गांधी स्मारक न्यास
INDIRA GANDHI MEMORIAL TRUST

दूरभाष : 3011358 Phone: 3011358
3010094 3010094
फैक्स : 3794117 Fax : 3794117

1 अकबर रोड, नई दिल्ली 110011
1 Akbar Road, New Delhi 110011
24 January 2000

No. IGP/2000/20003

Dear Swaminathan,

This is a formal communication regarding the 1999 Indira Gandhi Prize for Peace, Disarmament and Development which was awarded to you. You will recall my speaking to you the day the Prize was announced by the International Jury.

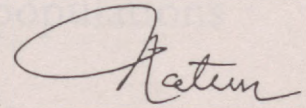
The Prize consists of an award of Rs. 2.5 million and a trophy with a citation.

The Award is normally conferred by the President of India at the Rashtrapati Bhavan, New Delhi, on the birthday of late Smt. Indira Gandhi i.e., 19 November in the following year.

It is my hope that you will be able to personally come to New Delhi to receive the Prize on 19 November 2000. The office of the Indira Gandhi Memorial Trust will be in touch with you in this regard.

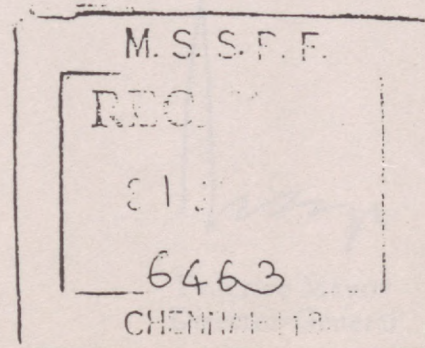
with good wishes

Yours sincerely,



(K. Natwar Singh)
Vice-Chairman

Dr. M.S. Swaminathan
Chairman
MSS Research Foundation
14, IInd Main Road
Kottur Gardens
Kotturpuram
Chennai - 600085





The United Nations Educational,
Scientific and Cultural Organization

hereby attests that

The UNESCO
Gandhi Gold Medal

has been awarded to

Professor Monkombu Swaminathan

in recognition of his outstanding work
in extending the benefits of biotechnology
to marginalized and poverty-stricken populations
in developing countries,
and in securing a sound basis
for sustainable agricultural, environmental
and rural development

A handwritten signature in black ink, appearing to read "Federico Mayor", written in a cursive style.

Federico Mayor
Director-General

Paris, 8 November 1999



Secretary-General and Treasurer

Secrétaire Général et Trésorier

Professor Eckart Ehlers

Departments of Geography

University of Bonn

Meckenheimer Allee 166

53 115 BONN, Germany

Phone: +49 228 73 92 87

Fax: +49 228 73 92 72

Email: secretariat@igu.bn.uunet.de

President

Président

Professor Bruno Messerli

Department of Geography

University of Bern

Hallerstrasse 12

CH-3012 BERN, Switzerland

Phone: +41 31 631 80 19

Fax: +41 31 631 33 81

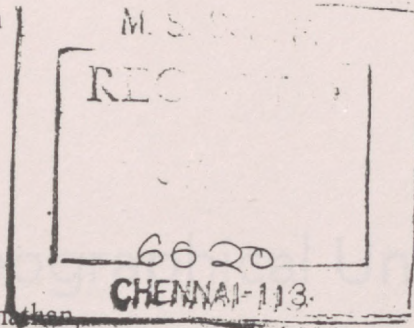
Fax: +41 31 631 85 11

Email: MESSERLI@giub.unibe.ch

International Geographical Union / Union Géographique Internationale

Prof. M.S. Swaminathan
M.S. Swaminathan Research Foundation
3rd Cross Road
Taramani Institutional Area
CHENNAI 600 113
India

✓ Fax: 0091-44-235 1319



1 February 2000

Dear Professor Swaminathan,

Allow me to address you in my capacity as Secretary-General of the International Geographical Union (IGU). The Executive Committee of IGU has unanimously decided to bestow on you the

IGU "Planet and Humanity" Medal.

This medal is awarded to honour outstanding personalities, who have made a significant contribution to environmentally relevant issues. The two other recipients of this distinction, which is awarded every four years, are Mary Robinson and Christian Pierret. In 1996, US Vice President Al Gore and Gro Harlem Brundtland, at that time still Prime Minister of Norway, received this medal.

The International Geographical Union would feel honoured if you would kindly accept this medal. It will be awarded in the Closing Ceremony of the 29th International Geographical Congress, which will be held in Seoul/Korea between August 14th and 18th, 2000.

Please let us know if we may expect your acceptance of the IGU "Planet and Humanity" Medal and if - in the case of a hopefully positive response - we may count on your presence in Seoul as a guest of honour of the International Geographical Union.

On behalf of the IGU Executive Committee I want to congratulate you on this highly deserved additional recognition of your outstanding scientific and humanitarian work. We all are looking forward to your reply.

Yours very sincerely,

E. Ehlers

E. Ehlers

CHANGE

Our new e-mail address:

secretariat@igu.bn.uunet.de

First Vice - President
Premier Vice - Président
Professor Warren Moran
Department of Geography
The University of Auckland
Private Bag 92019
AUCKLAND, New Zealand
Phone: +64 9 373 7599 ext. 8426
Fax: +64 9 373 7478
Email: w.moran@auckland.ac.nz

Past - President
Président Sortant
Professor Herman Th. Verstappen
ITC, The International Institute for
Aerospace Survey & Earth Sciences
PO Box 6
7500 AA ENSCHEDE, Netherlands
Phone: +31 53 487 44 44
Fax: +31 53 487 44 00

Professor Ronald F. Abler
Association of American Geographers
1710 Sixteenth Street NW
WASHINGTON, D.C. 20009-3198
U.S.A.
Phone: +1-202-234 1450
Fax: +1-202-234 2744
Email: rabler@aag.org

Professor Bertha K. Becker
LAGET / Departamento de Geografia
IGEO - UFRJ
Cidade Universitária, Ilha do Fundão
Caixa Postal 68537 - Cep. 21.945-970
21941-590 RIO DE JANEIRO-RJ-Brazil
Phone / Fax: +55-21 270-7773
Email: laget@igeo.ufrj.br

Professor Anne Buttimer
Department of Geography
University College Dublin
Belfield, DUBLIN 4, Ireland
Phone: +353 1 706 8174
Fax: +353 1 269 5597
Email: ANNE.BUTTIMER@UCD.IE

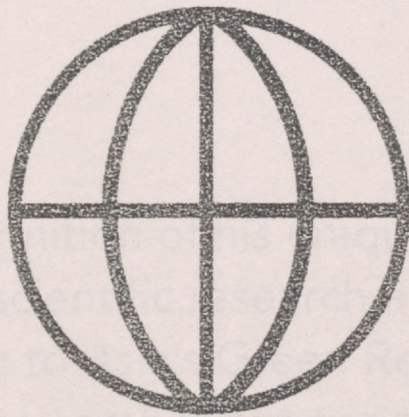
Professor B. Folasade Iyun
Department of Geography
University of Ibadan
P.O.Box 9746, U.I.Post Office
IBADAN, Nigeria
Phone / Fax: +234 2 2411 948
Email: FIYUN@lagosmail.sprint.com

Professor Chan Lee
Professor Emeritus
#1003 Pungnim Bld.
Kongdok-dong 404, Mapo-ku
SEOUL 121-022
Korea
Phone: +82-2-701 8383
Fax: +82-2-3272 7197
Email: chanlee@plaza.snu.ac.kr

Professor Adalberto Vallega
The University of Genova
Department Polis
Stradone S. Agostino, 37
16123 GENOVA
Italy
Phone: +39-10-209 5858
Fax: +39-10-209 5907
Email: vallega@polis.unige.it

The International Geographical Union presents
the medal "Planet and Humanity"

International Geographical Union



Union Géographique Internationale

Brigitte Messner
Brigitte Messner
IGU President

Georg Eber
Georg Eber
IGU Secretary General

The International Geographical Union presents

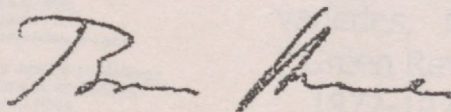
the medal "Planet and Humanity"

to

Professor M.S. Swaminathan

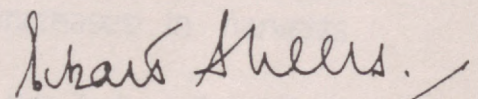
in recognition of his unique success
in outstanding scientific research and its application,
leading to Asia's Green Revolution.

His endeavours to combat hunger and food shortages
by promoting new seed varieties and applying these with
ecologically sound principles and sustainable agriculture
are all part of his profound humanitarian ethos,
which reminds scientists and politicians worldwide of
their responsibilities for stewardship
of nature and humanity on our common Planet Earth.



Bruno Messerli

IGU President



Eckart Ehlers

IGU Secretary-General



Secretary-General and Treasurer
Secrétaire Général et Trésorier
Professor Eckart Ehlers
Department of Geography
University of Bonn
Meckenheimer Allee 166
53 115 BONN, Germany
Phone: +49 228 73 92 87
Fax: +49 228 73 92 72
e-mail: secretariat@igu.bn.uunet.de

President
Président
Professor Bruno Messerli
Department of Geography
University of Bern
Hallerstrasse 12
3012 BERN, Switzerland
Phone: +41 31 631 80 18
+41 31 819 33 81
Fax: +41 31 631 85 11
e-mail: MESSERLI@giub.unibe.ch

International Geographical Union / Union Géographique Internationale

IGU Medal "Planet and Humanity"

Laudatio for Professor M. S. Swaminathan

The International Geographical Union is honoured and pleased to bestow its medal "Planet and Humanity" on Professor M. S. Swaminathan as one of the great scientists and – at the same time – humanists of the second half of the 20th century.

While it is impossible to pay tribute to all his scientific, political and humanitarian achievements in detail, the main highlights must be mentioned. Born and raised in Tamil Nadu, Monkumbo Sambasivan Swaminathan became aware not only of India's political situation on the eve of its independence, but he was also acquainted with the rural problems of his country and its manifold handicaps. His studies of bio-genetics in India, the Netherlands and the United Kingdom, which he finished with a Ph.D. in Genetics from Cambridge University, were followed by further research in the United States of America. These studies and their focus on agricultural research mark the beginning of a unique career characterized by a rare and extremely successful combination of applicable research – policy advice – implementation of research results and an effective dissemination of this knowledge to the benefit of the people. A few cornerstones of Dr. Swaminathan's scientific curriculum vitae may highlight his extraordinary career:

Since 1965: use of high-yielding Mexican wheat varieties and their cross-breeding with local Indian varieties, resulting in dramatic increases in harvests ("Green Revolution");

1972-1978: Director General of the Indian Council of Agricultural Research

First Vice - President
Premier Vice - Président
Professor Warren Moran
Department of Geography
The University of Auckland
Private Bag 92019
AUCKLAND, New Zealand
Phone: +64 9 373 7599 ext. 8426
Fax: +64 9 373 7478
Email: w.moran@auckland.ac.nz

Past - President
Président Sortant
Professor Herman Th. Verstappen
ITC, The International Institute for
Aerospace Survey & Earth Sciences
PO Box 6
7500 AA ENSCHEDE, Netherlands
Phone: +31 53 487 44 44
Fax: +31 53 487 44 00

Professor Ronald F. Ablor
Association of American Geographers
1710 Sixteenth Street NW
WASHINGTON, D.C. 20009-3198
U.S.A.
Phone: +1-202-234 1450
Fax: +1-202-234 2744
Email: rablor@aag.org

Professor Bertha K. Becker
LAGET / Departamento de Geografia
IGEO - UFRJ
Cidade Universitária, Ilha do Fundão
Caixa Postal 68537 - Cep. 21.945-970
21941-590 RIO DE JANEIRO-RJ-Brazil
Phone / Fax: +55-21 270-7773
Email: laget@geo.ufrj.br

Professor Anne Buttimer
Department of Geography
University College Dublin
Belfield, DUBLIN 4, Ireland
Phone: +353 1 706 8174
Fax: +353 1 269 5597
Email: ANNE.BUTTIMER@UCD.IE

Professor B. Folasade Iyun
Department of Geography
University of Ibadan
P.O. Box 9746, U.I. Post Office
3ADAN, Nigeria
Phone / Fax: +234 2 2411 948
Email: FIYUN@lagosmail.sprint.com

Professor Chan Lee
Professor Emeritus
1003 Pungnim Bld.
Jongdok-dong 404, Mapo-ku
SEOUL 121-022
Korea
Phone: +82-2-701 8383
+82-2-3272 7197
Email: chanlee@plaza.snu.ac.kr

Professor Adalberto Vallega
Department of Geography
University of Genova
Department Polis
Madone S. Agostino, 37
123 GENOVA
Italy
Phone: +39-10-209 5858
+39-10-209 5907
Email: vallega@polis.unige.it



Secretary-General and Treasurer
Secrétaire Général et Trésorier
Professor Eckart Ehlers
Department of Geography
University of Bonn
Meckenheimer Allee 166
53 115 BONN, Germany
Phone: +49 228 73 92 87
Fax: +49 228 73 92 72
e-mail: secretariat@igu.bn.uninet.de

President
Président
Professor Bruno Messerli
Department of Geography
University of Bern
Hallerstrasse 12
3012 BERN, Switzerland
Phone: +41 31 631 80 16
+41 31 819 33 81
Fax: +41 31 631 85 11
e-mail: MESSERLI@giub.unibe.ch

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1980-1982: Chairman of the Science Advisory Committee to the Indian Cabinet

1981-1985: Chairman of the FAO Council

1982-1988: Director of the International Rice Research Institute (IRRI) in Los Baños, Philippines

1984-1990: President of the International Union for the Conservation of Nature and Natural Resources (IUCN)

This – far from complete! – list of activities is not only a reflection of Dr. Swaminathan's wide range of scientific and science-based political activities, but also of his permanent endeavour to combine the local with the global – and vice versa. Especially his plea for a sensitive application of the Green Revolution's progress with an ecologically sound and sustainable agricultural development deserve special mentioning.

It is by no means self-understood that a person like Dr. Swaminathan – termed by the former UN Secretary General Perez de Cuellar "a living legend" – should return to his roots and apply his rich knowledge and international experience to the improvement of the living conditions and well-being of his immediate surroundings. This, however, happened. In 1988, the M. S. Swaminathan Research Foundation (MSSRF) was established as a non-political trust and with the explicit task to harness science and technology for an environmentally sustainable and socially equitable development. This foundation with its special foci on "Pro-nature", "Pro-poor" and "Pro-woman" was complemented in 1990 by the Centre for Research on Sustainable Agriculture and Rural Development (CRSARD) with special emphasis on research and training and the promotion of linkages between ecological and livelihood securities. Both institutions, employing by now more than 150 full-time scientific and support personnel, are based in Madras/Chennai. Today, research and training, especially of the rural poor, are focal activities of Dr. Swaminathan and his scientific collaborators.

First Vice - President
Premier Vice - Président
Professor Warren Moran
Department of Geography
The University of Auckland
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AUCKLAND, New Zealand
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Fax: +82-2-3272 7197
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The University of Genova
Department Polis
Stradone S. Agostino, 37
16123 GENOA
Italy
Phone: +39-10-209 5858
Fax: +39-10-209 5907
Email: vallega@polis.unige.it

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International Geographical Union / Union Géographique Internationale

Secretary-General and Treasurer
Secrétaire Général et Trésorier
Professor Eckart Ehlers
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University of Bonn
Meckenheimer Allee 166
53 115 BONN, Germany
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Fax: +49 228 73 92 72
e-mail: secretariat@igu.bn.uunet.de

President
Président
Professor Bruno Messerli
Department of Geography
University of Bern
Hallerstrasse 12
3012 BERN, Switzerland
Phone: +41 31 631 80 18
+41 31 819 33 81
Fax: +41 31 631 85 11
e-mail: MESSERLI@giub.unibe.ch

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Life and work of Dr. Swaminathan has been widely recognized and honoured. Prizes and awards include the World Food Prize (1987), the Tylor Prize (1991), and the Blue Planet Prize (1996) for his MSSRF – to name just a few. The International Geographical Union is proud to add modestly to these great recognitions by awarding its medal

Planet and Humanity

to Professor Monkumbo Sambasivan Swaminathan, a great scientist, a responsible and thoughtful caretaker of nature and an outstanding humanist.

First Vice - President
Premier Vice - Président
Professor Warren Moran
Department of Geography
The University of Auckland
Private Bag 92019
AUCKLAND, New Zealand
Phone: +64 9 373 7599 ext. 8426
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Past - President
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ITC, The International Institute for
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PO Box 6
7500 AA ENSCHEDE, Netherlands
Phone: +31 53 487 44 44
Fax: +31 53 487 44 00

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1710 Sixteenth Street NW
WASHINGTON, D.C. 20009-3198
U.S.A.
Phone: +1-202-234 1450
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Professor Bertha K. Becker
LAGET / Departamento de Geografia
IGEO - UFRJ
Cidade Universitária, Ilha do Fundão
Caixa Postal 68537 - Cep. 21.945-970
21941-590 RIO DE JANEIRO-RJ-Brazil
Phone / Fax: +55-21 270-7773
Email: laget@igeo.ufrj.br

Professor Anne Buttimer
Department of Geography
University College Dublin
Beifield, DUBLIN 4, Ireland
Phone: +353 1 706 8174
Fax: +353 1 269 5597
Email: ANNE.BUTTIMER@UCD.IE

Professor B. Folasade Iyun
Department of Geography
University of Ibadan
P.O.Box 9746, U.I.Post Office
IBADAN, Nigeria
Phone / Fax: +234 2 2411 948
Email: FIYUN@lagosmail.sprint.com

Professor Chan Lee
Professor Emeritus
#1003 Pungnim Bld.
Kongdok-dong 404, Mapo-ku
SEOUL 121-022
Korea
Phone: +82-2-701 8383
Fax: +82-2-3272 7197
Email: chanlee@plaza.snu.ac.kr

Professor Adalberto Vallega
The University of Genova
Department Polis
Stradone S. Agostino, 37
16123 GENOA
Italy
Phone: +39-10-209 5858
Fax: +39-10-209 5907
Email: vallega@polis.unige.it

Eckart Ehlers
Secretary-General of IGU

Corbis



Now for the Evergreen Revolution

Prof MS Swaminathan, a pioneer of India's Green Revolution, calls for a new approach to world farming.

In India, farming is part of our culture. Seventy per cent of our population—700 million people—are engaged in farming. Half the world's farmers live in India or China: every fourth farmer is Indian.

Famines were recurrent in India before Independence. Between 1870 and 1900, according to British records, 30 million people died of hunger and starvation. Nearly three million people died in the great Bengal famine—in what is now Bangladesh and India—at the time of Independence.

After Independence, both Nehru and Indira Gandhi laid great emphasis on bringing more land under irrigation, in order to insulate our farming from being 'a gamble on the monsoon', as Sir Albert Howard wrote in 1916. As every farmer knows,

without water you can do nothing.

Since I joined the Agricultural College at Coimbatore in Tamil Nadu in 1944, I have seen India's agricultural destiny transformed from being purely a 'gamble on the rain' to being a gamble on the market. In 1950, our total food grain production was 50 million tons. Last year it was 205 million tons. Our average growth rate, particularly in the last 30 years, has been about three per cent per annum, which is above our population growth rate.

Twenty-five years ago we were number 25 in the world in wheat production, and now we are number two. We are number two in rice production and number one in milk production: all produced by very small farmers. As Mahatma Gandhi said, 'Our production is production by masses'—in contrast to

the mass-production technology of the industrialized nations. What we need in India is job-led economic growth, not jobless growth: a human-centred kind of development. We need more farmers' farming and less factory farming.

How did this progress take place? The most important factor was the farmers' receptivity. Our farmers were thought of by Western writers as fatalistic, unlikely to respond to technology. They have proved to be like farmers anywhere else, with three determinants affecting their decisions—cost, risk and return.

The government had three major roles. One was technological: both national and state governments made large investments in agricultural research and education. We have

a vast network of agricultural institutes and universities. And we have had the good fortune of close international partnership.

Technology alone is not adequate—telling the farmer, 'Grow this seed', has no particular meaning unless the seeds are available. Jalna, in Maharashtra, has become 'the seed capital of India'. Such services as the production of seed, irrigation, credit supply, fertilizers have been very important.

Government's third, and most important, contribution was a package of public policy, particularly in terms of agrarian reform and input-output pricing. Thirty years ago, the average Punjab farmer produced one ton of rice per hectare, and kept 800 kg or so for his family. But if he can produce five tons, then he has four tons to sell, and more cash in hand. The smaller the farm, the greater the need for a marketable surplus.

A small farm is ideal for intensive, precision agriculture. On the other hand, small farmers often cannot take risks, have no access to credit and are resource-poor. This is why public policy—such as the small farmers' programme, marginal farmers' programme and programmes for drought-prone areas—matters so much.

The milk revolution was partly achieved by technology, but mostly by institutional reform. The cooperatives gave a power of scale to the woman who had only three or four litres to sell per day.

Cooperatives, joint stock companies and other forms of organization give small producers the power of scale both at the production end and at the post-harvest end. Modern ecological agriculture involves integrated pest management, integrated nutrient supply, scientific water management—'more crop per drop'. None of this can be done by a single small farmer alone. It has to be done on an area basis.

Our population now exceeds one billion. Arable land is going out of agriculture all the time. Water resources are shrinking. Our ground water is getting depleted and in many cases polluted. They are drawing water from lower strata in Bengal and Bangladesh with the result that arsenic is coming up. The greatest internal threat to agriculture is now the problem of conserving our soil fertility, land and water.

This is the phase which I call the Evergreen Revolution. This is where you have continuous advancement in productivity, but without associated ecological harm. It has three major preconditions.

The first is a happy farming family. Scientists like me can give advice and materials, but the farmers are the ones who toil in the sun and rain and produce the food. So we should not only work for the consumer, but also think of the producer.

The second ingredient is a sustainable farming system, not based on one crop alone. Almost every farm in India has one or two cows or buffaloes, or small ruminants like goat or sheep. These are part of our

life—crops, animals, fish, agro-forestry. If you go to Kerala every farm, every house, is a genetic garden: you will find jack fruit, pepper, coconut—up to 20 economic species in each garden.

A sustainable farming system is the very foundation of organic agriculture—some degree of animal husbandry, composting, organic manure and also crop rotation. In the bio-villages started by the JRD Tata Ecotechnology Centre in Chennai, one crop is a very powerful nitrogen fixer called *Sesbania prostrata*. It fixes large quantities of nitrogen both in the stem and in the root. You may need to combine this with mineral fertilizers and chemical pesticides, in a way that maintains both environmental and social sustainability and economic viability.

The third precondition is sustainable food security. Although the Indian Government has 45 million tons of wheat and rice in its warehouses, over 250 million women, children and men still go to bed hungry. Therefore jobs should be the bottom line of our agricultural policy. Where there is work, there is money, and where there is money there is food.

The JRD Tata Ecotechnology Centre tries to marry traditional wisdom, knowledge and technologies with the best in modern life.

Knowledge is a continuum, everyone of us leaves behind something new—and so will our children. You cannot freeze knowledge. So we have taken five different technologies: biotechnology, space technology (particularly in weather satellites), nuclear technology (particularly probes for underground mapping), information and digital technology (we have set up a series of information villages), and management technology. This last, in our definition, puts everything together into a management system for a farm which can be applied day by day.

Ecotechnology helps to bridge the divides in our country. We have found, for example, that bridging the digital divide in villages is a powerful method of bridging the gender divide. The people who are operating the knowledge centres in our information villages are women. Everybody comes to them for knowledge and this builds their self-esteem.

Everybody today talks about the globalization of the economy. Everyone knows about anything which happens—the earthquake in Gujarat for example—at the same time all over the earth. The global village in terms of information is a reality. But in economic terms it is a highly divided village.

We also know that our fates are intertwined ecologically. We can argue endlessly about who is responsible for mucking up the climate. But the fact remains that ecologically our fates are intertwined, and that is why we talk of our common future.

But you cannot have a common future without a common present. In 1994 agricul-

ture was introduced into the World Trade Agreement for the first time. It had five major components of importance to farmers: access to markets, domestic support from governments, export subsidies, sanitary measures—using products which are completely free of salmonella and toxins—and trade-related intellectual property rights (TRIPS)—patenting and protection of systems and plant varieties.

The Indian experience of this has been negative. We have no additional market access—in fact the market has even reduced in the OECD countries in the last six years. The domestic support we are given is a fraction of what is being given in the OECD countries. We don't give export subsidies.

Our sanitary measures are still poor, and this is bad for our own consumers. I tell my colleagues, 'Don't only think that the foreign consumer doesn't want salmonella, our people don't want it either.' Quality is quality, and we should not only think of export-quality. I have been calling for all our agricultural universities to set up short non-degree courses for farmers in the *Codex Alimentarius*, put together by FAO for food safety.

TRIPS has also worked against us so far. There are accusations of bio-piracy from 'gene-rich' countries like ours towards the 'technology-rich' countries. These are divisive forces. We hope that there will be a renegotiation of the World Trade Agreement on Agriculture.

Sarvodhya was a term coined by Gandhiji, meaning a win-win situation for all. I would like to see a *Sarvodhya* world of farming emerge, where there is unity of purpose in spite of the diversity of methodologies, farming systems, climates, soil and needs.

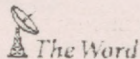
Mahatma Gandhi said the pathway to achieve *Sarvodhya* is *Anthodyhya*, attention to the poorest person. So if you want to have a *Sarvodhya* farming world, then I think the more affluent members will have to pay attention to those who are economically, socially and ecologically handicapped. As Gandhiji said, 'Before you do anything, ask yourself whether what you are about to do will help the poorest person you have seen in your life.'

We have to marry ethics with economics and technology. The technological push must be matched by an ethical pull. If you don't have these two matching each other, then you can't make sustainable progress.

This article is taken from Prof Swaminathan's opening address at the International Farmers' Dialogue at Asia Plateau, the MRA centre in Panchgani, India, last February. Dr Swaminathan's work in crop genetics and sustainable agricultural development earned him the World Food Prize in 1987. He has served as Secretary of India's Ministry of Agriculture and Cooperation, Director General of the Indian Council of Agricultural Research and Director General of the International Rice Research Institute.

The face of food security

Gnana Bharathy recounts the life and work of Dr. M. S. Swaminathan.



Eds. note: *This is the fourth in our series of profiles of people who have shaped India. A complete listing of these profiles will be maintained at this page, do visit periodically to view updates.*

When Monkombu Sambasivam Swaminathan was born on the 7th of August, 1925 in Tamilnadu, not many would have imagined the great changes that would sweep India in his lifetime. The struggle for independence lay unfinished, its promise still two decades from fulfillment. After the dawn of freedom, the country would be recast in the image of its own people, and would struggle to find that first measure of her independence, self-sufficiency in food production. As the population rose dramatically, even this much would become too much to ask of the new nation, and in the accomplishments of the genetecist from Tamilnadu, the quest for food security would be fulfilled.



Food security is a notion that many of us, drawn from middle and upper class India, have only noted in passing as a matter of some concern; its potential ravages rarely threatened us directly. Nevertheless, there is much for us to celebrate in Dr.Swaminathan's life, providing as it does for us a glimpse of how the accomplished and the able can dedicate their lives to both fulfilling professional endeavor and gratifying social service. More than an exciting scientist, Dr.Swaminathan has led a life of celebrated humanitarianism along the way, receiving repeated and remarkable honors for his work.

A major reason why this has been possible is that Dr.Swaminathan has, over the years, consciously and consistently broadened the purposes to which he has applied his learning as an agriculturist. Despite his conventional education as a geneticist at Coimbatore Agricultural College, The Indian Agricultural Research Institutie, and Cambridge University, he has gone far beyond the traditional understanding of agriculture - as a food creation process. In doing so, he has embraced ideas such as food security, social equity, gender equality, and the satisfaction of basic human needs. The value of these ideas cannot be overemphasized; they go a long way in reducing economic disparities and minimizing social conflict.

By linking these ideas to his scientific expertise in induced gene mutations and the creation of high-yield hybrid varieties, Dr.Swaminathan fostered and produced the Green Revolution, turning India from her status as the nation with the world's largest food deficit to a state of self-sufficiency in less than 25 years. The expansion of his ideas, and their application to other nations in Asia, doubled the output and consumption of traditional staples, especially rice, in southern and southeast Asia in a span of 20 years.

His career, understandably, paralleled the growing impact of his scientific and humanitarian genius. Beginning with institutional and governmental positions within India, he quickly reached greater heights, serving as Director of the

International Rice Research Institute and as independent chairman of the United Nations' Food and Agricultural Organization (FAO) Council. And alongside this progress, recognition also flowed in the form of numerous awards and honorary doctorates from leading institutions; these included the World Food Prize, the Honda Award, the Tyler Environment Award, and the Ramon Magsaysay award, among numerous others. The agriculturist Dr. Norman Borlaug, who received the Nobel Peace Prize in 1970, graciously credited Dr.Swaminathan as deserving due recognition alongside his own. A grateful India further honored her pioneering son, conferring in series, the Padma Shri (1967), the Padma Bhushan (1972), and the Padma Vibhushan (1989).

To bring his pioneering ideas together and to provide a forum for furthering them, Dr.Swaminathan founded the M.S.Swaminathan Research Foundation in 1988. The foundation was set up with the explicit purpose of harnessing science and technology for environmentally sustainable and socially equitable applications. In the dozen years of its existence, the foundation has reached deep into this mandate, furthering pro-poor, pro-nature and pro-women practices in every aspect of its functioning, ranging from assisting governments with enacting meaningful legislation, to working with farmers to combine their native knowledge with scientific discoveries. With over a 100 scientists on its rolls, the Swaminathan Foundation will no doubt be a robust force for continuing progress in maintaining food security in the coming years.

As well it should, for as the foundation has noted, the next two decades will test the skills of farmers even further, requiring them to produce food in even greater quantities that they already do. Amidst steep declines in per-capita water and land resources as global population continues to explode, the need to maintain intellectual and economic value in farming is great. Newer technologies must be rapidly brought to farming methods and support services, so that young people are motivated to address the challenge of food security and find their efforts fulfilling as well as productive.

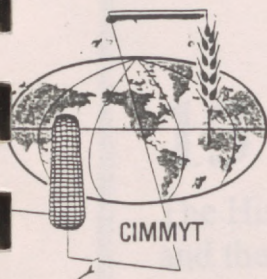
If the past is any indication of the future, the principles Dr.Swaminathan brought to his quest for food security will serve us well in the years to come as well. It isn't often that the life of an accomplished scientist is also one of enduring commitment to human causes, and in Dr.Swaminathan, the two have found equal homes. We have much to be grateful for, and equally, much to be optimistic about.

Gnana Bharathy

- Visit the M.S.Swaminathan Research Foundation on the Internet.
- Read other profiles of Indians who have helped shape the nation.
- Read profiles of famous Indians at swaraj.net

- Tell us what you think of this article.





CENTRO INTERNACIONAL DE MEJORAMIENTO DE MAIZ Y TRIGO

INTERNATIONAL MAIZE AND WHEAT IMPROVEMENT CENTER

Londres 40, México 6, D. F.

Apdo. Postal 6-641

Cable: CENCIMMYT

November 10, 1970

Dr. M. S. Swaminathan, Director
Indian Agricultural Research Institute
New Delhi 21, India

Dear Dr. Swaminathan:

I wish to thank you and all the members of your staff for your kind telegram of October 23rd.

In accepting the Nobel Peace Prize for 1970 I can only do so in the name of all organizations, officials, scientists and the millions of farmers throughout the world who are collectively struggling to feed the hungry billions.

The green revolution has been a team effort and much of the credit for its spectacular development must go to Indian officials, organizations, scientists and farmers. However, to you, Dr. Swaminathan, a great deal of the credit must go for first recognizing the potential value of the Mexican dwarfs. Had this not occurred it is quite possible that there would not have been a green revolution in Asia.

We must not become complacent because of the wonderful recent publicity that has come to the green revolution. Instead we must all increase our efforts to expand and stabilize wheat production. We must at the same time very aggressively push forward the production of rice, maize, sorghum and millet. Unless there is a more dynamic production effort in the latter four crops the green revolution will stall and die. Wheat cannot alone continue to carry the brunt of the attack on hunger - we must get the production of other crops moving more dynamically as well.

We want all of you to know that it has been a privilege

Dr. M. S. Swaminathan, Director
Indian Agricultural Research Institute

November 10, 1970

for both the entire CIMMYT staff and for me to have had an opportunity to participate in a modest way in your phenomenal increase in wheat production. We hope to continue to collaborate with your brilliant program.

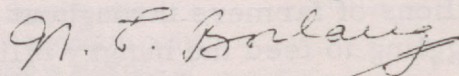
Keep the Green Revolution Viable and Aggressive!!

Best wishes for continued success from our entire CIMMYT staff.

Sincerely,

NEB/jms

Norman E. Borlaug



13

The History and Story Behind the World Food Prize and the First Laureate Dr. M.S. Swaminathan of India

Tonight we celebrate the awarding of the first World Food Prize to one of the world's greatest scientists, Dr. M.S. Swaminathan, for his outstanding contributions toward increasing food production and improving the equity of its distribution. His many and diverse contributions have alleviated hunger and misery, and have contributed greatly toward improving the well-being of millions of people in the Third World.

It is especially gratifying for me to have lived to see the establishment of the World Food Prize. The road which finally led to its establishment has been a long, winding, bumpy, and often-times frustrating one. Let me share with you some of the trials and tribulations encountered along the way, which finally led to the happy event we are celebrating here tonight.

In October, 1970, I was awarded the Nobel Prize For Peace for my (and my many associates') contributions toward increasing agricultural production in food-deficit Third World countries. As most of you know, there is no Nobel Prize for either agriculture or food. Moreover, this was the first time an agricultural scientist had received a Nobel Prize.

While preparing my Nobel Lecture, which is a requirement for all Nobel Laureates, I tried to find out why there was no Nobel Prize for agriculture and/or food. It became apparent that Alfred B. Nobel was indeed very conscious of the importance of food, for he once wrote: "I would rather take care of the stomachs of the living than the glory of the departed in the form of monuments". Despite such clarity of interest and concern about food, when Alfred Bernhard Nobel's will and testament were drawn-up on November 27, 1885, there was no provision made for a prize for either agriculture or food. We all know how strongly and jealously the territorial domain of individual prizes, not only Nobel Prizes, but all other prestigious prizes, are guarded or protected from intrusion by apparent imposters from other fields. This reaction is equally strong in the physical, chemical, biological and medical sciences, as well as in the terrain of literature and the arts. It is, indeed, no less true of the turf of the Nobel Peace Prize, which is generally understood to be the territory of outstanding political leaders.

During the mid-1960s, both India and Pakistan were hard hit by drought and huge food shortages. Some internationally renowned scientists proclaimed that the food situation in India was hopeless and stated that millions were

Remarks by Dr. Norman Borlaug on the occasion of the award of the First World Food Prize to Dr. Monkompu Sambasivan Swaminathan of India, January 10, 1987.

Norman Borlaug on World Hunger

doomed to starvation. Widespread famine was averted only by the importation of more than 15 million tons of grain, mainly wheat, into the two countries in 1965-66, much of it under terms of concessional sales or as outright gifts, from a number of countries. It was during this crisis that the high-yielding Mexican wheat varieties - and the accompanying package of improved agronomic practices which permitted the varieties to express their high genetic yield potential - were in the final stages of testing on thousands of farms in the two countries. Moreover, out of fear of continuing and worsening food crises, both countries by 1967 had discarded cheap food policies - which had long acted as a disincentive to production - and adopted economic policies that facilitated and encouraged the widespread use of the new wheat production technology by farmers - and a couple of years later the new high-yielding rice technology. Yields and production of wheat increased spectacularly in both countries in 1968 and 1969 and was dubbed the "Green Revolution" by Mr. William Daud, of USAID.

When the Nobel Committee of the Norwegian Storting designated me as the recipient of the Nobel Prize for Peace, it came as a great surprise to me and to the world. This was the only "window" through which work on agriculture and food production could qualify for a Nobel Prize. It was justified under Paragraph One, which laid down the conditions to be fulfilled by a recipient of the Nobel Peace Prize. It states: The award of the Prize shall be made to the person "who, during the preceding year, shall have contributed the greatest benefit to humankind".

I realized that it was not likely that a situation would again arise, within the next several decades, which would result in an agricultural or food scientist being selected as a recipient of a Nobel Peace Prize. For the next five hectic years, however, I was too busy strengthening the Green Revolution in the Indian sub-continent and spreading it to other countries to give much thought to trying to establish a deserving annual prize for agriculture and food.

By 1977, however, I wrote several letters to the Nobel Foundation inquiring about the possibility of establishing a Nobel Prize for agriculture and/or food, as had been done in establishing the Nobel Prize for Economics, (which is actually the BANK of Sweden Prize in Economics in memory of Alfred Nobel), in 1968. I was invited to present my case to the Board of Governors of the Nobel Foundation in Stockholm and to the Nobel Committee for the Nobel Prize for Peace in Oslo. Before doing so, I had done my home work well and had been assured by the three most prestigious agricultural and forestry organizations of Denmark, Norway, and Sweden that they would fund a Nobel Prize for agriculture and forestry if one could be established as had been done under the Nobel Foundation's auspices in establishing the Nobel Prize for Economics. During my presentation, the members of the Board assured me that the Nobel Foundation was well aware of the need for recognition of the importance of agriculture and food, but that since a prize for agriculture and/or food was not provided for in Alfred B. Nobel's will and endowment, it was not legally possible to establish a new prize with the use of these funds. There, my efforts to establish a new Nobel Prize for agriculture and food hit a dead end.

For the next three years, I searched ineffectively for a sponsor for a World Food Prize. In late 1981, I met the late Carleton Smith, who had been successful in establishing The Pritzker Architecture Prize, and The World Wildlife Prize sponsored by Kerr-McGee. Smith, too, had been wondering why there was no major prize for agriculture and food, and had begun trying to do something about it.

Over the next three years, Carleton Smith and I combined our efforts in a search for sponsors. Finally, we were scheduled to meet with President James Ferguson of General Foods Corporation, to work out final details concerning the prize and hopefully its funding on the day following Memorial Day weekend in May, 1984. Unfortunately, Carleton Smith's untimely death the night before the scheduled meeting, delayed a decision.

However, in October, 1985, Mr. James L. Ferguson told me General Foods Corporation had decided to sponsor and finance an annual World Food Prize. The monetary value of the Prize is the equivalent of a Nobel Prize. In the first three months of 1986, three organizational meetings were held under the leadership of Mr. A. S. Clausi, Senior Vice-President of General Foods, with participants from universities, foundations, government and industrial laboratories. The World Food Prize was initiated.

Now a word about the governance of the World Food Prize. A Council of Advisors, made up of eight internationally recognized authorities, representing different links in the food system, have laid down the guidelines and procedures for nominating candidates and selecting the winner of the prize.

All nominations for the prize are sent to the Secretariat at Winrock International Institute for Agricultural Development, where they are reviewed for appropriateness and completeness. The nominations are then passed on to the Selection Committee, who choose the winner.

The Selection Committee is made up of nine distinguished individuals from around the world, who are knowledgeable on various aspects of food production, processing, distribution, marketing, and nutrition. Their experience covers the fields of research, policy development, and business management.

The members of The Selection Committee remain anonymous except for the non-voting Chairman, the position in which I serve. The responsibility of the Selection Committee is to review and assess the nominations and to select the candidate most worthy of the award in accordance with the guidelines laid down by the Council of Advisors.

This year the Selection Committee voted unanimously to award the first annual World Food Prize to Dr. Monkompur Sambasivan Swaminathan. That brings us to this glorious evening.

Dr. Swaminathan was awarded the first World Food Prize for his outstanding contributions to expanding production and availability of food throughout the world.

During the 1960s and 1970s, I personally had the good fortune to see the important diverse roles he played in research, extension, and agricultural policy, which ushered in the Green Revolution in India. During the 1980s, I have

Norman Borlaug on World Hunger

seen this tremendous positive impact spread to many other countries.

In closing, Dr. Swaminathan, on behalf of all members of the Selection Committee of the World Food Prize, I have the very great personal pleasure to congratulate you for your many great contributions toward the improvement of the well-being of humankind. I know you will keep up the good work. You have our very best wishes as we continue the celebration and honor of your achievements.

Dr. Swaminathan, we are confident the trail you have blazed toward increasing production, and improving the quality and availability of food for millions will be an incentive to attract some of the most talented, creative and best motivated young women and men to careers in the food system.

I plead for coordinated nongovernmental initiatives in: first, *generating awareness* by taking advantage of the powerful mass media tools now available; second, *analysis* of field problems and developing solutions for them jointly by farmers and scientists; and third, *action* in utilizing the growing global grain surpluses for enabling all those in need of help to earn their daily bread.

We live in an age of unparalleled opportunity for promoting sustainable nutrition security. The prospect for a world without hunger is a glorious legacy given to our contemporary world by scientists and technologists; communicators and social scientists; administrators and industrialists; and workers in the factories, fields, forests, pastures, rivers, and oceans. As we depart for dinner this evening, what could be a more satisfying and joyful feeling than knowing that every other member of the human family will also go to bed after a nourishing meal? Until such a wholly attainable world becomes a reality, our task remains unfinished.

- - Dr. M.S. Swaminathan
From his Acceptance Speech
The 1987 World Food Prize

THE WHITE HOUSE

WASHINGTON

September 11, 1987

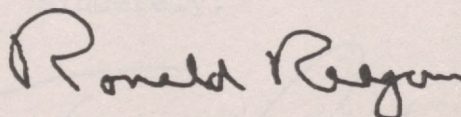
Dear Dr. Swaminathan:

It is with great pleasure that I congratulate you on being chosen as the First General Foods World Food Prize Laureate.

This award recognizes what many in the global food and agricultural community have known for a long time -- that your efforts have made a dramatic and lasting impact on improving world food supply. I also applaud your outstanding work in India, where you earned the well-deserved title of "Father of the Green Revolution," and your continued efforts to pioneer the field of agricultural research at the International Research Institute in the Phillipines. You can be proud of these accomplishments as well as the dignity and self-reliance you have helped to bring to the people you have served.

Again congratulations, and best wishes for continued success in your work.

Sincerely,



Dr. M. S. Swaminathan
General Foods
250 North Street
White Plains, New York 10625



JIMMY CARTER

October 6, 1987

To Dr. M. S. Swaminathan

Rosalynn and I want to add our congratulations to those you are receiving from your friends and colleagues throughout the world. The General Foods World Food Prize is an outstanding way to recognize your achievements in improving the world food supply.

You can take pride in knowing that many generations of people will benefit from your contributions. Your accomplishments will be of great advantage to scientists and agronomists of the future who will continue your efforts to meet the needs of our expanding population.

Sincerely,

A handwritten signature in cursive script that reads "Jimmy Carter". The signature is written in dark ink and is positioned below the typed name.



THE ROCKEFELLER UNIVERSITY

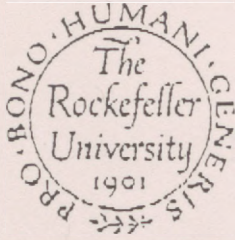
Soestdijk Palace, June 29th, 1990

Dr. M. K. Swaminathan, FRS
General Field Work Fund Prize

Dear Sir,

The Order of the Golden Ark is awarded to Dr. Monkombu S. Swaminathan for his outstanding contribution to science as one of the world's most distinguished plant geneticists; for his leadership in Asia as the scientific authority behind the "Green Revolution" and for his untiring work in India as President of both the IUCN and WWF-India.

Prince of the Netherlands



THE ROCKEFELLER UNIVERSITY

1230 YORK AVENUE • NEW YORK, NEW YORK 10021-6399

SEP 25 1987

Dr. M. K. Swaminathan, FRS
General Foods World Food Prize

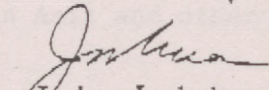
Dear Swami:

I was so pleased to hear the news of your award. There could not have been a more appropriate choice. The central focus of application of plant genetics technology has moved a long way since our association at the University of Wisconsin Genetics Department almost 40 years ago. I can think of no one who has combined the insights of the cutting edges of biological science, with attention to the most urgent of human needs, with the competence, devotion and energy that you have given.

The world is and will be a better place on account of your contributions to its welfare.

With my very best personal wishes and congratulations,

Yours sincerely,


Joshua Lederberg

NATIONAL ACADEMY OF SCIENCES

2101 Constitution Avenue Washington, D.C. 20418

OFFICE OF THE PRESIDENT

September 29, 1987

Dr. M.S. Swaminathan
Director-General
International Rice Research Institute
Los Banos, Philippines

Dear Dr. Swaminathan:

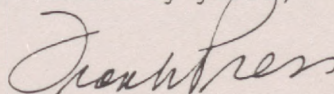
Of all the problems which the people of our world must tackle, none is more fundamental than insuring adequate food supplies. Food is basic to good health, child development and learning, productivity, and the ability to live a life free from want and physical deprivation.

To make a difference in the world's capacity to feed itself is indeed an awesome accomplishment, and so I congratulate you most sincerely and warmly on the honor given you as recipient of the 1987 World Food Prize. Your accomplishments as a scientist and a scientific leader should give you great personal satisfaction. More importantly, however, they have had an impact on the lives of millions of people in Asia and other parts of the developing world.

I am especially glad that this recognition comes when you are still actively at work on the new knowledge and applications of knowledge that will be needed to sustain future food supplies in the face of increasing world population and dwindling resources of land and water. May your efforts continue to be as productive and vital as they have to the present time.

With warm personal regards,

Sincerely yours,



Frank Press
President

Media Release

28 January, 1998

Prof. M.S. Swaminathan, Chairman
M.S. Swaminathan Research Foundation
3rd Cross St.
Taramani Institutional Area
Madras 600113, Tamil Nadu
INDIA

פרופ' מנחם מגידור

נשיא

Prof. Menachem Magidor

President

Dear Professor Swaminathan,

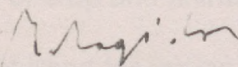
We are pleased to inform you that the Senate of the Hebrew University of Jerusalem resolved today to confer upon you the degree of Doctor Philosophiae Honoris Causa of our University.

The Senate has thus resolved in recognition of your outstanding achievements in the worldwide conservation and enhancement of biodiversity and in bringing the green revolution to Asia and endeavouring to keep it sustainable and evergreen; of your vision and leadership, integrating sound scientific approaches and deep humanist and social concerns; of your contribution to food security and human welfare; and for being an internationally valued, articulate spokesman for the importance and the role of agricultural research, education and rural development.

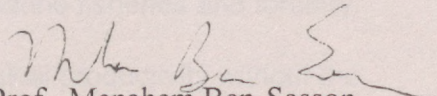
Our honorary degree ceremony will take place on Sunday afternoon, June 7, 1998 at the Rothberg Amphitheater on our Mount Scopus campus. Mr. Jonathan Davis, Director of the Division for Development and Public Relations, will be in touch with you with regard to the ceremony.

Please accept our sincere congratulations. We look forward to welcoming you in Jerusalem.

Yours sincerely



Prof. Menachem Magidor
President



Prof. Menahem Ben-Sasson
Rector

הר הצופים
ירושלים 91905
טל. 972-2-5882903/5
פקס. 02-5813102

Mount Scopus
Jerusalem 91905, Israel
Tel. 972-2-5882903/5
Fax 972-2-5813102

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Media Release

The food and environment tightrope
Crawford Fund seminar 24 Nov 1999

Heather Slater
Co-ordinator, Public Awareness
Crawford Fund
PO Box 3087
Belconnen MDC ACT 2617
Australia
Phone: 61 2 6251 9044
Fax: 61 2 6251 9045
Email: crawfpac@ozemail.com.au

Embargoed: 24 November 1999

THE "MODERN GHANDI'S" MESSAGE OF HOPE FOR AGRICULTURE AND THE ENVIRONMENT

World renowned specialists in agriculture, the environment and development addressed an important international seminar attended by over 200 senior representatives from government, industry, NGOs, science, academia and the general public in Parliament House in Canberra today (24 November). Organised by the Crawford Fund and entitled "The Food and Environment Tightrope", the seminar was opened by the Minister for Foreign Affairs, The Hon Alexander Downer.

Chairman of the Crawford Fund, The Hon Tim Fischer, welcomed keynote speaker Professor M S Swaminathan as an acknowledged world leader in the field of sustainable food security, an international authority on biotechnology in food, a humanitarian and, according to *Time* magazine, one of the 20 most influential Asians of the century.

"The Crawford Fund is honoured that Professor Swaminathan is able to accept our invitation to come to Canberra. In addition to delivering his address to you today, he has a series of high-level meetings scheduled with Federal MPs, senior civil servants, and fellow scientists. I am sure that they will gain much from their discussions with him," he said.

Having set out the seemingly impossible challenge for agriculture to feed the world's burgeoning population with less arable land and irrigation water without destroying the environment in his keynote address, "Walking the Tightrope", Professor Swaminathan, winner of the World Food Prize and numerous international environment awards, delivered a message of hope.

"A world without hunger is now within our reach if every nation pays attention to improving food availability through ecologically sustainable methods of production, to enhancing economic access to food by providing a job-led economic growth strategy, and to ensuring the biological absorption of food in the body through the availability of safe drinking water and environmental hygiene," he said.

Professor Swaminathan provided examples of the profound impact of science and technology (S&T) in every field of crop and animal husbandry, inland and marine fisheries and forestry.

"Science can be mobilised for raising further the ceiling to biological productivity without the associated ecological harm that has occurred in the past. This productivity advance can be sustainable over time if it is rooted in the principles of ecology, economics, social and gender equity and employment generation," said Professor Swaminathan.

"Future agricultural production technologies should be based on the foundation of integrated natural resources management and this is where Australian experience and expertise will be of particular value," he said.

FUTURE
HARVEST

Academy of Technological Sciences and Engineering • Australian Agency for International Development • Australian Centre for International Agricultural Research • Center for International Forestry Research • Centre for Integrated Resource Management • International Board for Soil Research and Management • International Centre for Research in Agroforestry • International Water Management Institute • Joint Venture Agroforestry Program • National Farmers' Federation • Queensland Department of Primary Industries

Professor Swaminathan discussed the three major revolutions in S&T that are the basis for his optimism for the future of agriculture and the environment:

- the gene revolution which is developing new processes and products for agriculture, industry, the environment and human and animal health;
- the ecotechnology revolution which promotes the blending of the best in traditional knowledge and technology with frontier technologies such as biotechnology, space and information technologies, renewable energy and new materials, and
- the information and communication revolution which allows a very rapid growth in the assimilation and dissemination of relevant and timely information.

The Professor provided examples of how a range of organisations such as his own research institute, the centres related to the Consultative Group for International Agricultural Research and Australia's own Australian Centre for International Agricultural Research are bringing these revolutions to the poor.

Professor Swaminathan congratulated Australia's development assistance program in its role in promoting the agricultural renaissance of his homeland India.

"The attitude of the development agency should be one of sustained partnership and not of patronage. The policy of the Government of Australia to strengthen concurrently both national agricultural research centres and international agricultural research centres is the most meaningful pathway of development assistance," he said.

Professor Swaminathan called on governments to make the safeguarding and strengthening of the livelihood security of the poor as a major goal of liberalised trade.

"The current trend of increasing the rich-poor divide will have to be stopped if social conflicts are not to increase," he said.

"Australia has provided innovative leadership in developing international institutional structures and development assistance procedures and should intensify its efforts to foster relevant partnerships in the Asia-Pacific Region for launching and sustaining an ever-green revolution on farms," he continued.

In a discussion about the international scene and the Climate Convention, the professor called on Australia to play a catalytic role in fostering cooperation in both avoiding and mitigating the adverse impact of climate change in the Asia-Pacific region.

Referring to the various international conferences and conventions held in the last decade, Professor Swaminathan highlighted that most of the talk is over.

"We are really walking a tightrope in terms of achieving sustainable solutions to the problems of population, poverty and environmental degradation. It is now up to nations to act so that the uncommon opportunities now opened up by science and technology and democratic systems of governance for creating a food secure world are not missed," he concluded.

For further information, copies of speeches and other speakers' press releases contact:
Cathy Reade, 07 54493095 or 0413 575934

To organise interviews contact: Heather Slater in Canberra 0413 027825

Professor Swaminathan will be addressing the National Press Club on 25 November on "Ecology of Hope for the 21st Century" including discussion of biotechnology in food, labelling and ethics – contact Heather Slater for an embargoed copy of the press release and speech.

Prof M. S. Swaminathan

Volvo Environment Prize Laureate 1999



The Prize Committee's Motivation

The 1999 VOLVO Environment Prize is awarded to Dr. M.S. Swaminathan because of his achievements as a plant breeder and administrator which led to dramatic increases in crop yields, his international leadership in agriculture and resource conservation, his deep concern for the poor and disadvantaged, and his continuing research and leadership to ensure that they get the opportunities needed to develop in ways that enhance the natural environment on which they depend.

Brief CV of Prof Swaminathan

Prof M S Swaminathan has been acclaimed by TIME magazine as one of the twenty most influential Asians of the 20th century and one of the only three from India, the other two being Mahatma Gandhi and Rabindranath Tagore. He has been described by the United Nations Environment Programme as "the Father of Economic Ecology" and by Javier Perez de Cuellar, former Secretary General of the United Nations, as "a living legend who will go into the annals of history as a world scientist of rare distinction". He was Chairman of the UN Science Advisory Committee set up in 1980 to take follow-up action on the Vienna Plan of Action. He has also served as Independent Chairman of the FAO Council and President of the International Union for the Conservation of Nature and Natural Resources.

A plant geneticist by training, Professor Swaminathan's contributions to agricultural renaissance of India have led to his being widely refereed to as the scientific leader of the farm revolution movement. His advocacy of sustainable agriculture leading to an ever-green revolution makes him an acknowledged world leader in the field of sustainable food security. The International Association of Women and Development conferred on him the first international award for significant contributions to promoting the knowledge, skill and technological empowerment of women in agriculture and for his pioneering role in mainstreaming gender considerations in agriculture, rural development and biodiversity conservation and management. Professor Swaminathan was awarded the Ramon Magsaysay Award for Community Leadership in 1971, the Albert Einstein World Science Award in 1986, and the first World Food Prize in 1987.

Professor Swaminathan is a Fellow of many of the leading scientific academies of India and the world, including the Royal Society of London, The US National Academy of Sciences and the Royal Swedish Academy of Agriculture and Forestry. He has received 38 honorary doctorate degrees from universities around the world. He currently holds the UNESCO Chair in Ecotechnology at the M S Swaminathan Research Foundation in Chennai (Madras), India.

Text by Prof. Tor Kihlman, Chairman Scientific Committee

Dr. Monkombu Sambasivan Swaminathan, UNESCO-Cousteau Professor in Ecotechnology, has a long and distinguished record of achievements. His work has through his life been based on a strong conviction that science should try to tackle problems of great relevance to society. He has been a spokesman for research for development with emphasis on the disadvantaged and poor in order to eradicate poverty.

Dr Swaminathan got his undergraduate training in India at Travancore and Madras Universities and was awarded his B. Sc. in 1944. He got his Ph. D at the School of Agriculture, University of Cambridge, UK, in 1952.

After his return to India, he worked for many years as a teacher, researcher and research administrator at the Central Rice Research Institute, Cuttack and at the Indian Agricultural Research Institute, New Delhi. From 1972 to 1980 he was Director General, Indian Council of Agricultural Research and Secretary to the Government of India, Ministry of Agriculture and Irrigation (1979-1980). Later, Dr Swaminathan became a member of the Planning Commission of the Government of India. During these periods he was very instrumental in turning Indian food production from a deficit to a much increased supply, combining modern science in plant breeding with appropriate government policy. During 1982-1988, Dr. Swaminathan was Director General of the International Rice Research Institute (IRRI), Los Banos, Philippines. At IRRI, Dr Swaminathan took an early decision to make use of biotechnology in the rice breeding.

Dr Swaminathan has held many honorary positions and worked in numerous international committees and organisations. In the 70's he was vice chairman of the Technical Advisory Committee to the Consultative Group on International Agricultural Research (CGIAR). He has chaired the UN Advisory Committee on Science and Technology for Development, 1980-83. During 1981-1985 he also served as Independent Chairman, FAO Council, dealing with world food security.

After retiring from IRRI, he returned to India and established the M S Swaminathan Research Foundation in Madras (1988), where he is the Chairman. Its major aims are to integrate the principles of ecological sustainability with those of economic efficiency and social equity in farm technologies.

In his early years, Dr. Swaminathan served as a professional geneticist and plant breeder with particular reference to potato, wheat and rice. Later on his involvement in government policy operations widened his interest to include the management of agricultural research and the planning of research strategies at local, national and international levels to better serve agricultural development. He has also been concerned with the management of climate-induced crop production shortfalls. His great concern for human welfare was partly met by the government policy to reach and involve poor and small farmers in agricultural development in the 1960's and early 1970's.

Dr. Swaminathan's emphasis turned towards the new concept of sustainability and how this could be achieved both through increased agricultural productivity and by appropriate attention to environmental issues. Ecology and sustainable development were added to his own research agenda, keeping in mind the population issue. His competence and concern for ecological aspects led to his involvement as Chairman of the World Conservation Union. (IUCN). There he attempted to guide its activities towards an integration of both the production of crops and forest trees and the management of natural resources while conserving biodiversity.

As a plant breeder, Dr. Swaminathan was early to realize the need to combine conservation of plant genetic resources with their utilization. Dr. Swaminathan also saw early on, a need to make better use of local communities in conservation work in India. This led him to be a spokesman for the need to recognize Farmers' Rights (as a supplement to plant breeders' rights and also patents, nowadays) at the FAO in the early 1980's.

He was active in the clarification and setting of the international rules for access to and use of plant genetic resources. He initiated work for the introduction of ethics and equity in the research process. He has also been active in attempting to develop principles of intellectual property rights.

VOLVO

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Press Information

IS IT THE KEY TO SUSTAINABLE DEVELOPMENT? THE WINNER OF THE 1999 VOLVO ENVIRONMENT PRIZE SEES CONSIDERABLE POTENTIAL

Access to know-how is a key factor for sustainable economic, ecological and social development. But how can this know-how benefit everyone? How do we build bridges between those with access to information, and those who need it most – the poor, the illiterate, those whose prime concern in life is to earn enough to survive each day?

For the underprivileged in the villages near Pondicherry in southern India, advances in modern information technology have opened the door to a new world filled with possibilities. Behind the project – the Knowledge System for Sustainable Food Security – is one of the world's leading agricultural scientists, Dr M. S. Swaminathan. Back in the 1960s, he championed India's transformation from a nation with a chronic food shortage into a country that became self-sufficient in its food requirements. In 1989, he founded the M. S. Swaminathan Research Foundation in Chennai in southern India, where through a number of internationally renowned projects, he demonstrated just how the conditions of poor people can be improved in a sustainable way. Now at the age of 74, he is still immensely active and enthusiastic over the potential for equal development opportunities offered by the new technology. Dr M. S. Swaminathan was awarded the Volvo Environment Prize in October 1999 for his invaluable innovations and unwavering dedication.

The new technology generates enormous possibilities

“My feeling is that the world has enormous opportunities today because of modern science and technology,” says Dr. Swaminathan. “Take information technology, modern biotechnology, space technology. Or take renewable energy technology, whether it is solar, biomass, biogas or wind. And finally, take management technology, putting all the pieces together in the form of eco-technology, which means ecological, economical and socially equitable technology.”

However, in the fast-growing world of global know-how, access to information is far from equal for everyone.

Knowledge for people's well-being

“Knowledge should be available for people's well-being. As Einstein said, if the product of a brain does not help the deprived, it will be more of a curse than a blessing. That's why modern technological empowerment of the poor has become so important. There we have a great opportunity through modern information technology. And the people that are to be reached in particular are women and children.”

Dr Swaminathan feels that our ability to create long-term support potential for all the peoples of the world is the one vital parameter determining whether or not we can ensure sustainable development. We cannot blame poor people if they cut down the forests near their homes, if there is no alternative fuel for them to use.

“Apart from the earth centric concept of sustainability – the earth and its life supporting-systems must be preserved – at the same time the human inhabitants, the humanistic form of sustainability is going to determine the future of our planet.”

A computer in every village

“Knowledge System for Sustainable Food Security” is a very interesting example of how to bridge the gap between those who have information and those who need it most. In each of the 20 villages included in the project, there is a so-called Village Knowledge Centre with a computer linked to the Internet and various databases providing information in the local language. The village inhabitants can receive information about such things as women's health care, advice on ecological ways of growing local crops and protecting them from diseases, daily market prices for these crops, local weather forecasts and so on. The system also provides them with information about programmes provided by the Indian government to aid poor people, that is to say know-how that can assist people in their daily lives. These Knowledge Centres are managed by a few of the village women who have been trained for this purpose.

Women now dare to question!

“If the information centres had been managed by men, many women would have hesitated to turn to them. By allowing women to take responsibility for the new technology, we're ensuring that everyone has the same access to information. And at the same time, we're helping to boost women's self-confidence and promote their place in society. We also know that measures that favour women also bring about improvements for the family as a whole.”

Women have an immense need for information on various health-related issues.

“Women often do not want to confide in the local doctor, who is usually a man, particularly when it comes to reproductive health problems,” says Dr. Swaminathan.

This meant that many women simply did not receive any help at all. However, because the information centres are run by women, women feel more comfortable about asking questions and taking advice on issues relating to their health.

What's in it for me?

“In the area covered by these villages, there are more than 140 different state-run development projects aimed at the underprivileged. The local population has been largely unaware of many of these projects, not least owing to the high illiteracy rate. Now however, people can turn to the information centres in their villages to find out which projects are running and which are relevant to their specific needs.”

Crucial weather forecasts

Something as commonplace as having access to local weather forecasts may be of crucial significance.

“For the people in the fishing-villages along the coast, for instance, the large-scale weather forecasts shown on TV have no relevance at all,” says Dr Swaminathan. “What they need to know before venturing out in their small vulnerable boats is what the weather is going to be like in their particular stretch of water. Being forewarned of an approaching storm may mean the difference between bringing home a catch – or not returning at all. Through the information centres, they can receive an up-to-date local weather forecast every morning.”

“So we find that these knowledge centres are having an impact on their total life. Not only in economic life, not only in terms of benefiting from their entitlements, but also in the information that affects their quality of life. We want to make this virtual college into a new social contract between those who have information and those who need it badly – especially the rural illiterate and the unprivileged, and particularly women.”

A source of inspiration for the rest of the world

The Knowledge System for Sustainable Food Security can be a source of inspiration of immense global significance. This is the view of experts such as Dr Bruce Alberts, President of the US National Academy of Sciences, who visited the villages and the M. S. Swaminathan Research Centre in January this year.

“Drawing on this concept, I envision a global electronic network that connects scientists to people at all levels – farmers’ organisations and village women, for example. The network will allow them to easily access the scientific and technical knowledge that they need to solve local problems and enhance the quality of their lives, as well as to communicate their own insight and needs back to scientists.”

Economy, ecology, ethics and equity

The over-riding purpose of the M. S. Swaminathan Research Foundation is to create new possibilities for work and economic development based on ecological consideration, ethics and equality. Among the projects that the Foundation has worked with since 1989 are the following:

- Coastal ecological system, one of whose aims is to preserve the vital but fast-disappearing mangrove swamps.
- Conservation of bio-diversity, with the purpose of carrying out an inventory of and preserving the biological diversity of local crops, among other things.
- Eco-technology, whose aim is to combine traditional expertise with modern science to forge an eco-technology base that is economically viable, environmentally friendly and socially equitable.
- “Reaching the Unreached”, whose purpose is to improve the conditions of women and children, with the emphasis on health care, education, population issues and reproduction health.

The Volvo Environment Prize

Dr M. S. Swaminathan is awarded the 1999 Volvo Environment Prize for his unique contributions in the wider environmental field. The 1.5 million kronor prize will be awarded at a ceremony in New York on 26 October.

The motivation of the prize committee was as follows: “The Volvo Environment Prize is awarded to Dr M. S. Swaminathan because of his achievements as a plant breeder and administrator which have led to dramatic increases in crop yields, his international leadership in agriculture and resource conservation, his deep concern for the poor and disadvantaged, and his continuing research and leadership to ensure that they get the opportunities they need to develop in ways that enhance the natural environment on which they depend.”

A decade of Volvo Environment Prizes

The Volvo Environment Prize was set up in 1988 and was awarded for the first time in 1990. The aim today is the same as it was a decade ago: that the environment – one of Volvo's core values – should be emphasised not just by the company meeting the very highest environmental standards in terms of production and products, but also by recognising the significance of inventions and discoveries that favour pro-environmental work through the provision of funds for an environmental award.

The Volvo Environment Prize is awarded every year by a non-profit-making foundation funded by capital allocated at the Volvo Annual General Meeting. The prize is awarded for prominent natural-science, socio-economic or technical inventions or discoveries of direct or indirect significance to the environment, on a global or regional basis. The prize cannot be awarded to anyone within Volvo. The Board can only award the prize to someone who is proposed by the foundation's Prize Committee. This committee consists of four internationally renowned representatives of various environmental institutes. The Prize Committee works together with a Scientific Committee, appointed by the Royal Society for Arts and Sciences in Gothenburg, Sweden.

Previous laureates of the Volvo Environment Prize:

- 1998, David Schindler and Malin Falkenmark- Availability and quality of freshwater
- 1997, Syukuro Manabe and Veerabhadran Ramanathan – Climate modelling and climate change
- 1996, James Lovelock – New sensitive measurement techniques
- 1995, Gilbert White – Natural resource planning
- 1994, Gita Sen – Poverty and environment, the role of women
- 1993, Paul Ehrlich and John Holdren, Population and resources
- 1992, Norman Myers and Peter Raven – Biodiversity, particularly in tropical regions
- 1991, Paul Crutzen – Atmospheric chemistry. He received the Nobel Prize in Chemistry in 1995.
- 1990, John Krutilla and Allen Kneese – Environmental and resource economics

October 26, 1999

For more information about the Volvo Environment Prize please contact:
Lena Gevert, Director Environmental Affairs, AB Volvo:
email vhk.lgevert@memo.volvo.se, tel +46 31 596990.
www.environment-prize.com, www.volvo.com/environment

For more information about Dr Swaminathan's work, please contact:
M. S. SWAMINATHAN RESEARCH FOUNDATION
Third Cross Street, Taramani Institutional Area, Chennai 600 113, India.
Phone : +91-44-2351698, 2350698 Fax : +91-44-2351319
E-mail : general@mssrf.org.
Web : <http://www.mssrf.org>, <http://www.ssrff.org/aeis>,
<http://www.mssrf.org.sg/webfris>

Volvo is a world-leading manufacturer of trucks, buses and construction equipment, marine and industrial engines and aerospace components. Volvo is strongly associated with quality, safety and concern for the environment. Volvo's head office is in Göteborg, Sweden. Annual sales in 1998 amounted to more than USD 14 billion, with about 52,000 employees.

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Press Information

M. S. SWAMINATHAN RECEIVES VOLVO'S TENTH ENVIRONMENTAL AWARD

Few scientists have had as great an impact on the world's food supply as Dr M. S. Swaminathan. In the 1960s, he led the process of transforming India from a nation with a chronic food shortage into a country self-sufficient in its food needs. His pioneering cultivation methods and innovative agricultural policies have since been implemented in many countries the world over, and today form a cornerstone for global food supply. Throughout his life, Dr Swaminathan has fought against poverty and social injustice, and has dedicated equal energy to securing the rights of women and children in society. At the age of 74, his pace of involvement continues unabated. At the M. S. Swaminathan Research Foundation in Chennai in southern India, he runs a number of projects aimed at demonstrating how modern technology and traditional know-how can work together to improve conditions for the underprivileged, contributing to sustainable economic, ecological and social development.

The motivation of the prize committee: The Volvo Environment Prize is awarded to Dr M. S. Swaminathan because of his achievements as a plant breeder and administrator which have led to dramatic increases in crop yields, his international leadership in agriculture and resource conservation, his deep concern for the poor and disadvantaged, and his continuing research and leadership to ensure that they get the opportunities they need to develop in ways that enhance the natural environment on which they depend.

The 1999 Volvo Environment Prize will be awarded at a ceremony in New York on 26 October. The award totals 1.5 million Swedish kronor. The Volvo Environment Prize was created in 1988 and this year's prize is the tenth awarded to date.

October 26, 1999

For more information about the beneficiaries and about the Volvo Environment Prize, please contact Lena Gevert, Director Environmental Affairs, AB Volvo: email vhk.lgevert@memo.volvo.se, tel +46 31 596990.
www.environment-prize.com, www.volvo.com/environment

For more information about Dr Swaminathan's work, please contact:
M.S. SWAMINATHAN RESEARCH FOUNDATION
Third Cross Street, Taramani Institutional Area, Chennai 600 113, India
Phone: +91-44-2351698, 2350698 Fax: +91-44-2351319
E-mail : general@mssrf.org
Web : <http://www.mssrf.org>, <http://www.mssrf.org/aeis>
<http://www.mssrf.org.sg/webfris>

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M. S. Swaminathan

MONCOMPU SAMBASIVAN SWAMINATHAN

"The principles of self-reliance, love towards all and community effort were inculcated in me during the first 10 years of my life," MONCOMPU SAMBASIVAN SWAMINATHAN writes. Born on August 7, 1925 in Kumbakonam in Madras State, South India, he was the second son of Surgeon M. K. Sambasivan and Parvathi Thangammal Sambasivan. "I learn't from my father," he adds, "that the word 'impossible' exists mainly in our minds and that given the requisite will and effort, great tasks can be accomplished."

He recalls how his father, a follower of Mahatma Gandhi, took the lead in their area in "burning his foreign clothes," a symbolic act in support of the *swadeshi* movement which emphasized the use of Indian rather than foreign-made clothes, and handloomed rather than mill-spun cloth. The purpose of *swadeshi* was to free India from dependence on foreign imports and to protect village industry. His father also led in opening the temples to "untouchables," and in eradicating filariasis in Kumbakonam, an area long infected with the dread disease. The sense of service to one's fellowman was thus ingrained in him early.

After his father's death when he was 11 young SWAMINATHAN was looked after by his uncle, M. K. Narayanaswami, a radiologist. He attended the local high school and later the Catholic Little Flower High School in Kumbakonam, from which he graduated at age 15. He went on to get his Bachelor of Science in Zoology from the University of Travancore (now Kerala University) in 1944. At that point he decided to take up the study of agriculture.

He had spent his holidays in the "rice bowls" of Kerala and Tamil Nadu and yet had been struck by the paucity of the grain yield and the poverty of the farmers. In contrast he noticed that plantation crops—coffee, rubber, tea—produced well in the same soils and conditions. His observations awakened his interest in agricultural problems and he read widely, discovering that yields in India were very low compared to those of other countries. "The interaction between heredity and environment fascinated me," he later said, "hence in 1944 I decided to take to agricultural education, and since then I have developed what my wife, Mina, says is a 'single track mind,' concerned with problems of improving agricultural productivity and agrarian prosperity."

He received a Bachelor of Science in Agriculture from the University of Madras in 1947 and did postgraduate work at the Indian Agricultural Research Institute (IARI), from which he received an Associate Diploma (with high distinction) in Cytogenetics two years later. He passed the Indian Administrative Service examination and was offered a post in the Indian Police Service and at the same time was advised that he was the recipient of a United Nations Education, Scientific and Cultural Organization (UNESCO) fellowship to study abroad. Choosing to pursue his studies rather than accept a government position he was, from 1949 to 1950, a UNESCO Fellow at the Institute of Genetics of the Agricultural University of Wageningen, the Netherlands. From there he proceeded to Cambridge, England, where he received a Doctorate of Philosophy in 1952 for his thesis *Species Differentiation and Nature of Polyploidy in Tuber-Bearing Solanum Species*. It presented an "entirely fresh concept of the relationships within the tuber-bearing *Solanums* [potatoes]."

To broaden his experience before returning home he accepted an appointment as Research Associate in Genetics at the University of Wisconsin in the United States, November 1952 to January 1954. There he continued his work on the potato, publishing nine papers during the next three years in American and European journals based on the results of his experiments on the *Solanum* species.

Back in India he took a position as Assistant Botanist at the Central Rice Research Institute in Cuttack, Orissa State, where he worked at crossing japonica and indica varieties of rice in an effort to produce a high-yield strain. Six months later he transferred to the IARI in New Delhi where he had done his first postgraduate work. Beginning as Assistant Cytogeneticist, he served as Cytogeneticist (1956) and Head of the Botany Division (1961) before being appointed, in July 1966, as Director of the Institute.

Agriculture has employed, employs and will have to continue to employ about 70 percent of India's population. Until a gift of \$30,000 was made by U.S. philanthropist Henry Phipps in 1905 there was no important research institute devoted to the scientific study of this major aspect of Indian life. That year the Pusa Institute, to become the IARI, was founded in the village of Pusa in northern Bihar State. The Institute had five sections: agriculture and cattle breeding, chemistry, economic botany, entomology and mycology. Pioneering research work was done in these fields and at this location until, as a result of the disastrous 1934 Bihar earthquake, the Institute was relocated in 1936 in New Delhi where it now occupies 1,250 acres.

The Institute, which SWAMINATHAN heads, is under the Central Government Ministry of Food and Agriculture. It has a teaching staff of 265 and consists of 17 divisions. There are also a number of Institute-related regional stations and substations in other parts of the country which are

devoted specifically to research on wheat, cotton, oilseeds and vegetable crops; seed production; plant introduction, and viruses. There are also three soil correlation centers. In 1958 the IARI was recognized as a university and now offers both graduate and postgraduate degrees. It cooperates on research projects with various state, national and international agencies and foundations, e.g., departments of agriculture of the various Indian states, the Central Rice Research Institute at Cuttack, the International Atomic Energy Agency, and the Ford and Rockefeller foundations. SWAMINATHAN has played a major role in the development of the IARI into one of the world's leading agricultural research and educational institutions.

Research and teaching facilities and modern laboratory equipment at IARI attract students from all over the world, but especially from South and Southeast Asia. It has the largest agricultural library in India with 200,000 books and 1,500 scientific journals, Indian and foreign. Its collection of over 22,000 insect specimens constitutes a valuable asset for work in systematic entomology—making possible the identification of pests, their parasites and their predators. It also has over 27,000 specimens of fungi which form the basis for the study of fungoidal plant diseases and the possibility of their control. The Indian Type Culture Collection of Microorganisms is the largest in the country. The germ plasm bank which has been built up by IARI for wheat, maize, sorghum and millet is utilized by scientists worldwide.

A Radiotracer Laboratory was established which includes "a Gamma Garden with 200-curie source and a gamma cell with a 2,000 curie source of radioactive cobalt-60." This is used in the program of mutation breeding by researchers from all parts of India. In 1968 a Nuclear Research Laboratory to expand this work was set up with assistance from the United Nations Development Program Special Fund.

IARI also has an excellent collection of ornamental plants, especially roses which number nearly 1,000, and it maintains a herd of Sahiwal and Freisian milch cows for milk-yield testing.

The major functions of the Institute are: "1) fundamental and applied research in agricultural science and related disciplines, 2) postgraduate instruction leading to the MSc and PhD degrees and 3) advisory and extension work." Research has been expanded to include not only the study of plants and factors necessary for their optimum growth, but improvement of storage techniques, development of soil test kits for use by farmers and designing improved but simple agricultural implements.

Education has been a main function of the Institute since its founding. SWAMINATHAN has refined the educational goals to "relevance" to the Indian economy and "excellence." Postgraduate training is based upon the credit-course system of American universities, SWAMINATHAN writes:

"research, teaching and extension are fully integrated and . . . instruction is broadbased so as to give the student a mastery not only in his major field of specialization but also in supporting minor fields." More than 2,000 applications a year are received but only 150 applicants are accepted. Preference has always been given to nominees of state agricultural universities. Courses are tailored to meet student requirements as well as community needs.

Between 1958 and 1970 the IARI graduated more than 720 Masters of Science and 600 Doctors of Philosophy. Over 50 of these took their degrees under SWAMINATHAN. His impact as an educator is felt throughout India and in other parts of the world. Those trained in the "SWAMINATHAN school of radiation genetics and plant breeding" are themselves beginning to make meaningful contributions.

"The ultimate aim for all agricultural research," SWAMINATHAN states, "is to bring the results of research within the reach of the cultivator." This is accomplished at IARI by advisory services, by supplying farmers with pure seeds of improved crop varieties, and by operating an extensive demonstration cultivation scheme in a number of villages around Delhi. One village has become a "seed village" that can supply seed to the whole state.

In 1964 SWAMINATHAN helped to develop the National Demonstration Program and in 1965 the High Yielding Varieties Program. By 1967 there were 2,000 demonstration farms laid out by scientists throughout the country to show the farmer new varieties, new yields and new techniques. SWAMINATHAN feels that these farms also educate state agriculture extension workers and are good training ground for agriculture students who should be required to work on them as a prerequisite to a degree. This extension program has a feedback advantage as well, shortening the time between recognizing a problem in the field and solving it in the laboratory.

SWAMINATHAN not only administers this complex university-research center, but is himself actively engaged in highly original genetic research, as a cursory glance at his more than 250 published papers will show. His training and major work is in cytogenetics, a branch of biology that deals with both cytology—the study of the variation of organisms by structure, function, multiplication, pathology and life history of the cells—and genetics, i.e. heredity, and the way to improve plant qualities by manipulating genes to redesign the plant structure. He has pursued the study of chromosome breakage and induced gene mutation—by means of X-ray; gamma ray; alpha ray; radio-active sulphur, phosphorus and cobalt; fast and thermal neutrons; ultra violet rays; or chemical agents such as ethyl methane sulphonate, nitrogen mustard and vegetable oils—in seeking to restructure major Indian food plants to increase both total yield and consumer quality.

Genes are located on chromosomes—rod-like bodies occurring in the nucleus of cells—and are transmitted from parents to progeny in a predictable fashion. Mutations in genes occur in nature at the rate of approximately one-to-one million and only a few are useful to breeders. Until 1927 man had to hope that he would happen on the million-to-one mutation that would be of help. In that year two American geneticists established the science of radiation genetics by using X-rays to induce mutation. Since World War II it has been possible to do intensive genetic manipulation with the use of atomic and nuclear technology. Breeders can now create "gene banks" and develop numerous new gene combinations according to plan and need. Furthering the possibilities of gene manipulation is the recent work of SWAMINATHAN in "purposeful direction."

In August 1968 he announced at the Tenth International Congress of Genetics in Tokyo that pulse treatments with potent chemical mutagens at different stages in chromosome development in the replication of DNA (the nucleic acids that are the molecular basis of heredity) could help alter the mutation spectrum. His work is based "on the principle that DNA synthesis along a chromosome is not synchronous, thereby an opportunity exists for affecting different parts of the chromosome differently through short duration treatments."

The ability to breed new "management-responsive plant types" has given agriculture a chance to catch up with the world-wide population boom since World War II. Modern science and international aid had prompted even the most underdeveloped nations to practice "death control" before they upgraded their economies or inaugurated "birth control." The result was tremendous pressure upon food supply. Concerned Western thinkers (e.g. Gunnar Myrdal, *Asian Drama*; and Paul and William Paddock, *Famine Nineteen Seventy-Five!*) predicted that India, in particular, would be facing massive starvation in the 1970s. After failure of monsoon rains in 1965 and 1966 with resultant severe drought, widespread famine was only alleviated by huge importations of aid grains. That predicted massive starvation did not recur in the 1970s, and that a revolution has taken place in Indian agriculture and in the Indian farmer's outlook, have been largely the result of the National Demonstration Program (1964-65) and the High Yielding Varieties Program (1965-66) of the IARI. SWAMINATHAN was the principal scientific architect of these programs and his role in generating a positive outlook among political and administrative leaders has been critical.

Rice is the main food crop of India, with about 34 million hectares planted to that crop today; wheat production is about half that of rice. Although food-grain production in India increased from 50 million tons in 1948 to 82 million by 1964, this was primarily due to an increase in land under cultivation, not in yield per hectare, and land opened for cultivation was chiefly marginal or forest land. These lands soon showed signs of soil

erosion and nutrient depletion, potentially increasing the problem of increased food production rather than solving it.

The first attempts to improve grain yield were with rice; simple demonstration farms were set up by the government around the country to try to persuade farmers to use fertilizer. The farmers proved reluctant even when the fertilizer was supplied free, and popular wisdom blamed "peasant conservatism." The data produced from these trial farms, however, showed that neither the addition of fertilizer nor proper irrigation made a significant yield difference. Since the japonica variety of rice grown in Japan produced a yield four times greater than the indica grown in India, attempts were then to make a cross of the two varieties that would utilize fertilizer more efficiently. SWAMINATHAN worked on this project at the Rice Institute in Cuttack. This approach also by and large failed.

SWAMINATHAN began the study of wheat when he came to IARI in 1954, publishing a paper on the "Effect of Fast Neutron Radiation on Cinkorn Emmer and Bread Wheats," as early as 1956. Indian wheat, he found, like rice, did not respond favorably to the addition of fertilizer and water. In both cases tall stalks made the plants susceptible to lodging (falling), even under normal growing conditions. The addition of fertilizer and water simply increased the height of the stalk and its inclination to lodge, and encouraged the viruses and fungi preying on it. Since an important consequence of lodging is the delayed maturity of the grain, and in the semi-desert conditions of the major wheat farming areas of North India maturity is always a race with the approach of the plant-searing heat, and soil and atmospheric drought of April, the development of a nonlodging variety of wheat seemed essential for increased yield.

SWAMINATHAN became convinced that local grain varieties, developed over the centuries by natural selection, had adapted to survival under poor soil and climatic conditions, and were structurally and physiologically unable to produce an improved yield. In 1961, as Head of the Plant Breeding Department of IARI, he wrote the government that the answer to yield breakthrough was the introduction of dwarf varieties of grains. With a short, strong stalk, plants would resist lodging, nutrients would be used in seed production rather than in plant growth, and the flat sturdy leaves of the dwarf would maximize photosynthesis and speed maturity. Dwarfs could also be planted closer together, minimizing weed growth and increasing moisture retention.

In 1963, with the help of the Rockefeller Foundation and the Mexican Ministry of Agriculture, SWAMINATHAN effected the introduction into India of breeding samples of dwarf wheats which had been developed in Mexico by Dr. Norman Borlaug and his associates. These were based on the dwarf genes of the Norin wheat discovered in Hokkaido, Japan in 1946 and developed in the United States at the state agricultural college in Pullman, Washington, from where they were made available to the Inter-

written. The only areas lacking that potential are the dry-farming regions. Even there IARI is experimenting with the possibility of a second crop by developing short-growth-duration wheat and experimenting with ridge-furrow planting.

In irrigated wheat regions IARI has been experimenting with possible multiple crop combinations since 1966-67. One workable mix is wheat-mung bean (a legume that puts nutrients back into the soil)-maize-potato. There are a number of variables that must be considered in multiple cropping however: crop, soil, climate, topography, water and the input mobilization potential of the farmers, plus the problems of pests and diseases, credit, storage and pricing. One cannot develop generalized know-how for agriculture as for industry. Each area—often each village—must be treated differently.

IARI studies have shown that in irrigated wheat areas 10 tons of crop per hectare per year are possible with relay cropping, but improved management technology must go with improved stock to achieve these high yields. Studies on tillage show that four crops will grow better on 4-5 ploughings than one crop with the traditional 15-20 ploughings. Addition of nitrogen and phosphorus is a must on most of India's soils, and introduction of the nodule bacteria *Rhizobium* will allow leguminous plants to fix more nitrogen. Water management is important—including amount, time of application and use of raised plant beds which can effect 35-40 percent saving of water and allow simultaneous double cropping if desired—and disease and pest control. Major grain loss occurs in post-harvest storage; studies show that low moisture, temperature and oxygen in storage are essential for maximum retrieval. Pricing is also important and the farmer must learn to figure profit on "net return per unit area" not on gross return of yield.

Many of these findings are the result of studies of the past 30 years, but the IARI, under the leadership of SWAMINATHAN, has realized the necessity for presenting them as an integrated package, showing the farmer their essential interrelationship and convincing him of the need for proper input from all to achieve optimum results. In his position as Director of IARI, SWAMINATHAN has lent his scientific talents, his administrative abilities, his capacity to convince political leaders and his power as a widely respected writer, speaker and teacher to make sure that all necessary ingredients are in the "package" before the farmer is encouraged "to buy."

Believing as he does that desired advances in agriculture can come about only if agriculture is treated as a whole, SWAMINATHAN has not only been a motivating force in the establishment of various multidisciplinary efforts, but he has written widely in the general field of agronomy for both agriculturalist and layman. For example, in 1956 in two articles in *Indian Farmer* he discussed the new vistas in plant production, and in

1967 he wrote for *Farmer and Parliament* and the *Indian Journal of Public Administration* on "New Crop Varieties and New Yield Possibilities," and "Integration and Application of Agricultural Research, Education and Extension," respectively.

Besides attempting to educate agricultural experts and government officials, SWAMINATHAN is very concerned about educating the individual farmer. He urges that government exploit mass communication media to inform the farmer as to both new yield and crop possibilities and attitudinal changes that must accompany the new technology. All-India Radio with the help of IARI put on an experimental agriculture-education television program that reached 72 villages in Delhi State in 1967. It proved "a powerful tool for dissemination of knowledge." Farmers, not surprisingly, retained more of what was presented through television than they did through radio. As a result SWAMINATHAN is urging that a satellite television system, with ground stations capable of covering all the villages in the country, be installed as soon as possible.

SWAMINATHAN also believes in educating the farmer to make his own decisions. He does not support either coercing or coddling the farmer. "I personally feel," he wrote in 1964, "that psychologically, the subsidy given to the farmer does more harm than good. It takes away his initiative. The farmer may be provided with seed, fertilizers, improved implements, etc. against full credit rather than at subsidized rates." This should "yield better results as the farmer tends to appreciate and use more efficiently the seeds and fertilizers he has purchased at good price." He therefore urges the government to make farm credit available as quickly and as broadly as possible.

SWAMINATHAN elaborated on this basic premise when he was asked to deliver the prestigious Zakir Hussain Memorial Lectures in September 1970. Psychologists, he said, believe that within each of us there dwells a captive spirit struggling to find fulfillment, and each has the need to succeed by his own efforts. Therefore we should work with, rather than work for, others. The latter situation produces an expectation of gratitude on the one hand and resentment at having to be obliged on the other.

He holds that agriculture students should participate in agricultural projects as part of their university training, and emphasizes that they should go into a village, not as social workers but as co-participants. Such experience should be required for graduation, not only in agriculture, but in all faculties. Students could be integrated into government projects, paid a modest salary and engage in the day-to-day work.

Such training would also be exceedingly beneficial in giving youth the "experience and self-confidence necessary for embarking upon a career of self-employment." The need to know how to be self-employed is necessary, SWAMINATHAN points out, because of the increasing dearth of jobs

for university graduates. By 1973, he estimates, over 4,600 postgraduates in agriculture will be surplus. Thus in trying to find ways students can employ themselves after graduation, SWAMINATHAN has announced that the IARI is no longer taking out patents on agricultural machinery designed by the Institute. On the contrary, it will supply the drawings to anyone wanting to start a small business by manufacturing them.

As an educator SWAMINATHAN also believes that there should be a restructuring of the educational system. Schools, especially in the villages, should become "learning situations," with an emphasis on Basic Education as propounded by John Dewey, Zakir Hussain and Gandhi, and the student should be educated to understand, work in, and if necessary be able to change, his environment and society.

Allied with his concern about education is his concern about the physical development of upcoming generations. Recent research, he points out, "has revealed a link between malnutrition and retarded physical and mental development." The first years of a child's life are crucial because the brain achieves 80 to 90 percent of its weight in the first four years. If the child doesn't get sufficient calories and protein during this growth period he will suffer, what SWAMINATHAN calls, "intellectual dwarfism." This is potentially a major problem for developing countries, with long-term implications: a country with a large portion of its population so afflicted would have difficulty competing in the world. A factor exacerbating the problem for India is rigidity of food habits. SWAMINATHAN therefore has been an advocate of diversification in food habits. He feels that a nutritional dimension should be added to land use planning and crop breeding.

SWAMINATHAN's international reputation rests not only on work done on major grain crops, but on other crops as well. He is credited with a scientific breakthrough in successfully crossing two *Solanum* species in the early 1950s. He repeated this success when he crossed two jute-yielding species, *Corchorus olitorius* and *c. capsularia*, in the next decade: it was "the dream of all those interested in jute improvement since the beginning of this century." He has also worked on cotton.

SWAMINATHAN, and those associated with him in radiation genetics at IARI, were pioneers in studying the indirect effects of radiation. Starting with plants, and then working with fruit flies, they found that frequency of spontaneous mutation is increased when either are fed irradiated food. These studies have been confirmed by other scientists and today genetic criteria are required in assessing the wholesomeness to man and animal of irradiated food.

SWAMINATHAN is a member of, and has been honored by, many learned societies. He is a Fellow of the Indian Academy of Sciences, the Indian National Science Academy and the Indian Society of Genetics and

Plant Breeding; an Honorary Member of the Swedish Seed Association, Svalof; a Member of the Technical Advisory Committee (TAC) to the Consultative Group on International Agricultural Research (CGIAR). He was Vice-President of the Ninth International Congress of Genetics in 1963 and the University Grants Commission of India chose him as the National Lecturer for 1971.

SWAMINATHAN was honored with the Shanti Swarup Bhatnagar Award for his contributions in the field of biological sciences in 1961. The Czechoslovak Academy of Sciences presented him with the Mendel Centenary Award in 1965, and in that same year he received the Birbal Sahni Award from the Indian Botanical Society and the *Indian Journal of Genetics* Medal. He was honored by the Government of India in 1967 with the Padma Shri Decoration and in 1970 he received an Honorary Doctorate from Sardar Patel University. The award he most appreciates, however, is a medal from the farmers of Delhi State in recognition of "his signal service to them for improving their agricultural practices."

SWAMINATHAN is one of the editors of *Radiation Botany* published by Pergamon Press, and is chief editor of the *Journal of the Post-Graduate School* of IARI. He has lectured abroad at international scientific conferences every year but one since 1957 when he first addressed the UNESCO Conference in Paris on "The Use of Radioisotopes in Scientific Research." He was a speaker at the Second U.N. Conference on the Peaceful Uses of Atomic Energy in Geneva in 1958. Over the years he has been invited to give a lecture or a series of lectures in Italy, Sweden, the Netherlands, Czechoslovakia, the USSR, Australia, the Philippines, Austria and the United States, and has given major addresses at IAEA conferences in 1960, 1963, 1964 and 1965. He gave a major address at the International Conference of Genetics in 1963 and again in 1968.

Despite his professional stature, SWAMINATHAN has an easy approachability and a becoming humility. *National Investment and Finance* which chose him as "Man of the Week" in February 1971, said of him: "He brings to bear on his work a missionary zeal which is infectious and a sense of dedication which is inspiring. It is said, knowledge is proud that it knows so much, wisdom is humble that it knows no more. Dr. SWAMINATHAN typifies that type of wisdom of the ancient without fanfare or trumps. He radiates cheer, hope and self-confidence."

SWAMINATHAN himself pays tribute to the strength and support he derives from his wife. "She is a person with an unique combination of qualities. Her sense of values and her faith that the future of India depends upon the education and nutrition of children have provided much of the stimulus for my work. Her humanism and dislike of material values have strengthened my personal convictions and goals."

Mina Bhoothalingam, whom he married in 1955, comes from a dis-

tinguished Madrasi family. Her father is head of the National Council of Applied Economic Research and her mother is a well-known writer and lecturer on Hindu philosophy and architecture. Mrs. Swaminathan has a Master in Economics from Cambridge and worked as a Planning Officer in the Planning Commission before their marriage. She returned to the university to earn a Bachelor of Education and has since taught at St. Thomas' Girls Higher Secondary School in New Delhi and is presently running the Nehru Experimental Center, a preschool. She also writes and lectures on the use of drama as a medium of education. The SWAMINATHANS share an interest in music, both Indian and Western, and a pride in their three daughters, aged 8, 10 and 12.

SWAMINATHAN's personal and scientific optimism and enthusiasm, with which he infects all those with whom he comes in contact, is expressed in an article he wrote for *Indian Agricultural News Digest* (1969) where he said: "That plants love India is clear from our having more number of plant species than countries with a much larger land area, such as the United States and USSR. If we will reciprocate this love and attend to the needs of plants, crop plants will take us on the path of abundance of food, full employment, mental happiness and total freedom."

September 1971

Manila

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Interviews with and letters from colleagues of M. S. Swaminathan at IARI and others in the field of scientific agriculture.

Dear Dr. Swaminathan,

I was delighted to see your name in the list of "100 Most Influential Asians of the 20th Century" in the "Time" Magazine of 23-30 August 1999.

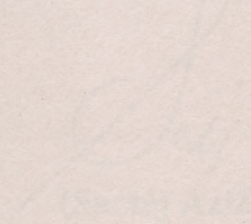
To be bracketed with political giants like Mao Zedong, Ho Chi Minh, Subarna, Mahatma Gandhi and M.A. Jinnah is a great achievement in itself, but for me the more gratifying aspect is the recognition of the role of scientists in changing the course of history.

Having watched and admired your outstanding contribution to the Green Revolution in Asia at first hand, I can say without hesitation that this recognition is well deserved.

Please accept my heartfelt congratulations.

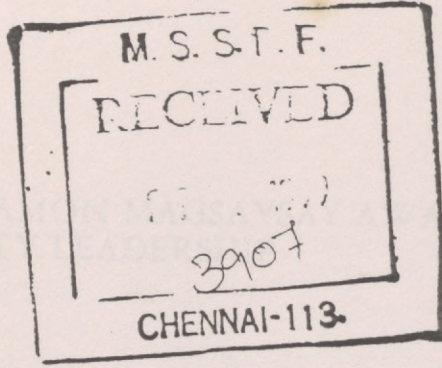
With regards,

Yours sincerely,



M. S. Swaminathan
Director, International Foundation
for Agricultural Development
New Delhi, India

بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ



ISLAMABAD

No.FMO-6/4/99-A

September 13, 1999

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Please accept my heartiest congratulation.

With regards,

Yours sincerely,

(Sartaj Aziz)

Dr. M.S. Swaminathan,
M.S. Swaminathan Foundation,
III Cross Street,
Taramani Institutional Area,
Chennai-600013 (India)
Fax No.0091-44-2351319

THE 1971 RAMON MAGSAYSAY AWARD FOR COMMUNITY LEADERSHIP

MONCOMPU SAMBASIVAN SWAMINATHAN

Citation read by Dr. José V. Abueva, Trustee, Ramon Magsaysay Award Foundation:

Whether India, with nearly one-sixth of the human race, can provide sufficient food for her growing numbers in the years ahead depends ultimately upon her farmers. Their performance is closely linked to what science develops and makes operative in rural life. Without continuing refinement of relevant knowledge and its efficient transference, especially to the poorer villages, the "green revolution" may foster more discontent than it satisfies.

In an age when radioisotopes, a Gamma Garden and chemical mutagens are among the plant breeders' tools, Dr. SWAMINATHAN is an originative follower of Gregor Johann Mendel, the Austrian monk and botanist who founded genetics over a century ago. A cytogeneticist, in the past 16 years he had made major advances in breeding sturdier, more productive and better quality plant types at the Pusa Institute, as the Agricultural Research Institute outside of Delhi is popularly known. Included in the wide-ranging studies by him and his associates have been India's most essential food crops—wheat, rice, maize, sorghum, millet, pulses, potatoes and vegetable oils—plus cotton and jute. By purposeful manipulation of genes, he and his co-workers in 1967 developed a dwarf, non-lodging wheat variety—Sharbati Sonora, with amber grains—from Sonora-64 which has red grains and hence a low consumer preference in India.

An ability and enthusiasm for passing on his knowledge to others in the laboratory, classroom and field, and his prolific writing have earned him a reputation as a most lucid educator. In the past five years since he became Director of the Institute, SWAMINATHAN has proven himself an equally gifted administrator.

Encouraged by him, scientists at Pusa extended their work to practical application in farmers' fields. University students were enlisted in this attack upon the limitations to a better life on the land. The primary demonstration arena for these efforts are villages around Delhi where tests of

improved seeds—by farmers with whom the Pusa Institute cooperates—have won confidence in their productive potential. As part of a High-Yielding Varieties Program designed by SWAMINATHAN one community was transformed into a "seed village" specializing in controlled multiplication of improved varieties to supply the needs of the entire state, and thousands of demonstrations were laid out by scientists in farmers' fields throughout India.

His particular combination of talents has made SWAMINATHAN an acknowledged leader of India's community of agriculturists. Now 46 years of age, he is carrying forward his Madrasi family tradition of energetic personal emphasis upon professional excellence. That he is doing so with such broadly beneficial results for rural India is the mark of a first-rate scientist who is also a humanist.

In electing MONCOMPU SAMBASIVAN SWAMINATHAN to receive the 1971 Ramon Magsaysay Award for Community Leadership, the Board of Trustees recognizes his contributions as scientist, educator of both students and farmers, and administrator toward generating a new confidence in India's agricultural capabilities.

RESPONSE by MONCOMPU SAMBASIVAN SWAMINATHAN

I deem it a very great honor and privilege to have been chosen for the Community Leadership Award instituted in the memory of one of the greatest world leaders and humanists of our time. The late President Ramon Magsaysay devoted his tremendous vision, wisdom and energy to the cause of helping his fellowmen build a better life for all. A satisfied stomach is a prerequisite not only for happiness but even to enable men to behave as human beings, a fact so well expressed by the Roman philosopher, Seneca, when he said, "A hungry people listens not to reason nor cares for justice, nor is bent by any prayers." Even as recently as the mid-sixties, the future of many of the developing nations appeared hopeless when assessed in terms of their ability to feed their fast growing populations. Drs. William and Paul Paddock, in their book *Famine Nineteen Seventy-Five!*, even went to the extent of comparing the fate of my countrymen after 1975 to that of sheep being led to the slaughterhouse. Then came the avalanche of scientific results from this great country, Mexico, Taiwan and India which opened up altogether new vistas in the yield potential of our major food crops. I consider this award as a tribute which the Magsaysay Foundation would like to pay to the entire community of agricultural scientists in my country who have helped to provide a breathing spell during which efforts can be made to prove the prophets of doom false.

New concepts of crop planning and land use, designed to get the maximum benefit from the physical, biological and environmental endowments of tropical and subtropical agriculture, are being developed. Where there is water four or even five crops can now be grown in a year in multiple, mixed and relay cropping systems, getting for the farmer the benefit of nearly 450 days of crop growth in a year of 365 days. New methods of water management and enrichment of soil fertility, coupled with crop varieties capable of avoiding the rigors of drought or floods through changes in their life length and coordinated pest control schedules, are opening up new hopes for peasants working in environmentally handicapped areas. The "green revolution" in cereals has paved the way for developing harmonious systems of agriculture and animal husbandry.

The scientific prospects for alleviating hunger, increasing the avenues for productive and remunerative employment, and banishing poverty through a radical transformation of cropping systems leading to the growth of agro-industries, are fascinating and immense. At the same time the magnitude of the problems of illiteracy, under- and malnutrition, under- and unemployment and population growth are truly staggering. In spite of all efforts, the number of illiterates in absolute terms is growing in many parts of Asia, including India. Leading scientific journals carry data indicating that protein calorie malnutrition in infants may affect the replication of the chemical substance of heredity, DNA, and lead to an irreversible underdevelopment of a child's intellectual potential, thus compounding the ill effects of the already poor educational opportunities.

The Indian achievement in wheat production, leading to a near doubling of the total harvest from a little over 12 million tons to over 23 million tons in four crop seasons, has few parallels in recorded agricultural history and serves to illustrate what can be accomplished provided farmers, scientists, extension and communication experts and political and administrative leaders, all function like members of a symphony orchestra. Unless such an orchestration in effort is generated for all crops, a scientific breakthrough may not necessarily lead to a production breakthrough. This is illustrated by the yield stagnation in sorghum in my country where, although new hybrids and varieties capable of yielding two to three times more than the earlier ones have been available since 1964, the yield per hectare has hardly altered in the last decade. Wheat posed fewer pest, management and marketing problems and the farmers responded with enthusiasm to produce as much or even more than what was harvested in the National Demonstration plots put up by scientists in the fields of poor peasants. In other crops like rice, sorghum, maize, millets and pulses, problems of management, pest control, storage, marketing and pricing require sophisticated and coordinated efforts of a type which few developing nations have yet generated. Consequently, a genuine feeling that they have been bypassed by the "green revolution" is growing in the minds of many farmers.

We are thus faced on one side by great scientific possibilities and on the other by vast problems of organization, coordinated action, communication, and population growth absorbing the fruits of all advance. Those who have the power and capacity to serve their fellowmen—be they scientists, educationists, administrators or political leaders—have probably never had in human history so many challenging opportunities for service and for experiencing the thrill of fulfillment. What is needed is the will to act and the determination to learn and adopt the correct techniques of action, since Asian farmers have given ample evidence in recent years that they are ready for change if the change is for the better economically.

I would like to end on a personal note. When over 10 years ago my colleagues and I at the Indian Agricultural Research Institute embarked on the relentless pursuit of high incomes from farming through high yields—without detriment to the long term productivity of the soil—we hoped that the high yielding varieties would not only help raise production but would also act as catalysts in bringing about a total transformation in the outlook and agronomic methodology of our rural community. Where sights are limited, action is equally circumscribed and cynical comment is the only reception accorded to new ideas. Mahatma Gandhi referred to this situation over 40 years ago, when addressing those who wished to work in Indian villages. He said, "The fact is the villagers have lost all hope. They suspect that every stranger's hand is at their throats and that he goes to them only to exploit them. The divorce between intellect and labor has paralyzed our agriculture. The worker should enter villages full of love and hope, feeling sure that where men and women labor unintelligently and remain unemployed half the year round, he working all the year round and combining labor with intelligence cannot fail to win the confidence of the villagers." I have had the privilege of personally experiencing the wisdom of Gandhi's recipe. Hence, while accepting the Award for Community Leadership bearing the name of one, whose main characteristic was his passionate love of poor people, I plead in all humility with the young men and women in the universities and scientific institutions of the developing nations to seize the opportunity and power, given them by science, to make real the possibilities of a truly human and meaningful life for millions of their fellow beings. It is to promote this cause that I propose to use the Award.

Ramanujam S, Siddiq E A, Chopra V L, Sinha S K, eds (1980)
Science and agriculture. Commercial Printers, New Delhi,
India. p. 1-16.

Biographical Sketch

Monkombu Sambasivan Swaminathan was born on 7th August, 1925 in the temple town of Kumbakonam in Tamil Nadu, in a well-known agricultural family of Kerala. His father, the late Dr. M.K. Sambasivan, a member of 'Kottarathu Madom' of village Monkombu in the Kuttanad area of Kerala, chose Kumbakonam for his professional career after taking the M.B.B.S. degree in 1921 from the Madras Medical College. Kumbakonam, in addition to being famous for its temples, was also then widely known for filariasis and other health problems. Swaminathan's mother Shrimati Thangammal, belongs to an old family at Pudukottai, a former princely State now part of Tamil Nadu. Swaminathan had his schooling at the Native High School and Little Flower High School, Kumbakonam. His father died suddenly on October 12, 1936 at the young age of 36. However, even within the short span of 15 years of professional life Dr. Sambasivan not only became a leading surgeon of South India but also carved for himself a permanent place in the history of Kumbakonam as the one who wiped out the filarial 'Kumbakonam' mosquito within two years of his becoming the Chairman of the Municipal Council.

After Dr. Sambasivan's death, Swaminathan and brothers, Krishnamurthy (elder) and Ramdas (younger) and sister Lakshmi, were all brought up by Dr. Sambasivan's younger brother, M.K. Narayanaswami, whose loving care filled to a great extent the void created by the father's death. During 1940-44, when Swaminathan and his elder brother studied at the University College, Trivandrum, Dr. Sambasivan's elder brother, the late Shri M.K. Nilakanta Iyer, who was then Chief Secretary to the Government of Travancore, provided parental guidance. Similarly, Ramdas was looked after by his maternal uncle, Prof. K. Swaminathan, who was then Professor of English at the Presidency College, Madras (currently, he is Chief Editor of Mahatma Gandhi's collected works). Swaminathan cites this as one of the great blessings of the Hindu joint family system.

Impact of Early Upbringing

His early upbringing had an important impact on his later work and outlook. Inspired by Gandhiji, Swaminathan's father believed strongly that a *swadeshi* movement was essential for the country's economic well being. This in turn fostered an awareness in Swaminathan of the need for self-reliance and the pivotal role of community action. These associations also created a firm conviction in his mind of the need to share with others whatever one can spare. He also came into contact with the essentials of Indian philosophy which instilled in him a deep understanding of the need for unilateral love and of humility of spirit which leads to continuous seeking and enquiry and thereby to progress. His deep understanding of various concepts, such as the much-maligned concept of karma, provided the stimulus for work with detachment.

The Swaminathan Family

Despite his professional stature, Swaminathan has always remained easily approachable both in his home and in the office. Swaminathan typifies the humble wisdom of the ancients, bereft of fanfare. He radiates cheer, hope and self-confidence. No wonder one always finds young research scholars in his house.

Swaminathan, who attributes his success to the support he derives from his wife, Mina, says : "She is a person with a unique combination of qualities. Her sense of values and her conviction that the future of India depends upon the education and nutrition of children have provided much of the stimulus for my work. Her humanism and dislike of material values have strengthened my personal convictions and goals." They were married on 11th April, 1955.

Mina Swaminathan, who has a Master's degree in Economics from the University of Cambridge gave up a job in the Planning Commission to take to a teaching career in 1956. Her principal interest has been the development of techniques which are relevant to the special needs of deprived as well as gifted children. During the last 10 years, she has been working with Mobile Creches, an organisation which caters to the educational needs of the children of unskilled labour. She has

also been actively involved in promoting the pre-school education movement in the country.

The Swaminathans have three daughters. The eldest, Soumya, is currently completing the M.B.B.S. Course at the Armed Forces Medical College, Pune. A Science Talent Scholar, she intends to follow her work in Medical Genetics. The second daughter, Madhura, is doing M.A. in Economics, at the Delhi School of Economics. She is a mountaineer as well as a dancer in the Odissi style. The youngest girl, Nitya, has joined B.A. (Hons) in History in St. Stephen's College, and is deeply interested in archaeology, ancient Indian history and Sanskrit.

Swaminathan says that he is deeply indebted to his daughters for providing a window into the thought processes and aspirations of the post-independence generation. He has been fond of quoting the following poem by Rabindranath Tagore on children in several of his lectures :

*Child, how happy you are sitting in the dust,
Playing with a broken twig all the morning !
I smile at your play with that little bit of broken twig.
I am busy with my accounts, adding up figures by the hour.
Perhaps you glance at me and think, "What a stupid game
to spoil your morning with !"
Child, I have forgotten the art of being absorbed in sticks
and mudpies.
I seek out costly playthings, and gather lumps of gold and
silver.
With whatever you find, you create glad games.
I spend both my time and my strength over things I can
never obtain.
In my frail canoe I struggle to cross the sea of desire,
And forget that I too am playing a game.*

Academic and Professional Career

After taking the B.Sc. (Agriculture) degree from the Agricultural College at Coimbatore in 1947, Swaminathan joined the Indian Agricultural Research Institute, New Delhi. He completed the Associate IARI Diploma Course in Genetics

and Plant Breeding in 1949. In between, in 1948, he sat for the All-India Competitive Examination for recruitment to Central Services held by the Union Public Service Commission, since he was then advised by seniors that "agriculture does not offer much scope for a professional career." He was offered in 1949 a position in the Indian Police Service on the basis of this examination. Swaminathan, however, opted for continuing his research work and joined the Department of Genetics, Netherlands Agricultural University, Wageningen, in December 1949 as a UNESCO Fellow.

After a year at Wageningen, he joined the School of Agriculture at Cambridge in 1950. Both at Wageningen and Cambridge, Swaminathan worked on the cytogenetics of the tuber-bearing *Solanum* species, to which group the cultivated potato belongs. Attracted by the scientific papers he published during the period, he was offered by the University of Wisconsin, USA, a Research Associateship in Genetics. He worked for a year in this capacity at Madison and Sturgeon Bay and returned to India in January, 1954, after deciding not to take up a regular job offered there.

It was not easy to get a suitable job on return to India. He joined a temporary project in the *indica-japonica* rice hybridization programme at the Central Rice Research Institute, Cuttack, in April, 1954. He was offered the post of Assistant Cytogeneticist at the Indian Agricultural Research Institute in October, 1954. From October, 1954 to January, 1972, he worked at the Indian Agricultural Research Institute as Assistant Cytogeneticist, Cytogeneticist, Head of the Botany Division and Director. His contributions to the research and teaching programmes of IARI as well as to the building up of the experimental farm, laboratory, library, hostel and residential facilities and above all three major multi-disciplinary research centres, the Nuclear Research Laboratory, the Water Technology Centre and the Pulse Research Laboratory have led to the widespread acknowledgement of his role in the development of the IARI into one of the world's leading agricultural research and educational institutions.

In January, 1972, he succeeded his teacher, Dr. B.P. Pal, as the Director-General of the Indian Council of Agricultural Research. He continued in this position until March 31, 1979,

when he joined as Secretary to the Government of India in the Department of Agriculture and Rural Development. On April 3, 1980, he retired from Government service and joined the Planning Commission as Member for Agriculture and Rural Development. He served as Deputy Chairman of the Planning Commission between April and June, 1980.

Thus, from June, 1944 when he joined the Agricultural College at Coimbatore until today he has been working in the field of agriculture as a scientist, an educator as well as developmental administrator.

Research Contributions

A resume of major research contributions and the relevant references to papers published in scientific journals are given in the next chapter of this book. Only a few significant landmarks, particularly as seen by other distinguished scientists, are mentioned here.

(a) *Research on Potato and Allied Solanum Species*

During 1947 to 1955, Swaminathan carried out extensive researches on the genetics, cytogenetics and differentiation of both non-tuber bearing and tuber-bearing *Solanum* species. Swaminathan's research not only helped to unravel several problems relating to the origin of the potato, but also provided material for the development of commercial varieties such as 'Alaska Frostless.' His techniques and results have continued till today to be of great help to researchers in this field. On his return to India, he found it difficult to continue his research on potato, since potato plants do not normally flower (barring a few exceptions) in Delhi. Nevertheless, before shifting to other crops, he carried out a detailed study of the origin of the potato varieties cultivated in India from the 18th century.

(b) *Induced Mutagenesis and Indirect Effects of Radiations*

During 1955-1965, Dr. Swaminathan and his students carried out a wide range of studies in experimental mutagenesis, using wheat, barley and rice as test material. These studies helped to : (i) discover the mutagenic properties of vegetable oils, (ii) isolate mutants of breeding and phylogenetic

value in wheat, barley and rice and (iii) establish that radio-mimetic products are produced in irradiated culture media, leading to an enhancement in the spontaneous mutation frequency in *Drosophila melanogaster*. The last mentioned finding led to a re-thinking on the criteria to be used to determine the wholesomeness of irradiated food.

(c) *Raising the Ceiling to Yield in Major Crop Plants*

(1) *Wheat*: The history of the wheat improvement work carried out during 1960 to 1970 is best told through the passage from the book "Facing Starvation" by Lennard Bickel printed by the Reader's Digest Press in 1974, reproduced elsewhere in this volume. Its results are there for all to see in the food reserves.

In 1966 India faced the threat of widespread famine due to severe drought. Nearly 10 million tonnes of wheat had to be imported mainly from the United States under the Public Law 480 programme. Foreign observers felt that India was destined only for a "ship to mouth" existence. At that time the B.B.C. of London had sent a television team to India to review the impact of drought. Based on various interviews, the B.B.C. produced a film called, "Indian Eyes on the Future", sometime towards the end of 1966. The film records the hope of Dr. Swaminathan that "the wheat harvest of 1968 in India will mark the beginning of a new era in Indian agriculture." This hope, based at that time on calculations of expected area under high-yielding varieties, proved to be correct and the Government of India issued a special stamp in 1968 to mark the beginning of the "Wheat Revolution." This stamp carried a portrait of the Library of IARI as a symbolic acknowledgement of the role of agricultural science in enhancing wheat production.

Dr. Swaminathan has repeatedly emphasised that the credit for agricultural progress should primarily go to farmers who toil tirelessly in the sun and rain to feed others. He is firmly convinced that but for the national grid of cooperative experiments established by ICAR through the All India Co-ordinated projects, there would have been very little progress in applied research in the country. He has hence placed stress on *collective* rather than *individual* excellence. Hence, he got a

prestigious award instituted by the ICAR for giving recognition to whole teams of workers. At his instance, another prestigious award bearing the name of Jawaharlal Nehru was instituted by ICAR to accord recognition to the work of young Ph.D. scholars.

(2) *Rice* : The concepts of rice breeding developed during the 1960's included –

- (a) transferring the gene for dwarfing into a *basmati* background
- (b) developing widely adapted strains through sequential selection under diverse environments
- (c) collection and preservation of the germplasm occurring in N.E India and
- (d) development of hybrid rice, particularly for cultivation under rainfed conditions, in order to take advantage of heterosis for root growth and early maturity.

Subsequent events have shown the far-sightedness of these steps initiated in the early 1960's. The impact of the rice research work carried out by a small group of workers at the IARI shows the value of well-planned and concentrated research, in contrast to the diffused, "chasing academic butterflies" approach so commonly seen.

(d) *Contingency Planning, Risk Distribution Agronomy and Disaster Preparedness*

Looking ahead, and a scientific analysis of the possibilities for converting calamities into opportunities for mitigating the adverse impact of similar calamities in the future, have been two distinctive features of Dr. Swaminathan's work. Thus, in March, 1972, while delivering the Rajendra Prasad Memorial Lecture of the Indian Society of Agricultural Statistics, he dealt with the question "Can we face widespread drought again without food imports?" His answer was "yes", provided the country took to the path of building grain reserves, introducing mid-season corrections in cropping patterns, building seed reserves and promoting crop life-saving techniques and risk-distribution agronomy. The fact that the severe drought of 1979 could be faced without food imports is a testimony to the power of Indian agriculture.

In several lectures, the strategy for capitalising on favourable seasons and for minimising the adverse impact of aberrant weather has been outlined. The strategy for facing drought consists of :

- (i) The development and popularisation of crop life-saving techniques;
- (ii) contingency land use plans to suit different weather probabilities;
- (iii) compensatory production programmes in irrigated areas.

In his capacity as Secretary in the Department of Agriculture, he worked on a detailed strategy for disaster preparedness, even before the fate of the S.W. monsoon was known.

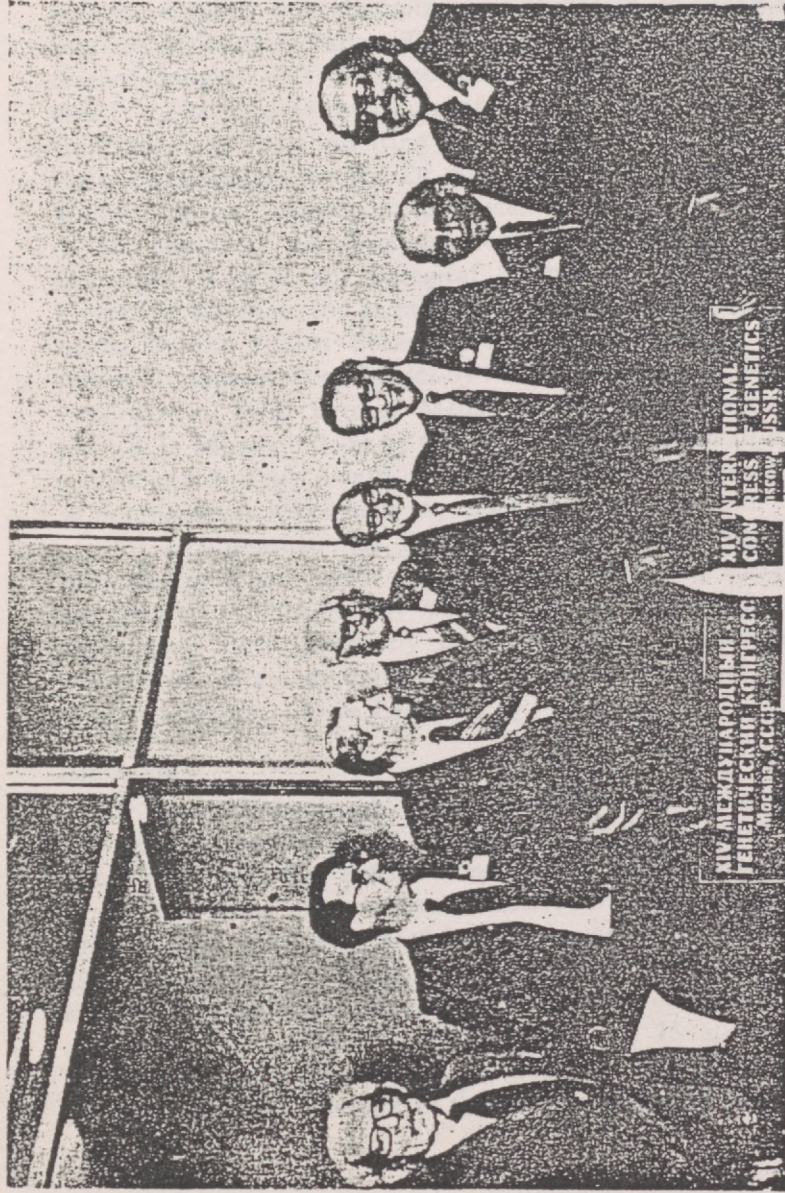
"Eternal vigilance is the price of good agriculture" is one of Swaminathan's firm beliefs. It is because of his capacity to anticipate problems and innovate approaches on a systems basis as well as to articulate ideas and information with clarity and precision, that Swaminathan has been most sought after in national and international scientific symposia as an invited speaker and has been described as a "Scientists' Scientist."

Recognition by Academies of Science and Professional Associations

Peer review is ultimately the best guide to the value of the work of a scientist. Dr. Swaminathan's work has been assessed by all the Scientific Academies in India as well as by the leading Science Academies in the U.K., U.S.A. and U.S.S.R. Since he is the only Indian scientist who has concurrently been honoured by the Royal Society of London, U.S. National Academy of Sciences and U.S.S.R. Academy of Agricultural Sciences, the scrolls sent by these Academies have been reproduced elsewhere in this book together with the scroll issued by the Indian National Science Academy (formerly known as the National Institute of Sciences of India).

The Czechoslovak Academy of Sciences awarded the Mendel Centenary Medal of the Academy to Dr. Swaminathan in 1965 on the occasion of the centenary of Mendel's discovery of the laws of heredity. The Swedish Seed Association, Svalof, elected him an Honorary Fellow of the Association in 1971.

XIV INTERNATIONAL CONGRESS OF GENETICS, MOSCOW, 1978



President and some Vice-Presidents

Left to Right : O.H. Frankel, R. Riley, N.V. Tsitsin (President) A. Gustafsson, Y. Tazima, A.R. Cordeiro and M.S. Swaminathan.

The Indian Science Congress Association elected him as General President of the 63rd session of the Science Congress held at Waltair in 1976. This session will go down in the history of the Science Congress Association as a significant evolutionary milestone, since Dr. Swaminathan introduced the concept of choosing a 'focal theme' for the Congress which will permit a detailed inter-disciplinary examination of a theme of supreme national relevance. The theme chosen for the Waltair Science Congress was "Science and Integrated Rural Development". The recommendations of this Congress led to the Government of India initiating in the same year an Integrated Rural Development Project. Dr. Swaminathan's address at the Waltair Science Congress is reproduced in this book.

The choice of Dr. Swaminathan for the Shanti Swarup Bhatnagar Award for Biological Sciences in 1961 by the Council of Scientific and Industrial Research, the Birbal Sahni Medal by the Indian Botanical Society in 1966, the Silver Jubilee Commemoration Medal by the Indian National Science Academy in 1973, Barclay Medal by the Asiatic Society in 1974, K.L. Moudgill Prize by the Indian Standards Institution in 1978 and Borlaug Award in 1979 indicate the wide spectrum of organisations which have expressed their appreciation.

Dr. Swaminathan has frequently stated that a well-knit scientific community and well-organised professional societies are essential for the healthy development of science. He has hence given time generously to the building up of scientific societies in India and abroad often serving as President, Secretary or a member of the Executive.

Education

Dr. Swaminathan's philosophy towards teaching has been that there is nothing called "teaching" and that there is only 'learning'. Both the 'teacher' and the 'taught' learn all the time. Only those who consider themselves students throughout life will have something useful to convey to others. Between 1954 and 1972, Dr. Swaminathan has taught several courses every year, without missing either a single class or a minute of any class. In addition, he has guided over 75 students in their thesis work for various degrees. In the first Zakir Hussain Memorial Lecture of the University Grants Commis-

sion delivered in 1970 as well as in a convocation address delivered at Kanpur, he dealt at length with his views on education. These lectures are hence reproduced in this volume along with a list of students who have done their thesis work for the Associate I.A.R.I., M.Sc. and Ph.D. degrees under his guidance.

He coined the term "techniracy" in 1972 to indicate the imparting of relevant technical skills by by-passing the regular literacy route. This concept was then converted into reality through the *Krishi Vigyan Kendras* organised by the Indian Council of Agricultural Research. During 1979, as Secretary in the Department of Agriculture and Cooperation of the Government of India, he initiated steps for organising *Van Vigyan Kendras* for providing grass-root level training in all aspects of social forestry.

According to Dr. Swaminathan, the letter he received from Jawaharlal Nehru in 1964 provided much of the stimulus for spending long hours in teaching young scholars. The letter is hence reproduced in this book.

Extension Methodologies

His firm conviction that green plants by virtue of their capacity to harvest solar energy provide the most powerful instrument for ending the irony of a rich country being inhabited by starving people (to quote Jawaharlal Nehru) led to Swaminathan becoming a leader of the technology transfer movement in agriculture.

His efforts in the field of technology transfer have led to

- (a) the initiation of the National Demonstration Programme for providing "windows into the world of higher productivity which awaits the farming community".
- (b) organisation of farmers into skilled seed producers,
- (c) whole village or watershed operational research projects designed to identify the constraints responsible for the gap between potential and actual farm yields ;
- (d) organisation of *Krishi Vigyan Kendras* for farmers and fishermen where learning is by doing and
- (e) a "Lab to Land" programme based on a systems approach to farming, with the entire farming family and farming system as units of the technology transfer effort.

In all the demonstration programmes, he has emphasised the need for selecting the poorest farmers in a village, since "demonstrations laid in rich farmers, fields will not have much extension value, as small farmers will attribute the yield obtained to the effects of affluence rather than of technology". He has also laid special stress on the development of technologies for increasing the income of landless labour families. For this purpose he initiated steps when he was in the ICAR for organising an All-India Coordinated Research programme for technologies for the landless poor.

It is his comprehension of a problem in its totality that has been of such significant help in the evolution of agricultural development strategies during the last two decades.

To fellow scientists, who hesitate to become actively associated in the "Lab to Land" programme, Swaminathan has often quoted the following statement of Albert Einstein :

"Concern for man himself and his fate must always form the chief interest of all technical endeavours in order that the creation of our minds shall be a blessing and not a curse".

Agricultural Research Administration : Conceptual and Operational Framework

Swaminathan holds firmly to the view that human resource development through emphasis on team work and collective excellence can alone help to solve the problems of poverty and unemployment in India. It is this conviction that only cooperative endeavour on symbiotic principles can lead to synergy that led to his elaboration of the pivotal role of synergy in agricultural development in the Sardar Patel Memorial Lectures of the All India Radio in 1973, parts of which are reproduced in this book.

Based on these guiding principles, the personnel policies of ICAR were restructured. The major aim was to make every staff member compete with his or her own past, rather with each other in a spirit of unhealthy rivalry. The prefaces written by Dr. Swaminathan in the ICAR Handbooks on the Agricultural Research Service and the Technical Services are reproduced in the following pages, because of their relevance

to achieving a synchrony between form and function. A National Academy of Agricultural Research Management was established at Hyderabad to provide relevant training and orientation to ARS personnel. Considerable importance is attached in the training programmes to getting to know well the clients of agricultural research, namely farmers and fishermen. The ARS system has evoked world-wide interest and received special mention in the New Delhi Declaration of the International Federation of Agricultural Research Systems for Development. The Declaration stated "The Agricultural Research Service of the Indian Council of Agricultural Research is a model which we would recommend for consideration and adaptation by all developing countries as soon as possible."

International Collaboration

Dr. Swaminathan has delivered numerous invited lectures at international scientific meetings. He was a Vice-President at the International Congresses of Genetics held at the Hague in 1963 and at Moscow in 1978. He is the Secretary-General of the XV International Congress of Genetics scheduled to be held in New Delhi in December, 1983. He was Vice-Chairman of the Technical Advisory Committee to the Consultative Group on International Agricultural Research during 1971 to 1976, during which period he played a key role in getting the International Board for Plant Genetic Resources organised. He was also Vice-Chairman of the Protein Calorie Advisory Group to the United Nations System during 1972 to 1976.

He has chaired several international conferences. At the U.N. World Food Congress held in Rome in 1974, he played a major role in getting a unanimous commitment for working towards the goal of ensuring by 1984 that "no one goes to bed hungry and no human being's physical or mental potential is stunted by malnutrition". Along with the late Senator Hubert Humphrey of the United States, he was invited by the Director General of F.A.O. to review the results of the World Food Congress for the benefit of the staff of F.A.O. Dr. Swaminathan chaired Commission II of the F.A.O. General Conference in November, 1979 at Rome. Dr. Edouard Saouma wrote

after the conference "Your brilliant chairing of Commission II of the conference earned the appreciation of the entire F.A.O. The fact that all these important and sensitive issues were dealt with so thoroughly and expeditiously, is certainly a tribute to your wisdom and decisiveness, as well as a reflection of the respect which you enjoyed from all delegations."

Dr. Swaminathan chaired the Committee of the Whole of the U.N. Conference on Desertification held at Nairobi in 1977. The Conference had to face several stormy issues including the role of biological warfare in desertification but the Committee of the Whole could arrive at unanimous recommendations on most of the issues where at the beginning of the conference there was a strong polarisation of views. Dr. Mostafa K. Tolba, Executive Director of the U.N. Environment Programme, later wrote: "As my colleagues and I again go through the reports and recommendations of the Conference on Desertification, I am even more aware of how much the Secretariat and the Conference itself are in debt for the way in which you, as Chairman of the Committee of the Whole, helped to guide our work."

Dr. Swaminathan is currently Chairman of the Board of Trustees of the International Council for Research in Agro-Forestry (ICRAF), and President of the International Bee Research Association and the International Federation of Agricultural Research Systems for Development. After an important session of the ICRAF Board, Dr. J.H. Hulse of Canada wrote: "I can think of no one who could have conducted the meeting with such sensitivity. I am sure we will all benefit immeasurably from observing the manner in which you brought the Board meeting to a conclusion from which every one felt optimism for ICRAF's future."

Dr. Swaminathan's contributions in promoting international scientific collaboration include efforts in the founding of (a) the International Genetics Federation, (b) Society for the Advancement of Breeding Researches in Asia and Oceania (SABRAO), (c) the International Crops Research Institute for the Semi-arid Tropics (ICRISAT) and (d) the International Federation of Agricultural Research Systems for Development (IFARD). SABRAO and IFARD represent the first significant efforts in promoting organised collaboration at the professional level

among agricultural scientists of developing countries.

Dr. Swaminathan has delivered key note addresses and concluding resumes at several international symposia. In May, 1980, he delivered the Nilsson Ehle Memorial lectures of the Mendelian Society of Sweden at Lund and Svalof. He also delivered a key-note address on "Fifty years of Agricultural Research and Development" at the Golden Jubilee Conference of the Commonwealth Agricultural Bureaux held in London on July 15, 1980.

While recognising the usefulness of international collaboration and institutions in promoting exchange of information and experimental material, Dr. Swaminathan has repeatedly underlined the essential need for a dynamic national research base for launching and sustaining an agricultural development programme that can work toward the triple goal of more food, more income and more jobs from available resources. "Without relevant location-specific research tailored to the needs of each agro-ecological, socio-economic, cultural and political milieu, sustained agricultural advance will not be possible." (M.S. Swaminathan in "Development and Transfer of Technology." Proceedings of the Inaugural Symposium, 1979, ICRISAT, pp. 179-182).

Three declarations, one issued by the Rome Forum on World Food Problems which met just prior to the World Food Congress in 1974 under the chairmanship of Barbara Ward, and two others issued by the International Federation of Agricultural Research Systems for Development are reproduced here because of their significance to agricultural research and development. Dr. Swaminathan served on the drafting committees which prepared these declarations.

Economic Ecology and Our Agricultural Future

In several scientific papers, lectures and reports, the need for launching an economic ecology movement so as to harmonise the short and long term goals of development has been stressed by Swaminathan.

He pointed out in his Presidential address to the Agriculture Section of the Indian Science Congress in 1967, "*Therefore, the initiation of exploitative agriculture without a proper understanding of the various consequences of every one of the*

changes introduced into a traditional agriculture and without first building up a proper scientific and training base to sustain it, may lead us into an era of agricultural disaster in the long run, rather than to an era of agricultural prosperity."

The basic building blocks of an action programme based on considerations of ecology and economics were dealt with in detail by Dr. Swaminathan in the Sardar Patel lectures of the All India Radio in 1973 and particularly in the 1973 Coromandel lecture entitled, "Agriculture on Spaceship Earth", where he said :

"The poorer nations, however, are faced with the desire and need to produce more food from hungry soils, more clothing and more housing. They are aware that historically a rising standard of living has depended on the ability of agriculture to release manpower to other more industrial pursuits. They hence naturally wish to develop more industries and to find productive and remunerative employment for their growing population. For them, conditions of poverty and inadequate arrangements for human and other waste disposal may be greater causes of water and air pollution than the effluents from factories or fertilizer from the fields. Since the causes of pollution are by and large different, the solutions will have to be different too and it would be a grave mistake to attempt to copy the policies now being propagated in the developed world.

"We are fortunately in a position to build a positive policy of economic ecology based on a series of DOs rather than DON'Ts."

It is this deep concern for a positive policy of economic ecology, that led to the promotion of projects like a cadre of soil health care workers in villages and a rural resource corps consisting of professionally qualified young persons. The International Union for Conservation of Nature and National Resources in its Bulletin of April, 1980 (New Series Vol. II No. 4) pointed out how, after posing the question "Have we the right to deny to future generations the fruits of millions of years of natural evolution?" with regard to the use of a part of the Silent Valley Reserve Forest in Kerala for a hydel-power project, Dr. Swaminathan offered a concrete set of proposals for providing adequate power, employment and water for irrigation to the people of the area where this project would have come up.

Servant of Agriculture

The Borlaug Award citation (presented on 4th September, 1979) sums up beautifully his contributions as well as the philosophy underlying them and hence it will be apt to conclude this narration by reproducing it.

"Monkombu Sambasivan Swaminathan (b. 7 August 1925)
Servant of Agriculture

in profound appreciation of his catalytic role in providing deep insights and inspiring fellow scientists to set goals, share experience in the process of social change and transformation to a society which treats of Man at the centre.

For evolving a strategy for agriculture rooted in science, but tempered by concern for ecology and human values.

For the amplitude of his perceptions which has encouraged community effort directed to a synthesis in the movement of agriculture".

Association for Women in Development

Award to

Dr. M. S. Swaminathan

Director General
International Rice Research Institute

for

Outstanding Contributions
to the Integration of Women in Development¹

¹ Presented by Celia Jean Weidemann on behalf of the Association for Women in Development, Washington, D.C., April 27, 1985

Award to Dr. M. S. Swaminathan

This is the first year that the Association for Women in Development is presenting awards for outstanding contributions to the integration of Women in Development. It is a great privilege for me to announce the award being given to Dr. M. S. Swaminathan, Director General of the International Rice Research Institute (IRRI) in the Philippines. Dr. Swaminathan deeply regrets that unforeseen meetings with IRRI's donors made it impossible for him to be here with us today.

As many of you know, IRRI is one of the network of thirteen International Agricultural Research Centers (IARCs) devoted to the study of various crops and livestock. One of the Centers, CIMMYT in Mexico, was in large part responsible for the Green Revolution. The Centers receive multi-lateral, bi-lateral, national, and private funding, often from foundations such as Ford and Rockefeller.

The Centers shape in large measure the agricultural research agenda for the world and have a profound influence on national level research in agriculture. The Centers generate basic research directed primarily at increasing crop yields which is then adapted by national research centers. It is rare indeed for a Center Director to concern himself with what might be viewed as a very user-oriented research perspective.

I first met Dr. Swaminathan in 1982 at the annual meeting of the Directors General of the International Agricultural Research Centers. I was giving a report with Barbara Knudson on some work which Jane Knowles, Susanna Lastarria, Susan Poats, and I were doing to engage the Centers' interest in Women in Development issues. Dr. Swaminathan, it turns out, had already taken the

leadership and was planning an international conference for the following year on the topic of Women in Rice Farming Systems. In 1983, I attended that conference of approximately 100 women from rice producing countries around the world. It was my experience of Dr. Swaminathan that prompted me to nominate him for this award. I heard his opening address and expected this would be the last we would see of him at the week-long conference. Instead, with his office down the hall and the demands of administering an international center tugging at him, he chose to spend most of every day in the conference room with us -- listening, contributing, and learning what the participants had to say about women and rice farming.

In the evening, he sat with a working group on his porch and searched with us for ways to overcome constraints faced by women in using the rice technology developed by IRRI. It was one of my few experiences of a man in a position of global influence being truly committed to WID at a deeper level than political expediency, and of publicly and continuously working on that issue. Dr. Swaminathan has labored tirelessly on this topic, with particular attention to the poor and landless women rice farmers in Asia. With the support of the Rockefeller Foundation, under the leadership of Dr. Joyce Moock, he was instrumental in organizing a seminar in March, 1985, on Women and Agricultural Technology to focus the attention of all of the Center Directors on WID issues in agricultural research. Earlier this month, he worked with the Ford Foundation and International Development Research Center of Canada to sponsor at IRRI a Project Design Workshop on Women in Rice Farming Systems. IRRI is the only international agricultural research center with two positions devoted to WID issues. Dr. Swaminathan is currently working with the national level agricultural

research networks throughout Asia to focus their attention on the impact of technological change on women in the rice sector.

I would like to quote from the paper² Dr. Swaminathan sent to us which he had presented at the IARC Seminar on Women and Agricultural Technology. In it he outlined three strategies for addressing WID in the IARCs: sensitization, studies, and scientific strategies.

"Within the CGIAR, steps to promote sensitization of all concerned could include the introduction of this item on the agenda for the Centers Week presentations and discussions every year, the incorporation of equity issues in the development of research priorities and strategies by Technical Advisory Committees, and the introduction of this item in IARC Annual Reports and in the terms of references to the quinquennial review missions of centers. While these steps can help to sensitize the higher level policy makers and research managers, they by themselves will not be adequate to generate the necessary motivation and appreciation at the working scientists' level. Therefore, each institute may develop an interdisciplinary and interdepartmental working group which could continuously analyze issues of this kind and reorient research strategies and priorities to the extent necessary to achieve the objective of the well-being of the family as a whole. The Program Committee of the Board of Trustees of each IARC could play a catalytic role in this process.

IARC research is a very small component of the total research efforts in progress for improving Third World agriculture. Therefore, the total impact of sensitization of IARCs on users' needs will be little, unless National Agricultural Research Centers are similarly influenced. Fortunately, IARCs are in a favorable position to accomplish this objective since they organize periodic seminars, conferences, and monitoring tours in addition to farming systems networks. All these mechanisms of interaction between scientists of NARS and IARCs should be fully utilized in the move for achieving a greater degree of understanding of the issues involved.

B. Studies and surveys:

Once there is appreciation of the concerns, the need for collecting precise data and for gaining meaningful insights into the problems arises. A carefully designed malady-remedy analysis will be necessary for assessing alternatives and priorities in technology development and transfer. For this purpose, social science institutions need to be linked up with national and international agricultural research systems. Much work on women and other types of users takes place in universities.

² "Role of International and National Agricultural Research Systems," Inter-Center Seminar on Women and Agricultural Technology, Bellagio, Italy, March 25-29, 1985.

or other research institutions outside of both NARS and CGIAR. The challenge before IARCs therefore is the development of effective networks with agricultural researchers and social scientists in LDCs, which can help to guide scientists, extension workers, and developmental administrators on methods of combining efficiency and equity in technology development and transfer.

There is a need to develop a problem-solving approach using multidisciplinary research teams and a variety of complementary research methods. The standard surveys should be supplemented with low-cost, rapid and imaginative ways of collecting reliable and relevant data. Some IARCs have already developed innovative procedures along these lines. There is also an urgent need for developing methods of studying the problems of men and women without assets (either land and/or livestock). A careful study followed by an objective analysis of the data collected is essential for rational decision-making by those engaged in the development and transfer of new technologies.

Suitable survey techniques will have to be developed which can help to reveal not only the consequences of new technologies on women specific occupations but also the constraints responsible for the inadequate transfer of relevant technologies to women. Efforts of banking institutions in the identification of credit-worthy occupations for women need study and monitoring. Public policy issues such as those relating to land and property ownership rights, credit supply, personnel policies of R&D institutions, etc. need particular attention. Above all, it is necessary to study the organizational and institutional aspects of input delivery and producer-oriented marketing.

C. Scientific strategies and programs

Since IARCs are primarily technology development institutions, it is essential that each research institute carefully consider its research priorities and programs from the users' perspective. For this purpose, the following questions will have to be asked:

1. Will technologies under development result in a reduction in drudgery and improvement in productivity and income?
2. Will they be labor displacing or will they result in labor diversification?
3. Will they result in equal benefits to both men and women or they have built-in seeds of sex discrimination?
4. Will they provide some flexibility in relation to timing, duration and place of work?
5. Will they help to make unskilled labor become skilled?
6. What steps are necessary to ensure that women managers and labor will benefit from new technologies?

The IARC social scientists should work with biophysical scientists to determine:

- o the package of technology most beneficial to users, taking account of sex-related differences in needs and constraints
- o the package of services including the delivery of knowledge, credit, and inputs with reference to their relevance and benefit to women users
- o the package of government policies in agrarian reform, rural development, credit, and marketing essential for conferring equal benefits on men and women farm managers and labor.

Unless socially sound technological packages are coupled with appropriate packages of services and government policies, the fruits of scientific work will not automatically accrue to women. Appropriate women's organizations will help both to promote attention on the special problems affecting women and to ensure the flow of benefits to them.

CONCLUSIONS

The scientific and social dimensions of this area (WID) of research are vast. In contrast, IARCs are now functioning at a near zero growth rate in terms of both budget and senior staff positions. Hence, there will be a justifiable temptation to take a defensive position in matters relating to user orientation in research priorities and strategies and plead that whatever each center is now doing represents an adequate response. It is essential that IARCs avoid a laissez faire approach and move positively and aggressively in the direction of assisting women dependent upon agriculture for their well being. This is particularly important in the context of the increasing emphasis placed by IARCs on attending to the problems of ecologically handicapped farming areas and economically disadvantaged farm families. It is precisely in such situations that the value of women's labor and income to household happiness and survival is immense.

How can IARCs help in generating greater opportunities for flexible and productive employment when most of them are not concerned with post-harvest technology and the off-farm employment sector?

An effective way of responding to this challenge is to capitalize upon IARCs' single most important asset, namely access to diverse scientific institutions and political systems. By the very nature of their functioning -- through networks, cooperative programs, monitoring tours, symposia and conferences, and training activities -- IARCs exert an influence on national research systems which far exceeds their budget or scientific capability and infrastructure. They have equal access to the knowledge and material pool in developed countries. "They can hence lead a positive movement of helping women, particularly belonging to small farmer and landless agricultural labor families, through the organization of workshops

which can help to compile a portfolio of research and training tasks for each major farming system and getting interested laboratories and scientists, both in developed and developing countries, to adopt specific tasks. In addition, they can set an example in involving women scientists to a greater extent in all aspects of technology development and dissemination."

Some of us hold the belief that the "hard" agricultural scientists are also hard to communicate with on WID issues. I'd like to point out that this is certainly not true in the case of Dr. Swaminathan. A plant geneticist, he received his first degrees from the Universities of Kerala and Madras and his doctorate in agriculture from Cambridge University.

I will close by mentioning some of the other distinctions awarded to Dr. Swaminathan. He holds honorary doctoral degrees from twelve Indian universities. He has published over 200 research papers in national and international journals and guided 50 students in Ph.D. thesis work. He developed the concept of national demonstrations in 1964 in order to enable scientists to directly test and demonstrate the validity of their experimental findings in farmers' fields. He was Director General, Indian Council of Agricultural Research and Secretary to the Government of India, Department of Agricultural Research and Education from 1972 to March 1979. From April 1979 until he went to IRRI, he was Secretary to the Government of India, for Agriculture and Rural Development, Minister of Agriculture and Irrigation. He was a Vice Chairman of the Technical Advisory Committee to the Consultative Group on International Agricultural Research. He received two awards from the President of India.

It is with deep affection and great pride that we recognize Dr. M. S. Swaminathan as a global leader, who is working with us to integrate WID into the world's agricultural agenda.

AWID Honors Swaminathan

Dr. M. S. Swaminathan, Director General of IRRI, received the Association for Women in Development Award for "outstanding contributions to the integration of women in development" at the Association's April meeting in Washington. In accepting the award for Dr. Swaminathan, Dr. C. Jean Weidemann of the Midwest Research Institute quoted from Swaminathan's address to the Bellagio meeting, part of which is excerpted below.

"It is essential that IARCs avoid a *laissez faire* approach (to women's issues) and move positively and aggressively in the direction of assisting women dependent upon agriculture for their well-being. This is particularly important in the context of the increasing emphasis placed by IARCs on attending to the problems of ecologically handicapped farming areas and economically disadvantaged farm families. It is precisely in such situations that the value of women's labor and income to household happiness and survival is immense.

How can IARCs help in generating greater opportunities for flexible and productive employment when most of them are not concerned with post-harvest technology and the off-farm employment sector?

An effective way of responding to this challenge is to capitalize upon IARCs single most important asset, namely access to diverse scientific institutions and political systems. By the very nature of their functioning—through networks, cooperative programs, monitoring tours, symposia and conferences, and training activities—IARCs exert an influence on national research systems which far exceeds their budget or scientific capability and infrastructure. They have equal access to the knowledge and material pool in developed countries. They can hence lead a positive movement of helping women, particularly (those) belonging to small farmer and landless agricultural labor families, through the organization of workshops which can help to compile a portfolio of research and training tasks for each major farming system and getting interested laboratories and scientists, both in developed and developing countries, to adopt specific tasks. In addition, they can set an example in involving women scientists to a greater extent in all aspects of technology development and dissemination.

While action on the above lines is feasible and should be taken, it is important to recognize that science is not a magic wand with which sex inequalities in workload and economic returns can be made to vanish. This should be emphasized clearly as otherwise false hopes will be aroused about the capacity of science and technology to remove deep-seated social maladies.

In the ultimate analysis, it is only the concern, commitment and concerted action of national agricultural research systems and policymakers that can lead to meaningful results in imparting a users' perspective in research priorities and strategies. The major role of IARCs should be to trigger a self-propelling and self-replicating pattern of involvement of NARS in R&D efforts designed to give equal attention to the needs of men and women farmers and agricultural labor. Prospects of external funding should not be the main motivating factor for the participation of NARS in networks or studies in this field. There are numerous examples to show that involvement without conviction and commitment leads to the collapse of bilateral or multilateral donor-aided programs when the external input is withdrawn. Enduring benefits will result only when a proper blend of political will, professional skill, and people's participation is achieved within each country."

CAS

中国科学院

CHINESE ACADEMY OF SCIENCES

October 13, 1992

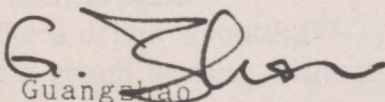
Dr M.S. Swaminathan
M.S. Swaminathan Research Foundation
14, Second Main Road
Madras--600085, India

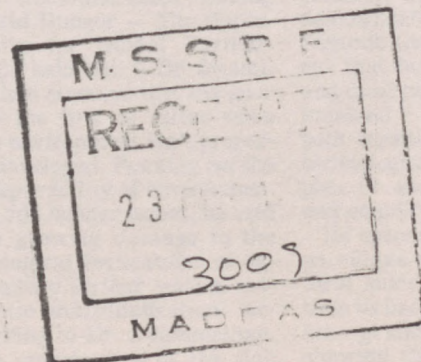
Dear Dr Swaminathan:

The Qianxian Biovillage, Yuanshi County, Hebei Province has been developing favourably under the auspices of the Chinese Academy of Sciences in the past one and half years. During that period it is very kind of you to have sent 5 scientists, namely, Dr. S. Rajaram, Dr Vineeta Hoon, Dr E. Agergaard, Dr. K Nair and Dr. R. Hopper to Qianxian Biovillage to help working with us, thus greatly pushing forward the biovillage programme. I would like to express our sincere thanks to you.

In order to make Qianxian biovillage grow into a successful model and a training base for China and for other parts of the world, your assistance and support is still needed. I hereby would like to ask you to be the Chief Adviser for the biovillage programme in China and it is my hope that you will accept this offer. Looking forward to hearing from you.

Yours Sincerely,


Zhou Guangshao
President



Hunger fighter never ceases

Inspired by Gandhi, Indian works to halt famine

By RITSUKO NAKAMURA
Staff writer

Nearing the end of his hectic schedule, Dr. Monkombu S. Swaminathan (67) was very tired on his last night in Japan. And although he had an early morning flight back to India the next day, he willingly accepted the abrupt request for an interview, confessing, "I like media. They can spread the messages and influence the public to make the world better. Very powerful."

Born into a family of medical doctors, he once intended to study medicine. But after witnessing the disastrous scenes of the 1943 Bengali Great Famine, his interest shifted to agriculture and technology, tools with which he dreamt to eliminate hunger in India and make uniform nutrition standards a basic human right.

After graduating from Cambridge University in 1952 with a doctorate in agriculture, he committed himself to agricultural and genetic research. His work helped end India's once chronic famine and stimulated a remarkable



Dr. Monkombu S. Swaminathan PHOTO BY RITSUKO NAKAMURA

rise in agricultural production. He was appropriately dubbed the "father of the Green Revolution."

He has been an Honorary Fellow of the National Academy of Science in India since 1976. He served as secretary at the Ministry of Agriculture and Irrigation, and as director general of the International Rice Research Institute in the Philippines.

Currently, he holds several titles such as chairman of Center for Research on Sustainable Agricultural and Rural Development, president of

the International Union for Conservation of Nature and Natural Resources and board of directors of the Hunger Project.

His devotion to world hunger has been widely recognized and he has received a number of awards including the Albert Einstein World Science Award and the First World Food Prize. This year he is to be nominated for the Nobel Peace Prize.

Although he wears many hats, everything is very organized in the head of Dr. Swaminathan. His work consists of three main parts, he says. The first goal is to produce more food. The second, to educate young people and farmers (he has helped more than 60 students get doctorate degrees). The last is to protect the environment.

"I was inspired by Gandhi," he said, answering the question what motivates him, "and by his principles such as 'For those who are hungry, God is bread,' and 'The earth has enough for everybody's need but not for everybody's greed.'"

Two years ago, he added another title to his long career record when he became chairman of the International Society for Mangrove Ecosystems (ISME). Mangroves function as a natural barrier against wind, waves and sand and also as a source of food and fuel for people in the tropics. But mangroves' important role was only recently realized after many had been damaged or lost completely.

At a seminar titled "Ending World Hunger — The Opportunity for Global Partnership" held Oct. 5, Dr. Swaminathan stressed that the poor are the first to suffer when the environment isn't properly developed. Pointing out the inseparability of environmental and hunger issues, he said the growing damage to the ecological foundations of agriculture further widens economic marginalization. According to Dr. Swaminathan, the polarization of the rich and the poor is the main cause of existing hunger.

Another important item on Dr. Swaminathan's agenda in Japan was taking part in the Oct. 2 press conference announcing ISME's cooperation with the production of Masashi Yamamoto's film "Kumagusu."

More than a year ago, director Yamamoto ("What's Up Connection," "Robinson's Garden") began to work on a film about the life of 19th century naturalist and biologist, Kumagusu Minakata. Kumagusu's reputation as an internationally minded scholar with an encyclopedic knowledge of many academic subjects has recently inspired "Kumagusu genso," a phenomenal interest in him.

Unfortunately, the shooting of "Kumagusu" was halted mid-way, due to a lack of funds. However, with the blessings of ISME and Dr. Swaminathan, it was announced that production work would resume and the collaboration's goal would be twofold: to raise not only funds for both ISME and the "Kumagusu" production, but also the public's awareness of environmental issues.

Director Yamamoto jokingly said at the recent press conference that the common thing between mangroves and the "Kumagusu" production is that both are on the verge of extinction. In fact, he's still unsure when, or even if, the film will be completed.

Dr. Swaminathan sagely commented "We shouldn't be overly ambitious. We just do our duties even though they only make a small change." And for someone whose ultimate goal is to create a world without hunger, Dr. Swaminathan knows about ambition and patience.

He also knows the virtues of global cooperation. At the seminar, he urged Japan to demonstrate at the 1995 U.N. Summit (its 50th anniversary) that hunger, "the oldest and most persistent foe of humankind," can be solved by both traditional and modern technologies based on principles of ecology, economics and equality.

He spends most of his time on village work and agricultural study. With what little time he has left, he plays with his grandchildren. While showing the pictures of his grandchildren, he said, "That's my trouble — I don't have enough time!" But in his loving, grandfatherly expression, one finds perhaps the true motive of his devotion: He's staying busy to make a better world, not only for us, but also for the next generation.

HAIKU MOMENTS

Translated with comments
By KRISTEN DEMING and KŌJI SUZUKI

A mantis stands
Like a driver shouting
At a coach leaving without him.

螳螂は	Tōrō wa
馬車に逃げられし	Basha ni nigerareshi
取者のさま	Gyosha no sama

中村 草田男 Nakamura Kusatao

The season word for autumn is *tōrō* (a mantis).

The point of interest lies in the aptness of the figure of speech. A driver would be astounded and quite at a loss to see his horse-drawn coach suddenly leaving without him. What the poet wants to convey is that the characteristic pose of a mantis — as though startled, waving its long arms in alarm — makes us imagine a driver in such an embarrassing situation.

In English, a mantis has another name, "rear-horse" meaning "rearing horse." The name has some similarity to the image in the poem. However, in this case, the image conceived would not be a driver, but the figure of a horse standing on its hind legs.

The IRRI Reporter

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Swaminathan is first laureate of General Foods World Food Prize

The first General Foods World Food Prize was presented to M. S. Swaminathan, director general, IRRI, in ceremonies at the Smithsonian Institution in Washington, D.C., on 6 Oct 1987.

James L. Ferguson, chairman of the Executive Committee of General Foods Corp., presented the prize, which consists of a \$200,000 cash award and a commemorative sculpture.

The prize was conceived by Norman E. Borlaug, 1970 Nobel Peace Prize laureate, to recognize, encourage, and reward outstanding individual achievement in improving and increasing the world food supply. Another purpose of the prize is to attract talented, creative, and dedicated

young people to careers in the complex and challenging systems of food and agriculture. It is financed by the General Foods Fund, Inc., a foundation funded by General Foods.

Swaminathan announced that he would use the cash award to foster farmer-scientist partnerships to develop an integrated approach to biological and social engineering applied to technological development and diffusion under small-farm conditions.

Commendation letters

Many of the world's scientific and political leaders sent commendation messages. Several of them are excerpted here.

"Dr. M. S. Swaminathan . . . is a living legend. . . His contributions to agricultural science . . . have made an indelible mark on food production in India and elsewhere in the developing world. By any standards, he will go into the annals of history as a world scientist of rare distinction. . ."

— Javier Perez de Cuellar
Secretary General, United Nations

"This award recognizes what many in the global food and agricultural community have known for a long time—that your efforts have made a dramatic and lasting impact on improving world food supply. . . You can be proud of these accomplishments as well as the dignity and self-reliance



M. S. Swaminathan, director general, IRRI, receives the General Foods World Food Prize from James L. Ferguson, chairman, Executive Committee of General Foods Corp., at ceremonies in Washington, D.C. on 6 October 1987. Swaminathan is the first recipient of the prize, which recognizes individual achievement in improving and increasing the world food supply.



M. S. Swaminathan, first laureate of the General Foods World Food Prize (extreme right) posed for this picture with administrators of the prize before the award ceremonies. From left are James L. Ferguson, chairman, Executive Committee of General Foods Corp.; Al Clausi, chairman, Council of Advisers of the prize; Norman E. Borlaug, 1970 Nobel Peace Prize laureate, who conceived the World Food Prize; and Swaminathan. The General Foods World Food Prize is funded by the General Foods Foundation, a philanthropic foundation financed by General Foods Corp.

you have helped to bring to the people
you have served. . . ."

— Ronald Reagan
President, United State of America

"Of all the problems which the people
of our world must tackle, none is more
fundamental than insuring adequate
food supplies. . . . To make a difference
in the world's capacity to feed itself is
indeed an awesome accomplishment. . . .
I am especially glad that this recognition
comes when you are still actively at
work. . . . May your efforts continue to
be as productive and vital as they have
[been] to the present."

— Frank Press
President, US National
Academy of Sciences

"You certainly merit this award
because of your great enthusiasm and
engagement for the cause of improving
the situation of the poor."

— Dieter Bommer
Chairman, German Council for Tropical
and Subtropical Agricultural Research

NAST honors Swaminathan

On 6 November, the National Academy
of Science and Technology of the
Philippines (NAST) held a special
convocation to honor Swaminathan as
the first laureate of the World Food
Prize.

The convocation was held at the
Philippine Council for Agriculture,
Forestry, and Natural Resources
Research and Development in Los
Baños.

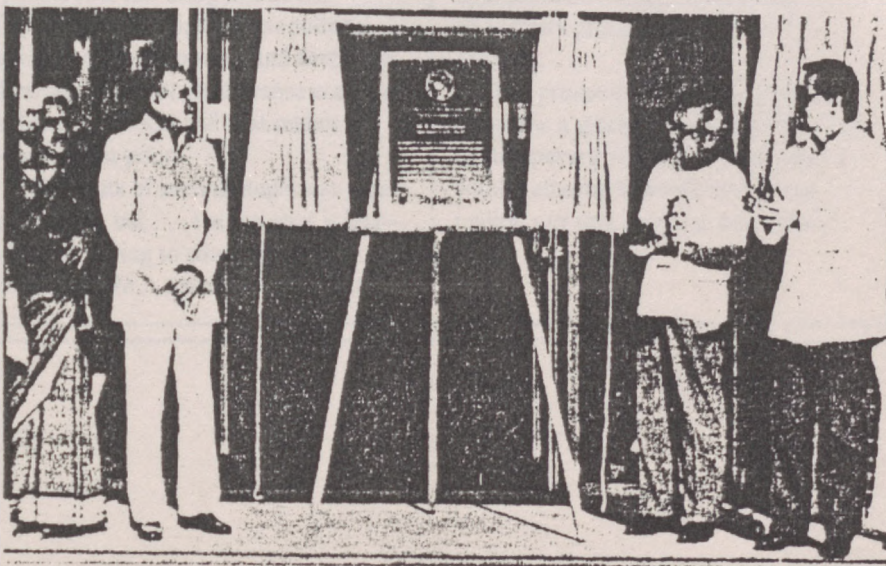
Golden Heart Award to MSS



Philippine President Corazon C. Aquino presented the Golden Heart Presidential Award to Dr. M. S. Swaminathan, director general, IRRI, on 10 November 1987 in a special ceremony at Malacañang Palace. Among the achievements President Aquino cited were Swaminathan's role in strengthening IRRI as a source of knowledge and expertise to further agricultural science, his support in the establishment of the Philippine Rice Research Institute, the initiation of Technology Transfer Workshops for the exchange of ideas and information between the Philippine Department of Agriculture and IRRI, and the expansion of IRRI's capacity for upstream research to bring the fruits of recent advances in science and technology to Asian rice farmers.

Swaminathan Hall dedicated

The IRRI Board of Trustees has named the
Training and Technology Transfer Center as M. S.
Swaminathan Hall, in honor of IRRI's director
general from 1982 to 1988. The Trustees also
established a special fund in honor of Swami-
nathan to provide fellowships to scholars to work
on technologies for women farmers and farm
laborers. From left are Mina Swaminathan,
Swaminathan, Prof. Kenzo Hemmi, chairman,
IRRI Board of Trustees, and Carlos G. Dominguez,
Philippine Secretary of Agriculture and vice-
chairman of the IRRI Board.



Resistance to change perpetuates hunger

When M. S. Swaminathan, director general, IRRI, accepted the General Foods World Food Prize in Washington, D.C., on 6 October 1987, he used the occasion to focus on the irony of hunger in the midst of plenty. "Why," he asked, "have all of our intellectual, technological, financial, and spiritual resources failed to find a solution. . . .?" Highlights from Swaminathan's acceptance remarks suggest answers to that question.

"In no other area of human need and endeavor is there so much global interdependence as in agriculture. Yet the urban public seldom recognizes that we live in this world as guests of green plants, and of the farmers, who cultivate them.

"Experience shows that countries that take farmers and farming for granted come to grief sooner or later. . . . Complacency is creeping into the thinking of many planners and political leaders as they establish the priority accorded to the farm sector in national development plans. . . .

"Globally speaking, reserves of food grains, milk powder, and butter are growing daily. Simultaneously, the number of children, women, and men who go to bed hungry is also increasing. . . . Why?

"If statesmen who determine national policies and priorities would all become

conversant with food production and equitable distribution, hunger could be made a problem of the past sooner than otherwise would be possible. . . .

"Sixty years ago, Mahatma Gandhi said: 'It would . . . save a great deal of time and trouble if we cultivate the habit of never supporting resolutions . . . if we had not either the intention or the ability to carry them out.' I wish that this would become the guiding principle for government representative speaking in national and international forums. . . .

"The elimination of hunger and its real cause, poverty, should be at the top of the human agenda for common action. Unfortunately, the well-fed do not seem to be very concerned with the hunger of other people. . . . Most people fear that 'if others get more, I will get less'. . . .

"If we are really serious about eliminating hunger, we have to overcome the resistances to a change in systems that can bring this about. Economic interests, the sociopolitical interests of small groups, and sometime sheer ignorance or indifference combine to form a political will that makes the poor remain poor.

"The roots of such attitudes are many and varied, but . . . the tap root is fear—a fear of having to share power and resources. We . . . need to show that

helping the weak to become strong solidifies the whole community. . . .

"In most developing countries, a vertical growth in productivity and a higher intensity of cropping are the two major pathways through which the additional food needed will have to be produced. Many of them . . . have the capacity to increase both yields and cropping intensity with current technology. . . . small farmers have been able to double the average yields in several countries with chronic food shortages. . . .

"The quality of life of small farmers can be improved only through higher efficiency in the use of the land, water, labor, and credit resources available to each family. . . . However, a small farm family suffers from many economic and social handicaps. . . . These are problems which can be solved only by political leaders.

"Thus, scientists should bring the best in science and technology to upgrade, on a sustainable basis, the productivity of small farms. Political leaders and administrators should ensure that all farmers profit from new technologies. . . .

"The prospect for a world without hunger is a glorious legacy given to our contemporary world. . . . Until such a wholly attainable world becomes a reality, our task remains unfinished."

INTERNATIONAL RICE RESEARCH INSTITUTE

P.O. Box 933
Manila, Philippines
Telephone: 88-48-69
88-83-51 to 53

Cable: Ricfound Manila
Telex (ITT) 45365 RICE PM
40890 RICE PM
(RCA) 22456 IRI PH
(EASTERN) 63786 RICE PN
FAX: 63-2-8178470

August 18, 1988

Dear Dr. Swaminathan:

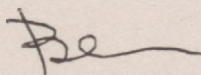
Belated happy birthday!

MSS Well #6 was inaugurated two weeks ago. This is located near Block E just outside the fence of IRRI. The well serves only around 10 families but we decided to do something about it since it is very near IRRI and it is the area where Tissue Culture and Plant Physiology people bring their Christmas bags. The AFSTRI officials came to inaugurate the well together with Dr. Pathak. It is actually an existing well but it was almost delapidated and the people had difficulty pumping water. We reconditioned the well and changed the pump. The people requested that the pump should have a gadget so that they can use the well for irrigating their plots of vegetables and ornamental plants.

MSS Well #7 was finished yesterday and we will inaugurate it sometime middle of September since we are very busy with the coming meetings for the China-IRRI and the Think Tank first week of September. I am in charge of both meetings and we are very busy preparing for it. The MSS Well #7 is quite far from the main road. You have to walk across the town cemetery, cross a small river and walk for another half a kilometer. The area has around 20 families. On the way to the area we met an old couple and the man was carrying two empty plastic bottles. We stopped them to inquire about the dead well we heard in their community. The old man happened to be on his way to go to the cemetery to fetch drinking water which is more than a kilometer from their house and he also happened to be the headman in that community. He told us that the community contributes monthly for the maintenance of the well that they have. Unfortunately the well went dry and the contribution was not sufficient to put up a new well. The people there have to get their drinking water in the cemetery and use the river water for their washing purposes. This is okay during the rainy season but during the dry season the river dries up. We had to dig a new well and deeper than the old one to get water. Fortunately in Los Banos it is not difficult to get water if we dig deep enough.

This is probably the last well. Both Bill and I were very fortunate to have had the opportunity to work on these wells in your name and also to serve the community.

Sincerely yours,



B.S. Vergara
Plant Physiologist

Dr. M.S. Swaminathan
B-4/142, Sasdarjang Enclave
New Delhi 1100 29, India

cc: Bill Smith



**COMMONWEALTH
SECRETARY-GENERAL**

H. E. Chief Emeka Anyaoku, C.O.N.

28 August 1996



Jean Dr Swaminathan

Iwokrama International Centre: Board of Trustees

As you know, following the eighth and final meeting of the interim Board of Trustees in Georgetown in May, Iwokrama's successor Board is being constituted. Article 11.1(a) requires the President of Guyana and the Commonwealth Secretary-General to appoint jointly the Chairman of the Board.

With President Jagan's agreement, I am now writing to invite you to serve as Chairman of the Board for an initial period of three years, as provided in Article 11.2 of the Iwokrama Agreement, starting from 16 September 1996.

President Jagan and I think you have made an outstanding contribution to the Iwokrama Programme's conception and subsequent development since 1990. Thanks to your chairmanship of the interim Board, the Programme has made substantial progress. We are confident that the new Board will derive great benefit from your skilful leadership and guidance as the Programme now enters a new and crucial phase in its development.

Dr M S Swaminathan

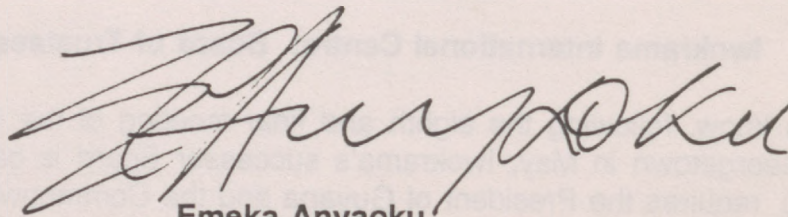
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TEL: Switchboard (44) 0171 839 3411 Direct Line (44) 0171 747 6103
FAX: (44) 0171 930 2299 CABLES: COMSECGEN LONDON SW1 TELEX: 27678

We hope you will be able to accept this appointment and look forward to hearing from you as soon as possible.

Yours Sincerely



Emeka Anyaoku

Dr M S Swaminathan
Chairman, M S Swaminathan
Research Foundation
3rd Cross Street, Taramani
Institutional Area
Madras 600113, India
Fax: 00-91-44-235-1319

cc H E Dr Cheddi Jagan MP
President of Guyana
Takubu Lodge
254 South Road
Georgetown, Guyana
Fax: 592-2-63395



United Nations Educational, Scientific and Cultural Organization
Organisation des Nations Unies pour l'éducation, la science et la culture
Organización de las Naciones Unidas para la Educación, la Ciencia y la Cultura

7, place de Fontenoy
75352 Paris 07 SP

Tel : +33 (0)1 45 68 10 00
Fax : +33 (0)1 45 68 55 55

The Director-General

21 OCT 1999

Reference: DG/2.4/99.233

Dear Professor,

I am pleased to inform you that in recognition of your outstanding work in extending the benefits of biotechnology to marginalized and poverty-stricken populations in developing countries, and in securing a sound basis for sustainable agricultural, environmental and rural development, I have decided to award you the *UNESCO Gandhi Gold Medal*.

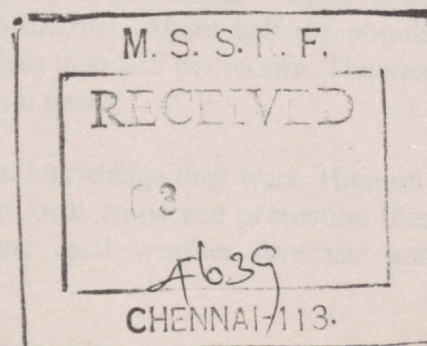
The Medal will be presented on Monday, 8 November 1999 during the 30th session of UNESCO's General Conference, in Paris. You will shortly be contacted for all practical arrangements relating to the award ceremony.

I very much hope that you will be able to attend the ceremony in person and look forward to seeing you then.

Yours sincerely,

Federico Mayor

Professor M.S. Swaminathan
Chairholder
M.S. Swaminathan Research Foundation
c/o Le Parker Meridien
118 West 57th Street
New York
United States of America



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PIONEER OF THE GREEN REVOLUTION FIGHTS POVERTY WITH THE INTERNET

Budapest, 29 June - M. S. Swaminathan, who helped harness emerging biotechnology techniques in the 1960s to bring about a Green Revolution to alleviate poverty in rural India, is applying a similar strategy again, this time using the Internet. In an address at the opening of the World Conference on Science (WCS) in Budapest on 26 June, he said that "new technologies supported by appropriate services and public policies have helped prove the doomsday predictions wrong". And while the agricultural ('Green') revolution "is becoming one of the most significant of the scientific and socially meaningful revolutions of this century", Swaminathan holds out a similar hope for the Internet. His goal today is much the same as thirty years ago - to bring the latest scientific advances into the poorest communities to help overcome the poverty and malnutrition that divide humankind.

For Swaminathan, "time is running out in many developing countries. There is enormous poverty and social disintegration. According to the Oslo Peace Research Institute, of the over 90 intra-national conflicts in the last eight years, most are related to economic reasons of poverty, unemployment and despair". And, he says, the potential for scientific knowledge is not being used to change this picture. "The new social contract between science and society, the main theme of this conference, is not happening in most of the developing world".

One of the most serious problems, he says, is the 25% - 50% of children born with low birth weight in developing countries. Where it does not kill, this under-nutrition hampers "the full expression of innate genetic potential for physical and mental development", further limiting possibilities for change through the acquisition of knowledge, even if that knowledge were to be delivered.

In the 1960s the Green Revolution took high-yield hybrid strains of wheat produced by new gene transfer technology and planted them in the poorest farms with the lowest yield. The experiment paid off. While wheat production had reached 7 million tonnes at the end of colonial rule in 1947, production based on the new strains rose from 10 to 17 million tonnes between 1964 and 1968. "Four thousand years of progress was repeated in four years", says Swaminathan. And from 1998 to 1999, wheat production in India exceeded 70 million tonnes, a ten-fold increase in 50 years.

The research behind this Green Revolution earned Swaminathan over \$500,000 in science prizes, which he decided to plough back into alleviating poverty and malnutrition among the poor, again using the latest technology. Founded about eight years ago, his M. S. Swaminathan Foundation (MSSF) is now setting up experimental Village Knowledge Centres in twenty isolated rural villages, using the Internet. About half the population in many of these villages has a total family income of less than \$25 per month. The idea of the project is to bring knowledge on demand to meet local needs.

Project volunteers first poll villagers to find out what knowledge they want. High on the list are women's health information, advice on growing local crops and protecting them from diseases, the daily market prices for these crops, local weather forecasts and clear

information about the welfare programmes the Indian government provides to aid poor families. This information, together with targeted dietary information, based on an analysis of local nutrition deficiencies, is then entered into databases in a dedicated World Wide Web site. Most important, the information is presented in local languages. Telephones are rare in these rural areas, so access to the Web site is community-based. And where a village is not connected to the electricity grid, renewable energies can be used to power the project computer.

To take part in the project, each village has to provide a room to house the computer as well as the salaries of trained women officers. The choice of women is also a deliberate strategy to redress the "feminisation of poverty", through technological empowerment, as recommended at the 1995 Fourth World Conference on Women, held in Beijing (China). "Women", says Swaminathan, "are the poorest of the poor, being both socially and economically handicapped". The Village Knowledge Centres, he says, have already proved "a tremendous source of empowerment. The project has opened up a new world and has increased self-esteem of these women".

Now, says Swaminathan, China and countries in some other developing regions, such as West Africa, are interested in setting up similar schemes. But his project has also had an unexpected impact at the leading edge of science and Internet use. Drawing on the experiences of the Village Knowledge Centres, Bruce Alberts, President of the US National Academy of Science (NAS), told WCS delegates that he sees the Internet as a means for scientists to "step outside the lab and to interact with ordinary citizens. While the public needs a better understanding of science", he says, "scientists also need a better understanding of the public".

Managed by the US Office of Public Understanding of Science, the NAS Beyond Discovery (<http://www4.nas.edu.beyond.beyonddiscovery>) Web site is one attempt to achieve this. In a collaboration between professional science writers and prominent scientists, the site posts a series of case studies on the Web on important applications arising from basic scientific research. The information is free of copyright, said Alberts, inviting developing countries to make use of the material. He sees this project as just a first step towards a "global electronic network that connects scientists to people at all levels". While end-users like farmers and village women may access the scientific and technical knowledge they need to solve local problems, they can also feed information back to scientists.

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Swaminathan's Contributions to Gender Equity in Technology Development and Dissemination

From: Susan V Poats, 1991, The role of gender in agricultural development, Issues in Agriculture 3, Consultative Group on International Agricultural Research, Washington, 63 pp.

The International Rice Research Institute (IRRI) is the leader in engendering agricultural research and development. The cornerstone of IRRI's focus on women and gender issues is the Women in Rice Farming Systems (WIRFS) program. WIRFS traces its history to IRRI's 1983 Women in Rice Farming Conference organised by Dr M S Swaminathan, within a year after he became the Director General of IRRI.

"It is no coincidence that WIFRS developed during IRRI's leadership by Dr M S Swaminathan. Long committed to both gender staffing and gender analysis in research, Dr Swaminathan provided the young WIRFS with guidance, as well as insulation during the time it needed to become established. The critical role of such a "guardian angel" during efforts to institutionalise new approaches is recognised in development literature and was the key to the acceptance of WIFRS by IRRI scientists".

No wonder, the Association for Women in Development (AWID), Washington, DC, USA chose Dr Swaminathan for their first award for outstanding contributions to the integration of women in development in 1985. The President of AWID, Dr C Jean Weidemann, while presenting the award, mentioned. "In the evening during a Conference on Women in Rice Farming Systems held at IRRI in 1983, Dr Swaminathan sat with a working group on his porch and searched with us for ways to overcome constraints faced by women in using the rice technology developed by IRRI. It was one of my few experiences of a man in a position of global influence being truly committed to WID at a deeper level than political expediency or publicity, and continuously working on that issue. Dr Swaminathan has laboured tirelessly on this topic, with particular attention to the poor and landless women rice farmers in Asia. It is therefore with deep affection and great pride that we recognise Dr M S Swaminathan as a global leader, who is working with us to integrate WID into the world's agricultural agenda".

Professor M S Swaminathan First Recipient of the World Food Prize

Professor M S Swaminathan described as 'a living legend' by Mr. Javier Perez de Cuellar, the former Secretary General of the United Nations, is one of the leading agricultural scientists in the world. He is the first recipient of the World Food Prize in 1987 - the most prestigious international award in the field of agriculture which honors outstanding individuals who have contributed toward the improvement of the world food supply.

Professor Swaminathan was born in the state of Tamil Nadu in India. He obtained a B.Sc. from both the Travancore and Madras Universities, and in 1952 he received a Ph.D. in genetics from Cambridge University. He has since worked on various problems in the field of agriculture and has made major scientific discoveries, which have served as pioneering solutions to many agricultural problems in Asia. He was the first to introduce high-yielding varieties of wheat and rice in India - thus playing a key role in the country's 'Green Revolution' between 1960 and 1982. He also standardized the techniques for the induction of polyploidy in some economic plants, elucidated the factors influencing the induction and recovery of mutations in wheat and rice, identified the barriers to high yields in wheat, and initiated the wheat breeding program involving the 'Norin' dwarfing genes from Mexico. Professor Borlaug who won the Nobel Peace Prize in 1970, credited Professor Swaminathan for recognizing the potential value of the dwarfing genes with the following words: 'The green revolution has been a team effort and much of the credit for its spectacular development must go to the Indian officials, organizations, scientists and farmers. However, to you, Dr. Swaminathan, the great deal of credit must go for first recognizing the potential value of the Mexican dwarfs. Had this not occurred, it is possible that there would not have been a green revolution in Asia.'

Professor Swaminathan has held various prestigious positions. He was the Director General of the Indian Council of Agricultural Research, and Secretary to the Government of India, Department of Agricultural Research and Education from 1972 to 1980. He has served as the Director General of the International Rice Research Institute in Los Banos, the Philippines, from 1982 to 1988. The Philippines president awarded him the Golden Heart Presidential Award in 1987 for his contributions in resolving a wide range of problems in basic and applied genetics and agricultural research and development in the country. Professor Swaminathan was also the Chairman, United Nations Advisory Committee on Science and Technology for Development from 1980 to 1983; President, International Federation of Agricultural Research Systems for Development (IFARD) from 1976 to 1983; President, International Bee Research Association (IBRA) from 1978 to 1990; Independent Chairman, Food and Agricultural Organization from 1981 to 1985; Chairman, Governing Board, CAB International from 1991 to 1994; Andrew D White Professor-at-Large of Cornell University from 1989 to 1995; and Trustee of the Fort Foundation from 1989 to 1997. He has also been actively involved in numerous organizations devoted to nature conservation and sustainable development. Professor Swaminathan who is a Fellow of the Royal Society of London, the US National Academy of

Sciences, Indian National Academy of Sciences, Chinese Academy of Sciences, Russian Academy of Agricultural Sciences, was the President of the Indian National Academy of Sciences (1988 to 1990), and President of the Indian National Academy of Agricultural Sciences (1991 to 1996).

In recognition of his outstanding contributions, he received the following awards from the Indian President - the Padma Shri award (1967), the Padma Bhushan award (1972), and the Padma Vibushan award (1989). He also received the Mendel Memorial Medal from the Czechoslovak Academy of Sciences in 1965; Ramon Magsaysay Award for Community Leadership in 1971; Bennett Commonwealth Prize from the Royal Society of Arts in 1984; Bicentenary Medal from the University of Georgia in 1985; and the Albert Einstein World Science Award by the World Cultural Council in 1986. In 1991 Professor Swaminathan received the Tyler Prize for Environmental Achievement and also the Honda Prize from the Honda Foundation in Tokyo. In 1994 he received the Asian Regional Award from the Asian Productivity Organisation, the Sasakawa Environment Prize, and a special award from the World Academy of Art and Science. The Climate Institute in Washington DC awarded him with the Global Environmental Leadership Award in 1995. In 1997 he received the highest award for International Cooperation on Environment and Development from China. He also received the *Ordre du Merite Agricole* in France in 1997. This award was created in 1883 to honor persons who have rendered services of the highest quality to the cause of agriculture and its development and amelioration. In 1998, the Board of Trustees of the Missouri Botanical Garden awarded him the Henry Shaw Medal for his services to humanity through the emphasis on sustainability in agriculture.

Professor Swaminathan has been awarded honorary degrees by many universities in the world including the Technical University of Berlin, University of Wisconsin in Madison, University of the Philippines in Quezon City, the Agriculture University in Wageningen, The Netherlands; North Eastern Hill University in Shillong, USA; University of Bologna in Italy; and the Hebrew University in Jerusalem. Besides this, numerous universities in India have also awarded him with honorary degrees. In 1996, UNESCO designated him as the UNESCO-Cousteau Professor in Ecotechnology for Asia.

Professor Swaminathan, is currently the UNESCO Chair in Ecotechnology and Chairman of the MS Swaminathan Research Foundation, which is an institution devoted to strengthening the ecological security of coastal areas and the livelihood security of rural and tribal communities. In 1996, the institution was the first in Asia to receive the Blue Planet Prize.

'Dr. Swaminathan is a living legend. His contributions to agricultural science have made an indelible mark on food production in India and elsewhere in the developing world. By any standards he will go into the annals of history as a world scientist of rare distinction.'

Mr. Javier Perez de Cuellar, former Secretary General of the United Nations

Selected publications:

1. Swaminathan MS (1950). Einige Verfahren für die Verwendung wilder *Solanum* arten zu zuchtzwecken, *Zuchter* 20: 358-360.
2. Swaminathan MS (1995). Agriculture, food security and employment: changing times, uncommon opportunities. *Nature and Resources*, UNESCO. Vol. 31(1): pp. 2-15.
3. Swaminathan MS (1998). Crop production and sustainable food security. In: *Crop Productivity and Sustainability - Shaping the Future*, Proceedings of the Second International Crop Science Congress, ed. by VL Chopra, RB Singh, and Anupam Varma (Oxford & IBM Publishing Co. Pvt. Ltd., New Delhi) pp. 3-18.
4. Swaminathan MS (1998). Science and Food Security: Contemporary Issues. World Science Report (UNESCO Publishing, Elsevier, France) pp. 248-259.
5. Swaminathan MS (1996). Sustainable Agriculture: Towards an Evergreen Revolution (Konark Publishers Pvt. Ltd., Delhi) p. 232.
6. Swaminathan MS (1996). Sustainable Agriculture: Towards Food Security (Konark Publishers Pvt. Ltd., Delhi) p. 232.

Ceremoniously Conferred on
Prof. M. S. SWAMINATHAN

Worldknown agriculture scientist & pioneer of
green revolution for his dutiful services and for
dedicating his life for prosperity of the nation.

on the 81st death anniversary of

Lokmanya Tilak

1st August 2007

Trustee

Lokmanya Tilak Smarak Trust



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Lokmanya Tilak Award 2001



This Award is honourably and
Ceremoniously Conferred on

Prof. M. S. SWAMINATHAN

Worldknown agriculture scientist & pioneer of
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1st August 2001

Trustees
Tilak Smarak Trust



TAMIL NADU AGRICULTURAL UNIVERSITY
BEST ALUMNUS AWARD FOR THE MILLENNIUM-2000

CITATION

The "TNAU BEST ALUMNUS AWARD FOR THE MILLENNIUM-2000" is awarded to Prof. Dr. M.S. Swaminathan for his outstanding contribution in the field of Agriculture and Environment.

Prof. Swaminathan was born in 1925 at Kumbakonam in Tamil Nadu. He has graduated from Travancore University in 1944, obtained his Bachelor's degree in Agriculture from the then Agricultural College and Research Institute under the Madras University in 1947, his Associateship of the Indian Agricultural Research Institute, New Delhi in 1949 and his Ph.D. degree from the School of Agriculture, University of Cambridge, United Kingdom in 1952. He started his career as Rice Breeder, CRRRI, Cuttack. He was the Director, IARI, New Delhi and held the highest position of the country in Agriculture as Director General, ICAR and Secretary DARE. He was elevated to the International position as Director General of International Rice Research Institute, Los Banos, the Philippines and currently he is the Chairman of M.S. Swaminathan Research Foundation, Chennai which is one of the World famous Institute contributed a lot to the people of India and International groups on Environment and Agriculture.

Prof. Swaminathan has been acclaimed by TIME magazine as **one of the twenty most influential Asians** of the 20th Century and one of the only three from India, the other two being the Father of the Nation, Mahatma Gandhi and the great poet and Noble Laureate Rabindranath Tagore. Prof Swaminathan has been described by the United Nations Environment Programme as "**The Father of Economic Ecology**" and by Javier Perez de Cuellar, Secretary General of the United Nations, as "**A living legend who will go into the annals of history as a world scientist of rare distinction**". He was the Chairman of the UN Science Advisory Committee set up in 1980 to take follow-up action on the Vienna Plan of Action. He has also served as Independent Chairman of the FAO Council and the President of the International Union for the Conservation of Nature and Natural Resources.

A Plant Breeder by professional training, Prof. Swaminathan's contributions to the agricultural sciences of India have led to his being widely referred to as the scientific leader of the green revolution movement. His advocacy of sustainable agriculture leading to an ever-green revolution makes him an acknowledged world leader in the field of sustainable food security. The International Association of Women and Development conferred on him the first international award for significant contributions to promoting the knowledge, skill, and technological empowerment of women in agriculture and for his pioneering role in mainstreaming gender considerations in agriculture and rural development. Prof. Swaminathan was awarded the **Ramon Magsaysay Award** for Community leadership in 1971, the **Albert Einstein World Science Award** in 1986, and the prestigious **First World Food Prize** in 1987 which was awarded to him in USA by the former President of US Mr. Ronald Reagan. The recent prestigious award received by Prof. Swaminathan was the **Indira Gandhi Prize for Peace, Disarmament and Development**.

Prof. Swaminathan is a Fellow of many of the leading Scientific Academies of India and the world, including the Royal Society of London and the U.S. National Academy of Sciences. He was the Founder President of Indian National Academy of Agricultural Sciences, New Delhi. He has received 39 honorary doctorate degrees from Universities around the world. Tamil Nadu Agricultural University had honoured him with honorary degree of Doctor of Science in its XIV Convocation held on 16th February, 1989. He currently holds the **UNESCO Chair in Ecotechnology** at the M.S. Swaminathan Research Foundation in Chennai, India.

Prof. Swaminathan graduated from this great Historically known Agricultural College and Research Institute of this University in 1947. We are all very proud of you Sir, as an illustrious alumnus of TNAU. The Tamil Nadu Agricultural University and TNAU Alumni Association, Coimbatore feel proud and place on record the very many outstanding achievements of one of its great Alumni and would be privileged to honour itself by honouring this Great Son of India by awarding "**TNAU BEST ALUMNUS AWARD FOR THE MILLENNIUM-2000**".

All the Agricultural Scientists, Teachers, Students and Staff of this almatmater wholeheartedly convey to you Sir, our congratulations and greetings of Millennium New Year 2001, for your great achievements and contributions for Agriculture and Environment.

Amman
April 2000

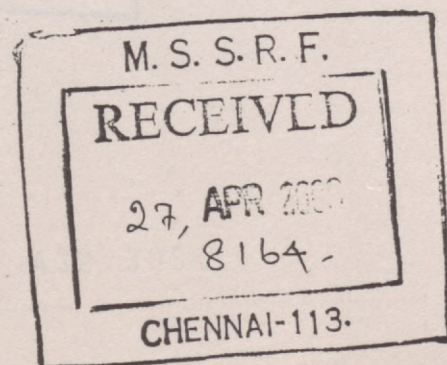
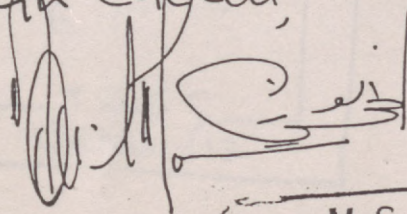
Dear Members of the Secretariat,

It is my privilege to write in support of Dr. M.S. Swaminathan's nomination for the Nobel Peace Prize.

While I had known of Dr. Swaminathan's work for a number of years previously, it was only when I became a member of the International Commission on Peace and Food, which he chaired, that I had the opportunity to witness firsthand his leadership and dedication to improving global wellbeing. Dr. Swaminathan guided the ICPF through five years of international research and debate which culminated in the publication of the report 'Uncommon Opportunities: An Agenda For Peace and Equitable Development', which I had the honor to present to the UN Secretary General in 1994. The goal of the report was to help in accelerating the pace of progress in the evolution of a new human ethic conducive to human beings living in harmony with nature and each other. While hundreds of individuals assisted in the compilation of the report, it was Dr. Swaminathan's drive, vision, his own personal experiences in the field in different countries, and his unwavering natural leadership skills which lead to its successful completion.

Dr. Swaminathan has devoted his life to identifying ecologically sustainable advances in biological productivity, to ensuring food security for all, and to improving the lives of the worlds poor. The list is endless. I hope that you will look favorably upon his nomination for the Nobel Peace Prize; this acknowledgement of a remarkable citizen of the world is truly merited. He is truly an inspiration to us all.

With very high esteem,



SCHOOL OF FORESTRY AND
ENVIRONMENTAL STUDIES

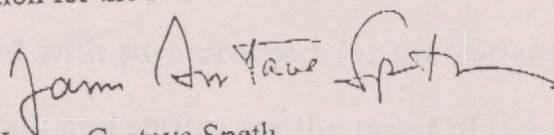
*Sage Hall
205 Prospect Street*

*(203) 432-5100
FAX: (203) 432-5942*

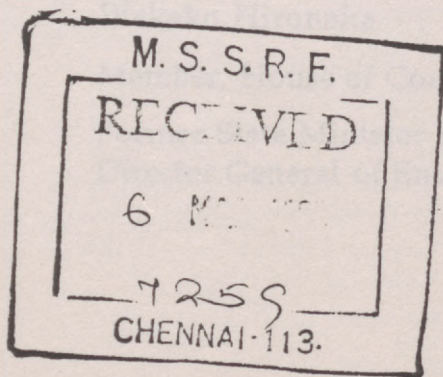
Re: In Support of the Nomination of M.S. Swaminathan for Nobel Peace Prize

No figure in the second half of the 20th Century has done more than M.S. Swaminathan to improve the conditions of life of the world's poor. He has brought an extraordinary humanistic vision and profound commitment to human development to all of his scientific accomplishments. During a period when science has been moving forward with unprecedented success, M.S. Swaminathan has been at the forefront of international and Indian efforts to ensure that those successes translated into better lives for the poor and marginalized. No other figure in recent decades has contributed so abundantly to development that is, in his words, pro-poor, pro-women, pro-job, and pro-environment.

It is a privilege to support his nomination for the Nobel Peace Prize.


James Gustave Speth
Dean

JGS:bb




WAKAKO HIRONAKA
Member, House of Councillors
2-1-1, Nagata-cho, Chiyoda-ku
Tokyo 100, Japan
Tel 03(3508)8403

January 25, 2000

To whom it may concern:

Not only is Dr. Swaminathan a world class scholar in the field of agriculture and pioneer in the Green Revolution, he is a humanist trying to improve the lives of the people by applying scientific knowledge to rural India.

I personally visited one of the "Bio Villages" initiated by the Swaminathan Foundation in the outskirts of Madras and saw happy faces of women, men and children working in the field with sure prospect for the better future. Their shining eyes, enthusiastic talk and smiles are the proof of the success of his humanitarian endeavor.



Wakako Hironaka
Member, House of Councillors
Former State Minister and
Director General of Environment Agency

January 24, 2000

The Norwegian Nobel Committee
The Norwegian Nobel Institute
N-0255 Oslo
Norway

Supporting letter for the nomination of M S Swaminathan for the Nobel Peace Price

We who write this letter are professors at Göteborg university resp. Chalmers university of technology. We are also members of the Royal Society of Arts and Sciences in Gothenburg.

We want to support the nomination of Dr. Monkombu Sambasivan Swaminathan, UNESCO-Cousteau Professor in Ecotechnology for the Nobel Peace Price 2000. Dr. Swaminathan would be an extremely worthy recipient of the Price considering his outstanding research and leadership in agriculture development and resource conservation with emphasis on the disadvantaged and poor in order to eradicate poverty. To eradicate poverty and hunger are primary conditions for a sustainable development aiming at solving our global environmental problems and creating stability and peace on earth. Dr. Swaminathan has devoted his life to increase the food supply and improve the conditions for poor, esp. with emphasis on underprivileged women. He has achieved remarkable results in these areas.

Dr. Swaminathan has tackled the most urgent problems of the poor in the developing countries. How can the food problem be solved without unacceptable impact on the environment and how can poverty be eradicated? His work has through his life been based on a strong conviction that science should try to tackle problems of great relevance to society. He has been a spokesman for research for development with emphasis on the disadvantaged and poor.

From 1972 to 1980 he was Director General of the Indian Council of Agricultural Research and Secretary to the Government of India, Ministry of Agriculture and Irrigation (1979-1980). Later, Dr Swaminathan became a member of the Planning Commission of the Government of India. During these periods he was very instrumental in turning Indian food production from a deficit to a much increased supply, combining modern science in plant breeding with appropriate government policy. During 1982-1988, Dr. Swaminathan was Director General of the International Rice Research Institute (IRRI), Los Banos, Phillipines. There, Dr Swaminathan took an early decision to make use of biotechnology in the rice breeding.

In the 70's he was vice chairman of the Technical Advisory Committee to the Consultative Group on International Agricultural Research (CGIAR). He then successfully argued for an important change of its mission to additionally include "poverty eradication" in its mission "to promote sustainable agricultural development based on environmentally sound management of natural resources". The new wording has strong implications for future research.

Dr Swaminathan has chaired the UN Advisory Committee on Science and Technology for Development, 1980-83. During 1981-1985 he also served as Independent Chairman, FAO Council, dealing with world food security.

After retiring from the Rice Research Institute, Dr Swaminathan returned to India and established the M S Swaminathan Research Foundation in Madras (1988), where he is the Chairman. Its major aims are to integrate the principles of ecological sustainability with those of economic efficiency and social equity in the development and dissemination of farm technologies; to undertake the blending of frontier and traditional technologies in a manner that will improve the opportunities for skilled jobs in both the farm and non-farm sectors; and to develop and introduce technology, knowledge and input delivery and management systems which will enable disadvantaged sections of rural communities, particularly women to derive full benefit from technological progress. As example one can mention the introduction of Bio-Villages in rural areas, where modern and traditional forms of biotechnology research are being applied. Here, the active participation of women is also assured in their traditional conservation of plant genetic resources. The aims of the Foundation express Swaminathan's focus on the concept of sustainability and even a need for a new paradigm of agricultural research with a clear orientation towards the poor as the major target group.

In his early years, Dr. Swaminathan served as a professional geneticist and plant breeder with particular reference to potato, wheat and rice. Later on his involvement in government policy operations widened his interest to include the management of agricultural research and the planning of research strategies at local, national and international levels to better serve agricultural development. He has also been concerned with the management of climate-induced crop production shortfalls. His great concern for human welfare was partly met by the government policy to reach and involve poor and small farmers in agricultural development in the 1960's and early 1970's.

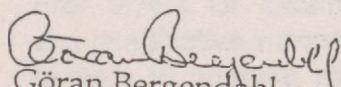
Dr. Swaminathan's emphasis turned towards the new concept of sustainability and how this could be achieved both through increased agricultural productivity and by appropriate attention to environmental issues. Ecology and sustainable development were added to his own research agenda, keeping in mind the population issue. His competence and concern for ecological aspects led to his involvement as Chairman of the World Conservation Union. There he attempted to guide its activities towards an integration of both the production of crops and forest trees and the management of natural resources while conserving biodiversity.

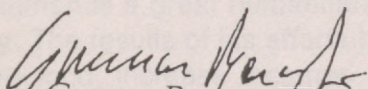
As a plant breeder, Dr. Swaminathan was early to realize the need to combine conservation of plant genetic resources with their utilization. Dr. Swaminathan also saw early on, a need to make better use of local communities in conservation work in India. This led him to be a spokesman for the need to recognize Farmers' Rights (as a supplement to plant breeders' rights and also patents, nowadays) at the FAO in the early 1980's.

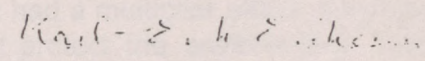
He was active in the clarification and setting of the international rules for access to and use of plant genetic resources. He initiated work for the introduction of ethics and equity in the research process. He has also been active in attempting to develop principles of intellectual property rights.

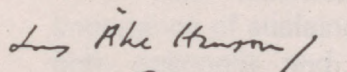
To summarize: Dr M S Swaminathan is an eminent scientist well recognized globally. He has significantly contributed to the insight of how to combine agricultural productivity with justified concern for the environment and biodiversity. His research efforts have resulted in very remarkable contributions to human welfare. By merging modern and traditional sciences in his current endeavours he is proving that natural resource management is possible and can yield practical results both in the farm and the non-farm sectors, in particular for disadvantaged groups. His role in fighting poverty and hunger has been central, important and very productive through his whole life.

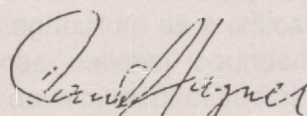
Dr. M S Swaminathan would really be a worthy recipient of the Nobel Peace Prize.

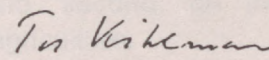

Göran Bergendahl
Business Administration

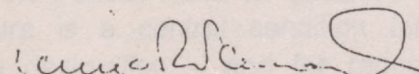

Gunnar Bergström
Ethological Chemistry
And Chemical Ecology


Karl-Erik Eriksson
Physical Resource
Theory


Lars Åke Hanson
Clinical Immunology


Daniel Jagner
Analytical and Marine
Chemistry


Tor Kihlman
Applied Acoustics


Gunnar Weimarck
Plant Taxonomy and
Phytogeography



The Secretary
Nobel Peace Prize Secretariat
Oslo
NORWAY

January 27, 2000

Dear Sir:

Nobel Peace Prize: Nomination of Dr. M. S. Swaminathan

I am honored to support the nomination of Dr. M. S. Swaminathan, President of the M. S. Swaminathan Research Foundation of India, for consideration as a candidate for the Nobel Peace Prize. I have known Dr. Swaminathan in my earlier capacity as the World Bank's Vice President for Environmentally and Socially Sustainable Development and as Chairman of the Consultative Group on International Agricultural Research (CGIAR).

In his statement of nomination, Professor Norman Myers, CMG, has presented a cogent and strong set of arguments, both in broad concept and in details about the candidate's specific achievements. I fully endorse the rationale outlined and developed by Prof. Myers. Dr. Swaminathan is a great humanitarian, an international scientist, and a bold and imaginative visionary. The results of his efforts have had a multiplier effect, helping small farmers to produce more food, increase incomes, and protect the environment. This has resulted in the elimination of major sources of discord and conflict.

The nomination of Dr. Swaminathan rests, first, on an understanding of the importance of sustainable agriculture as a critical factor in contributing to peace and security both nationally and across national boundaries; and, second, on the nature of Dr. Swaminathan's role in the development of sustainable agriculture.

The administrators of the Nobel Peace recognized the importance of agriculture as a determinant of peace and security when it awarded the prize to Norman Borlaug some 30 years ago, for his research which sparked the "green revolution." More recently, a groundbreaking study by the Peace Research Institute of Oslo (PRIO) determined that "the rehabilitation of agriculture is a central condition for development, reducing poverty, preventing environmental destruction – and for reducing violence. Poor conditions for agriculture hold grave implications for socio-economic development and sustainable peace."

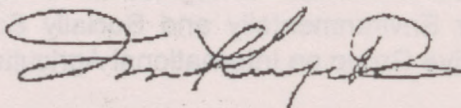
Dr. Swaminathan's contribution to the development of sustainable agriculture is unassailable, and is universally acknowledged, as pointed out by Prof. Myers. Norman Borlaug himself has said that "green revolution research" owes as much to Dr. Swaminathan

as to himself. Since then, Dr. Swaminathan has redefined and redirected the scope of agricultural research towards the achievement of an *evergreen* revolution characterized by a harmonious balance between productivity and natural resources management. He has broadened the concept of agricultural sustainability to include not only considerations of ecology and economics but also of ethics, social and gender equity, and employment generation.

Dr. Swaminathan has also been involved in training a whole new generation of young Indian scientists through his innovative "Biovillage" program that seeks to bring modern technology to rural villages in an environment-friendly and socially-sustainable fashion.

Dr. Swaminathan's efforts and achievements represent an important and effective initiative by an outstanding scientist to mobilize the potential of cutting edge agricultural science to meet the needs and aspirations of the poor; and to do so in a manner that helps to maintain peace and security. I strongly urge his consideration as a suitable candidate for the Nobel Peace Prize.

Sincerely,



Ismail Serageldin
Chairman, CGIAR



र.अ. माशेलकर, एफ.आर.एस

महानिदेशक, वै.औ.अ.प.

एवं सचिव, भारत सरकार

वैज्ञानिक तथा औद्योगिक अनुसंधान विभाग

R.A. MASHELKAR, F.R.S

Director General, CSIR

& Secretary, Government of India

Department of Scientific & Industrial Research

वैज्ञानिक तथा औद्योगिक अनुसंधान परिषद्

अनुसंधान भवन, 2, रफी मार्ग, नई दिल्ली - 110 001

COUNCIL OF SCIENTIFIC & INDUSTRIAL RESEARCH

Anusandhan Bhawan, 2, Rafi Marg, New Delhi - 110 001

No.DG/PS[२३९]/1999-1867

22 October, 1999

Dr.M.S.Swaminathan

Chairman

M.S. Swaminathan Research Foundation

3rd Cross St.,

Taramani Institutional Area

CHENNAI 600 015

Dear Dr. Swaminathan,

As you know, the 87th Indian Science Congress will be held at Pune during 3-7 January, 2000. The Indian Science Congress Association (ISCA) has instituted a number of awards for honouring the great achievers of this nation in diverse fields of activity in Science & Technology and also some other fields, which impact the society.

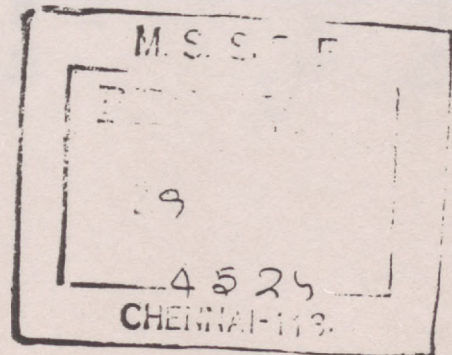
I am happy to inform you that based on the recommendations of the Awards Committee, the Executive Committee of ISCA in its meeting held on 7-8th October, 1999 has unanimously decided to confer on you the **Asutosh Mookerjee Memorial Award for 1999-2000**.

May I very heartily congratulate you on this award, which comes to you as a recognition from the entire scientific community of India for the pioneering contributions that you have made over the years, which has done the nation proud. I do hope that you will kindly accept this award. The details of the award are enclosed separately.

With warm personal regards,

Yours sincerely,

[R.A. Mashelkar]



UNIVERSITY OF WISCONSIN-MADISON

The Board of Regents of The University of Wisconsin System,
on the nomination of the faculty, has conferred upon

MONKOMBU SAMBASIVAN SWAMINATHAN

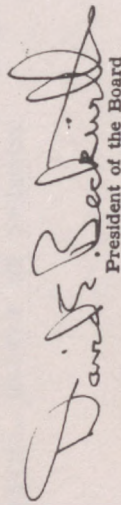
The Degree of

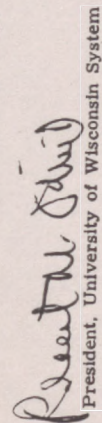
DOCTOR OF SCIENCE

Together with all honors, rights, and privileges belonging to that degree.

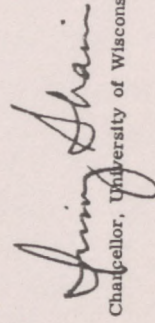
In witness whereof, this diploma is granted. Given at Madison
in The State of Wisconsin, this twenty-second day of May
in the year nineteen hundred eighty-three, and of

The University the one hundred thirty-third.


President of the Board


President, University of Wisconsin System




Chancellor, University of Wisconsin-Madison

C I T A T I O N

MONKOMBU SAMBASIVAN SWAMINATHAN

For over a quarter of a century, M. S. Swaminathan has been a major force in shaping the Indian government's policies in agriculture and environmental affairs. Equipped with post-doctoral work at the University of Wisconsin, he has dedicated his career to preventing famine and ameliorating hunger in his homeland and throughout the world. As a geneticist, he worked for the development of strains of wheat, rice and coarse grains that would flourish in the ecological settings of India. As a public servant, he has had the responsibilities of leadership in the Indian Council of Agricultural Research, the Departments of Agriculture and Rural Development of the Indian government, the Science Advisory Committee to the Indian Cabinet, and the International Rice Research Institute in the Philippines. He has served as President of no less than nine Indian professional societies, including the Indian National Academy of Science.

As a result of his having put science at the service of his people, India, which seemed doomed to mass starvation by this period of its history, now feeds itself by its own efforts. Dr. Swaminathan has been at the center of one of the notable human achievements of our generation.

C O N F E R R A L

MONKOMBU SAMBASIVAN SWAMINATHAN: For your brilliant work in science, which has helped to sustain a great nation, the University of Wisconsin confers on you its honorary degree, Doctor of Science.

BOARD OF TRUSTEES MEETING

September 25, 1997

RESOLUTION

Monkombu S. Swaminathan joined the Board of the Foundation in 1989. An internationally renowned geneticist and agricultural expert, educator, administrator and policymaker, he brought to our deliberations a unique blend of insight, wisdom and perspective.

M.S. was born in the southern Indian state of Tamil Nadu. He earned a Bachelor of Science degree from Coimbatore Agricultural College and a Ph.D. in genetics from Cambridge University. He served in many positions with the Indian government, including Secretary of Agriculture and member of the Government's Planning Commission. For six years he was the Director-General of the International Rice Research Institute in Manila and thereafter he founded the M.S. Swaminathan Research Foundation in Madras, India, which he currently heads. The program and physical structure of the Research Foundation express M.S.'s interests in sustainable development and in the encouragement of young talent. During the course of his extraordinary career, M.S. performed seminal scientific work in genetics and agricultural research and played a pivotal role in India's agricultural development.

The impact of the life and work of this modest citizen of the world is reflected in the many tributes, honorary degrees and prestigious awards he has received. The scientist, Dr. Norman Borlaug, on accepting the 1970 Nobel Peace Prize for his agricultural work in India, acknowledged that but for M.S.'s work on wheat seedlings "it is quite possible that there would not have been a green revolution in Asia." Among the awards that have been bestowed on M.S. are: the first annual General Foods World Food prize, the foremost international award recognizing individual achievement in improving the world food supply; the Magsaysay Award for Community Leadership; and the Sasakawa Environment Prize for lifelong work dedicated to the protection and management of the environment.

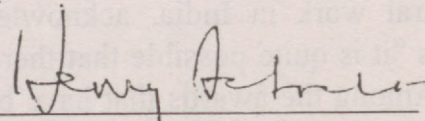
M.S. has devoted his life to many of the subjects that are at the core of the Foundation's program work: sustainable development; education; issues of equity and the role of women; and international collaboration and cooperation. While unassuming, M.S. has never been reticent in speaking with conviction at our

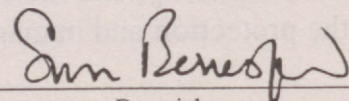
BOARD OF TRUSTEES MEETING

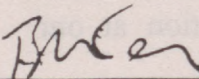
meetings, and he has always done so in a generous and supportive fashion. He has pointed out critical connections between different aspects of our work and identified opportunities for cross-regional learning. He has described both local realities at the village level and their global implications. He has emphasized the importance of biodiversity in the plant and animal kingdoms and has brought to our attention significant parallels in the realms of human behavior and international relations. As Trustee and as Chair of the Urban and Rural Poverty Committee and later of the Asset Building and Community Development Committee, he helped shape our programs in poverty and development.

In M.S., intellectual power is combined with an arresting humility. His unflinching kindness and thoughtfulness are appreciated by Foundation staff at all levels. He has always been cognizant of grantees' perspectives and sensitive to their needs. His judgment and thoughtfulness have made M.S. an unusually effective Trustee and have led to key Committee appointments as well as important assignments relating to the governance of the Foundation. Over the years he comfortably assumed senior trustee status and became a goodwill ambassador and eloquent spokesman for the Ford Foundation. This was especially evident during the visit of the Board to South Africa in 1996.

As we lose M.S. to the rules of retirement, we have no doubt that he will remain active -- indeed overextended -- as he continues the important work of his center in Madras and pursues other missions around the world. We thank M.S. for all he has given us. We also salute Mina, who has long been effectively engaged in issues relating to children, families and education, and has graced our program trips with her zest and intelligence. The two Swaminathans are a formidable force for good, and we extend to them our gratitude and warmest best wishes.


 Chairman of the Board


 President


 Secretary

Prof M S Swaminathan

Prof M S Swaminathan has been acclaimed by TIME magazine as one of the twenty most influential Asians of the 20th century and one of the only three from India, the other two being Mahatma Gandhi and Rabindranath Tagore. He has been described by the United Nations Environment Programme as "the Father of Economic Ecology" and by Javier Perez de Cuellar, former Secretary General of the United Nations, as "a living legend who will go into the annals of history as a world scientist of rare distinction". He was Chairman of the UN Science Advisory Committee set up in 1980 to take follow-up action on the Vienna Plan of Action. He has also served as Independent Chairman of the FAO Council and President of the International Union for the Conservation of Nature and Natural Resources.

A plant geneticist by training, Professor Swaminathan's contributions to agricultural renaissance of India have led to his being widely referred to as the scientific leader of the **farm revolution** movement. His advocacy of sustainable agriculture leading to an ever-green revolution makes him an acknowledged world leader in the field of sustainable food security. The International Association of Women and Development conferred on him the first international award for significant contributions to promoting the knowledge, skill and technological empowerment of women in agriculture and for his pioneering role in mainstreaming gender considerations in agriculture, rural development and biodiversity conservation and management. Professor Swaminathan was awarded the Ramon Magsaysay Award for Community Leadership in 1971, the Albert Einstein World Science Award in 1986, and the first World Food Prize in 1987.

Professor Swaminathan is a Fellow of many of the leading scientific academies of India and the world, including the Royal Society of London, The US National Academy of Sciences and the Royal Swedish Academy of Agriculture and Forestry. He has received 38 honorary doctorate degrees from universities around the world. He currently holds the UNESCO Chair in Ecotechnology at the M S Swaminathan Research Foundation in Chennai (Madras), India.

- (b) Director General, Indian Council of Agricultural Research and Secretary to the Government of India,
- (c) Acting Deputy Chairman, Planning Commission, Government of India,
- (d) Member of the Planning Commission for Agriculture, Rural Development, Science and Education, Government of India,
- (e) Director General, International Rice Research Institute, Los Banos, Philippines,
- (f) Chairman, M.S. Swaminathan Research Foundation, Madras,
- (g) Vice Chairman, Protein-Calorie Advisory Group of United Nations,
- (h) Chairman, U.N. Advisory Committee on Science and Technology for Development,
- (i) Independent Chairman, FAO Council, Rome,
- (j) Chairman, Global Board of Directors, The Hunger Project,
- (k) Chairman, Governing Board, CAB International
- (l) Andrew D. White Professor-at-Large, Cornell University,
- (m) Trustee, World Resources Institute,
- (n) President, International Union for the Conservation of Nature and Natural Resources,
- (o) Chairman, Expert Group for the preparation of a draft national population policy for India,
- (p) Working Group on control of blindness,
- (q) Working Group on control of leprosy,
- (r) Trustee, The Ford Foundation,
- (s) President, XV International Congress of Genetics, and so on.

He is the recipient of numerous international honors and awards. He is an Honorary Fellow of the National Academy of Sciences of India, a Fellow of the Royal Society of London, a Foreign Member of the U.S. National Academy of Sciences, and a Foreign Member of the Russian Academy of Agricultural Sciences, etc.

Scientific contributions of Swaminathan

The early research of Swaminathan and his associates, during the period: 1947-60, dealt with the genetics, cytogenetics, and species differentiation of both non-tuber bearing and tuber-bearing Solanum species. It helped to elucidate the origin of the potato, Solanum tuberosum, the nature of the polyploidy in this taxon, and its interrelationship with related cultivated and wild species. Polyploidy was induced in tuber-bearing species of Solanum and genes for frost resistance were transferred from the wild species, S. acaule, into S. tuberosum.

Cytogenetic and breeding studies in rice included the search for diverse genes for semi-dwarfing, "shuttle breeding" under two contrasting environments, search for male sterile lines for the purpose of developing hybrid rice and the collection, conservation, and classification of rice genetic resources from the Northeastern Himalayas. Much attention was paid to the task of conserving and utilizing wild germplasm and primitive

cultivars. The concept of rice breeding developed by Swaminathan during the 1960s, including the principle of "shuttle breeding", proved the farsightedness of the approach and showed the value of well-planned and concentrated research.

Induced mutagenesis

This subject was reviewed by Pal and Swaminathan (1960) with special reference to wheat breeding. They wrote: "A combination of the effects of duplicate factors at many loci and of functional diploidy in others seems to give rise to a high viable mutation rate in bread wheat." Under Swaminathan's leadership, extensive research was carried out to elucidate several basic problems such as the role of macro- and micro-mutations in sub-specific differentiation of Triticum aestivum, and the standardization of methods for screening spontaneous and induced mutations. Swaminathan and his students carried out wide ranging studies in experimental mutagenesis and indirect effects of radiation using barley, rice, and wheat as test material. Among other aspects, the relationship between polyploidy and radio-sensitivity was studied in detail. Pal and Swaminathan suggested that polyploidy confers on bread wheat the advantage of viability in the face of drastic intra and inter-chromosomal changes induced by radiations. It was found that certain characters like awning and grain color could be changed in bread wheat thereby making the induced mutation technique serve a purpose similar to backcrossing for achieving changes in one character while keeping all the other parental traits intact. Other studies involved a discovery of the mutagenic property of some widely used vegetable oils. Cytogenetic studies of the effects of radiation on cells and whole plants revealed that radio-mimetic products are produced in irradiated seeds and substrates which in turn could enhance natural mutation frequency in barley and Drosophila (Swaminathan et al, 1963). A series of papers using a wide range of test organisms published between 1958 and 1965 aroused considerable interest in view of their implications for the assessment of the wholesomeness of irradiated food material. These findings led to the inclusion of genetic criteria in the assessment of wholesomeness of irradiated food products.

Mutation experiments carried out at the Indian Agricultural Research Institute in all the six hexaploid Triticum species showed that while aestivum forms can be obtained from T. compactum, T. sphaerococcum, T. macha, and T. vavilovi, such types never arise from T. spelta. The investigators suggested that the hexaploid Triticum species are derived from two independent hybridizations followed by chromosome doubling. In this context, it is of interest that J.B.S. Haldane (1959) had emphasized that new species occasionally arise by the formation of a sterile or nearly sterile hybrid followed by a doubling of the chromosomes which renders it fertile but still vigorous.

This is an example of a rapid process of evolution which is in contrast to the Darwinian concept that evolution occurred by imperceptibly small steps.

Wheat Revolution

Swaminathan is best known to the general public as the father of the "Green Revolution". It is entirely due to his tireless efforts and creative genius that India was transformed from a country that was importing food grains to an exporting country. We can thus regard Swaminathan as a rare scientist who made distinguished contributions to both basic and applied genetics.

In the book, Wheat Revolution, which he edited, Swaminathan quoted the first Prime Minister of India, Jawaharlal Nehru, who recognized the urgency of India's food problem long time ago. Swaminathan wrote: "Alarmed at the growing gap between the rates of growth of population and of food production, India's first Prime Minister, Jawaharlal Nehru, said in 1948: "Everything else can wait but not agriculture." Several measures to stimulate food production, including land reform, irrigation, fertilizer production, strengthening of research, and organization of a national extension service, were initiated in the fifties. Production of wheat and rice went up but productivity per unit area of land remained practically stagnant. Enhanced production came from an increase in both total cropped area and irrigated area."

Wheat Revolution is the only authentic account of that exciting period. It is a chronicle of the early steps in green revolution which was led by M.S. Swaminathan, and was narrated by all the original actors themselves including Swaminathan. In 1961, the Government of India initiated the Intensive Agriculture District Programme (IADP) which was to introduce good seeds and a package of agronomic practices and to optimise the benefit from irrigation water. However, one important missing ingredient was the inclusion of varieties which would perform particularly well under those circumstances. The missing ingredient was provided in 1966 through the High Yielding Varieties Programme (HYVP) in wheat, rice, maize, sorghum (jowar) and pearl millet (bajra). Wheat production rose to nearly 17 million tonnes in 1968. Swaminathan described this phenomenon as "land-saving agriculture". It was a truly historic moment because the stagnation in yield which remained at low levels for thousands of years was broken in a dramatic fashion, leading to a great revolution in agriculture!

The discussions in the dialogue, which were published under the title, Wheat Revolution, were held in two different symposia at Madras and New Delhi, in March 1990. They contain three major groups of issues:

- (a) Package of Technology: (includes new varieties, agronomic practices, and post-harvest handling).

(b) Package of Services: (includes the timely supply of seeds, fertiliser, water and credit).

(c) Package of Public Policies: (includes input and output pricing, assured and remunerative marketing, building up of grain reserves and strengthening of rural and techno-infrastructure).

Dwarfing genes

Soon after joining the Indian Agricultural Research Institute in New Delhi in 1954, Swaminathan noted that, in wheat varieties, short and stiff straw was always associated with short panicles with fewer grains. Straw stiffness was an important prerequisite for favorable response to water and fertiliser because the tall wheat varieties that were then cultivated tended to lodge or fall down when fertiliser was applied. Yields remained as low as one tonne per ha at best.

It was during the late '50s that the first papers on the transfer of dwarfing genes from the Norin-10 wheat variety to North American winter wheats were published in the U.S.A. Swaminathan contacted Dr. O. Vogel and Dr. N.E. Borlaug to obtain seeds of semi-dwarf varieties in a spring wheat background. In 1962, a few dwarf spring strains were grown in the fields of the IARI. In Swaminathan's words, "Their phenotype was most impressive. They had reduced height and long panicles, unlike the earlier hybrids ..."

Through Swaminathan's efforts, Dr. Borlaug visited India in 1963 and later sent a wide range of Mexican dwarf wheat material. In 1964, Swaminathan proposed a National Demonstration Programme in farmers' fields for additional confirmation of results and to introduce farmers to the new opportunities opened up by semi-dwarf varieties for increasing the productivity of wheat. What happened afterwards was narrated by Swaminathan himself: "When small farmers, who with the help of scientists organised the National Demonstration Programme, harvested over five tonnes of wheat per hectare, its impact on the minds of other farmers was electric. The clamour for seeds began and the area under high yielding varieties of wheat rose from four ha in 1963-64 to over four million ha in 1971-72. A small Government programme became a mass movement..."

In summary, the success of the "wheat revolution" was due to a five-pronged approach:

- (a) direct introduction of varieties from Mexico which performed well under the growing conditions in India,
- (b) selection of strains from advanced breeding material received from Mexico,
- (c) hybridization between well adapted tall strains and semi-dwarfs having the Norin dwarfing genes,

- (d) transfer of the dwarfing gene(s) to Triticum durum cultivated in Central and Peninsular India, and
- (e) mutational rectification of undesirable traits.

The remarkable speed with which the high-yielding varieties were identified from the initial Mexican material and later developed within the country was the result of the multi-location testing and inter-disciplinary research organised under the All-India Co-ordinated Wheat Research Project of the Indian Council of Agricultural Research."

The Package of Technology

At first, seeds of three varieties, Sonora 63, Sonora 64, and Lerma Rojo 64A (which Dr. Swaminathan had earlier obtained from Dr. Borlaug), were planted at the Indian Agricultural Research Institute (IARI) in New Delhi. In the words of Dr. O.P. Gautam, who was Head of the Department of Agronomy in 1963 when the first Mexican large-scale experiments with semi-dwarf wheat varieties were first initiated, the results were spectacular: "as the tillers came up and we saw the synchronous tillering in that crop, it was a joy. And when we saw its uniform maturity, it was a still greater joy. And by the time the crop flowered and reached the milky stage, people came to see it. Dr. Swaminathan had, at that time, introduced the idea of mass demonstrations and this one-acre plot looked like being a prize plot."

The three varieties clearly not only excelled in yield (more than 60 quntals per hectare) but they also appeared to be completely resistant to disease and pests. What was more important was the fact that this wheat was a short-duration wheat (only 100 days) and could be used for multiple cropping (for instance, "moong-maize-potato-wheat" was the most intensive rotation considered at that time). The fodder requirements were also met as the amount of straw produced was adequate.

After achieving success in initial experiments, Dr. Swaminathan introduced the idea of mass demonstrations and the seed was used for multiplication. In the following years, other improvements were added on to maximise productivity. Tillering and fertiliser response, fertiliser costs, irrigation practices, mechanisation, and the gradual chemicalisation of agriculture, were some of the other issues addressed in the following years when the revolution was advancing in many steps, in many ways, and on all fronts.

The Indica x Japonica Hybridisation Programme

Another research programme which preceded wheat revolution had an impact on the subsequent breeding work with dwarf wheats because the breeding objective became a combination of both response to fertilisers and resistance to a number of pests and diseases. Earlier, in the early '50s, Swaminathan was

involved in a programme called the Indica x Japonica ^{Vice} Hybridisation Programme, which was designed for selecting strains responsive to fertilisers. Its primary purpose was to transfer what were then believed to be genes for fertiliser response from the japonicas to the indicas.

Cooperative movement among scientists

The success of the "wheat revolution" is the result of the combined effort among a number of scientists as well as farmers, government officials and others. It also appears that the cooperation involved the right people at the right time. The scientific disciplines represented include genetics, agronomy, soil science, pathology, physiology, statistics, and economics, to name a few. Of course, no scientific project of this dimension could succeed without the active support of politicians and national leaders. Both Prime Minister Lal Bahadur Sastri and later Prime Minister Indira Gandhi as well as the Union Minister for Food and Agriculture (1964-67), C. Subramaniam, were most supportive of Dr. Swaminathan's efforts.

Transformation of Agriculture

The following is largely based on M.S. Swaminathan's Presidential Address to the Agricultural Sciences Section, Fifty-fifth Indian Science Congress, Varanasi, January 1968. During the late '60s, Indian agriculture underwent a major transformation, from "natural" to "exploitive" agriculture. According to Swaminathan, natural agriculture involves the use of natural factors supported by minimal assistance from man to achieve the survival and productivity of cultivated plants. On the other hand, exploitive agriculture is based on an efficient use of both natural as well as artificially created resources for producing a continuous rise in the yield and income. Several novel scientific developments contributed to this process - genetic engineering, especially the artificial transmutation of genes, chemical technology (fertilisers, hormones, pesticides, etc), water technology, and farm machinery, etc.

Swaminathan discussed the benefit of growing varieties of two crops together in the same field under ideal agronomic practices. For instance, such crops may include the dwarf varieties of wheat or rice and the hybrids of maize, sorghum, or pearl millet. The yield may go up to 20 tonnes per hectare per year, especially when 3 or 4 crops are raised through the adoption of suitable multiple or relay cropping techniques. Such practices offer vast scope for exploiting the potential yield in Indian agriculture which involves about 100 million hectares under food crops. For sustaining high wheat yields, Swaminathan emphasized the use of varietal diversity and a rapid replacement

of varieties. From the material received from Mexico, several rust-resistant strains were selected. For instance, Kalyan Sona, Saonalika, Safed Lerma, and Chhoti Lerma were among the dwarf varieties derived from the Mexical crosses. Among the challenges faced at that time are: (a) scientific and technical innovation, (b) tailoring crop varieties for wide adaptation to suit different agronomic practices and farm conditions, and (c) mass communication and information transfer to large numbers of farmers (including the use of television programmes). The success of the "green revolution" was largely due to a resolution of these and other challenges. No programme could succeed without the support of political leaders. It is to Swaminathan's great credit that he was able to bring together the support of the then Prime Minister Lal Bahadur Sastry as well as the cooperation of numerous scientists, administrators, and farmers in this great enterprise. In his address to the XV International Congress of Genetics (New Delhi, 1983), Swaminathan wrote: "The world population may reach about 10 billion within the next 50 years. If world population is stabilised by then, the new tools of genetics should help us to to see a world without hunger."

References

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Material received from Mexico

S.No.	Material	No. of Lines	Places where sown during rabi 1963
1.	Released varieties	4	Delhi, Ludhiana, Kanpur, Pusa, Pantnagar
2.	Near-East American Spring Wheats	25	Delhi, Ludhiana, Pusa
3.	Highest yielding lines from Sonora	29	Delhi, Ludhiana, Pusa, Wellington, Bhowali
4.	Best F ₇ lines from Sonora	67	-do-
5.	Best F ₅ and F ₆ lines from Sonora	42	-do-
6.	F ₄ progenies from Sonora	30	Delhi, Ludhiana
7.	F ₃ progenies from Sonora	211	Delhi, Ludhiana, Pusa
8.	F ₂ progenies from Sonora	209	-do-

From Wheat Revolution, A Dialogue, Ed. M.S. Swaminathan

Origin of the semi-dwarf wheats

DARUMA
(Japanese semi-dwarf)

FULTZ
(U.S. winter wheat, high yield)

FULTZ-DARUMA
(semi-dwarf, high yield)

TURKEY RED
(U.S. winter, high yield)

LOCALS
(adapted to U.S. Northwest)

NORIN 10
(semi-dwarf, winter, high yield)

GAINES
(semi-dwarf, winter, U.S. adapted)

LOCAL
STRAINS

NEW WHEATS
(semi-dwarf, high yield, adaptable,
rust-resistant, fast-maturing, spring)

Productivity per day in some wheat varieties

<u>Variety</u>	<u>Days in the field</u>	<u>Productivity (Kg/ha/day)</u>
NP 880	151	17.1
Lerma Rojo	153	24.8
S.227	154	34.2
Sonora 64	133	42.5

Wheat yield in rotations involving late sowing

<u>Location</u>	<u>Rotation</u>	<u>Wheat variety</u>	<u>Yield Q/ha.</u>
Delhi	Jowar-Wheat	Sonora 64	42.4
Jullundar	Potato-Wheat	Sonora 64	40.9
		Lerma Rojo	36.2
		Sonora 64	34.4
		Lerma Rojo	33.5
Samastipur	Rice-Wheat	Sonora 64	37.1
Darbhanga	Rice-Wheat	Sonora 64	25.5
Shahabad	Rice-Wheat	Sonora 64	23.2
Delhi	Paddy-Wheat	Sonora 64	55.3



PRIME MINISTER

New Delhi
March 30, 1982

Dear Dr. Swaminathan,

As you prepare to leave for Manila, I should like to express my appreciation of your work in India and also to tell you how much we shall miss you. You have made significant contribution to our scientific and economic policy making. Your role in the strengthening of our agricultural base is not inconsiderable. To your tasks in the Planning Commission you brought deep concern for the nation's realities besides the intellectual discipline of a scientist.

My good wishes to you in the new assignment you have taken up.

Yours sincerely,

Indira Gandhi
(Indira Gandhi)

Dr. M.S. Swaminathan
Member
Planning Commission
New Delhi

INSIGHT...INSIGHT...INSIGHT

Tribute to a hero of the green revolution

Report by
Normita Thongtham

ON the occasion of his receiving the Nobel Peace Prize in 1970, Dr N.E. Borlaug wrote: "The green revolution has been a team effort and much of the credit for its spectacular development must go to Indian officials, organisations, scientists and farmers. However, to you, Dr Swaminathan, a great deal of the credit must go for first recognising the potential value of the Mexican dwarfs (wheat strains). Had this not occurred, it is quite possible that there would not have been a green revolution in Asia."

Wheat and rice-growing countries around the world are indeed heavily indebted to Indian cytogeneticist Dr Monkombu Sambasivan Swaminathan, who has devoted more than 30 years of his professional career to increasing the yield of existing crops. He was the one who introduced the dwarf wheat varieties, which were the foundation of the "green revolution" that produced spectacular increases in India's wheat production.

Last Friday, April 19, at its 43rd graduation ceremony, the Asian Institute of Technology paid its own tribute to Dr Swaminathan when it awarded him an honorary degree, making him a Doctor of Technology. He was also the guest speaker at the ceremony.

Receiving honorary degrees, awards and honours has become routine for Dr Swaminathan, now the director general of the International Rice Research Institute in the Philippines. The honorary doctorate from AIT was the 21st he has received from various universities in India, West Germany, the United States, the Philippines and now Thailand. The recipient of the Ramon Magsaysay Award for Community Leadership in 1971, Dr Swaminathan is flying to Washington this week to receive an award from the Association for Women in Development, for his outstanding contributions to activities which foster development for women. He will be the first ever to receive the award.

Despite all the international awards he has received, the IRRI job is the first and only assignment

the Indian researcher has taken outside his country. "My whole research career was in India, from 1947 to 1982," he said. "India went through a very interesting phase from a begging bowl to a bread basket, and I was happy to be associated with that very important transformation."

But he won't take all the credit for India's green revolution. "That transformation in the 1960s and the 1970s was made possible by the commitment of the political leadership," he said, "especially the late prime minister Indira Gandhi, who gave tremendous support to science and technology, particularly agriculture science."

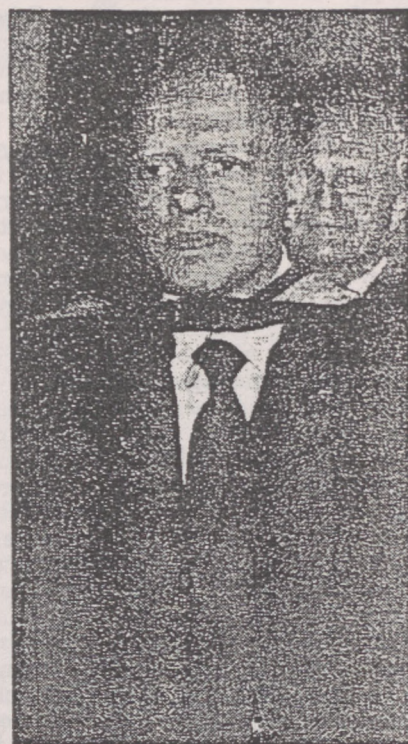
Any project needs three important ingredients for success, said Dr Swaminathan. One is political will, "for it is the political leadership or the government who provide the overall guidance and overall support, and decide on priorities and allocations."

Next is professional skill — a vast army of professionals who are conversant with modern science and technology, and who are committed to the cause of using science and technology for national development.

"But even though you have political will and professional skill, still nothing will happen without people's cooperation and participation, in this case farmers' participation," Dr Swaminathan said.

He joined IRRI in 1983 because, he said, "I am a scientist and at IRRI I will have the facilities to continue my research work in plant genetics. Secondly, rice is an important crop for the whole region, not only India. I feel that in the future it is the rice economy of South and Southeast Asia which will determine largely the future of agricultural economy, because rice can grow under a wide range of conditions."

Rice improvement holds the key to ensuring food security in South and Southeast Asia, Dr Swaminathan believes. Hence IRRI, which has been responsible for the development of short-straw rice varieties that have doubled and even tripled rice production, is forever doing research to improve existing



Above: just the latest in a long line of awards and honorary degrees.

strains. While Dr Swaminathan was in Bangkok, news 10 days ago from the Philippines said IRRI had developed a new strain of rice that can yield up to 24 per cent more grain than the common varieties. The new strain, called IR-64, yields up to 7,000 kilogrammes per hectare more than the IRRI-developed IR-36 and IR-42 commonly grown throughout Asia, the news report said.

Productivity

"What is called the green revolution technology has largely been based upon improving the yield or productivity per hectare of irrigated rice," Dr Swaminathan said. "That kind of area provides more than 75 per cent of the world's rice today but it constantly faces threats like pests, diseases and soil problems," and IRRI has to be always vigilant to defend, maintain and improve the gains already made.

IRRI has also made experiments to extend the benefits of new technology to less favourable environments, like the deep-water areas of southern Thailand and the drought-prone areas of northeastern Thailand. It has developed floating rices for the deep-water areas, and rain-fed rices for areas prone to drought.

Dr Swaminathan believes that for the rest of the century, the famine of jobs and job opportunities will be far more serious than the famine of food in South and Southeast Asia. "With the population still going up, a lot of rural people are unemployed or underemployed. Many women have no jobs, yet unless the woman's income is also added, the family income will be very low.

"Agriculture will not go wrong if farmers are helped, and farmers include the whole farming family. Women play a key role both as decision makers as well as farm workers and farm managers but developing countries' extension service in the past did not fully realise the importance of also taking the latest skills and knowledge to women."

To help rice-farming families, IRRI has initiated a project with support from the Asian Development Bank. Called Prosperity Through Rice, it has three components: showing the farmers how to produce rice at minimum cost; improving their income through mixing farming and crop, livestock and fish production; and producing bio-gas from plant waste materials.

Dr Swaminathan praised the AIT for its excellent remote sensing centre, as well as natural resource and water resource engineering that are the bases of agriculture. "But the greatest contribution from institutions like AIT is the production of manpower — the human resource development. Only trained people have a multiplier effect so you can never measure what the impact of this kind of contribution is." IRRI itself plays an important role in education and training; so far it has trained 3,500 students from 80 rice-growing countries including Thailand.

Although the scientist and his colleagues at IRRI are forever on the look-out for pests and diseases, Dr Swaminathan does not advocate the use of pesticides. "Our approach is based on integrated pest management. IRRI is famous for its pest-resistant varieties. We make crosses to find rices which have a very high degree of resistance to most pests and diseases, or what you call genetic resistance, so that the farmers do not have to buy any pesticide."

IRRI has 75,000 varieties of rice in its collection, called the rice gene bank, from where the rice scientists draw their materials for cross breeding. Many of the genes are of wild rice strains which occur in forest areas and other places

which are continually being destroyed and therefore in danger of vanishing forever.

Other important forms of pest control are through biological control and cultural practices, said Dr Swaminathan. "In nature, most pests have their own enemies so if you spray indiscriminately, you kill the natural enemies. The important thing is not to spray insecticides unnecessarily but to promote the growth of the pests' natural enemies.

"And plant rice in rotation with other crops, particularly a leguminous crop which can fix nitrogen from the air, to break the pest multiplication cycle."

But farmers do need fertiliser to produce a good yield, said the rice expert. One ton of rice requires about 20 kilogrammes of nitrogen, he said, so if you want to produce five tons of rice, your crop has to be given 100 kilos of nitrogen.

"Usually the soils of Thailand and most of Southeast Asia have enough nutrition to support one ton of rice. Then we may be able to add other nutrients to produce two tons through organic matters. But if you want to yield five or six or seven tons, then you have to use some inorganic fertiliser."

Dr Swaminathan does not altogether rule out the need to import insecticides and fertilisers, but in general the policy must be integrated pest management and integrated nutrient supply, he said. And we should not neglect our own local resources such as manures, natural nitrogen from the air, crop rotations and growing of leguminous crops, in addition to the pest management which he mentioned earlier. All these should form part of any government's integrated strategy in production planning, he stressed.

Dr Swaminathan is not only interested in breeding rice, wheat and other economic crops. Late last year he was named president of the International Union for the Conservation of Nature and Natural Resources, and vice president of the World Wildlife Fund, thus putting him in the same league as Prince Philip of Britain and Prince Bernhard of the Netherlands. Prince Philip is president of World Wildlife Fund and vice president of IUCN, posts earlier held by Prince Bernhard.

Swaminathan. "Ecology means remaining in harmony with nature, and agriculture means using natural resources in a sound and scientific way. Therefore, anybody who's interested in agriculture, not only for today but for the future, has to think of the conservation of nature and natural resources. My main job is with IRRI, but I know the importance of conservation and it is my duty to share that knowledge."

The son of a famous surgeon, Dr Swaminathan was born in Tamil Nadu, India, on August 7, 1925. He said he was interested in agriculture because "it is the very basis of our economy in India and in many of the developing countries. Most of the people depend upon agriculture, not only for food but also for income and employment. The rural masses are mostly illiterate so I've always felt that we must get the best of science and technology for rural transformation."

He went to agricultural institutes in India before obtaining his PhD from the University of Cambridge, UK, in 1952. He also received fellowships in Genetics at the Agriculture University at Wageningen, the Netherlands, and at the University of Wisconsin in the US.

But he is not the only one in his family who is dedicated to helping the poor. His wife, Mina, is a teacher of economically handicapped children, teaching vocational skills to construction worker children. Of their three daughters, the eldest, Soumya, is working on her post-graduate degree in paediatrics to better serve child patients; Madhura, who has a degree in economics, works in villages in South India on the role of credit to landless families; and Nitya, the youngest, works with an organisation which helps very poor and destitute women in Hamdabad, Gujarat state of India, by teaching them vocational skills.

"Helping fellow human beings is our mission in life, because it brings the greatest satisfaction, mentally and spiritually. It would be short-sighted to think that we can be happy while millions of people are impoverished and unhappy," said Dr Swaminathan, who, many would agree, is himself a rare breed of the human species.

Applied Ecology

"Agriculture is what you call applied ecology," explained Dr

OUTLOOK PEOPLE

Swaminathan: A rare breed of man

Noted Indian scientist Monkombu Sambasivan Swaminathan, the Father of the Green Revolution and recipient of a long list of honorary degrees and scientific awards, has received a prize yet again for his efforts in increasing the world food supply. But he is unique for another reason, writes Normita Thongtham.

THE world population is approaching five billion but among them it will be difficult to find another Monkombu Sambasivan Swaminathan. As director general of the Philippine-based International Rice Research Institute he is a banker of a different kind: he collects rice genes, of which Thailand has contributed 4,000 varieties. But that is not the reason why he is a rare breed of man.

The Indian cytogeneticist was recently named the recipient of the General Foods World Food Prize, a newly created international award to recognize, encourage and reward outstanding individual achievement in improving and increasing the world food supply. He will receive the coveted prize on October 6 at the Smithsonian Institution in Washington, D.C., it was simultaneously announced in Manila and New York recently by General Foods Corporation and General Food Funds, Inc, sponsor of the award.

Although he is the first to receive the award, the prize is not unique. In fact, receiving awards has become routine for this superachiever, who has been showered with no less than 21 honorary doctorate de-



grees by various universities in India, West Germany, the United States, the Philippines and the Thailand-based Asian Institute of Technology.

He has received an equally long list of scientific awards, including the highly esteemed Albert Einstein World Science Award; the Shanti Swarup Bhatnagar Award of India for his contributions to Biological Sciences; the Mendel Memorial Award of the Czechoslovak Academy of Sciences for his contributions to Plant Genetics; the Birbal Sahni Medal of the Indian Botanical Society for his contributions to Applied Botany; and the Barclay Medal of the Asiatic Society for contributions to Genetics, to name just a few. In 1971 he received the Ramon Mag-saysay Award for Community

Dr Swaminathan in 1985, when he received the Doctor of Technology honorary degree from the Asian Institute of Technology. It was the 21st honorary doctorate he has received from various universities.

Leadership in recognition of his "contributions as scientist, educator of both students and farmers, and administrator towards generating a new confidence in India's agricultural capabilities."

Even Nobel Prize winners paid tribute to him. Agricultural scientist Dr Norman E. Borlaug said it best when he received the Nobel Peace Prize in 1970: "The Green Revolution has been a team effort and

much of the credit for its spectacular development must go to Indian officials, organisations, scientists and farmers. However, to you, Dr Swaminathan, a great deal of the credit must go for first recognising the potential value of the Mexican dwarfs (wheat strains). Had this not occurred, there would not have been a Green Revolution in Asia."

Despite these honours, Dr Swaminathan has always tried to play down his role as an architect of the Green Revolution that swept from Afghanistan to China and throughout Asia — and turned his native India from a begging bowl to a bread basket — in the 1960s and 1970s. And this very humility is what separates him from ordinary men.

Instead of enumerating his own achievements when he was named recipient of the General Foods World Food Prize, he paid tribute to the small farmers of the world, saying, "I would have liked to see the prize go to a farmer, for it is the farmer who toils in the sun and the rain so that the rest of us can exist."

He seemed to have forgotten that without him, the world's farmers would still be struggling with less productive and disease-prone wheat and rice varieties.

When he came to Thailand in 1985 to receive the Doctor of Technology honorary award from AIT, Dr Swaminathan told this writer of his self-appointed mission to help fellow human beings, "because it brings the greatest satisfaction, mentally and spiritually. It would be short-sighted to think that we can be happy while millions of people are impoverished and unhappy." The sincerity in those soft-spoken words was most convincing, but his achievements speak even more eloquently.

Born in Tamil Nadu, India, on August 7, 1925, Dr Swaminathan could have easily followed in his father's footsteps and become a famous surgeon. Instead, he chose to become an agriculturist because "it is the very basis of our economy in India and in many of the developing countries. Most of the people depend upon agriculture, not only for food but also for income and employment."

He went to agricultural institutes in India before obtaining his Ph.D. from Cam-

bridge University in England in 1952. He also received fellowships in genetics at the Agricultural University at Wageningen in the Netherlands, and at the University of Wisconsin in the United States.

For 35 years, from 1947 to 1982, he devoted his life to improving the yield of existing crops ("in collaboration with my colleagues and students," he is quick to say) such as rice, wheat and potato, and disseminating the knowledge to illiterate farmers in a language they could understand.

He has been active in the collection and conservation of plant genetic resources, particularly of rice and wheat, and his discovery of certain genes and the technique of their manipulation triggered the Green Revolution that has increased the yield and improved the lot of farmers.

Despite the international impact of his work, the noted scientist spent the whole of his research career in his native country, where he served in various capacities including that of a teacher, researcher, research administrator and secretary to the government of India. In 1983 he finally accepted an offer to head the International Rice Research Institute in Los Banyos, a university town 65 kilometres southeast of Manila, "because I am a scientist and at IRRI I will have the facilities to continue my research work in plant genetics. Secondly, rice is an important crop for the whole region, not only India. I feel that in the future it is the rice economy of South and Southeast Asia which will largely determine the future of agricultural economy, because rice can grow under a wide range of conditions."

IRRI spearheads the Herculean task of collecting and assembling under one roof samples of all the rice types in the rice-producing world. So far, the gene bank has assembled almost 80,000 types of domesticated and wild rices from all parts of the world, the top contributors being India with 15,000 varieties; Indonesia, 7,800; Bangladesh, 5,300; China, 5,000; and Thailand, 4,000.

IRRI protects the rice seeds from extinction and promotes their use to benefit small subsistence farmers. Each newly-collected rice strain is tested to determine its agronomic

potential and pest resistance, and varieties with desirable genetic traits are used as parents in IRRI's Genetic Evaluation and Utilisation programme of breeding and testing.

Rice improvement holds the key to ensuring food security in South and Southeast Asia, Dr Swaminathan believes. Hence IRRI is continuously doing research to improve existing strains and forever finding ways to increase yields. The strains it has developed are grown throughout the rice-producing countries in South and Southeast Asia.

The man at the helm of IRRI is not only interested in breeding rice, wheat and other economic crops. In late 1984 he was made the president of the International Union for the Conservation of Nature and Natural Resources and vice president of World Wildlife Fund, thus putting him in the same league as Prince Bernhard of the Netherlands, who used to hold both positions, and Prince Philip of England. Prince Philip is president of World Wildlife Fund and vice president of IUCN.

"Agriculture is what you call applied ecology," he patiently explained to this writer, to whom he has kept close contact by regularly sending news of his and IRRI's activities over the years. "Ecology means remaining in harmony with nature, and agriculture means using natural resources in a sound and scientific way. Therefore, anybody who's interested in agriculture, not only today but for the future, has to think of the conservation of nature and natural resources. My main job is with IRRI, but I know the importance of conservation and it is my duty to share that knowledge."

A teacher, researcher, scientist, administrator and the father of the Green Revolution. Dr Monkombu Sambasivan Swaminathan is all that, and more. For, with the exception of the King of Thailand, how many people of his status can you find who derive personal satisfaction, not from accumulating material wealth, but from improving the lot of people in the grassroots level? Not many, and for that reason, Dr Swaminathan is a rare breed indeed.



FOR THE AMAR

MONKOMBU SAMBASIVAN SWAMINATHAN b. 7 August 1925

servant of agriculture

in profound appreciation of his catalytic role in providing deep insights and inspiring fellow scientists to set goals, share experience in the process of social change and transformation to a society which treats of Man at the centre.

for evolving a strategy for agriculture rooted in science, but tempered by concern for ecology and human values.

for the amplitude of his perceptions which has encouraged community effort directed to a synthesis in the movement of agriculture.

COROMANDEL FERTILISERS LIMITED

4 September 1979

UNIVERSITY OF WISCONSIN-MADISON

The Board of Regents of The University of Wisconsin System,
on the nomination of the faculty, has conferred upon

MONKOMBU SAMBASIVAN SWAMINATHAN

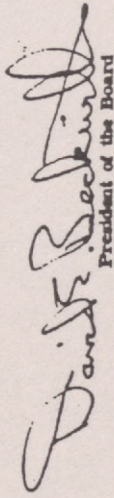
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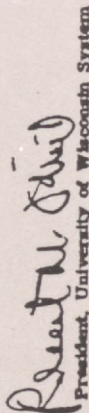
DOCTOR OF SCIENCE

Together with all honors, rights, and privileges belonging to that degree.

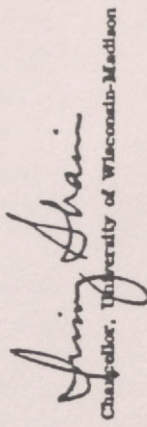
In witness whereof, this diploma is granted. Given at Madison
in The State of Wisconsin, this twenty-second day of May
in the year nineteen hundred eighty-three, and of

The University the one hundred thirty-third.


President of the Board


President, University of Wisconsin System




Chancellor, University of Wisconsin-Madison

C I T A T I O N

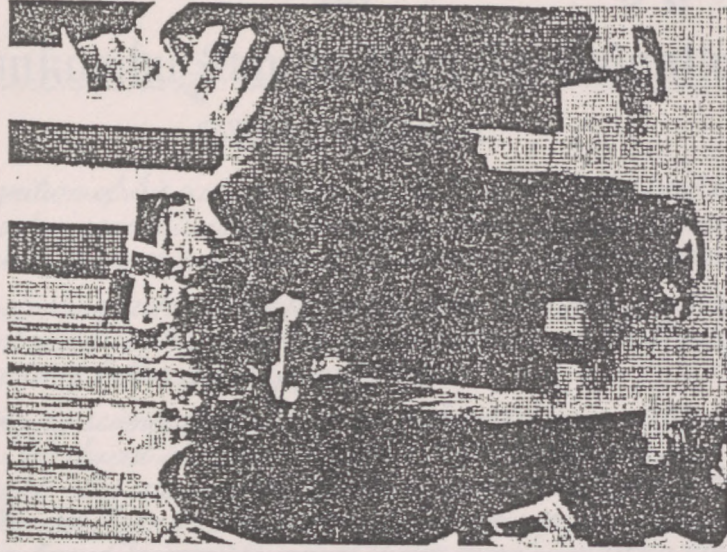
MONKOMBU SAMBASIVAN SWAMINATHAN

For over a quarter of a century, M. S. Swaminathan has been a major force in shaping the Indian government's policies in agriculture and environmental affairs. Equipped with post-doctoral work at the University of Wisconsin, he has dedicated his career to preventing famine and ameliorating hunger in his homeland and throughout the world. As a geneticist, he worked for the development of strains of wheat, rice and coarse grains that would flourish in the ecological settings of India. As a public servant, he has had the responsibilities of leadership in the Indian Council of Agricultural Research, the Departments of Agriculture and Rural Development of the Indian government, the Science Advisory Committee to the Indian Cabinet, and the International Rice Research Institute in the Philippines. He has served as President of no less than nine Indian professional societies, including the Indian National Academy of Science.

As a result of his having put science at the service of his people, India, which seemed doomed to mass starvation by this period of its history, now feeds itself by its own efforts. Dr. Swaminathan has been at the center of one of the notable human achievements of our generation.

C O N F E R R A L

MONKOMBU SAMBASIVAN SWAMINATHAN: For your brilliant work in science, which has helped to sustain a great nation, the University of Wisconsin confers on you its honorary degree, Doctor of Science.



THE UNIVERSITY OF WISCONSIN
CONFERRING
1951

University of the Philippines

TO
Monkombu Sambasivan Swaminathan

GREETINGS:

In recognition of his outstanding contributions to India and the Third World as scientist, educator, agricultural planner and administrator, community leader, international public servant and leading exponent of modern peasant agriculture;

For his sterling achievements in the field of science, particularly in basic and applied plant genetics that resulted, among others, in the breeding of sturdier, more productive and better quality food crops;

For bringing science to bear on one of the most acute problems facing India in this century--the threat of mass starvation and death in the mid-1960s because of a severe drought--by causing the introduction to India of the Mexican dwarf Sonora 64 and Lerma Rojo 64 wheat varieties, improving on them, and convincing India's tradition-bound farmers to adopt them, thereby making possible the Green Revolution on the Indian subcontinent and making India self-sufficient in wheat for the first time in its modern history;

For his enviable record of leadership in the field of Science, having served as president of no less than nine Indian Professional societies, and as a fellow in as many as nine academies of Science all over the world, and for his leadership in international bodies, including service as Chairman, U.N. Advisory Committee on Science and Technology for Development, as President, International Federation of Agricultural Systems for Development (IFARD), and as Director-General of the International Rice Research Institute.

For his work as a gifted agricultural educator, who has imparted the virtues of selfless service and self-reliance to the scores of doctoral and masteral students who have studied under his wing, as well as to the thousands of farmers who have benefited from his teaching;

And for giving others the splendid example of his life as scientist and humanist--a life of integrity and humility, of self-abnegation and total commitment to the welfare of others, especially the poor farmers of Asia, bringing to his work a missionary zeal which is infectious and a sense of dedication which is inspiring, the Board of Regents, by unanimous vote of its members and upon recommendation of the University President and the Committee on Honorary Degrees, today confers upon you the degree of

Doctor of Science

Honoris Causa

In testimony whereof, this diploma and these vestments of distinction of the highest rank of honor in the University of the Philippines are hereby presented to you on this twenty-eighth day of April in the year of our Lord One Thousand Nine Hundred and Eighty-Four and of the University of the Philippines, the Seventy-Sixth.



Edgardo J. Angara
EDGARDO J. ANGARA
President

Attested: *Martin V. Gregorio*
MARTIN V. GREGORIO
Secretary of the University

The Board of Trustees of the

Asian Institute of Technology

Has Conferred Upon

Monkombu Sambasivan Swaminathan

The Honorary Degree of

Doctor of Technology

Given this Nineteenth day of April 1985

Santini M. Veth

President of the Institute



Th. Khoman

Chairman of the Board

CITATION ON THE OCCASION OF THE CONFERMENT OF THE HONORARY DEGREE
OF DOCTOR OF TECHNOLOGY ON MONKOMBU SAMBASIVAN SWAMINATHAN AT THE FORTY-THIRD GRADUATION CEREMONY
OF THE ASIAN INSTITUTE OF TECHNOLOGY

Mr. President, I am honoured to present Dr. Monkombu Sambasivan Swaminathan, Director-General of the International Rice Research Institute, for the conferment of the honorary degree of Doctor of Technology. The Board of Trustees has approved the award in recognition of Dr. Swaminathan's outstanding contributions to the academic and technological development of this region of the world. Indeed, Mr. President, his achievements have been so numerous that I cannot possibly mention all of them in the short space of time allowed to me in this address and I beg his forgiveness for these necessary omissions.

The Asian Institute of Technology exists to find solutions to the technological needs of Asia. There is probably no more important need than the requirement to attain and, in some cases, maintain food self-sufficiency for this region. If present population growth rates continue there will be twice as many Asians alive in 25 years time as there are today. The problems of feeding this vast population will be enormous, particularly since most of the land which is good arable land has, with few exceptions, already been put to the plough. The only possible solutions to this problem lie in the intensification of agricultural production. Either more crops per year must be grown or the yield of existing crops must be increased. It is in this second area that Dr. Swaminathan has made such outstanding contributions. He has, in fact, devoted the whole of his professional career to improving the yield of the staple food grains of this region, and he has been tremendously successful in this endeavour.

He started out in his career as a Cytogeneticist at the Indian Agricultural Research Institute and from 1961 to 1966 was Head of the Botany Division at this Institute. During this period he was made an honorary member of the Swedish Seed Association, was given the Shanti Swarup Bhatnagar award for contributions to biological science and the Mendel Centenary Award from the Czechoslovak Academy of Science.

His talent was soon recognised and in 1966 he became Director of the Indian Agri-

cultural Research Institute, a post he held until 1972. At this time Dr. Norman Borlaug and his team from the International Maize and Wheat Improvement Centre in Mexico (or CIMMYT in short) were making available the dwarf wheat varieties which were the foundation of the "green revolution". Dr. Swaminathan introduced these varieties into India. The results were quite spectacular.

In the decade 1960-1970 wheat production in India more than doubled and in 1978 the country achieved self-sufficiency in food grains. In honour of his achievements during this period he was made a Fellow of the Royal Society of London, of the U.S. National Academy of Sciences, of the Swedish Seed Association, the Indian Academy of Sciences and was made a foreign member of the Lenin Academy of Agricultural Sciences.

From 1972 to 1980 he was Director-General of the Indian Council of Agricultural Research and from 1980 to 1982 was a member of the Planning Commission of India.

He then turned his attention to the major food grain of this region — rice. In 1982 he became Director-General of the International Rice Research Institute in the Philippines (or IRRI as it is known in short) a post which he still holds. IRRI has made possible the revolution in rice yields that CIMMYT made possible for wheat, developing short-straw varieties that are very responsive to fertiliser input and which make it possible to double or even triple yields compared to the traditional varieties. This is work of enormous value for this region.

Mr. President, I have the honour and pleasure, on behalf of the Board of Trustees and the Institute to present Dr. Monkombu Sambasivan Swaminathan for the conferment of the Honorary Degree of Doctor of Technology.

19 April 1985

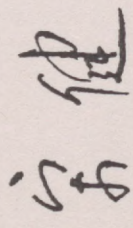
CHINA COUNCIL FOR INTERNATIONAL COOPERATION
' ON ENVIRONMENT AND DEVELOPMENT (CCICED)

**Award for International Cooperation
on Environment and Development**

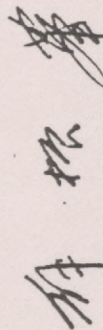
China Council for International Cooperation on Environment and Development
hereby bestows this, its highest award, upon

M. S. Swaminathan

for his outstanding contributions to the lofty cause of environmental protection
and development, and for his signal accomplishments in the field of
international cooperation.


Song Jian

Chairman, CCICED
State Councilor


Nie Zhenhua

Beijing, China
September 23, 1996

Secretary-General, CCICED
Administrator, NEPA

1987

General Foods

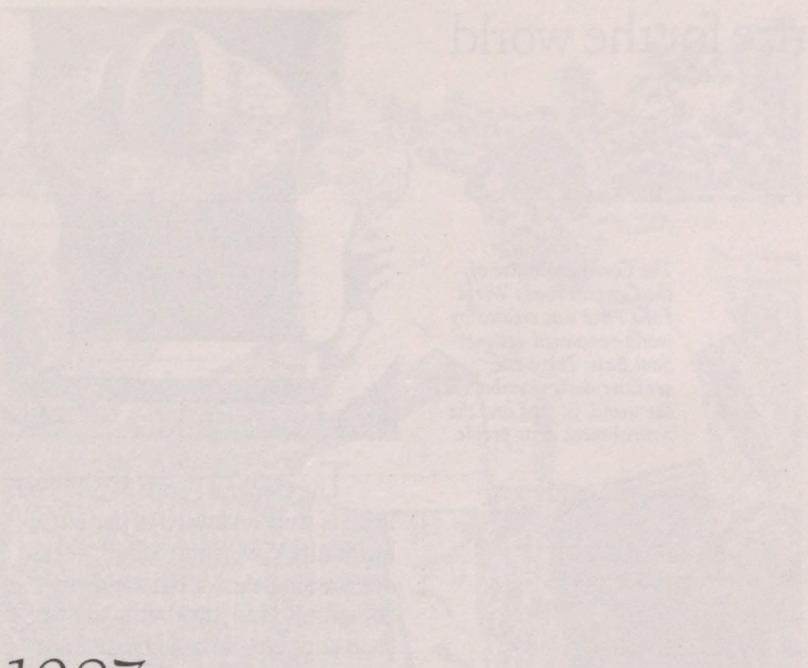
By their fruits the world shall know them.

Dr. M. S. Swaminathan

Director General

International Rice Research Institute

Los Baños, Laguna, Philippines



1987

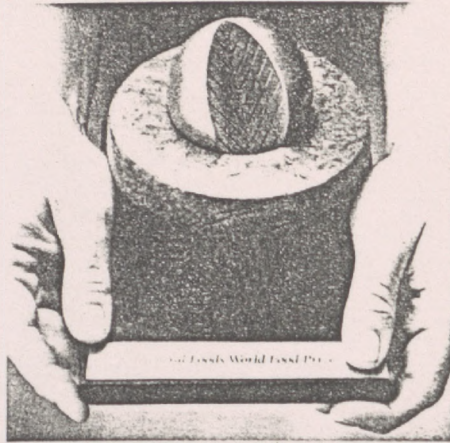
General Foods

World Food Prize

Dr. M. S. Swaminathan
Director General
International Rice Research Institute
Republic of the Philippines

A prize for the world

The Commemorative of the General Foods World Food Prize was created by world-renowned designer Saul Bass. This basic, sensitive design symbolizes the world, its food and the nourishment of its people.



The General Foods World Food Prize is truly an award to benefit all humanity. Given annually, it seeks out the single most outstanding contribution to improving the world food supply – in quality, quantity or availability.

The Prize is not simply international – it is global in scope, seeing our world food

supply as a total system. Feeding the world's far-flung populations involves a fragile and intricate web that extends across the full breadth of our planet – a web that links the African farmer and the Indian scientist, the Italian merchant and the Chinese statesman.

Awarded for the first time in 1987, the \$200,000 Prize rewards achievement in any field that impacts our food chain: the food and agricultural sciences, food processing and preservation, nutrition and genetics, transportation and distribution, agricultural and economic policy.

It is fitting that the first Prize be awarded to a man whose career has contributed to practically every one of these disciplines – Dr. M. S. Swaminathan of India. His brilliant career and humane philosophy have enriched the lives not only of his countrymen, but also of individuals and entire populations across the globe.

M. S. Swaminathan: Scientist, educator, administrator, humanitarian

M. S. Swaminathan, first laureate of the General Foods World Food Prize.



"The word 'impossible' exists mainly in our minds," his father once told him, "but given the requisite will and effort, great tasks can be accomplished." In a career dedicated to alleviating human suffering, Dr. Monkombu Sambasivan Swaminathan has completed the work of many lifetimes.

He is widely recognized as the architect of the "Green Revolution" in India, which radically improved agricultural yields through the introduction of genetically superior grain varieties. This work alone

transformed India from a "begging bowl" to a "breadbasket" almost overnight, nearly doubling the total crop yield from 12 million tons to 23 million tons in four crop seasons.

His enthusiasm for passing on knowledge has earned him a reputation as a lucid educator. And his record of community service and political leadership has won him recognition as a profound humanitarian.

The impact of Dr. Swaminathan's work has reached far beyond the borders of his homeland. His worldwide reputation has made him an apt choice to chair many prestigious international conferences, including the U.N. World Food Congress in Rome in 1974. His foresight and inspiration have led to the establishment of renowned organizations to promote international scientific collaboration, notably the International Union for the Conservation of Nature and Natural Resources (where he currently serves as President), the International Crops Research Institute for the Semi-Arid Tropics, and the International Federation of Agricultural Research Systems for Development – the first significant efforts to promote scientific collaboration in developing countries.

The fruits of his labor

Dr. Swaminathan takes his teaching into the field, enabling small farmers to reap the most benefit from advanced technologies.



India, Dr. Swaminathan's homeland, is a country whose 780 million people comprise 20% of the Third World population; seven out of ten people live in rural areas. Dr. Swaminathan has long held that the key to enhancing the prosperity of India – and many other nations – is to make agriculture the cornerstone of the economy.

In the '60s, as a cytogeneticist and administrator of the Indian Agricultural Research Institute, he made major scientific advances, pioneering solutions to major agricultural problems in Asia. He led the way in introducing high-yielding varieties of wheat and rice to India – starting the "Green Revolution" that subsequently swept Southeast Asia.

By taking this new information to the farmer – at the farmer's level, with field demonstration plots – Dr. Swaminathan bypassed the stumbling block of illiteracy and converted a generation of Indians to a belief in the effectiveness of modern agriculture.

Dr. Swaminathan is noted for his understanding of the breadth of entire food systems. His service in government is testament to this: in several political leadership positions, he established programs of ecological rehabilitation, rural development and technology transfer. His programs effectively helped subsistence farmers reap their fair share

of credit and income while conserving national resources. "Ultimately," Swaminathan states, "it is the political will of the country to have policies in place which will stimulate production by small farmers. Without it, all research, technology ... any external advice will go in vain."

At his side throughout his career has been his wife, Mina, herself a noted author, teacher and community leader.

Today Dr. Swaminathan is Director General of the International Rice Research Institute (IRRI) in Los Baños, The Philippines. Here over 600 researchers from around the world work to increase yields of one of the world's most important food crops.

IRRI released the first improved rice varieties in the mid-1960s; today farmers grow improved varieties on 55% of the Third World's ricelands. Their increased production feeds 650 million more people than earlier varieties would have been able to do.

Dr. Swaminathan has proven that he is not only a brilliant scientist, but a capable administrator as well. His infectious enthusiasm and love of humanity have inspired and motivated thousands of others to give wholeheartedly to the cause he has chosen for his life's work: humbly serving the rural poor.

Born on 7 August 1925 in Kumbakonam in Tamil Nadu, India.

Education

B.Sc. from Tranvancore University (1944).
B.Sc. Agriculture from Coimbatore Agricultural College, Madras University (1947).
Associateship of the Indian Agricultural Research Institute, New Delhi, in Genetics and Plant Breeding (1949).
Ph.D. from the School of Agriculture, University of Cambridge (1952).
UNESCO Fellow in Genetics at the Agriculture University at Wageningen, The Netherlands (1949-50).
Research Associate in Genetics at the University of Wisconsin (1952-53).

Honorary Degrees (D. Sc.)

The Sardar Patel University, Vallabh Vidyanagar (1970).
The Andhra University, Waltair (1972).
The Haryana Agricultural University, Hissar (1973).
The Andhra Pradesh Agricultural University, Hyderabad (1973).
G. B. Pant University, Pantnagar (1974).
Jodhpur University, Jodhpur (1975).
Marathwada Krishi Vidyapeeth, Parbhani (1975).
Kumaon University, Nainital (1975).
Burdwan University, Burdwan (1976).
Agra University, Agra (1978).
Kerala Agricultural University, Trichur (1978).
Sri Venkateswara University, Tirupati (1979).
University of Agricultural Sciences, Bangalore (1980).
Banaras Hindu University, Varanasi (1981).
Technical University of Berlin, West Berlin (1981).
Mahatma Phule Agricultural University, Rahuri (1982).
Chandrasekhara Azad Agricultural University, Kanpur (1982).
University of Wisconsin, Madison, Wisconsin (1983).
Delhi University, Delhi (1984).
University of the Philippines, Diliman, Quezon City (1984).
Asian Institute of Technology, Bangkok (1985).
University of Mangalore, Mangalore (1986).
University of Hyderabad, Hyderabad (1987).

Honorary Professorships

Universidad Nacional Agraria-La Molina, Lima (National Agricultural University of Peru).
University of Mangalore, Mangalore.

Professional Profile

Positions held

Teacher, researcher and research administrator at the Central Rice Research Institute, Cuttack and at the Indian Agricultural Research Institute, New Delhi (1954-72).
Director General, Indian Council of Agricultural Research and Secretary to the Government of India, Department of Agricultural Research and Education (1972-79).
Secretary to the Government of India, Ministry of Agriculture and Irrigation (1979-80).
Acting Deputy Chairman, Planning Commission, Government of India (April-June 1980).
Member (Agriculture, Rural Development, Science and Education), Planning Commission, Government of India (June 1980-April 1982).
Director General, International Rice Research Institute (IRRI), Los Baños, Philippines (April 1982-present).

Honorary positions in international organizations

Vice Chairman, Technical Advisory Committee of the Consultative Group on International Agricultural Research (CGIAR) (1971-77).
Vice Chairman, Protein-Calorie Advisory Group, United Nations (1972-77).

Chairman, First Quinquennial Review, International Rice Research Institute (IRRI) (1976).
Chairman, U.N. Advisory Committee on Science and Technology for Development (1980-83).
President, International Federation of Agricultural Research Systems for Development (IFARD) (1976-83).
Chairman and Member, Board of Trustees, International Council for Research in Agroforestry (ICRAF) (1977-82).
President, International Bee Research Association (IBRA) (1978-84).
Independent Council Chairman, U. N. Food and Agriculture Organization (FAO) (1981-85).
Member, Scientific and Technical Advisory Committee, Tropical Diseases Research, World Health Organization (WHO) (1983-85).
Honorary Vice President, World Wildlife Fund (WWF) (1985-present).
President, International Union for the Conservation of Nature and Natural Resources (IUCN) (1984-present).

Recognition by Scientific Academies

Fellow of the Indian National Science Academy (FNA) (1962).
Fellow of the Indian Academy of Sciences (F.A.Sc.) (1957).
Honorary Fellow of the National Academy of Sciences, India (1976).
General President, Indian Science Congress, Waltair (1976).
Honorary Fellow of the Swedish Seed Association, Sweden (1971).
Fellow of the Royal Society of London (FRS) (1973).
Foreign Associate, National Academy of Sciences, USA (1977).
Foreign Member, All-Union Academy of Agricultural Sciences, USSR (1978).
Founding Fellow, Third World Academy of Sciences (1983).
President, XV International Congress of Genetics, New Delhi (1983).
Foreign Member, Royal Swedish Academy of Agriculture & Forestry (1983).
Foreign Honorary Member, National Academy of Arts and Sciences, Massachusetts (1984).
Foreign Fellow, National Academy of Science of Italy (Accademia Nazionale delle Scienze) (1985).
Fellow of the Royal Society of Arts, London (1985).

Scientific Awards

Shanti Swarup Bhatnagar Award for contributions to Biological Sciences (1961).
Mendel Memorial Award of the Czechoslovak Academy of Sciences for contributions to Plant Genetics (1965).
Birbal Sahni Medal of the Indian Botanical Society for contributions to Applied Botany (1966).
Silver Jubilee Commemoration Medal of the Indian National Science Academy for contributions to Genetical and Agricultural Research (1973).
Barclay Medal of the Asiatic Society for contributions to Genetics (1978).
K. L. Moudgill Prize for contributions to Standardization (1978).
Borlaug Award (1979).
Meghnad Saha Medal of the Indian National Science Academy (1981).
Rathindranath Tagore Prize of Visva Bharati University (1981).
R. D. Misra Medal of the Indian Environmental Society (1982).
R. B. Bennett Commonwealth Prize (1984).
Bicentenary Medal of the University of Georgia, USA (1985).
Albert Einstein World Science Award by the World Cultural Council (1986).

Awards by the President of India

Padma Shri (1967).
Padma Bhushan (1972).

Award for Community Leadership

Awarded the Ramon Magsaysay Award for Community Leadership in 1971, in recognition of contributions as "Scientist, educator of both students and farmers and administrator towards generating a new confidence in India's agricultural capabilities."

Award for serving the cause of Women in Development

In 1985, first recipient of the Award instituted by the Association for Women in Development, Washington, D.C., for "outstanding contributions to activities which foster development for women."

"Krishi Ratna" Award

Awarded in 1986 for serving the farming community by the Bharat Krishak Samaj/World Agriculture Fair Memorial Trust Society. This award was made by His Excellency Giani Zail Singh, President of India, for devotion "to the cause of agro-science" and for "being the benefactor of the farming community throughout the world."

Some Major Contributions

Dr. Swaminathan has worked in collaboration with colleagues and students on a wide range of problems in basic and applied plant genetics and agricultural research and development over a period of 30 years. The results of these research studies have been published in about 200 scientific papers in international journals. Among the more important contributions are:

- Elucidation of the origin and differentiation of potato species.
- Understanding the genetic relationships among wheat species.
- Accomplishment of difficult crosses in potato and jute species.
- Standardization of techniques for the induction of polyploidy (i.e., doubling the number of chromosomes) in several economic plants.
- Elucidation of the factors influencing the induction and recovery of mutations in wheat and rice.
- Identification of the barriers to high yields in wheat and the initiation of the wheat breeding program involving the "Norin" dwarfing genes obtained from Mexico.
- Development of the concepts of "crop cafeterias," "mid-season corrections in crop scheduling," risk-distribution agronomy and alternative cropping strategies for different weather conditions.
- Purposeful manipulation of genes in improving the yield, quality and stability of performance of wheat, rice and potato.
- Development of whole-village or watershed operational research projects based on principles of ecology and economics.
- Development of disaster management strategies based on relief and rehabilitation measures in the "most seriously affected areas" and improved crop productivity in the "most favorable areas."
- Management of the disastrous drought of 1979 as Secretary to the Government of India in the Ministry of Agriculture.
- Collection and conservation of plant genetic resources, particularly of rice and wheat.

Contribution to Education

Over 50 students have done their Ph.D. thesis work under the guidance of Dr. Swaminathan. In 1972 he introduced the "Techniracy" concept of imparting training in the latest technical skills entirely through work experience, in order to bypass the problems created by illiteracy.

General Contributions to National Development

During 1980-82, Dr. Swaminathan chaired the following national committees set up by the Government of India:

- Expert Group on programs for alleviation of poverty.
- Task Force for the study of eco-development in the Himalayan Region.
- Task Force for developing an eco-development plan for Goa.
- Committee for the development of the water resources of Western Ghats.
- Expert Group on perishable agricultural commodities.
- Study Group on fuel wood requirements.
- Working Group on control of blindness.
- Working Group on control of leprosy.
- Chairman, Science Advisory Committee to the Cabinet of India.
- Chairman, National Biotechnology Board.
- Member, National Commission on Agriculture (1971-77).



M. S. Swaminathan and the Green Revolution

THE GREEN REVOLUTION was and is primarily a phenomenon of high-yielding wheat and rice. While it began in Mexico and spread throughout much of the world, it had its greatest impact in South Asia.

More than any other person, M. S. Swaminathan promotes the revolution, bridges the two principal crops, and symbolizes the area. A native of India, he first worked with Borlaug to introduce high-yielding wheat into his own country and then headed the International Rice Research Institute (IRRI) at Los Baños in the Philippines.

Swaminathan is a pleasant, open man, soft-spoken and congenial. A competent scientist and a devout Hindu, he is respectful of his Indian heritage and at home in the Western world. He is an ideal person through whom to understand the Asian transition from a traditional to a modernizing agriculture.

Momkambu Sambasivan Swaminathan was born in 1925 in Kumbakonam, a small town in Tamil Nadu in the south of India, the son of a land-owning surgeon father and a well-born mother. He began studying agriculture to prepare himself for managing the family plantation but soon became deeply interested in science, particularly genetics. He received a bachelor's degree in agriculture from Coimbatore Agricultural College in Madras and went on to the Indian Agricultural Research Institute at New Delhi, concentrating on genetics and plant breeding, completing his study there in 1949. Then followed study abroad, at Wageningen, Netherlands, with the help of a UNESCO fellowship, and at Cambridge, England, where, in 1952, he received his doctoral degree. He did not at once return to India but took a position as research associate in genetics at the University of Wisconsin for two years. He then went back to India and had his first close look at rice as assistant botanist at the prestigious

Central Rice Research Institute at Cuttack in Orissa. After a short stay he accepted a post as cytogeneticist at the Indian Agricultural Research Institute in New Delhi, where he had studied six years earlier. A well-trained geneticist, thirty-eight years old, already established and influential, full of good motives and common sense, he was there in 1963 when Norman Borlaug met him.

Borlaug's wheat had found its way into test plots throughout the world. Swaminathan had observed some of these short-strawed high-yielding varieties in the New Delhi plots. These wheats, which looked so strange alongside the tall Indian lines, resisted rust and responded vigorously to fertilizer and irrigation. They outyielded the native Indian wheats by 2 or 3 to 1. Observant and decisive as he was, Swaminathan moved quickly. With his urging India ordered 10 bushels of seed from Mexico which Swaminathan planted at his Indian Agricultural Research Institute in the fall of 1963. Yield was sensational, so India ordered 250 metric tons seeded on 7000 acres, which produced a very good crop.

On this limited but highly successful experience Swaminathan and Borlaug proposed rapid adoption of the Mexican wheats. A strategy was developed. Swaminathan the scientist became Swaminathan the promoter, the same transformation Borlaug had experienced.

This was the plan: Half the wheat produced on the 7000 acres would go for commercial increase to make more seed available the following year. The other half would go for demonstrations, planted in small plots by hundreds of farmers. Meanwhile, breeding work would go forward to modify the Mexican wheats in accordance with India's special conditions, and there would be a step-up in the training of young scientists. The extension service would pitch in.

A great debate arose. The Mexican wheats had looked good, very good, but should a full commitment be made to the plan outlined by Swaminathan and Borlaug? Counsel was divided. The farmers wanted the wheat, but many of the scientists were dubious about staking so much on a wheat so new, subjected to such limited testing. Suppose there should be an outbreak of some plant disease to which the new wheats proved susceptible and the whole crop were lost? The food supply of the people and the credibility of the officials were at stake. The cultural practices recommended for the Mexican wheat were far beyond the experience of the Asian scientists. Where would the necessary fertilizer come from? Could farmers be taught to fertilize and irrigate properly? The doubters contended, incorrectly, that the Mexican wheats produced less straw—how would the bullocks be fed? The color of the wheat was red, while the Indians preferred amber. Baking qualities were not the preferred ones. With abundant supplies, the price would be driven down. And so on and on.

In all this Swaminathan showed great strength. He lobbied successfully for the new wheats, his own career at stake, and the results of the demonstration-experiment were almost unbelievably successful. Farmers were enthusiastic, doubters were subdued, and India was off to its agricultural transformation.

Efforts to modify the Mexican wheats to meet India's needs were successful. At the Indian Agricultural Research Institute and under Swaminathan's direction, the reddish color was changed to the desired amber by induced mutation, using gamma rays and ultraviolet light. The high-yielding rust-resistant short-strawed characters of the Mexican wheats were retained. This was a scientific achievement of a high order. Crosses were made of native Indian lines with the Mexican wheats, resulting in a number of new varieties superior to both parents. Sharbati Sonora and Pusa Lerma were released. Thus was established an important principle: that the international research centers alone are not enough; they can be most effective when their work is associated with strong national research efforts.

There is one very precious thing about the wheat experience in Asia. The newly introduced wheats were called "the Mexican wheats," not "the Rockefeller wheats" or "the American wheats," though the Rockefeller Foundation had supplied the money for the Mexican initiative and Borlaug had done his original study in America. The Rockefeller people had the grace and wit to buoy up the Mexicans and the Indians rather than claim credit for themselves. By so doing they increased the acceptability of the new wheats abroad and elevated the morale of the Mexicans.

Indian wheat production, which had stood at 12 million tons in 1964-65, more than trebled in eighteen years, reaching 42 million tons by 1982-83 in a country that supposedly was tradition bound. It was this amazing increase that, more than anything else, averted the mass starvation that had been widely predicted for India.

The high-yielding wheats spread to other countries. By the mid-1980s, more than half the wheat area in the Third World was sown to the high-yielding varieties. Swaminathan and Borlaug, one from the East and the other from the West, teamed up to transform wheat production. There is symbolism here as well as agricultural history.

India produces twice as many tons of rice as it does wheat. Worldwide, the two leading staple foods are wheat and rice, the two staffs of life, and it is questionable whether we lean on one more than on the other.

Major trends were under way in the mid-twentieth century and new perceptions emerged. There was growing concern about world hunger. In South Asia, most of the tillable land was already in use. Agricultural

science was spreading throughout the rice-growing area but rice yields had changed very little. An able cadre of Asian agricultural scientists had been formed but rice production had been little affected.

The idea of international agricultural research took hold. The principles of heredity know no national boundaries. Promising genetic material is not likely to be confined to any one country. The basic agricultural disciplines—physics, chemistry, biology—are not location specific. Epidemic plant diseases are a concern to all nations that grow the affected crop.

Recognition of these facts and action thereon came together in 1962 when the IRRI was dedicated in the Philippines with the collaboration of the two American founding agencies, the Rockefeller Foundation and the Ford Foundation, assisted by the facilities generously provided by the government of the Philippines. The objective was to improve rice. The multidisciplinary, mission-oriented, international approach used successfully in Mexico for wheat would be used in Asia for rice.

By the time IRRI was founded, rice scientists knew that there was a short-strawed variety of rice in Taiwan named Dee-geo-woo-gen. An immediate and credible hypothesis was that the short-strawed rice from Taiwan might have a yield-enhancing capability. Acting on this hypothesis, crosses were made and were successful. A new variety of rice was bred having double the yield potential of the traditional rice plant. The first variety, IR8, was released in November 1966, only four years after IRRI was established. It proved equal to its promise and became the "miracle rice" known throughout the world. It had a prodigious appetite for nutrients, stood erect despite heavy applications of fertilizer, and yielded amazingly well.

Subsequent varieties had better grain quality, greater resistance to insects and diseases, more variation in length of growing season, and improved adaptation to specific locations. In India, rice production had stood at 46 million tons in 1966 and rose to 80 million tons in 1980. By the mid-1980s more than half the Third World's rice area was planted to the high-yielding varieties.

The IRRI scientists, many of whom are Asians, worked at developing equipment and technology to accommodate the requirements of the high-yielding rice with minimal disturbance to established ways of doing things. Threshing machines have been developed that are small and portable, picked up and carried by two men. Dusters are of the knapsack type, suited to small fields. Tillage equipment is small-scale, as are grain driers.

Rice culture probably provides the greatest contrast in methods of any crop. In the United States rice fields are leveled with the help of laser beams, seeded from airplanes, and harvested with self-propelled com-

bines. In Asia the typical tools are the mattock (tillage), the human hand (planting), and the sickle (harvest). Yet the production costs of the two systems, taking account of alternative opportunities, are similar. Asian rice competes effectively with American rice.

While all these changes were beginning for rice, Swaminathan was working away at the wheat revolution in India. Rice and wheat, both self-pollinating crops, call for similar plant-breeding procedures, so he had potential skills for rice.

In 1982, when Robert Chandler retired as director general of IIRI, the institute turned to Swaminathan, then fifty-seven years old. The wheat revolution was then well under way and Swaminathan the scientist-promoter was ready for a new challenge. He joined a going organization, adding his own prestige to it.

The Green Revolution has evoked both applause and criticism. Approval has come from those concerned with producing food and overcoming hunger. Disapproval comes from those whose prime purpose is to reduce inequalities in income among rural people. The high-yielding varieties generate deep-seated change, which conservatives mistrust and venturesome people accept. The Green Revolution has profound influence on established institutions. The terms for the division of the crop between landlord and tenant become outdated and need changing. With double-cropping the seasonal rhythm of rural activity is transformed. Some farmers are demoted from tenants to laborers as the landlords themselves undertake the now profitable farm operation. Some laborers are unemployed as a result of mechanization. Heavier production means lower prices. Problems of shortage may be replaced by problems of surplus which, though the more tractable of the two, are problems nonetheless. The disadvantaged and the dispossessed form the nuclei of dissident groups.

But these aspects of the Green Revolution, if dwelt upon, can immobilize the will, defy the existing state of affairs, negate every proposed change, and predispose a country to famine. Anyone who has visited the less-developed parts of the world and has seen hunger at close range will hesitate not a moment in trying to increase the availability of food. If this effort brings with it some associated problems, they are next in line for treatment.

The countries of the Third World look on IIRI as a major resource in the battle to overcome hunger. In April 1983 Dr. Swaminathan went to Beijing, China to receive the prize given by the Third World to IIRI for "its scientific contribution to improving the productivity of rice and rice-based cropping systems." The citation stated, in part, "IRRI's quiet, persistent, highly professional and wholly dedicated work touched the lives

of millions in the Third World, improving the human condition in truly practical and lasting ways."

IRRI is an institutional invention of the first magnitude. The successes of IIRI in the Philippines and CIMMYT in Mexico have led to establishment of eleven additional institutes. The total list:

CIAT: Centro Internacional de Agricultura Tropical, Colombia
 CIMMYT: Centro Internacional de Mejoramiento de Maíz y Trigo, Mexico

CIP: Centro Internacional de la Papa, Peru

IBPGR: International Board for Plant Genetic Resources, Italy

ICARDA: International Center for Agricultural Research in the Dry Areas, Lebanon

ICRISAT: International Crops Research Institute for the Semi-Arid Tropics, India

IFPRI: International Food Policy Research Institute, United States

IITA: International Institute of Tropical Agriculture, Nigeria

ILCA: International Livestock Center for Africa, Ethiopia

ILRAD: International Laboratory for Research on Animal Diseases, Kenya

IIRI: International Rice Research Institute, Philippines

ISNAR: International Service for National Agricultural Research, Netherlands

WARDA: West Africa Rice Development Association, Liberia

The thirteen centers are supported through the Consultative Group on International Agricultural Research (CGIAR), an international consortium of thirty-three governments and private agencies dedicated to the support and improvement of agricultural research in the Third World. By the mid-1980s there were about seven thousand persons employed within this network, including more than six hundred senior scientists from forty nations, having an annual budget of more than \$200 million.

The major institutional inventions (the Experiment Station Systems of various countries and the International Research Centers of the Third World) provide quantum improvement in the world's food system. Using these agencies Dr. Swaminathan, Indian scientist, fights hunger and appears to be winning.

There has been no major famine in India since the high-yielding varieties of wheat and rice were introduced. There is no known previous period of equal length in India's history of which this can be said. During the later years of that period India outgrew, one hopes permanently, its need for food assistance from abroad. All of this happened despite phe-

nominal population growth. Credit for so significant an achievement must be shared by many—farmers, educators, government administrators, agribusiness firms, providers of food assistance, and, perhaps most significantly, agricultural scientists. Among these latter Swaminathan merits special recognition.

On June 18, 1987, Swaminathan was named winner of the first annual General Foods World Food Prize, an honor that carried with it an award of \$200,000. The prize is intended "to recognize and reward those men and women who have made outstanding contributions to expanding and improving the quality, quantity, and availability of food throughout the world."

As this is written Swaminathan is again in India, assisting his native country in meeting the food problems that result from the 1987 drought.

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Professor M S Swaminathan First Recipient of the World Food Prize

Professor M S Swaminathan described as 'a living legend' by Mr. Javier Perez de Cuellar, the former Secretary General of the United Nations, is one of the leading agricultural scientists in the world. He is the first recipient of the World Food Prize in 1987 - the most prestigious international award in the field of agriculture which honors outstanding individuals who have contributed toward the improvement of the world food supply.

Professor Swaminathan was born in the state of Tamil Nadu in India. He obtained a B.Sc. from both the Travancore and Madras Universities, and in 1952 he received a Ph.D. in genetics from Cambridge University. He has since worked on various problems in the field of agriculture and has made major scientific discoveries, which have served as pioneering solutions to many agricultural problems in Asia. He was the first to introduce high-yielding varieties of wheat and rice in India - thus playing a key role in the country's 'Green Revolution' between 1960 and 1982. He also standardized the techniques for the induction of polyploidy in some economic plants, elucidated the factors influencing the induction and recovery of mutations in wheat and rice, identified the barriers to high yields in wheat, and initiated the wheat breeding program involving the 'Norin' dwarfing genes from Mexico. Professor Borlaug who won the Nobel Peace Prize in 1970, credited Professor Swaminathan for recognizing the potential value of the dwarfing genes with the following words: 'The green revolution has been a team effort and much of the credit for its spectacular development must go to the Indian officials, organizations, scientists and farmers. However, to you, Dr. Swaminathan, the great deal of credit must go for first recognizing the potential value of the Mexican dwarfs. Had this not occurred, it is possible that there would not have been a green revolution in Asia.'

Professor Swaminathan has held various prestigious positions. He was the Director General of the Indian Council of Agricultural Research, and Secretary to the Government of India, Department of Agricultural Research and Education from 1972 to 1980. He has served as the Director General of the International Rice Research Institute in Los Banos, the Philippines, from 1982 to 1988. The Philippines president awarded him the Golden Heart Presidential Award in 1987 for his contributions in resolving a wide range of problems in basic and applied genetics and agricultural research and development in the country. Professor Swaminathan was also the Chairman, United Nations Advisory Committee on Science and Technology for Development from 1980 to 1983; President, International Federation of Agricultural Research Systems for Development (IFARD) from 1976 to 1983; President, International Bee Research Association (IBRA) from 1978 to 1990; Independent Chairman, Food and Agricultural Organization from 1981 to 1985; Chairman, Governing Board, CAB International from 1991 to 1994; Andrew D White Professor-at-Large of Cornell University from 1989 to 1995; and Trustee of the Fort Foundation from 1989 to 1997. He has also been actively involved in numerous organizations devoted to nature conservation and sustainable development. Professor Swaminathan who is a Fellow of the Royal Society of London, the US National Academy of

Sciences, Indian National Academy of Sciences, Chinese Academy of Sciences, Russian Academy of Agricultural Sciences, was the President of the Indian National Academy of Sciences (1988 to 1990), and President of the Indian National Academy of Agricultural Sciences (1991 to 1996).

In recognition of his outstanding contributions, he received the following awards from the Indian President - the Padma Shri award (1967), the Padma Bhushan award (1972), and the Padma Vibushan award (1989). He also received the Mendel Memorial Medal from the Czechoslovak Academy of Sciences in 1965; Ramon Magsaysay Award for Community Leadership in 1971; Bennett Commonwealth Prize from the Royal Society of Arts in 1984; Bicentenary Medal from the University of Georgia in 1985; and the Albert Einstein World Science Award by the World Cultural Council in 1986. In 1991 Professor Swaminathan received the Tyler Prize for Environmental Achievement and also the Honda Prize from the Honda Foundation in Tokyo. In 1994 he received the Asian Regional Award from the Asian Productivity Organisation, the Sasakawa Environment Prize, and a special award from the World Academy of Art and Science. The Climate Institute in Washington DC awarded him with the Global Environmental Leadership Award in 1995. In 1997 he received the highest award for International Cooperation on Environment and Development from China. He also received the *Ordre du Merite Agricole* in France in 1997. This award was created in 1883 to honor persons who have rendered services of the highest quality to the cause of agriculture and its development and amelioration. In 1998, the Board of Trustees of the Missouri Botanical Garden awarded him the Henry Shaw Medal for his services to humanity through the emphasis on sustainability in agriculture.

Professor Swaminathan has been awarded honorary degrees by many universities in the world including the Technical University of Berlin, University of Wisconsin in Madison, University of the Philippines in Quezon City, the Agriculture University in Wageningen, The Netherlands; North Eastern Hill University in Shillong, USA; University of Bologna in Italy; and the Hebrew University in Jerusalem. Besides this, numerous universities in India have also awarded him with honorary degrees. In 1996, UNESCO designated him as the UNESCO-Cousteau Professor in Ecotechnology for Asia.

Professor Swaminathan, is currently the UNESCO Chair in Ecotechnology and Chairman of the MS Swaminathan Research Foundation, which is an institution devoted to strengthening the ecological security of coastal areas and the livelihood security of rural and tribal communities. In 1996, the institution was the first in Asia to receive the Blue Planet Prize.

'Dr. Swaminathan is a living legend. His contributions to agricultural science have made an indelible mark on food production in India and elsewhere in the developing world. By any standards he will go into the annals of history as a world scientist of rare distinction.'

Mr. Javier Perez de Cuellar, former Secretary General of the United Nations

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